

Durham E-Theses

*The Theorist: Thomas Burnet and his sacred history
of the earth*

THOMAS ROSSETTER

How to cite:

ROSSETTER, THOMAS (2019) *The Theorist: Thomas Burnet and his sacred history of the earth*.
Doctoral thesis, Durham University.

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a <https://etheses.durham.ac.uk/id/eprint/13080/> is made to the metadata record in Durham E-Theses
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full Durham E-Theses policy](#) for further details.

The Theorist: Thomas Burnet and his sacred history of the earth

Thomas Rossetter

Thesis submitted for degree of Doctor of Philosophy

Department of Philosophy

Durham University

2019

Abstract

Thomas Burnet's *Telluris theoria sacra* and its English translation the *Theory of the earth*, published in two volumes between 1681 and 1690, was one of the most widely-discussed and controversial philosophical and theological works of late-seventeenth-century England. In it, Burnet attempted to trace the earth's history from the Creation, through the Deluge, Conflagration, and Millennium, to the final consummation. Despite its notoriety, a full, in-depth study of this work has yet to be produced in English. This thesis is a first step to providing such a study. The thesis is composed of six chapters. The first offers a detailed overview of the *Theory's* two volumes and their historical context. Chapter two examines its philosophical, theological, scriptural, and antiquarian foundations. The third chapter looks at two early responses to the work, Burnet's replies to these responses, and his hugely controversial supplement to the *Theory*, the *Archaeologiae philosophicae*, published in 1692. Chapter four examines the so-called "Burnet controversy", a proliferation of writings which emerged following the publication of the *Archaeologiae* and which attacked the *Theory* and proposed alternative philosophical accounts of the earth's history. The final two chapters explore the relationship between Burnet and two important Newtonians who were involved in the controversy, chapter five discussing William Whiston's 1696 *New theory of the earth* and the sixth and final chapter analysing John Keill's attack on and subsequent debate with Burnet.

Thesis title: The Theorist: Thomas Burnet and his sacred history of the earth

Number of volumes: 1

Name: Thomas Rossetter

Qualification submitted for: Doctor of Philosophy

Department: Philosophy

Institution: Durham University

Year: 2019

Contents

Statement of copyright	viii
Acknowledgements	ix
Introduction	1
1. The <i>Theory</i>	12
1.1. Introduction	12
1.2. A brief, sacred history of the earth	15
1.3. Book one: The Deluge and Creation	22
1.4. Book two: The antediluvian earth and Paradise	42
1.5. Book three: The Conflagration	52
1.6. Book four: The Millennium	65
1.7. Conclusion	70
2. Reason, Scripture, and antiquity	72
2.1. Introduction	72
2.2. Reason part one: Burnet's Cartesianism	74
2.3. Reason part two: Burnet's rational theology	90
2.4. Scripture	113
2.5. Antiquity	128
2.6. Conclusion	133
3. A prologue to a controversy: Croft, Warren, and the <i>Archaeologiae</i>	135
3.1. Introduction	135
3.2. Some <i>Animadversions</i> and a <i>Review</i>	137
3.3. The <i>Geologia</i> , an <i>Answer</i> , a <i>Defence</i> , a <i>Short consideration</i> , and some <i>Reflections</i>	153
3.4. The <i>Archaeologiae</i>	165
3.5. Conclusion	187
4. The Burnet controversy	189
4.1. Introduction	189
4.2. The reception of the <i>Archaeologiae</i>	191
4.3. Attacks on the <i>Theory</i>	195
4.4. New theories and their opponents	200
4.5. Peripheral comments	209
4.6. Unpublished remarks	211
4.7. The reception of the second volume	219

4.8.	Conclusion	226
5.	Burnet and the Newtonians part one: Whiston's Newtonian-Burnettian synthesis.....	228
5.1.	Introduction.....	228
5.2.	<i>A more sacred theory of the earth</i>	232
5.3.	The Newtonian influence.....	239
5.4.	The Burnettian influence	242
5.5.	Newtonian miracles and Burnettian motivations.....	255
5.6.	Whiston vs. Keill	260
5.7.	Conclusion	282
6.	Burnet and the Newtonians part two: Keill's <i>Examination</i> and "T.B."s <i>Reflections</i>	284
6.1.	Introduction.....	284
6.2.	Keill's <i>Examination</i>	286
6.3.	Attacking Cartesianism and courting patronage.....	297
6.4.	Some <i>Reflections</i> and a second <i>Examination</i>	307
6.5.	Burnet, Whiston, Keill, and theories of the earth in eighteenth-century England	330
6.6.	Conclusion	337
	Conclusion	339
	Appendix: A Remark on a Passage in Dr. Burnets <i>Telluris Theoria Sacra</i> pag. 108 Edit. Lat.	342
	References	346
	Primary sources.....	346
	Secondary sources.....	356

Statement of copyright

The copyright of this thesis rests with the author. No quotation from it should be published without the author's prior written consent and information derived from it should be acknowledged.

Acknowledgements

When I type the word “thanks” into my phone, the word that unfailingly comes up next on predictive text is “Pete”. The Pete to whom my phone refers is Pete Vickers, my primary supervisor. Pete’s tireless reading of numerous chapter drafts and helpful and insightful comments on and conversations about my work have helped immeasurably in the development of my ideas and have added valuably to the quality of the finished product. His positive outlook on the project and frequent words of encouragement, moreover, have been indispensable during the many periods when my own positivity and energy was in perilously short supply. I thank Pete also for providing me with the opportunity to do a PhD in the first place by giving me the studentship on his Arts and Humanities Research Council project *Contemporary scientific realism and the challenge from the history of science*. This has been a truly fascinating and fun project to be a part of, and although my thesis has little connection with it – and I thank Pete again here for allowing me the freedom to pursue my own interests – I hope that my other contributions to the project’s output have compensated for this in some measure. I thank both him and his wife Laura, too, for inviting me to their home during the holidays for a great meal and a fun kickaround with their football-loving son, a day that provided some much-needed respite from an otherwise solitary Christmas of intense thesis writing.

Less directly involved in my thesis but no less important is my secondary supervisor, Matthew Eddy. Matthew has provided me with numerous important comments on drafts of my work and with countless hours of enjoyable and inspiring conversation about both my PhD work and the history of science and religion more generally. His impressive bibliographic knowledge has been of vital importance in alerting my attention to several primary and secondary sources which may otherwise have passed me by, and which have served greatly to improve the finished product. Matthew was also my master’s supervisor, and during that degree I learned from him countless important lessons about

historical scholarship without which this thesis – and indeed my work more generally – would be vastly inferior and for which I am extremely grateful.

Having been in Durham's Department of Philosophy not only for my PhD and MA but also my BA, there are many other members of the Department to whom I am greatly indebted, and from whom I have learned many important lessons which have been vital to my intellectual development. In addition to this, during all three degrees I have experienced some incredibly difficult periods, and without the understanding and support of many of the Department's staff, both academic and administrative, I certainly would not have made it this far. I thank in particular Robin Hendry, my undergraduate supervisor, from whom I have learned many important aspects of the history and philosophy of science and with whom I have spent many enjoyable moments, both in academic and licensed retail environments. I thank also Holger Maehle, Andreas Pantazatos, Alex Carruth, Andy Hamilton, Simon James, Cheryl Lancaster, Sophie Gibb, Richard Stopford, Ben Smith, Jonathon Gilderoy, and several past members of the Department. Most important among the latter are Jill Lockey, whose help and understanding during certain periods of crisis has been absolutely indispensable, and Daniel Becker and Ian Kidd, who first sparked my interest in the history and philosophy of science through their fascinating and adeptly-delivered lectures in a first-year undergraduate module which I very nearly didn't take and was soon glad that I'd changed my mind at the eleventh hour. I thank also the Department's frequent visitor, Alan Chalmers, with whom I have enjoyed numerous conversations about the history and philosophy of science which have shaped and developed my own interests in many important areas. I am indebted, too, to my fellow research students, in particular my fellow historians of science, medicine, and philosophy, Can Wang, Jay Bosanquet, Rachel Dunn, Ursula Mulcahy, and Tom Bunce, whose conversation and presence at my talks and workshops have been greatly appreciated. And though our research interests do not coincide, I am thankful to Andrew Woodard and Jamie Taylor for their friendship and humour, and to the latter for his valuable aid in navigating the absurd complexities of Microsoft Word while preparing my thesis for submission.

The Department of Philosophy is not the only Durham University department with which I have been involved. Equally important is the University's Foundation Centre, of which I am incredibly fortunate to have been a part, both as student and teacher. The Centre's efforts at widening participation at a university known for its exclusivity are nothing short of heroic, and I am greatly indebted to Steve Leech, Catherine Marshall, Alison McManus, Olwyn Hazelton, Megan Bruce, Ian Moreton and several other members of the Centre, both past and present, for many things. In the first place, it was the Foundation Centre that gave a twenty-nine-year-old with no A-levels and nothing to recommend himself other than a keen interest in philosophy the opportunity to do a degree at Durham, and who furnished me with all the necessary knowledge and skills to perform both at undergraduate level and beyond. My foundation year was one of the most interesting and enjoyable of my life so far, and the knowledge I acquired on several subjects from teachers of the highest quality during that year has been drawn upon ever since in a variety of contexts and will continue to be. I am grateful also for the opportunity the Centre has given me to teach and interact with many new, intelligent, interesting, and enthusiastic students from "non-traditional" backgrounds like myself.

An equal debt of gratitude goes to my family and friends. The support I have received from my mother, Priscilla Rossetter, has been far beyond anything a son – especially one approaching forty – can reasonably expect. Not only has she supported me financially during my unfunded fourth year, she has encouraged and supported all that I have endeavoured to achieve at university and has been on the other end of countless phone calls, helping me through the numerous crises of confidence that have arisen during the course of my PhD. Without her love, generosity, and dedication, this thesis may very well have never been completed. My sister, Alice Rossetter, my brothers, John and George Rossetter, and my siblings-in-law, Adriano Agreda and Cat Tandy, have also been immensely supportive, as have my aunt and cousin Christine Mainstone and Sally Jenkins. So too have my old friends Ben Stutchbury, Jez Smith, and Amina Hays, and I look forward to catching up with these important people now that the PhD is finished and time is no longer in such short supply. I am particularly grateful to Jenni Dixon, who has helped me immensely by taking care of the dog so often

during the past few months so I can concentrate on writing, something that has improved my work-rate dramatically. And I thank Ace himself, my loyal, affectionate, though often badly-behaved and annoying companion, with whom I am looking forward to spending time again.

Unhappily, there are a number of people to whom I am heavily indebted but who are no longer here to receive my gratitude. David Knight was a truly great historian, and I am fortunate to have witnessed his fascinating, engaging, and flawlessly delivered lectures and talks; to have received his kind gifts of books; and to have enjoyed numerous stimulating and inspiring conversations with him on the history of science. Geoff Wren of the Foundation Centre has had an especially profound impact. His fascinating lectures on anthropology and cultural studies, his refreshingly honest and unpretentious approach to learning and scholarship, and his dedication to widening participation in higher education have been heavily influential in my approach to academic life and have played important roles in shaping who I have become since I arrived at Durham nearly a decade ago. My uncle, Bob Mainstone, was a fantastic man whose joviality and sense of humour will be missed by many, and his support and encouragement over the years have been immensely appreciated. Most importantly, my father, Bob Rossetter, who passed just as I was finishing my BA, will always have my deepest love and gratitude. It was him who first introduced me to the history of philosophy, encouraged me to go to university, and supported and believed in me until the end. Not being religious, I cannot take comfort from any notions of him “looking down on me” (which, to be honest, would be a bit weird anyway). But I can be assured of the counterfactual conditional that if he were here, he would be pleased with what I have achieved.

Having now completed my viva examination, I am delighted to add my examiners to this section. It seems fitting that Robin Hendry, having supervised my first degree, should examine my last, and I am hugely grateful to him for taking the time to read my work, for his thoughtful and stimulating questions, and for his calming influence in the viva. I am likewise immensely grateful to Catherine Wilson for taking the time to read this long thesis, for making the not inconsiderable journey to

Durham for the viva, for asking numerous fascinating and inspiring questions which will be of great value as I endeavour to develop the work further, and, above all, for her friendly, engaging manner, which very quickly transformed an event I had been dreading for several weeks into an immensely enjoyable experience. I really could not have hoped for better examiners.

Dedicated to the memory of

Bob Rossetter,

Geoff Wren,

Bob Mainstone,

and

David Knight.

Introduction

The first volume of *Telluris theoria sacra* by Thomas Burnet appeared in 1681 in an edition of just twenty-five copies. In it, Burnet attempted to give a philosophical account of the earth's history from the Creation to the Deluge. This fascinating and novel explication of earth and Sacred history quickly became well known among the reading public in England and an immensely popular English translation, the *Theory of the earth*, translated by Burnet himself at the request of King Charles II, appeared in 1684. By the early 1690s, a second volume dealing with the future Conflagration and Millennium had been added to the work. This, too, had been translated into English, and the *Theory* had acquired two supplementary works: a short essay appended to the first English edition of the second volume entitled *A review of the theory of the earth* and the hugely controversial *Archaeologiae philosophicae*. By the end of the century, the *Theory* was in its third English and second Latin edition. By now it had been subjected to numerous attacks, some of which had elicited responses from its author, and had inspired several imitations, new theories of the earth in which authors tried to supply what appeared to them to be insurmountable defects in the old one. In the meantime, Burnet had become Master of the Charterhouse school, had been appointed to and subsequently forced to resign from the positions of Chaplain-in-Ordinary and Clerk of the Closet to King William III, and had been considered but passed over for the Archbishopric of Canterbury. The *Theory* was now so notorious that its author could be referred to simply as "the Theorist".

In contrast with his later notoriety, Burnet's beginnings were rather humble. He was born in Croft-on-Tees in North Yorkshire around 1635 and educated at the free school in Northallerton. In 1651, he entered Clare Hall, Cambridge as a pensioner. Here, though officially a student of William Owtram, he was heavily influenced by the Latitudinarian divine John Tillotson and the Cambridge Platonist Ralph Cudworth, and after receiving his BA, he followed Cudworth to Christ's shortly after the latter became master of the College in 1654. Originally admitted as a pensioner, he became a

fellow in 1657, received his MA in 1658, and alongside Cambridge Platonist Henry More became prominent in teaching the new, Cartesian philosophy at the college. He left Cambridge in 1678 and relocated to London. Here, owing to Tillotson's recommendation, he became personal tutor to the Earl of Ossory, grandson of the Duke of Ormond, in 1681, the latter helping him obtain the position of Master at the Charterhouse in 1685. As Master, he played a prominent role in the governors' opposition to King James II's attempt to appoint a Catholic pensioner at the school, a role for which he was rewarded after the Revolution of 1688-9 when, again under Tillotson's influence, he was appointed Chaplain-in-Ordinary and Clerk of the Closet to King William III in 1689 and 1691. In the latter year, Tillotson had become Archbishop of Canterbury and Burnet looked like a likely successor. By the time of Tillotson's death in 1694, however, his heterodox views on Scripture had been made clear in the *Archaeologiae* and he was passed over for the position. Shortly afterwards, he was forced to resign his positions at court and returned to the Charterhouse. Toward the end of the century, he published a third English edition of his *Theory*, three responses to John Locke's *Essay concerning human understanding* (the only works published in his lifetime that were not related to the *Theory*), and a defence of the *Theory* against the Newtonian John Keill. His only published output in the 1700s was a third Latin edition of the *Theory*, published in 1702. He died in 1715 and was buried in the chapel of the Charterhouse.¹

Burnet's *Theory* was one of the most widely read and discussed philosophical and theological works of the late seventeenth century. As Dimitri Levitin has recently noted, "it is difficult to find a major natural philosopher who did not have at least a cursory interest".² Given its contemporary significance, it is no surprise that the work has attracted a great deal of attention from historians of science, philosophy, and religion. The historiography of Burnet and his theory is a familiar story. Nineteenth- and early-twentieth-century geologists, the first to write the history of their science,

¹ For these and other biographical details, see Heathcote (1759); Kelly (1970); Mandelbrote (2008).

² Levitin (2015), 189-90.

made Burnet the arch villain in their heroes-and-villains narratives. “Even Milton”, wrote Charles Lyell in 1830 when surveying the discipline’s history in the first volume of his *Principles of geology*,

had scarcely ventured in his poem to indulge his imagination so freely in painting scenes of the Creation and Deluge, Paradise and Chaos, as this writer, who set forth pretensions to profound philosophy. He explained why the primeval earth enjoyed a perpetual spring before the flood! shewed how the crust of the globe was fissured by ‘the sun's rays’, so that it burst, and thus the diluvial waters were let loose from a supposed central abyss.³

Archibald Geikie drew heavily on Lyell in his *Founders of geology*. Having paid little attention to the *Theory* in the first edition of 1897, he expanded his discussion of “[t]he grotesque speculations of Burnet” in the second edition of 1905.⁴ “Nowhere”, he wrote of the seventeenth century, “did speculation run so completely riot as in England with regard to theories of the origin and structure of our globe”. The *locus classicus*, he explained, was Burnet’s *Theory*, a work designed rather “to support orthodox religion” than further our understanding of the earth.⁵

Around the same time, the first discussions of the historical relationship between science and religion began to appear and early works by John William Draper and Andrew Dickson White pioneered the long since discredited “conflict thesis”, the image of a perennial struggle between the scientific and the religious worldviews.⁶ Interested predominantly in the purported conflict between science and Catholicism, Draper did not discuss Burnet. White, however, concerned with the supposed impediment to science presented by Christianity more generally, examined Burnet and other seventeenth-century theorists of the earth at length in his influential book of 1896, *A history of the*

³ Lyell (1830), 37-8.

⁴ Geikie (1905), 61. Geikie mentions Burnet’s theory only briefly in the first edition – see Geikie (1897), 9-10.

⁵ Geikie (1905), 66. For further discussion of Lyell’s, Geikie’s, and other earlier historians of geology’s treatment of Burnet, see Gould (1987), 23-4. For discussion of Geikie’s historiography, see Oldroyd (1980).

⁶ Draper (1875 [1874]); White (1896 [1897]). For historiographical discussion of the conflict thesis and subsequent developments in the historiography of science and religion, see, e.g., Lindberg and Numbers (1986), 1-10; Russell (2000); Wilson (2000); Weldon (2017).

warfare of science with theology in Christendom.⁷ “In th[e] second stage of the theological struggle with geology”, he assessed, “England was especially fruitful in champions of orthodoxy, first among whom may be named Thomas Burnet”. The first stage was the denial of the organic origin of fossils. The second, to which White refers here, is the belief in a universal Deluge. Burnet and his fellow diluvialists exemplify the impediment to progress that this belief presented, an impediment eventually overcome by the heroic efforts of Lyell.⁸

The picture of Burnet’s theory that emerges from Lyell, Geikie, and White, then, is of a purely speculative, unscientific account of the earth’s history that was motivated and constrained by an orthodox reading of Scripture and hindered rather than influenced the early development of the earth sciences. It is not until later in the twentieth century that historians began to look at the theory on its own terms and in its proper intellectual context. The first major work to do this was Katherine Brownell Collier’s 1934 book *Cosmogonies of our fathers*, an influential, comprehensive and highly informative study of seventeenth- and eighteenth-century theories of the earth which remains one of the best sources on the topic.⁹ This was followed the next decade by Don Cameron Allen’s 1949 classic work *The legend of Noah*, in which Burnet’s work is examined in the context of the history of ideas concerning the biblical Flood.¹⁰ Around the same time appeared papers by H.V.S. Ogden, E.G.R. Taylor, and Earnest Tuveson which examined Burnet respectively in relation to the history of aesthetics, geography, and literature.¹¹ Later in the 1950s, Michael Macklem discussed the theory at length in relation to early-modern ideas about natural and moral law and appended an influential bibliography of works connected with Burnet in his 1958 book *The anatomy of the world*.¹² The following year, Marjorie Nicolson expanded upon Ogden’s earlier work, including an extensive and highly illuminating

⁷ White (1897 [1896]), 206-30.

⁸ White (1897 [1896]), 218-33. For further discussion of White’s treatment of Burnet, see Gould (1987), 24-6.

⁹ Collier (1934), 68-134.

¹⁰ Allen (1949), 92-112.

¹¹ Ogden (1947); Taylor (1948), 107-8; (1950); Tuveson (1950).

¹² Macklem (1958), 23-37, 97-9. Macklem’s bibliography has been drawn on by, among others, Kubrin (1968), 150 [note 140], 209 [note 1]; Force (1983), 5; Cohn (1996), 150; Magruder (2000), 143-5.

treatment of Burnet's theory and its role in the history of aesthetics in her important book *Mountain gloom and mountain glory*.¹³ And the following decade saw the appearance of one of the most significant and influential discussions of Burnet and theories of the earth in David Kubrin's unpublished but widely-cited PhD thesis *Providence and the mechanical philosophy*, which examines Burnet and other theorists in relation to Newton and Newtonianism in seventeenth-century England.¹⁴

Since this time, Burnet and his theory have been discussed extensively in a variety of contexts. Paolo Rossi and more recently William Poole have produced works similar in certain respects to that of Collier, examining Burnet alongside other seventeenth-century theorists in relation to early-modern ideas about human history, chronology, and the origins of language.¹⁵ Norman Cohn, Michael Kempe, and others have added valuably to Allen's discussion of Burnet in the context of ideas concerning the Flood and natural disasters.¹⁶ Robert Mayhew, Noah Heringman, Alexander Wragge-Morley, and William Barton have continued Nicolson's exposition of the importance of Burnet's theory and the seventeenth-century debate about the earth in the history of aesthetics.¹⁷ Burnet's place in literary history has been elucidated further by Al Coppola, Gregory Lynall, and Kevin Killeen.¹⁸ Following Taylor, numerous historians of the earth sciences have discussed Burnet's role in their early development, with Martin Rudwick, Roy Porter, Margarita Bowen, Stephen Jay Gould, Rhoda Rappaport, and numerous others thoroughly discrediting the early, whiggish assessments of Lyell and Geikie.¹⁹ And since Kubrin, Burnet has occupied an ever-prominent place in studies of Newton and

¹³ Nicolson (1959), 184-270.

¹⁴ Kubrin (1968), 86-150. See also Kubrin (1967), 331-8, 345-6.

¹⁵ Rossi (1984), 33ff; Poole (2010), 55ff. See also Poole (2008), 72-9.

¹⁶ Cohn (1996), 47-61, 134-7; Kempe (2003), 153-7, 162-5. See also Goldgar (1982), 137-8; Pleins (2003), 74-5; Willmoth (2007), 26-7.

¹⁷ Mayhew (2004), 46, 76-7, 83, 109, 256-7; Heringman (2004), 83-7; Wragge-Morley (2009); Barton (2017), 145-50.

¹⁸ Killeen (2007); Coppola (2010); Lynall (2012), 2, 13, 52-68.

¹⁹ Rudwick (1976), 77-82; (2005), 134-5; (2014), 58-61; Porter (1977), 23-31, 62-90; Bowen (1981), 107-10; Gould (1987), 21-59; Rappaport (1997), 139-49. See also Dean (1981), 443-9; Ito (1988), 301-7; Gohau (1991), 46-56; Bowler (1992), 119-20; Willmoth (2007), 26-7; Eddy (2008), 164, 181; Young and Stearley (2008), 62-70; Dean (2009), 210-14; Lewis (2009), 113-4; Newcomb (2009), 121-2; Schweizer (2009), 96-7; Montgomery (2012), 64-77; (2013), 11-12.

Newtonianism. This is largely due to his correspondence with Newton and the theory's connection with that of Newton's protégé and successor at Cambridge William Whiston, which, along with certain other connections, have been discussed in detail by James Force, Scott Mandelbrote, and others.²⁰

Burnet and his theory have also been examined in several other contexts. One of the most important of these is the history of Cartesianism and its development in England during the seventeenth century. The two most significant studies of Burnet's use of Cartesian natural philosophy are papers by Jacques Roger and Peter Harrison, and his teaching of the Cartesian system at Cambridge has been discussed by John Gascoigne.²¹ Another important context in which Burnet, his theory, and related work have been explored in considerable depth is the history of antiquarianism, with Gascoigne, Luciano Malusa, and Dimitri Levitin offering extensive discussion of Burnet's use of ancient texts in the *Theory and Archaeologiae*.²² The second volume of the *Theory* has been prominent in studies of seventeenth-century millenarianism and apocalyptic thought, the most in-depth discussions being those of Margaret Jacob and Wilfred Lockwood, Reiner Smolinski, and Arthur Williamson.²³ Perhaps most importantly, Burnet and his theory have featured prominently in many important studies of the fascinatingly complex historical relationship between science and religion by such authors as Joseph Duncan, Barbara Shapiro, Peter Harrison, John Hedley Brooke, Kerry Magruder, Alexandra Walsham, and countless others which have come to replace the simplistic and highly

²⁰ Force (1983), 4-6; (1985), 5-6, 32-62, 65, 192 [note 13]; (1990a), 47, 58; (1990b), 159-60 [notes 24-5]; (2001a), 71-4. (2001b), 160-3, 169-70; (2004), 65-7, 70-1 [note 17], 78-9 [note 43]; Mandelbrote (1994). See also Austin (1970), 534, 538; Schaffer (1977), 19-21, 28-9; Gascoigne (1984), 9-11; Gascoigne (1989), 144-5; Gascoigne (1991), 180-6; Westfall (1987), 565-6; Hall (1992), 172-3; Harrison (1995), 539-40, 544-7; Smolinski (1999), 267-73, 277-8, 280-1, 284-9; Snobelen (2004), 575-6; Friesen (2008), 40-7; Newman (2009), 41; Janiak (2012), 422-6; Buchwald and Feingold (2013), 181-2, 237 [note 54]; Levitin (2013), 324-5; Iliffe (2017), 240-4; Kaplan (2018), 460.

²¹ Roger (1982); Gascoigne (1989), 65; Harrison (2000). See also Oldroyd (1974), 166; Force (1985), 34-8; Rogers (1985), 301; Gohau (1990), 47-8; Bowler (1992), 119-20; (2003), 32-4, 39; Vermij (1998), 153-66; Magruder (2006), 245-55; Poole (2010), 55-61; Henry (2013), 127.

²² Gascoigne (1991), 180-6; Malusa (1993 [1981]), 330-70; Levitin (2015), 181-90.

²³ Jacob and Lockwood (1972); Smolinski (1999), 267-73, 277-8, 280-1, 284-9; Williamson (2008), 176-85. See also Jacob (1976), 337-40; Harrison (1998), 147-8; Poole (2010), 159-64; Johnston (2011), 42, 206-7; Iliffe (2017), 300-1.

misleading conflict thesis of Draper and White.²⁴ Burnet and the theory are also frequently discussed in studies of the scientific revolution and seventeenth-century science more generally.²⁵

The image of Burnet and his theory that emerges from the above histories is very different from that presented by Lyell, Geikie, and White. The Burnet of this more recent historiography is someone who was closely engaged with the science and scholarship of his time and one of the first to teach the “new philosophy” at an English university. Far from being constrained by orthodox religion, his theory flatly contradicted the first three chapters of Genesis, and his frank admission of this and bold conclusion that Moses lied to the Jews about the Creation of the earth and the first humans because they were incapable of receiving the truth ultimately cost him his ecclesiastical career. His theory, moreover, though based in part on Scripture, was not an impediment to progress but on the contrary fostered considerable interest in the earth and its history and as such played an important role in the early development of the earth sciences. The picture I present of Burnet and his theory in this thesis is largely the same. The difference is that I endeavour to present it in greater depth and at greater length than has been done before in Anglophone scholarship. Burnet’s theory was one of the most notorious texts, one of the most notorious *ideas*, of late-seventeenth-century England, and yet no detailed, book-length study of it has been written in English.²⁶ This thesis is a first step toward providing such a study.

To elucidate more fully what the thesis is, it is important first to get clear about what it is not. The most important thing to note here is that it is not a biography. A comprehensive biography of Burnet is far beyond the scope of a PhD thesis. Biographical details are of course important and are

²⁴ Duncan (1969), 171-2, 181-6; (1972), 271-7; Shapiro (1985), 54-6, 127, 159; Harrison (1990), 95, 104-5, 115-6, 127; (1998), 135ff; (2001), 200-2; (2007), 123; (2011), 134-5; Brooke (1991), 9-14; Magruder (2008); (2009), 55-63; Walsham (2012), 381-94. See also Schaffer (1977), 19-21, 28-9; Rudwick (1986), 305-7; Force (2001b), 160-3, 169-70; Numbers (2002), 236-7; Thompson (2005), 143-53; Poole (2006), 46-7, 50-2, 56; Young and Stearley (2008), 62-70; Lewis (2009), 113-4; Schweizer (2009), 96-7; Gaukroger (2016), 570-3.

²⁵ See, e.g., Gaukroger (2006), 494, 504, 508; (2010), 34-9; Knight (2014), 117-9; Wootton (2015), 396, 467.

²⁶ The only full study of Burnet is Pasini (1981), which was written in Italian and has never been translated.

discussed at various points, but the thesis is not primarily concerned with the life of Burnet. Rather, it is a history of a theory, of an idea; of its historical context; its philosophical, theological, Scriptural, and antiquarian foundations; its development during the final two decades of the seventeenth century; and its reception among the reading public in early-modern England. Points about Burnet's life are discussed only insofar as they help to elucidate these things. This is also the case with Burnet's other works, that is, those besides the *Theory* and works directly related to it, nearly all of which were published posthumously. Discussion of these would be a vital component of a biography, yet they are attended to here only at certain points where they are able to shed light on the above issues concerning the theory. Burnet's private correspondence, too, detailed discussion of which would be essential in a biography, is explored only to the extent that it illuminates the above topics.

The aim of the thesis is to provide depth rather than breadth of analysis. To this end, I focus my attention mainly on primary sources. The central texts are of course the two volumes of the *Theory*. Also discussed at length are certain attacks on the theory and Burnet's responses to them, the *Archaeologiae*, and William Whiston's 1696 book *A new theory of the earth*, an attempt to provide an alternative theory to Burnet's which, I shall argue, was heavily influenced by the original Theorist. There were many reactions to the theory and many published and unpublished responses to it, and while I pay some attention to a large number of them, it is impossible to discuss them all in depth. My principal focus, therefore, is limited to those texts which in my view were most closely connected with Burnet and with the theory itself, and these are Burnet's writings on it, the responses to it with which he engaged directly, and the alternative theory in which his influence is most evident. Also due to space constraints, when discussing the public reaction to Burnet's theory, I limit my attention almost entirely to England, where that reaction was most profound.²⁷

My historiographical approach in the thesis is primarily intellectual or philosophical. My main interest is in the theory as an idea and as a series of texts and in the various philosophical and

²⁷ For discussion of the debate on the continent, see Rossi (1984), 69-106; Rappaport (1997), 139-72.

theological frameworks which informed its development and governed the reading public's reaction to it. The most important frameworks in the development of Burnet's theory are the philosophy and theology of the Cambridge Platonists and Latitudinarians with whom he was closely associated and the Cartesian system of natural philosophy to which he was introduced by the former group. The reaction to the theory among the reading public in England was shaped in large measure by the Newtonian natural philosophy, which in the years following the publication of the *Theory* came to supersede the Cartesian framework on which the work was largely based. It is these four frameworks and ideas and the texts in which they are set down that provide the primary context of the thesis. This is not to say that I do not pay due attention also to social and cultural context. Ideas and texts are of course situated in society and culture, and so attention to these contexts is important for understanding them. Yet these contexts, much like biographical details about Burnet, are attended to in order to elucidate ideas and texts rather than as an end in themselves. Burnet would likely have approved of such an approach. As he wrote in the preface to his own work on the history of philosophy:

THE State of Learning makes a considerable Part of the History of Mankind. Now in this History of Literature, there can be nothing more excellent or profitable than to explain the various Opinions of Philosophers, and what they professed in different Sciences: as for other Matters which frequently make up a literary History, such as the Lives of Philosophers, the Circumstances of their Births, and Funerals, their Praises, Travels, together with their good and bad Actions, and Particulars of the like Nature, they do indeed fill up and adorn the Subject; but are of lesser Moment when we are endeavouring to search out the Seeds and Progress of human Knowledge.²⁸

The thesis consists of six chapters. The first two are devoted primarily to the *Theory*. In chapter one, I give a detailed analysis of the work's four books and their intellectual context. I begin by discussing Burnet's theory of the Deluge in book one which he arrives at via an account of the Creation.

²⁸ Burnet (1736a [1692]), i – italics omitted.

I then look at book two in which he gives an account of the antediluvian earth and Paradise before turning to the *Theory's* second volume and examining his theories of the Conflagration and Millennium which are presented in books three and four respectively. The second chapter is concerned with the theory's foundations. This chapter is framed around the three "guides" which Burnet used in formulating the theory: reason; Scripture; and antiquity. In this chapter I discuss what, for Burnet, each of these things consisted in and the different roles they played in constructing and supporting the theory. In chapter three, I first explore two early objections to the theory from the Bishop of Hereford Herbert Croft and the Rector of Worlington Erasmus Warren and Burnet's responses to these critics and lengthy debate with the latter. I then turn my attention to Burnet's controversial work of 1692, the *Archaeologiae philosophicae*, examining the content of the work and its theological and antiquarian foundations and considering the extent to which it was shaped by the preceding debates with Croft and Warren.

The final three chapters focus on the "Burnet controversy": a series of reactions to the theory that arose out of its heterodox implications being exposed by Burnet in the *Archaeologiae*. In chapter four, I give an overview of the controversy. Here I depart from my narrow focus and adopt a broader-brushed approach, the aim being to give the reader an impression of the extent and nature of the debate. I do, however, go into some detail on one unpublished response to the theory which I argue was most likely written by the Astronomer Royal John Flamsteed and Burnet's reply to this work. I also discuss in some depth the rigorous application of the *Theory's* second volume in the London clergyman Edward Waple's analysis of the Book of Revelation. In the final two chapters, I focus on what I consider to be the most important works to come out of the controversy: that of Newtonians William Whiston and John Keill. Whiston is the subject of chapter five, in which I argue that his *New theory of the earth* is essentially a synthesis of Newtonian and Burnettian ideas concerning Scripture, theology, and the earth. I also discuss Whiston's debate with Keill and its implications for late-seventeenth-century Newtonianism. In the final chapter, I turn my attention to Keill's devastating attack on Burnet and the subsequent debate between them, considering what it was about Keill's attack that was so damaging

to the theory, the conflict between Burnet's resolute Cartesianism and Keill's particular brand of Newtonianism, and the impact Keill's work had on the controversy and on subsequent thinking about the earth and its history.

Before proceeding to the first chapter I should say a brief word about editions of primary texts. Regarding the *Theory* itself, I cite mainly the first English editions of the two volumes, published in 1684 and 1690. The English editions contain some material which is not present in the Latin text, but the reverse is rarely the case, and so we obtain a more complete view of Burnet's thought from the English than from the Latin. Additionally, the English editions were much more widely read than the Latin, and so the public reaction to the theory which I shall be assessing was directed much more toward the former than the latter. Where there is material in the Latin texts which is not in the English and where there are significant differences between the Latin and English editions this is made clear and the former are cited and in certain places discussed in some depth. There are also some minor variations between different English editions. These, too, are discussed at various points where they are important. Regarding the *Archaeologiae*, I again cite the English edition, which was published in three parts during the eighteenth century – I am not aware of any significant differences between the Latin and English editions. The books by Croft, Warren, and Keill were all written in English, and I cite the first editions. Whiston's *New theory* and his responses to Keill, too, were written in English. Here again I cite primarily the first editions, though I also discuss in detail certain important differences between the first and second editions of the work and their connection with Whiston's debate with Keill. Finally, I note that all italicisations in quotations are the authors' unless otherwise stated.

1. The *Theory*

1.1. Introduction

The purpose of this first chapter is to acquaint the reader with Burnet's theory of the earth and its historical context. The chapter consists of five main sections. In the first section, I give a brief overview of Burnet's history of the earth from the Creation to the final consummation. In the remaining four sections, I discuss each of the four books of the *Theory* in turn, providing a summary of each book and discussing how the various details of the work relate to the intellectual context in which it was written. The overall context in which I want to situate the theory begins essentially with the Protestant Reformation during the previous century. Wanting to re-establish the Christian religion on the basis of scriptural rather than ecclesiastical authority, the Protestant reformers eschewed what they viewed as excessive allegorising of biblical texts by medieval exegetes in favour of a literal interpretation.¹ It is important to note, as Peter Harrison emphasises, that this new Protestant literalism is to be understood in a broad sense as "determinacy of meaning". For medieval exegetes, the texts of Scripture had multiple meanings. A single text had a variety of symbolic or allegorical senses. And these senses were applied dogmatically to Scripture by the Catholic Church. In contrast, for the Protestant reformers, biblical texts have a single, fixed meaning. And it is the task of the individual exegete rather than ecclesiastical authorities to determine what this meaning is.²

As Harrison has so perceptively observed, the new literalism that emerged at the Reformation had several profound effects on the development of early-modern natural philosophy and Christianity and on the relationship between them.³ Two such effects are especially important for our purposes. The first is that scriptural texts not obviously (i.e., literally) imparting moral or theological knowledge

¹ Harrison (1998), 92-120.

² Harrison (1998), 111.

³ Harrison (1998), 114-273. See also Harrison (2004), 68-80. Cf. van der Meer and Oosterhoff (2008).

became seen as providing factual – i.e., historical, geographical, philosophical, etc. – information. The Pentateuch in particular, the first five books of the Old Testament which were generally – though not universally – believed to have been written by Moses, became seen as communicating factual information about the first ages of the world and human existence – it is at this point that we begin to see the Pentateuch being described in new ways such as “the Mosaic *history*”. As a result of this new historicity, the Pentateuch and other biblical texts came to be read and assessed in essentially the same way as any other historical document as exegetes began to consider such things as the background of the author, the author’s intentions, the audience for which the text was written, and so forth. This was very different from the approach of medieval exegetes who assumed that the meanings of sacred texts transcended the human intentions of the author.⁴

The second important effect of the Protestant literalism on early-modern natural philosophy and Christianity is that the natural sciences came increasingly to be employed in biblical exegesis; in uncovering the single, true meaning of texts and enhancing one’s understanding of the texts, their authors, and the events and phenomena depicted in them. In the case of the Pentateuch, Moses was widely held to have possessed a detailed, philosophical knowledge of the events and places he described but to have accommodated his teachings to the limited capacities of his audience. By applying the natural sciences to his teachings, it was believed, one could come to understand what Moses actually knew and thought as well as what he explicitly taught.⁵ Closely related to this use of the natural sciences in biblical exegesis was the use of non-Christian texts. Moses’ and other sacred writers’ status as historians implied that “prophane” histories could now be used to aid our understanding of sacred history. To be sure, the latter, being divinely inspired, was more reliable than the former. But the shift in focus away from the transcendent truths of the medieval theologians

⁴ Harrison (1998), 121-6.

⁵ Harrison (1998), 132-8.

toward the human authors of the reformers now meant that the difference between sacred and pagan texts was essentially one of degree rather than kind.⁶

As Harrison observes, this new historicity of Moses and the application of the natural sciences and “prophane” writings to biblical exegesis resulted in the appearance during the later-sixteenth and seventeenth centuries of a large number of philosophical theories of the events described by Moses.⁷ By the time of the first volume of Burnet’s *Theory* in 1681, then, there was already a venerable tradition of such theorising. Burnet’s account of the Creation, Deluge, and antediluvian earth, insofar as it embodied the Protestant literalism, the historicity of Moses, and the application of natural philosophy and pagan writings to scriptural exegesis, was very much a part of this tradition. As I will show in this chapter, however, these first two books of the *Theory* were as much a *reaction* to this tradition as they were a part of it. For Burnet, the direction that philosophical theorising about the Mosaic history had taken had led to conclusions which were inconsistent with the true sense of Scripture and were therefore conducive to irreligion. Additionally, these theories were in Burnet’s view contrary in various respects to our current understanding of the natural world and employed concepts which he viewed as unphilosophical and wanted to discard from natural inquiry.

The Protestant Reformation and the emerging biblical literalism also sets the stage for the second volume of Burnet’s *Theory*, which dealt with the Conflagration and Millennium. Although literal interpretations of prophecy had been common in the first and second centuries, they became challenged from the third century and officially renounced by the Church in the fifth. Most influential here was St Augustine’s interpretation of the Book of Revelation as an allegory describing spiritual struggles on earth and of the Millennium as a spiritual rather than physical reign of Christ which began at his birth and will continue until the end of the world. Augustine’s interpretation was accepted by

⁶ Harrison (1998), 124-6.

⁷ Harrison (1998), 126-9, 138-60

the church and became official dogma at the Council of Ephesus in 431 where literal interpretations of prophecy were condemned as superstitious.⁸

This interpretation of the prophecies went largely unchallenged until the Reformation when they came increasingly to be read as depicting contemporary struggles in Europe between conflicting Christian doctrines and as predicting a physical Kingdom of Christ on earth which was to follow from these struggles. This revival of a historicist reading of prophecy resulted in a period of significant political unrest both in England and on the continent as radical Protestants during the sixteenth and seventeenth centuries attempted to overthrow what they believed were illegitimate governments in order to usher in the millennial Kingdom of Christ.⁹ In England, this millenarian-inspired civil discord largely ceased after the Restoration of King Charles II in 1660. As Warren Johnston has shown, millenarian thinking persisted but increasingly came to take less radical forms as moderate Protestants, reacting to the previous unrest, endeavoured to interpret prophecy in ways that would not be conducive to such radicalism. The historicist interpretation inherited from the Reformation was still predominant. But exegetes now wanted to interpret this history in ways that would not pose a threat to social order.¹⁰ As David Kubrin and Margaret Jacob and Wilfred Lockwood have argued, the second volume of Burnet's *Theory* fits firmly into this tradition in that it was an attempt to provide a historicist interpretation of the Scripture prophecies, by way of a physical theory of the Conflagration and Millennium, which would not be conducive to – indeed, would actively *discourage* – civil discord.¹¹

1.2. A brief, sacred history of the earth

In Burnet's theory, the chaos from which the earth formed was a fluid mass of particles containing all the matter of the earth and its atmosphere. The particles descended toward the centre in order of their specific gravity, the densest descending first and compacting to form a spherical inner core. The

⁸ Williamson (2008), 9-13; Johnston (2011a), 2-3.

⁹ Williamson (2008), 135-66; Johnston (2011a), 4-16.

¹⁰ Johnston (2011a), 23ff.

¹¹ Kubrin, (1968), 100-4; Jacob and Lockwood (1972), 271.

remainder of the chaos then separated into an inner sphere of liquid and an outer sphere of air, both regions containing numerous particles of solid matter which were lighter than those at the centre and therefore descended more slowly. The liquid then separated again into two regions: an inner sphere containing denser, watery fluids; and an outer sphere composed of lighter, oily fluids. The earthy particles in the air then descended into the oil and accumulated and hardened to form a solid crust above the water (Figs.1-5).¹² The earth's water in the beginning, then, was entirely enclosed within the crust and there were no seas. And because the crust formed on a body of liquid, it must originally have taken the same shape as the surface of the liquid and so must necessarily have been entirely uniform, with no hills or mountains. Owing to the uniformity of the surface, the earth's weight in the beginning was evenly distributed. Its axis, therefore, was at a right angle to the plane of the ecliptic rather than oblique as it is on the present earth.¹³ Finally, because the fluid body from which the earth formed rotated on its axis and a rotating body will recede from its centre of motion, the fluid at the equator endeavoured to recede from the centre but was prevented from doing so by the atmosphere and therefore moved toward the poles where it met with less resistance. As a result, the first earth took the form of a prolate spheroid, its circumference larger at the poles than at the equator.¹⁴

¹² Burnet (1684), 51-60.

¹³ Burnet (1684), 61-8.

¹⁴ This argument appears in book two of the Latin edition of the *Theory* in Burnet's discussion of the antediluvian earth's hydrography – Burnet (1681), 186. In the English edition, he simply assumes this form of the antediluvian earth on the basis of ancient philosophers' comparisons of the first earth with an egg (I shall discuss this doctrine of the "mundane egg" in the next chapter), omitting the above argument from his account of the antediluvian earth's hydrography – Burnet (1684), 64-5, 227-8. In the third English edition, he adds an argument for this form of the earth based on the shape of its vortex to his account of the earth's formation – Burnet (1697c), 44.

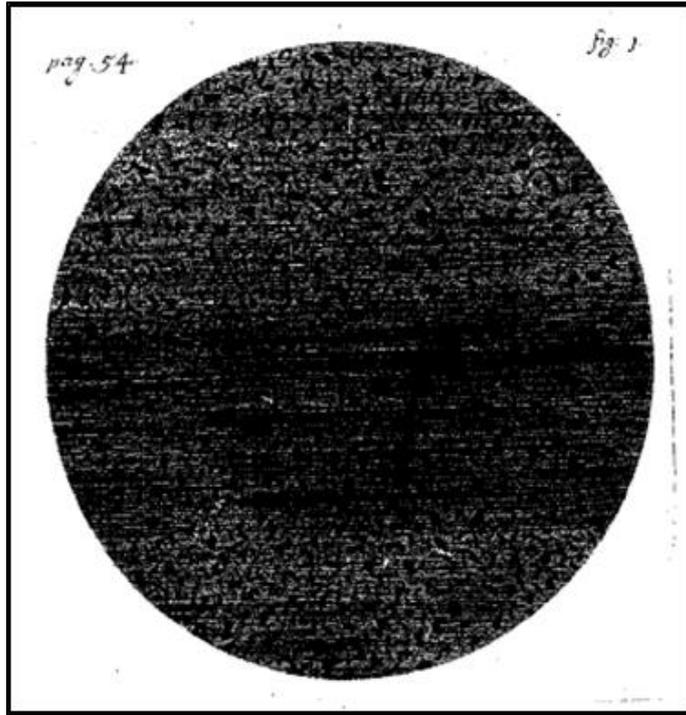


Fig. 1

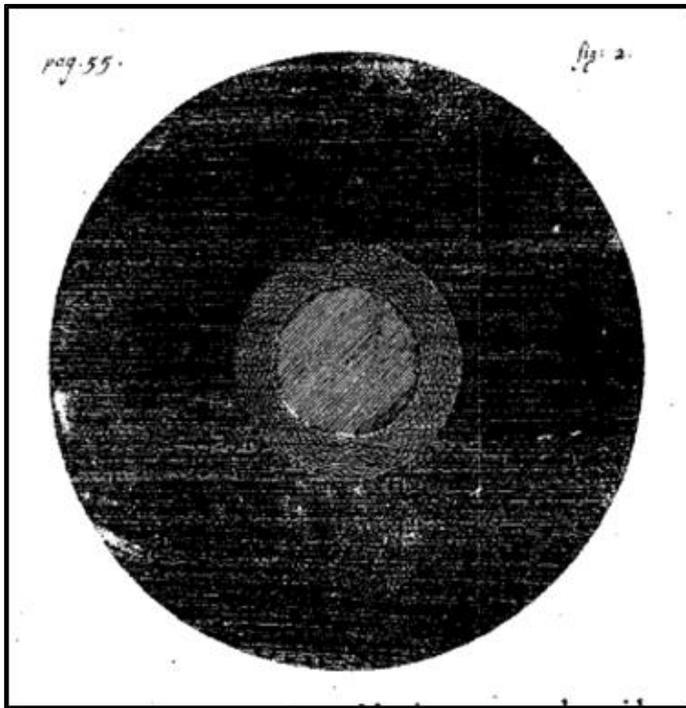


Fig. 2

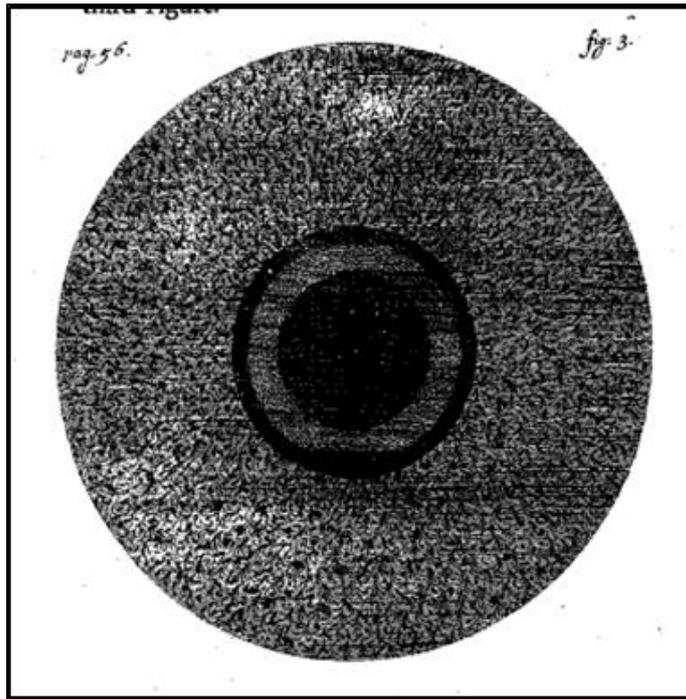


Fig. 3

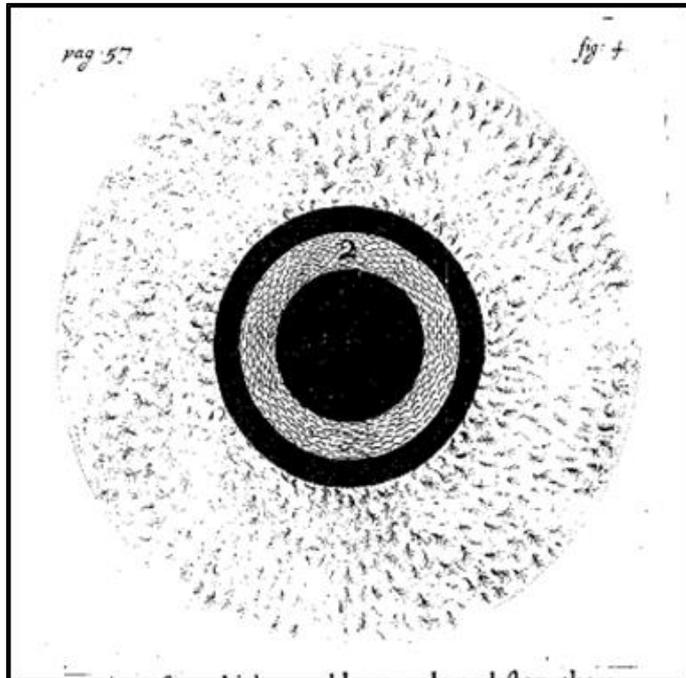


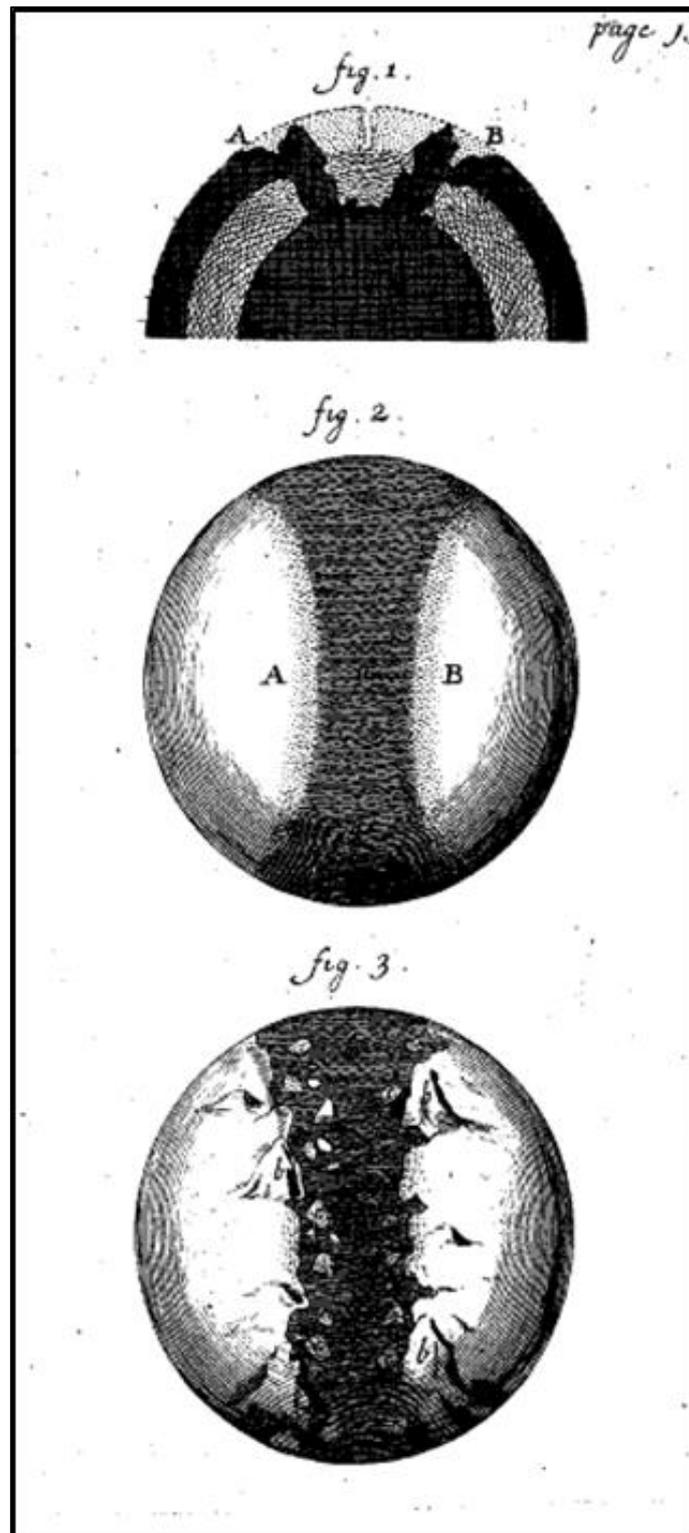
Fig. 4



Fig. 5

The situation of the primitive earth's axis meant that the sun shone directly and perpetually on the equator. This dehydrated the crust in this region, causing fissures to form. At the same time, the heat of the sun penetrated through the crust, volatising the waters of the abyss and exerting pressure on the weakened crust and eventually causing it to break apart. This dissolution of the crust was the cause of both the universal Deluge and the present form and situation of the earth. The descent of the fragments into the abyss agitated the waters such that they covered the earth for a period of time (i.e., the duration of the Deluge) before settling into their newly formed channels. These channels were formed by the fragments of crust coming to rest on the inner core and taking on a variety of postures with some parts in and some out of the water, thereby forming the present earth's seas, continents, mountains, and other geological phenomena (Fig. 6). The newly formed inequalities

in the earth's surface meant that its weight was no longer uniformly distributed, and the axis became oblique relative to the ecliptic.¹⁵



¹⁵ Burnet (1684), 66-77.

Fig. 6

In addition to leaving the earth terraqueous and mountainous, the dissolution of the crust made it hollow and cavernous. These vacuities serve as ventilation, rendering it vulnerable to destruction by fire.¹⁶ Prior to the Conflagration, a worldwide drought will dry the rivers, depriving the oceans of water and thus significantly reducing their size and removing the impediment they present to the spread of fire. The earth and its plant life will be desiccated and turned into fuel, their dehydration also releasing various combustible chemicals into the atmosphere. Fiery exhalations within the earth will enlarge its vacuities, providing further ventilation for the fire while also bringing about those earthquakes which are said in Scripture to precede the Conflagration.¹⁷ The immediate cause of the Conflagration will be a combination of three phenomena, each affecting a different section of the globe. The surface will be destroyed by a series of volcanic eruptions beginning in Italy – the volcanic centre of the Christian world and the seat of Antichrist (the Papacy) – and spreading throughout the earth. The interior parts will succumb to the combustion of various flammable solids, liquids, and gasses. And the atmosphere will be consumed by “fiery meteors”. (It is important to note here that Burnet uses the term “meteor” not in its modern sense but to refer to *meteorological phenomena* such as thunder, lightning, and other more mysterious “fiery exhalations” in the air.)¹⁸

Aside from the inner core, all the earth’s matter will be burned, reducing it to a second chaos from which a new earth will form. As in the first chaos, the matter will separate according to its specific gravity. It will divide first into two regions: an inner orb of the heaviest molten matter; and an outer sphere composed of flames, vapours, smoke, fumes, and ashes. The outer sphere will then separate, the heavier particles of solid matter descending first, followed by the liquid and then the lighter particles of earth. The latter will coalesce on the surface of the liquid and harden to form a solid crust. Like the first earth, then, though purer and more perfect due to the refining properties of fire, the new

¹⁶ Burnet (1990c), 54-5.

¹⁷ Burnet (1990c), 65-9.

¹⁸ Burnet (1990c), 43-6, 52-65, 74-90.

earth will be entirely smooth and uniform with no mountains or seas, and its weight once again being evenly distributed, its axis will again be perpendicular relative to the ecliptic.¹⁹ This new, paradisiacal earth will be home to the Kingdom of Christ during the Millennium, after which, when the righteous ascend to heaven, it will burn again, leave the vortex of the sun, and become a star.²⁰

1.3. Book one: The Deluge and Creation

Published in Latin in 1681 and English in 1684, the first volume of the *Theory* consisted of books one and two which dealt with the Creation, antediluvian earth, and Deluge.²¹ Though in the above summary I have given the chronological order of the events themselves, it is important to note that it is not in this order that Burnet deals with them. Indeed, in the first volume he reverses the order significantly, addressing the Deluge in book one before discussing the antediluvian earth in book two. In the first book, moreover, he discusses the Deluge *before* the Creation. He then returns to the former after explicating the latter. What is important about this is that it highlights the extent to which this first book was intended as a theory primarily of the Deluge and only secondarily of the Creation. Burnet gives a detailed explanation of the Creation, but his principal reason for doing so is that an explanation of the Creation is necessary in his view for understanding the Deluge. Book one of the *Theory*, then, is essentially an account of the *Deluge* which is arrived at *via* an account of the Creation. Though the Creation is *chronologically* prior to the Deluge, in the *Theory*, both in terms of its place in the text and its importance, the Deluge has priority.

One thing that is immediately striking about Burnet's account of the Deluge compared with earlier treatments is that there is almost no discussion of Noah's ark. Previous theorists had grappled extensively with such issues as the dimensions and design of the ark, how it was built, how the animals were separated from one another, and so on. As Don Cameron Allen notes, such discussions were

¹⁹ Burnet (1990c), 129-41.

²⁰ Burnet (1990c), 142-224.

²¹ Burnet (1681); (1684).

especially prevalent in the late Renaissance.²² Yet the logistics of the ark was still a going concern in Burnet's time.²³ As late as 1675, for example, the German Jesuit Priest Athanasius Kircher had dedicated almost the entire first book of his *Arca Noë* to such issues, providing extensive discussion and attractive illustrations of the ark, its construction, and its inhabitants before dealing with the Deluge itself in the subsequent two books.²⁴

Burnet, in contrast, bypasses such concerns entirely and launches immediately into what for him was the central question concerning the Deluge: its physical causes. He first calculates the quantity of water required to make a universal Deluge, computing that "at least eight Oceans" are required to submerge the entire earth up to the tops of the highest mountains – the depth of the Flood according to Genesis.²⁵ Besides the oceans, the only significant stores of water on the present earth are the clouds and subterraneous waters. These, moreover, are the only sources to which Moses directs us in his narration of the Deluge, that is, the breaking open of the fountains of the abyss and forty days rain.²⁶ The latter, he concludes quoting Marin Mersenne's calculation of the Flood rains but omitting his conclusion that the inadequacy of ordinary rainfall underscores the miraculous nature of the event, "would supply little more than the hundredth part of the water required to make the Deluge".²⁷ As to Moses' abyss, this was typically interpreted as referring either to the sea or subterraneous waters. Neither of these, however, could rise so as to encroach upon the land unless moved by some force. And even supposing such a force to be applied, in order to submerge the entire earth, other waters would be required to fill the space vacated by the rising waters.²⁸

²² Allen (1949), 71-3.

²³ See, e.g., Cohn (1996), 41-2; Poole (2010), 45-54.

²⁴ Kircher (1975), 16-116. For analysis of Kircher's discussion of the ark, see Pleins (2003), 73-4; Breidbach and Ghiselin (2006), 992-1001; Buonanno (2014), 97-119. On Kircher's illustrations, see Godwin (1979), 25-33.

²⁵ Burnet (1684), 9-12 – quotation from 12.

²⁶ Burnet (1684), 12-13 – quotation from 13.

²⁷ Burnet (1684), 13-14 – quotation from 13. For Mersenne's calculation and miraculous conclusion, see Poole (2010), 45-6.

²⁸ Burnet (1684), 14-15.

What Burnet termed the “common explication of the Deluge” or “vulgar Deluge”, then, that is, the view that it was effected by a combination of rains and rising seas and/or subterraneous waters, makes the Deluge impossible, for there is insufficient water on the present earth for it to have been brought about by such means.²⁹ Another “vulgar” notion was the idea of super-celestial waters, the “waters above the firmament” mentioned in Genesis which had been appealed to in order to supply the waters of the Flood. This Burnet dismisses merely as a relic of the old astronomy, the “firmament” having been understood as referring to the celestial sphere and the “waters above the firmament” to waters above this supposed sphere. Even supposing such waters to exist or to have existed at the Creation, it was unclear how they could be deployed in the Deluge. If the heavens *were* crystalline, then any waters placed above them could not pass through and descend upon the earth. If, on the other hand, the heavens are composed of air or ether, then water being heavier than these elements, it could not have remained above the heavens until the Deluge. There was also the problem of how these waters could have been removed after the Deluge, it being impossible for them to be raised again above the heavens and there being no place on earth to which they could have retired.³⁰ The “vulgar Deluge”, then, was “impossible and unintelligible upon a double account”. Firstly, it required vastly more water than could be obtained. And secondly, even if the requisite water *could* be found, it could not be disposed of such that the earth could be made habitable again after the Deluge.³¹

Following the above confutation of the “vulgar Deluge”, Burnet turns his attention to two “Evasions” which had been used to overcome the difficulty of supplying and disposing of the water. The first was the notion that God miraculously created new water or transmuted air into water and then annihilated or transmuted it back after the Deluge.³² Miraculous interpretations such as these conflicted with Burnet’s maxim – to be discussed in subsequent chapters – that what can be explained

²⁹ Burnet (1684), 15-17.

³⁰ Burnet (1684), 16-17.

³¹ Burnet (1684), 17.

³² Burnet (1684), 18-21

in terms of natural causes ought not to be attributed to miraculous intervention.³³ Burnet's stance on this issue was typical of Protestant thinkers. Catholics, on the other hand, were more willing to appeal to Miracles.³⁴ Kircher, for example, had recently appealed to precisely the kind of miraculous transmutation to which Burnet was opposed.³⁵ The Protestant literalism played an important role here, too. As Burnet pointed out, there is no mention in Moses' narration of the Deluge of any such miraculous creations or transmutations. Moses gives two causes: the breaking open of the abyss and forty days rain. Any other purported causes were contrary to Scripture.³⁶

Miraculous creations and transmutations were also inconstant with current natural philosophy. According to the prevailing Cartesian physics, there was no empty space in which God could create new matter. In order to create new waters, therefore, he would have to destroy an equal amount of matter to obtain the necessary space. And to annihilate the waters after the Deluge, he would have to create as much new matter to fill the space.³⁷ To Burnet, the thought of God subjecting himself to such toil was inconsistent with his wisdom. "[M]ethinks they make very bold with the Deity", he writes of those who espouse such views, "when they make him do and undo, go forward and backwards by such countermarches and retractions, as we do not willingly impute to the wisdom of God Almighty".³⁸ The transmutation of air into water also ran into philosophical difficulties, for it was known that water is vastly heavier than air. "34 foot of water", Burnet noted, is of the same weight as "a proportionable Cylinder of Air reaching to the top of the Atmosphere". Hence, even if the *entire* atmosphere were transmuted, it would yield merely "eleven or twelve yards water about the Earth", a quantity "very inconsiderable as to our eight Oceans".³⁹

³³ Burnet (1684), 19-20.

³⁴ Allen (1949), 84-5.

³⁵ Kircher (1675), 129-31.

³⁶ Burnet (1684), 19.

³⁷ Burnet (1684), 19-20.

³⁸ Burnet (1684), 20.

³⁹ Burnet (1684), 21.

The second “evasion” that Burnet discusses deserves special attention, for it was one of the key motivations – arguably *the* key motivation – for his producing a theory of the Deluge, and this has not been adequately appreciated in the historical literature. The “evasion” in question was the proposal that the Deluge was not universal.⁴⁰ As Allen notes, doubts about the universality of the Deluge date back to ancient times. When confronted with the story of Noah, pagans argued against early Christians that the Deluge was merely a Hebrew version of one of their flood legends and “Noah” simply a Jewish pseudonym for one of their heroes or gods. Like their flood stories, the biblical Deluge was merely a local rainstorm rather than a universal inundation. Initially, the patristic writers fought back, pointing for example to what appeared to be the remains of marine animals on mountains as evidence of the Flood’s universal extent. But the issue became largely forgotten during the middle ages as theologians turned their attention away from the historical details of the Flood and toward its symbolic significance. It resurfaced, however, during the Renaissance as scholars attempted, as Allen puts it, “to turn the tables on the heathens” by asserting that pagan myths were essentially corrupted versions of biblical texts, that their flood myths were corruptions of the biblical Deluge, and that many of their heroes and Gods could hence be identified with Noah.⁴¹

This Renaissance tradition of identifying pagan floods with the biblical Deluge was still very much in use in Burnet’s time and would play important roles in his theory. What had also become increasingly popular in the latter half of the seventeenth century, however, was the notion of a local Deluge. Now, however, it was being promulgated not by pagans in opposition to Christians but by Christians themselves. Crucially, the Protestant insistence on accounting for the Deluge in terms of natural processes combined with the difficulty of actually doing so had led several thinkers to conclude that the Flood was not universal. The most famous work to appear during the seventeenth century in which this was argued was the French Calvinist theologian and lawyer Isaac La Peyrère’s *Prae-*

⁴⁰ Burnet (1684), 21-8.

⁴¹ Allen (1949), 73-4, 84-5 – quotation from 84.

Adamitae, published in Latin in 1655 and translated into English the following year under the title *Men before Adam*. In this immensely controversial work, La Peyrère argued that God had created other humans long before he created Adam. Adam was merely the first Jew. The Pentateuch, moreover, was not a history of the world but a local, Jewish history, and was not written by Moses. Importantly for our purposes, at the Deluge, God did not wish to punish all humans but only the Jews, having been offended by their interbreeding with the Gentiles. Accordingly, the Deluge was not universal but confined to Palestine, where the Jews resided at the time.⁴²

Though published anonymously, La Peyrère's views were well known among the reading public and his authorship of the work immediately obvious. In 1656, he was arrested, taken to Rome, and forced to recant and convert to Catholicism.⁴³ It was not only the Catholics who took offence. The views in *Prae-Adamitae* were widely rejected and attacked among the Protestant community, too.⁴⁴ As Norman Cohn observes, however, the idea of a local Deluge was soon taken up by less radical thinkers.⁴⁵ In 1659, the Dutch scholar Isaac Vossius, in a work which was ostensibly an attack on La Peyrère, nevertheless agreed that the Deluge was not universal. For Vossius, there were no "men before Adam". Instead, he argued that at the time of the Deluge the earth was largely uninhabited. The nine generations from Adam to Noah had only dispersed to Mesopotamia and Syria, and so the Deluge was limited to these countries.⁴⁶ A few years later, the German polymath Georg Kirchmaier argued similarly that the Deluge was confined to Asia, the only part of the earth that was inhabited at the time. What is especially interesting about Kirchmaier's work is that he explicitly states that the impossibility of explaining a universal Deluge *necessitates* the conclusion that the Deluge was *not* universal. To counter the objection that a local Deluge is contrary to Scripture, he notes that the ancients often talked of local events in universal terms. He also points out that humans did not move

⁴² Rossi (1984), 132-6; Popkin (1977), 182-6; (1987); Cohn (1996), 43; Poole (2010), 27-30.

⁴³ Popkin (1977), 186-8; (1987), 14-18.

⁴⁴ Popkin (1987); Jorink (2008), 438-41; Poole (2010), 30-7.

⁴⁵ Cohn (1996), 43.

⁴⁶ Allen (1949), 86-7; Rossi (1984), 147-8; Cohn (1996), 43.

beyond Asia until the Dispersion at Babel, a postdiluvian event, and so the destruction of the human race did not require a universal inundation.⁴⁷

By this time, the idea of a local Deluge had become adopted by moderate clergymen in England. Most notably, Edward Stillingfleet, the Latitudinarian Rector of Sutton in Bedfordshire, advanced the view in his *Origines sacrae*. First published in 1662, Stillingfleet's book was immensely popular, appearing in five editions in under two decades.⁴⁸ Addressing the Deluge in the final book, Stillingfleet was clearly well-versed in the recent literature on the topic. As was typical in discussions of the Deluge prior to Burnet's *Theory*, Stillingfleet addressed two main concerns: first, the physical possibility of the Deluge itself; and second, the dimensions and capacity of the ark.⁴⁹ He begins his discussion of the first issue by articulating precisely the same problem with which Burnet would begin his *Theory* two decades later, that is, finding sufficient water for the Deluge.⁵⁰ His proposed solution, however, is essentially the same as that of Vossius and Kirchmaier. "I cannot see any urgent necessity from the Scriptures", he writes, "that the Flood did spread itself all over the surface of the earth".⁵¹

Stillingfleet of course does not go as far as La Peyrère. That all humans save for those on the ark perished in the Deluge, he stresses, "is most certain according to the Scriptures".⁵² And clearly wanting to distance himself from that notorious heretic, he explicitly rejects the notion that the Deluge could have been restricted to "so small a country as Palestine..., as some have ridiculously imagined".⁵³ Humans in general, not just the Jews, were corrupt. God's wrath was directed at all humans. And the effects of the Deluge were universal. He introduces a subtle distinction, however, between universality with respect to *the earth* and a restricted sense of universality with respect to *humans*.

⁴⁷ Allen (1949), 89; Cohn (1996), 43.

⁴⁸ Poole (2010), xi-xii.

⁴⁹ Stillingfleet (1662), 538-2.

⁵⁰ Stillingfleet (1662), 538-9.

⁵¹ Stillingfleet (1662), 539.

⁵² Stillingfleet (1662), 539.

⁵³ Stillingfleet (1662), 539.

The Deluge, he argues, was universal in this latter sense, but not necessarily in the former.⁵⁴ This distinction in Stillingfleet was clearly drawn from Vossius, who Stillingfleet cites elsewhere in his discussion and who had argued that “the Deluge still was universal because the destruction that fell on the entire *then-inhabited world* was universal”.⁵⁵ It was beyond all doubt, Stillingfleet stressed echoing Vossius, “that the Flood was universal *as to mankind*, but from thence follows no necessity at all of asserting the universality of it *as to Globe of the earth*, unless it be sufficiently proved that the whole earth was peopled before the Flood: which I despair of ever seeing proved”.⁵⁶ Following Vossius, he surmised that the human population of the earth could not have increased so as to spread to all areas of the globe in the relatively short period between Adam and Noah.⁵⁷

A possible objection to a local Deluge which Stillingfleet anticipates and answers concerns the destruction of non-human animals. Scripture, he acknowledges, states that “all flesh died that moved upon the earth”.⁵⁸ In answering this objection, Stillingfleet does not want to say that animals, like humans, had not yet dispersed throughout the earth. Indeed, that animals – but *not* humans – populated the entire globe was evident from their different mode of creation according to Scripture, for Moses teaches that they were produced by the water and earth whereas humans were created by God in a particular location.⁵⁹ Instead, he answers that non-human animals were destroyed only “as far as the Flood extended”. The reason for this is that God’s punishment was for “the sin of *man*”, and the animals that were destroyed were so *for man’s sake*. In parts of the earth where there were animals but no humans, then, there was no necessity of their being destroyed.⁶⁰ To the further anticipated rejoinder that if animals elsewhere were to survive there was no need for Noah to save the animals on the ark, Stillingfleet offers a similarly anthropocentric answer. The animals saved on

⁵⁴ Stillingfleet (1662), 539.

⁵⁵ Quoted in Rossi (1984), 147-8 [my italics].

⁵⁶ Stillingfleet (1662), 539 [my italics].

⁵⁷ Stillingfleet (1662), 539-40.

⁵⁸ Stillingfleet (1662), 540.

⁵⁹ Stillingfleet (1662), 541-2.

⁶⁰ Stillingfleet (1662), 540.

the ark were saved for the sake of humans. Had they not been saved in that part of the world where the human race was to be repopulated, there would have been no animals “for the use of men” for several generations.⁶¹ If, then, the entire continent of Asia was populated before the Deluge, “which is as much as we may in reason suppose”, and the Deluge confined to this continent, there would have been as much reason to save the animals in this region as there would if the Deluge was universal.⁶²

That the Deluge destroyed all human but not all animal life had many advantages. In the first place, it could solve the perplexities with which thinkers had grappled since the discovery of new species in America. Exegetes, Stillingfleet notes, had long struggled to explain how these creatures could have travelled to Noah in time for the Deluge and how they were transported back to their native countries after it. The supposition that animals were destroyed only in the area of the globe that was populated by humans removed such difficulties.⁶³ It also helped solve the problems that had exercised thinkers for many decades as to the capacity of the ark. Supposing, that is, that only the animals of a single continent needed to be saved implied that the ark, given the dimensions that Moses relates in his history, was better able to accommodate them.⁶⁴

I have gone into some detail on Stillingfleet’s version of the local Deluge argument because, as Kerry Magruder has very plausibly noted, it was likely Burnet’s main target when discussing this particular “evasion”.⁶⁵ As we shall see shortly, the content of his discussion certainly suggests that this was the case. At the very least, it was surely moderates *like* Stillingfleet whose espousal of such views exercised him most. Such ideas were only to be expected from radicals like La Peyrère. They become dangerous, however, when they become mainstream. Though merely a provincial rector at the time the *Origines sacrae* was first published, by the time of Burnet’s *Theory* Stillingfleet was Archdeacon of

⁶¹ Stillingfleet (1662), 540-1 – quotation from 541.

⁶² Stillingfleet (1662), 540-1 – quotation from 540.

⁶³ Stillingfleet (1662), 542-3.

⁶⁴ Stillingfleet (1662), 552.

⁶⁵ Magruder (2008), 462.

London, Dean of St. Paul's, and Chaplain-in-Ordinary to the King.⁶⁶ The *Origines*, moreover, was in its fifth edition and had thus been widely read and disseminated.⁶⁷ Vossius, too, now resident in England, was Canon of Windsor and a Fellow of the Royal Society.⁶⁸ What had begun as a heathen attack on Christianity and was just two decades ago the opinion of a renowned heretic had, it seemed to Burnet, become acceptable to the ecclesiastical, political, and scientific establishment.

Against the notion of a local Deluge Burnet pits three main arguments. The first and most important since it attacked the main premise of Vossius, Kirchmaier, and Stillingfleet's argument is his attempt to establish what Stillingfleet had two decades earlier "despair[ed] of ever seeing proved", that is, that the entire earth was inhabited by humans at the time of the Deluge. Here Burnet appeals to the longevity of the antediluvians, a subject to which he would devote considerable attention in the second book of the *Theory*, in order to show that the earth's population before the Deluge was more likely considerably *larger* than it is now. The antediluvians, he argues, lived around nine hundred years and therefore had many more offspring than the postdiluvians. Indeed, he notes rehearsing what was a commonly held opinion at the time, this longevity of the antediluvians was likely "providentially design'd" specifically for the "quicker multiplication and propagation of mankind". Within sixteen hundred years, then, the lowest estimate of the period between the Creation and Deluge, the population was more likely so vast that the greater puzzle is how the earth could have accommodated it.⁶⁹ He now attempts a calculation of the antediluvian population, arguing that if the first couple during the first century "left ten pair of Breeder, which is no hard supposition" and the population increased in quadruple proportion each century after that, then the number of humans on earth by the time of the Deluge would exceed ten billion, which is considerably larger than the current population. It was, therefore, "a very groundless and forc'd conceit to imagine, that *Judaea* only, and

⁶⁶ Till (2008).

⁶⁷ Stillingfleet (1680).

⁶⁸ Davids (2012), 199-200; Jorink and van Miert (2012), 2.

⁶⁹ Burnet (1684), 22-3 – quotations from 23. For discussion of the view that longevity was designed for the propagation of the human race, see Almond (1999), 21-2.

some parts about it in *Asia*, were stor'd with people when the Deluge was brought upon the old World".⁷⁰

Burnet's second argument was based on Scripture and clearly aimed at confuting Stillingfleet's claim that there was no "urgent necessity from the Scriptures" for the universality of the Flood. Here, Burnet appeals to two texts, one from the Old and one from the New Testament. The first, unsurprisingly, is Genesis. Here, in chapter 6, verse 13 Moses calls the Deluge a destruction *of the earth*. In 7.19 he says that "[t]he waters exceedingly prevailed upon the Earth, and all the high Hills that were under the whole Heavens were covered", "under the whole Heavens" clearly implying that the mountains around the entire globe were covered. After the Deluge in 9.1 God gives his blessing to Noah and his family to replenish the population of the *earth*. And in 9.11 he promises never again to destroy the *earth* with water.⁷¹ There was also the issue of God telling Noah to build an ark, for if the Deluge was local, he could simply have told him to take his family and the animals to some other part of the world.⁷² More important for Burnet, however, both here and elsewhere in the *Theory*, was his New Testament source: The Second Epistle of St. Peter. Here, the Apostle states explicitly that the old heavens and earth were destroyed at the Deluge and juxtaposes this with the destruction of the present heavens and earth at the Conflagration. This juxtaposition clearly implied that the destruction at the Conflagration will be of the same extent as that at the Deluge, and Conflagration is clearly a universal rather than local event.⁷³

The third argument is based on non-Christian texts, a source on which Burnet draws heavily throughout the *Theory* and even more so in later work. He uses pagan antiquity here for two distinct purposes. The first is inherited from Renaissance writers who, as I noted above, had argued that various pagan flood stories were to be identified with the biblical Deluge. Here Burnet brings these

⁷⁰ Burnet (1684), 23-4.

⁷¹ Burnet (1684), 24-6.

⁷² Burnet (1684), 24.

⁷³ Burnet (1684), 25.

arguments to bear on the question of the universality of the Flood, arguing that this tradition, which is found in all ancient cultures, clearly indicates that there was a single Deluge which encompassed the entire globe. These cultures, moreover, all taught of “the restauration of mankind”, indicating that they believed the entire human race to have been destroyed.⁷⁴ What is especially interesting here is that Burnet makes a point of discussing “the Chineses”.⁷⁵ This was likely aimed at Vossius who, as Eric Jorink notes, had introduced Chinese antiquity into the debates about chronology and earth history and had appealed to Chinese sources in arguing for a local Deluge, claiming that their lack of any tradition concerning the flood indicates that the Deluge did not extend to that part of the world.⁷⁶ Against this, Burnet asserts – albeit, as was customary at the time, without any citation to support his claim – that the ancient Chinese *did* in fact have such a tradition.⁷⁷ Burnet’s second use of Pagan antiquity in arguing against a local Deluge would resurface in various other contexts and was aimed at bolstering his interpretation of St. Peter. “All Antiquity”, he asserts, has taught of successive periods of the earth punctuated by universal destructions resulting from water and fire. The biblical Deluge was in his view “the first and leading instance of this kind”.⁷⁸

As well as the above arguments concerning the antediluvian population, Scripture, and antiquity, Burnet noted also certain philosophical problems with the notion of a local Flood. One seemingly insuperable difficulty was that the water could not cover the mountains in just one part of the globe without dispersing into other areas, for the parts of fluids lack cohesion and so a fluid body will always conform to the convexity of the globe. “We cannot imagine”, he asserts conjuring up the kinds of fantastic images for which the *Theory* would achieve renown among literary scholars, “Hills and Mountains of water to have hung about *Judaea*, as if they were congeal’d, or a mass of water to

⁷⁴ Burnet (1684), 27.

⁷⁵ Burnet (1684), 27.

⁷⁶ Jorink (2008), 444.

⁷⁷ Burnet (1684), 27.

⁷⁸ Burnet (1684), 25.

have stood upon the middle of the Earth like on great drop, or a trembling Jelly, and all the places about it dry and untouch'd".⁷⁹

I have dwelled for some time on this issue of the universality of the Deluge because, as I noted above, it seems to me one of the primary motivations for the first volume of Burnet's *Theory*. Indeed, it is no overstatement to suggest that the entire first book of the *Theory* is essentially an extensive philosophical response to the increasingly popular and increasingly acceptable notion of a local Flood. At the beginning of his discussion of the issue, Burnet notes, as Kirchmaier had acknowledged, that this notion had resulted ultimately from the "straits they [i.e., authors discussing the Deluge] have been put to in all Ages, to find out water enough for *Noah's Flood*" and conjectures that "[t]he Authors that set up this opinion, were not themselves satisfied with it: but seeing insuperable difficulties in the old way [of explaining the Deluge], they are the more excusable in chusing, as they thought, of two evils the less".⁸⁰ He returns to this point toward the end of the discussion, alleging that proponents of this view "do not offer any positive argument for the proof of it, but depend only upon that negative argument, That an universal Deluge is a thing unintelligible" and proclaiming that the purpose of his theory is to remove this "stumbling-stone" by showing that such a Deluge *is* intelligible.⁸¹ His assessment of these authors is somewhat unfair. As we have seen, Vossius, Kirchmaier, Stillingfleet, and even the heretic La Peyrère had produced several positive arguments as well as the above negative one. Burnet was nevertheless correct to suggest that this apparent unintelligibility of a universal Deluge was the principal *motivation* for the view. Faced with the apparent choice between the Deluge being either local and intelligible or universal and wholly mysterious, they had chosen the former. By removing this apparent obstacle, Burnet hoped, he could show that such a choice need not be made.

⁷⁹ Burnet (1684), 26.

⁸⁰ Burnet (1684), 22.

⁸¹ Burnet (1684), 28.

Having dealt at length with the universality of the Deluge, Burnet offers a few brief hints as to his own solution to the problem of supplying and disposing of the waters of the Flood before turning his attention to the Creation.⁸² Before explicating his theory of the earth's formation, he first dedicates almost an entire chapter to proving that it had an origin at all.⁸³ Here of course his target is Aristotle, the only ancient philosopher to have maintained that the earth and life on it have existed for eternity, and who, regrettably, "so great a part of the Christian world have made their Oracle or Idol".⁸⁴ He then rehearses a number of what were by this time standard arguments against this Aristotelian doctrine, appealing first to "Divine Authority" before advancing a series of arguments from "natural Reason" and devoting considerably more attention to the latter than to the former.⁸⁵ On this note, it is interesting to compare Burnet's work with other contemporary discussions of eternalism. Though his methods and arguments are similar, his attitude toward the issue is markedly different. Sir Matthew Hale, for example, in his 1678 book *The primitive origination of mankind*, had lamented that many will believe Scripture only insofar as it is corroborated by reason, and that this necessitated a philosophical refutation of eternalism.⁸⁶ Burnet, in contrast, was a far more willing participant in the use of reason in religion. As we shall see in subsequent chapters, he stressed repeatedly throughout his career that Scripture must not be opposed to reason, and that where Scripture appears to be *contrary* to reason, one must reinterpret the former in light of the latter.

Happily for Burnet, eternalism was as strongly confuted by reason as by Scripture. Both the earth and organic bodies, he noted for example, are composed of parts, that is, material corpuscles, and it is inconceivable for any compound mass to have existed from eternity without its parts having previously been in a simpler state. The earth's mountains and higher regions more generally are evidently subsiding and eroding. Had the earth existed from eternity they would have long since

⁸² Burnet (1684), 28-32.

⁸³ Burnet (1684), 34-51.

⁸⁴ Burnet (1684), 34.

⁸⁵ Burnet (1684), 35-44.

⁸⁶ Hale (1678), preface.

disappeared, leaving the entire surface submerged in water and uninhabitable. Human life, too, is manifestly a relatively recent creation. The world's population is evidently increasing. If humans had existed from eternity, the earth would have long ago become overpopulated. The various mechanical arts, civil society, laws, letters, money and other aspects of modern human life are all relatively recent inventions. The sciences, too, are in an incomplete and imperfect state, and what progress has been made has been made very recently. Had humans existed from eternity, the mechanical and civil arts and the sciences would have been developed and perfected much earlier.⁸⁷

Having dispatched with eternalism, Burnet turns to the Creation. That the earth formed from a chaos he takes as given, since all ancient authors both sacred and pagan who acknowledge that the earth had an origin – that is, all but Aristotle and his followers – agree that it formed from a chaos.⁸⁸ He now sets down the first of three “propositions” of his theory of the Deluge:

*That the Form of the Ante-diluvian Earth, or of the Earth that rise first from the Chaos, was different from the Form of the present Earth”.*⁸⁹

At this point he wanted to establish merely that the antediluvian earth was different, not what the difference consisted in. This, he noted, had effectively been proved already, since it had been shown that the earth in its present form is not capable of a universal Deluge and hence that the antediluvian earth must necessarily have been different.⁹⁰ He nevertheless offers further proof of the proposition from both Scripture and philosophy. First, he discusses at length a passage from St Peter's Second Epistle in which, he alleges, the Apostle makes a distinction between the form of the antediluvian and postdiluvian worlds – I shall discuss this passage in depth in the next chapter.⁹¹ He then considers the nature of the chaos and what kind of body would form from it, defining the chaos as “a Fluid Mass, or

⁸⁷ Burnet (1684), 35-44.

⁸⁸ Burnet (1684), 44.

⁸⁹ Burnet (1684), 44-5.

⁹⁰ Burnet (1684), 45.

⁹¹ Burnet (1684), 45-8.

a Mass of all sorts of little parts or particles of matter, mixt together, and floating in confusion, one with another”, “the matter of the Earth and Heavens, without form or order; reduced into a fluid mass, wherein are all the materials and ingredients of all bodies, but mingled in confusion one with another”.⁹² He surmises that such a fluid mass will necessarily form itself into a uniform body with no inequalities. Additionally, all parts of the body will flow together into a continuous mass with no vacuities. The present earth, therefore, with its unequal surface and numerous cavities, cannot have formed immediately from the chaos.⁹³

He next articulates his second Proposition:

*That the face of the Earth before the Deluge was smooth, regular, and uniform; without Mountains, and without a Sea.*⁹⁴

This he proves by describing the formation of the earth from the chaos as detailed above and citing various passages of Scripture and other ancient writings which indicate that this is the correct account of both the formation and form of the primitive earth.⁹⁵ As with the Deluge, there was by Burnet’s time a long tradition of philosophical theorising about the Creation. This, too, begins essentially at the Reformation when the idea that there is philosophical knowledge in Scripture begins to gain currency, though it should be noted that there are earlier examples. Nicolas of Lyra, for example, who in the fourteenth century argued for the priority of the literal sense of Scripture over the symbolic, mystical, and allegorical senses prioritised by his late-medieval contemporaries, attempted to apply the then-prevailing Aristotelian philosophy to the biblical six-day Creation.⁹⁶ Although Nicolas’s literalism was

⁹² Burnet (1684), 48-9, 53.

⁹³ Burnet (1684), 49-51.

⁹⁴ Burnet (1684), 52.

⁹⁵ Burnet (1684), 52-65.

⁹⁶ Poole (2010), 3-4.

censured by his contemporaries, it was taken up by the Protestant reformers, and from this period we begin to see an increasing number of similarly philosophical explications of the Creation.⁹⁷

By this time, the growing disenchantment with Aristotle, itself closely related to the Reformation, saw the emergence of rival systems of natural philosophy.⁹⁸ Thus, increasingly, it was these systems rather than Aristotle's that became applied to biblical exegesis. The first new system to challenge the authority of Aristotle and to be widely applied to scriptural interpretation was the chemical philosophy of Paracelsus, and in the first half of the seventeenth century several Paracelsians – for example, Jean Baptist van Helmont, Robert Fludd, and Jan Amos Comenius – pitted various chemical interpretations of Moses against the “heathenish” philosophy of Aristotle.⁹⁹ Such interpretations were still popular later in the century. Most notably, Isaac Newton, who was heavily engaged in alchemical work at the time of his correspondence with Burnet in 1680, suggested to Burnet various chemical processes which may explain the formation of mountains at the Creation and discussed chemical theories of the Creation in his notebooks. And as I shall discuss in chapter four, during the controversy surrounding the *Theory* in the 1690s, one of Burnet's critics, Thomas Robinson, proposed an alternative theory of the Creation which was heavily influenced by these earlier chemical interpretations.¹⁰⁰

By mid-century, however, the Paracelsian challenge to Aristotle was becoming eclipsed by the mechanical philosophy of René Descartes, and during the 1660s and 1670s interpretations of the Creation based on Cartesian cosmogony and physics began to emerge. An early attempt to reconcile Descartes and Moses appeared in *The defence of the threefold cabbala*, published in 1662 by Henry More, Burnet's colleague at Christ's and the foremost populariser of Cartesianism in England at the

⁹⁷ Allen (1949), 66-7.

⁹⁸ For the role of the Reformation in the overthrow of Aristotelian philosophy, see Harrison (1998), 101-7.

⁹⁹ Debus (1965), 24-6, 88-91, 105-27; Emerton (1994); Poole (2010), 11-15; Walton (2011).

¹⁰⁰ Poole (2010), 13-15.

time.¹⁰¹ This was followed shortly afterwards on the continent by similar works from Joannes Amerpoel, Géraud de Cordemoy, Christoph Wittich, and others.¹⁰² Burnet, with some qualification, belongs in this tradition of Cartesian biblical exegesis. Certainly he has nothing at all in common with the chemical philosophers and given his resolutely mechanistic worldview it is highly likely that he saw the chemical philosophy, with its “virtues”, “qualities”, “sympathies”, “antipathies”, and the like, as retaining all the explanatory deficiencies of the Aristotelian framework it was intended to replace. Physical processes, he would stress to a later critic, “must be Mechanical: There being no other Modes, or Powers of Matter... but what are Mechanical”.¹⁰³ And as I shall discuss in detail in the next chapter, his account of the formation of the earth very closely mirrors that of Descartes.

The qualification mentioned above is important, however, for there is one very significant difference between Burnet’s account of the Creation and these earlier Cartesian glosses of Genesis. That is, it is not a gloss of Genesis. It is a theory of the *Creation*, but unlike these earlier accounts, it is not a theory of the *Mosaic* Creation, for whereas More, Amerpoel, and others go to great lengths to reconcile the stages of their Cartesian Creations with the six days of Genesis, Burnet makes no such attempt. His is a purely *physical* account of the formation of the earth, with no reference whatsoever to the Hexameron. In this respect, Burnet’s account of the earth’s formation is closer to that of Descartes than these other authors in that Descartes, too, makes no attempt to reconcile his account with Genesis. Burnet differs from Descartes, however, in that where Descartes presents his cosmogony as hypothetical or counterfactual, Burnet’s theory is intended as a true, historical account of the earth’s formation. Also unlike Descartes, he appeals to Scripture in support of his account. This, however, is done only after he has articulated his physical theory, and as we shall see in the next

¹⁰¹ More (1662), 71-98. For discussion of More’s theory of the Creation and its connection with Descartes and Burnet, see Harrison (2000), 169-71.

¹⁰² Roger (1982), 102-3; Harrison (2000), 183; Poole (2010), 18-19.

¹⁰³ Burnet (1699), 61.

chapter, the support is derived from texts other than Genesis, which he – privately at this point – believes does not give a true account of the formation of the earth.

As I have noted above, Burnet’s account of the Creation was articulated primarily in order to give an account of the Deluge. Accordingly, then, after explicating the former, he turns his attention back to the latter, first introducing his theory of the dissolution of the crust and showing how his theory is supported by Scripture before explaining the cause of the dissolution, how the agitation of the waters produced a universal Deluge, and how the breaking and collapse of the crust resulted in the earth taking its present form and situation.¹⁰⁴ He concludes the chapter by stating the third proposition:

*That the disruption of the Abyesse, or dissolution of the primaeval Earth and its fall into the Abyesse, was the cause of the universal Deluge, and of the destruction of the old World”.*¹⁰⁵

His explanation of the Deluge is followed by a lengthy chapter designed to prove that his theory “is not an *Idea* only, but an account of what really came to pass in this Earth, and the true explication of *Noah’s Flood*”.¹⁰⁶ To this end, he presents further in-depth analysis of Moses’ account of the Deluge and various other passages of Scripture, showing how these writings support his theory and how his theory illuminates aspects of these passages which are otherwise obscure – I shall discuss these points in detail in the next chapter.¹⁰⁷ He also discusses again some pagan accounts of floods. Having as we have seen enlisted such accounts to argue for the universality of the Deluge, he now appeals to them in arguing for its causes by pointing to evidence that they were believed to have been brought about by a dissolution of the crust.¹⁰⁸ After this chapter, he bolsters his theory further by showing how it explains various details of the Mosaic account before considering the state of the earth immediately

¹⁰⁴ Burnet (1684), 66-77.

¹⁰⁵ Burnet (1684), 77.

¹⁰⁶ Burnet (1684), 78.

¹⁰⁷ Burnet (1684), 79-94.

¹⁰⁸ Burnet (1684), 94-5.

after the Flood and the role played by Providence in bringing about and governing the Deluge – also to be discussed in the next chapter.¹⁰⁹

Having “deduc’d” his theory of the Deluge “by the intuition of causes”, that is, by reasoning from the nature of the chaos, Burnet proceeds over the last four chapters of the first book to prove his theory “from the Effects”, that is, from the present form of the earth.¹¹⁰ Here, he sets down his final proposition:

That the present form and structure of the Earth, both as to the surface and as to the Interiour parts of it, so far as they are known and accessible to us, doth exactly answer to our Theory concerning the form and dissolution of the first Earth, and cannot be explain’d upon any other Hypothesis”.¹¹¹

He begins his discussion with a general description of the present earth which he characterises as a “great Ruine”, a “broken and confus’d heap” of continents, mountains, seas, caves and other geological phenomena “plac’d in no order to one another, nor with any correspondency or regularity of parts”, which is precisely what we would expect to find given his account of the crust’s dissolution.¹¹² He then considers particular features of the earth individually, dedicating the remainder of the ninth chapter to underground cavities before turning in the tenth and eleventh to the channel of the sea and mountains, showing how each phenomenon is accounted for by his theory.¹¹³

In the final chapter of the first book, after making some further observations concerning the present form of the earth, he addresses and confutes some rival explanations for the formation of mountains.¹¹⁴ He then concludes the first book with some brief but intriguing considerations about the moon and other planets and the extent to which they are of a similar formation and structure to

¹⁰⁹ Burnet (1684), 96-108.

¹¹⁰ Burnet (1684), 109.

¹¹¹ Burnet (1684), 110.

¹¹² Burnet (1684), 110-14 – quotation from 110.

¹¹³ Burnet (1684), 114-51.

¹¹⁴ Burnet (1684), 159-67.

the earth and therefore subject to the same fate. The mountains observed on the moon, he notes, indicate that it has undergone a deluge similar to the earth. Venus and Mars, too, from the “spots” observed on their surfaces, seem also to be terraqueous globes and thus to have suffered a deluge. Singling out Saturn and Jupiter for special consideration, he proposes that the ring of Saturn indicates that at its deluge the two polar regions of the crust disintegrated and collapsed into the abyss but the middle section remained intact and rose above the equator to form an “Arch” or “Bridge” around the planet. Turning finally to Jupiter, he argues that this planet is evidently in its antediluvian state, its “Fasciae” or “Belts” marking different “Zones” similar to those on the antediluvian earth – of which he gives an account in book two. Other planets, then, likely formed via the same process as ours and like the earth have either undergone or will undergo a universal Deluge caused by the same processes as that which occurred on the earth.¹¹⁵ This discussion of Saturn would become the subject of an interesting objection to the *Theory* which I shall discuss in chapter four.

1.4. Book two: The antediluvian earth and Paradise

Having ascertained certain key features of the antediluvian earth during his explication of the Deluge in book one, Burnet proceeds in book two to give a fuller account of this former world. He sets out a number of key questions in the first chapter: “what were the other properties of this World? how were the Heavens, how the Elements? what accommodation for humane life? why was it more proper to be the seat of *Paradise* than the present Earth?”.¹¹⁶ For Burnet, it was the latter question that was most central, the main purpose of this second book being as he put it “to give a just account of *Paradise*”.¹¹⁷ He notes that we know the main characteristics of *Paradise* from Scripture and other Christian writings. We also have knowledge from pagan accounts of the “Golden Age”, which was evidently contemporary with *Paradise* and the antediluvian earth and can thus reliably be identified with them. The aim of this second book was to use the theory to explain the causes of these

¹¹⁵ Burnet (1684), 168-70.

¹¹⁶ Burnet (1684), 174.

¹¹⁷ Burnet (1684), 174.

characteristics. The three principal differences between the antediluvian and present earth which had been established in the previous book and which were to be used to explain why the former was paradisiacal were: (a) its uniform surface and lack of seas; (b) its situation relative to the sun; and (c) its oval figure.¹¹⁸ Here, rather than reason from causes as he does in the earlier chapters of book one, he begins the second book by reasoning from effects, that is, from characteristics of the antediluvian earth of which we have knowledge from sacred and pagan history and from Jewish and Christian accounts of Paradise. The three principal characteristics are: (a) a perpetual spring; (b) the longevity of humans; and (c) the generation of (non-human) animals from the soil.¹¹⁹

These three characteristics of Paradise, he argues in the following chapter, do not, and cannot, obtain on the present earth. The position of the axis does not allow a perpetual spring on any part of the earth. The soil does not produce animals. And the kind of longevity that humans enjoyed in Paradise and the Golden Age is entirely alien to our world. Paradise, therefore, cannot have been on the present earth.¹²⁰ Having shown this, he returns in the next chapter to those three features of the antediluvian earth which distinguish it from the present earth, viz., its uniform surface, the position of the axis, and its oval figure. Of these, the key factor for Burnet in explaining the three principal characteristics of Paradise was the position of the axis. From this feature followed immediately a perpetual spring, and from a perpetual spring followed the generation of animals and longevity.¹²¹ Dealing first with the generation of animals, Burnet draws an analogy between seeds and eggs. These things being so similar, he argues, it is easy to conceive of the primitive soil, which was more fertile than the present, containing both the seeds of plants and animal eggs. For the fertilisation of eggs in the earth, he appeals to “an aethereal element in the male-geniture”. This “aethereal element”, he argues, given the purer atmosphere on the antediluvian earth, was also present in the air and fell on

¹¹⁸ Burnet (1684), 175.

¹¹⁹ Burnet (1684), 176. Though certain ancient philosophers had claimed that humans were generated in the soil, Burnet explicitly restricts this generation to non-human animals.

¹²⁰ Burnet (1684), 184-93.

¹²¹ Burnet (1684), 193-6.

the soil in dews, fertilising the eggs. The perpetual spring provided the constant, unchanging temperature necessary for incubation, thus preventing miscarriages.¹²²

Following his explanation of the generation of animals, Burnet devotes a chapter to giving a detailed account of antediluvian longevity. This chapter is especially interesting and deserves some attention. The longevity of the antediluvians and the shortening of human life that followed the Deluge represented an interesting puzzle for seventeenth-century philosophers and theologians. Aside from the view that the antediluvians' lives were measured in lunar rather than solar years, there were essentially three main kinds of explanation. The first was diet. It was widely believed that the antediluvians were vegetarian, and that the introduction of flesh into the human diet had shortened life. The second was Adam's perfect medical knowledge, passed down to his progeny but lost after the Deluge. The third pointed to environmental differences between the antediluvian and postdiluvian earth resulting from climatic changes brought about at the Flood.¹²³ A seventeenth-century project which was closely related to that of trying to discover the causes of antediluvian longevity was the effort to try and restore it. Those who believed that the antediluvians' vegetarian diet contributed to their longevity held that such a diet would be conducive to longer life in the postdiluvian world. Those who attributed longevity to Adam's medical knowledge believed that rediscovery of this knowledge would inevitably re-establish our former lifespan.¹²⁴ The most famous seventeenth-century philosopher to have actively pursued this dream of restoring antediluvian longevity was René Descartes. He believed that a new system of medicine founded on his new mechanical philosophy could lengthen human life to that of Adam and Noah.¹²⁵

¹²² Burnet (1684), 196-9 - quotation from 198.

¹²³ Almond (1999), 19-27; Harrison (2007), 164-7; Haycock (2008), 168-9. On the latter environmental explanation, see especially Lydia Barnett's fascinating discussion of Antonio Vallisneri's theory that toxins released into the air by the decaying corpses of victims of the Deluge weakened the human constitution and shortened life – Barnett (2015).

¹²⁴ Almond (1999), 24-5; Shapin (2000), 131-42; Gaukroger (2001), 95-100; Gruman (2003 [1966]), 133-54; Harrison (2007), 167-72; Haycock (2008).

¹²⁵ Shapin (2000), 135-42; Gruman (2003 [1966]), 133-8; Harrison (2007), 167-70; Haycock (2008), 175-6.

For Burnet, antediluvian longevity and the postdiluvian shortening of human life were important for essentially two reasons. First, they were phenomena that any theory of the earth had to account for. Second, they were crucial evidence of (a) a significant difference between the antediluvian and present earth, (b) this change in the earth having occurred specifically at the Deluge, and (c) what this difference and this change consisted in. As Philip Almond has noted, Burnet's account of antediluvian longevity is especially important in the context of seventeenth-century thinking on the topic in that he was the first to offer what may be considered a "scientific" account of the phenomenon in terms of environmental factors.¹²⁶ The particular change in the earth to which he attributes the shortening of life is the change in the axis and consequent introduction of seasonal variation. The effects of this change in the body are explained in terms of Descartes' mechanistic physiology. Burnet takes seriously the Cartesian notion that the body is a kind of machine. An important difference between the body and an artificial machine, he notes however, is that the former has the capacity to regenerate, to repair or replenish its own worn components. Were we to give this capacity to an artificial machine, even a complex machine analogous to the body, we would expect it to continue to function for a far longer period than the human lifespan. To illustrate this point, he introduces a thought experiment concerning a highly complex lamp whose workings are exactly analogous to Descartes' account of nutrition in his *Description of the human body*. Such a lamp, he argues, if given this regenerative capacity, would continue to function far longer than the body.¹²⁷

Burnet offers this thought experiment not to explain the longevity of the antediluvians but rather to *problematise* the comparative brevity of life in his own time. It was this brevity rather than the antediluvians' longevity that was a surprising phenomenon, and which was in need of explanation.

¹²⁶ Almond (1999), 26-7 – quotation from 26.

¹²⁷ Burnet (1684), 203-5. For the relevant parts of Descartes' physiology, see Descartes (1982 [1644]), 275-82; (2006), 38-49; (1998), 99-205. For discussion, see Bitbol-Hespériès (2000); Gaukroger (2002), 180-214. For Descartes' account of nutrition, see Descartes (1998 [1664/1667]), 182-6. Burnet also draws on Cartesian physiology in his posthumously published work *Of the state of the dead, and of those that are to rise* – see Burnet (1728), 21-32.

We naturally think of the antediluvians' long lives, he observes, as mysterious, as something to be explained, but such longevity is precisely what we should expect given the composition of the body. We consider it unusual merely because we are accustomed to a short existence, and when something is familiar, we are apt to think that we know more about it than we do. In the case of our short lifespan, though, we know very little. Indeed, the shortness of life runs directly counter to our best physiological knowledge, and so is an especially puzzling phenomenon. The issue to be addressed, then, was not why the antediluvians live so long, but

*[w]hy the frame or Machine of an humane Body, or of another Animal, having that construction of parts and those faculties which it hath, lasts so short a time? And though it fall into no disease, nor have any unnatural accident, within the space of eighty years, more or less, fatally and inevitably decays, dies and perisheth?*¹²⁸

This question could not be answered in terms of our physiology alone, for our physiology implies that we should live far longer than we do. We must therefore look to external factors. It is here that Burnet appeals to the change in the earth's axis and consequent seasonal variation, offering a detailed explanation of the effects of this change on the body in terms of a mechanistic physiology and physics. The main effect of seasonal variation on the body in his view is that which it has on the "Tone or Tonick disposition of the organs". By this, he means their elastic or spring-like properties. Bodily organs, he argues, are essentially springs or configurations of springs. It is the decay of these springs that constitutes the main cause of the body's degeneration. The main springs which, through their decay, bring on the decay of the rest of the body are those of the heart and stomach, for these are the principal springs by which the body is nourished, "the two Master-Springs in the Mechanism of an Animal". In the stomach are small spring-like fibres which push the food into the intestines from which it travels to the liver and then through the veins to the heart. The heart has a spring-like action,

¹²⁸ Burnet (1684), 203-6 – quotation from 203.

which, when opened by the rarefaction of the blood, forces blood out of the heart and into the arteries through which it circulates and nourishes the various parts of the body.¹²⁹

The key environmental factor which affects these organs for Burnet is the motion of small particles which pervade all bodies. On the antediluvian earth, this motion was calm and ordered. On the postdiluvian earth, however, due to our varying seasons, it is erratic and disorderly.¹³⁰ The force of springs, he notes, results from particles exerting pressure on the depressed parts such that, when those parts are released, they return to their original posture as the pent-up particles are allowed freely to follow their natural course.¹³¹ The variable, non-uniform motion of these particles brought on by our intemperate seasons weakens the springs of the heart and stomach far more quickly than the uniform motion of these same particles on the antediluvian earth. This causes these organs to fail, that is, to lose their spring-like or elastic properties, thereby inhibiting their ability to nourish and maintain the body and bringing on its more general decay.¹³²

Burnet was clearly well-versed in contemporary discussions about antediluvian longevity. He engaged with all the major views on the topic, paying particular attention to the notion that the antediluvians' lives were measured in lunar years, which he argued was untenable for several reasons.¹³³ He also engaged with the related endeavour of restoring our former longevity, offering a decidedly pessimistic outlook which contrasts sharply with the optimism of Descartes and others. Crucially, the shortening of life being due to environmental factors put the prolongation of life beyond human capabilities. He does not disagree *in principle* that Descartes's mechanistic physiology showed

¹²⁹ Burnet (1684), 207-13 – quotations from 210. It is interesting to note here that Burnet's view of the movement of the heart, though not explicated in depth, appears to be closely in line with Descartes' in that he believes it to result from the rarefaction of the blood, something generally rejected by English natural philosophers and physicians, even those who adopted substantial parts of Descartes' physiology and natural philosophy more generally – see Anstey (2000), 425-36.

¹³⁰ Burnet (1684), 206-13.

¹³¹ Burnet (1684), 212.

¹³² Burnet (1684), 211-13.

¹³³ Burnet (1684), 189-92, 215-21.

that the body is *theoretically* capable of longer life. Indeed, in certain respects he is even more confident of this than Descartes. Descartes had argued that with better knowledge of the mechanism of the body we could *potentially* learn how to make it function for a longer period. Burnet went further. Adopting various details of Descartes's physiology and taking seriously his conception of the body as a machine, he claimed that what we know about the body *already* implies that it *should* live longer than it does. In practice, however, because the accelerated decay of the body results from that intemperate motion of particles which is caused by the position of the earth's axis, antediluvian longevity was not something that could be restored. Assessing "those Projectors of Immortality, or undertakers to make Men live to the Age of Methusalah, if they will use their methods and medicines", he urged that "[t]here is but one method for this, To put the Sun into his old course, or the Earth into its first posture; there is no other secret to prolong life; Our Bodies will sympathize with the general course of Nature, nothing can guard us from it, no Elixir, no Specifick, no Philosopher's-stone".¹³⁴

After his lengthy discussion of antediluvian longevity, Burnet turns his attention to the important issue of how the antediluvian earth was watered. This, he admits, was an especially perplexing problem given that he had enclosed the water within the crust and removed all the inequalities in the surface which facilitate the flow of rivers.¹³⁵ To overcome these difficulties, he proposes a novel antediluvian hydrography. The heat of the sun, he argues, raised vapours from the earth at the equator – at first from the moist soil and then, as the crust became dehydrated and fissured, from the abyss. The vapours, following the path of least resistance, moved toward the polar regions where they were condensed by the cooler air and descended, forming reservoirs in the northern and southern hemispheres from which, owing to the earth's oval figure, rivers flowed toward the equatorial region where they were either evaporated again or absorbed by the dry earth (Figs. 7-8).¹³⁶

¹³⁴ Burnet (1684), 214.

¹³⁵ Burnet (1684), 223-4.

¹³⁶ Burnet (1684), 223-31.

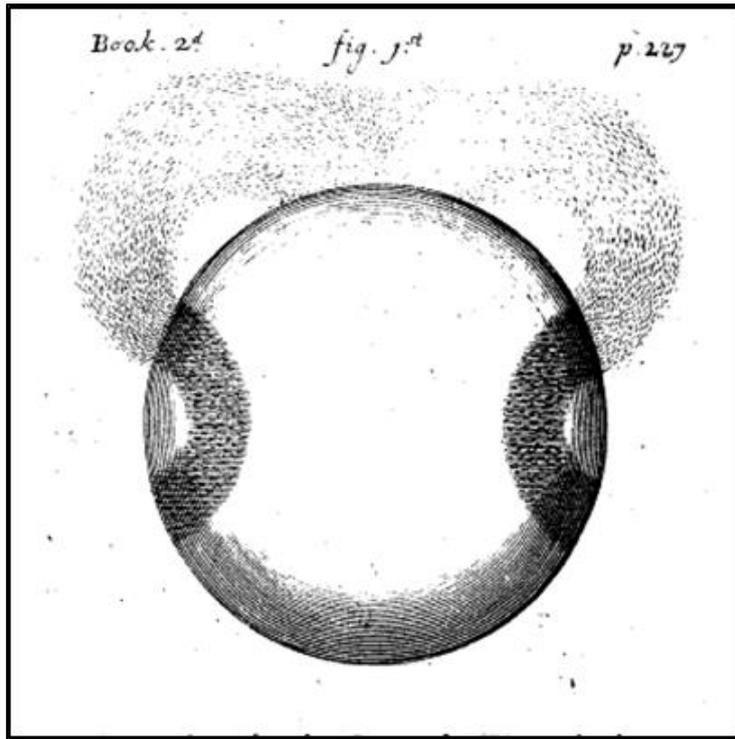


Fig. 7

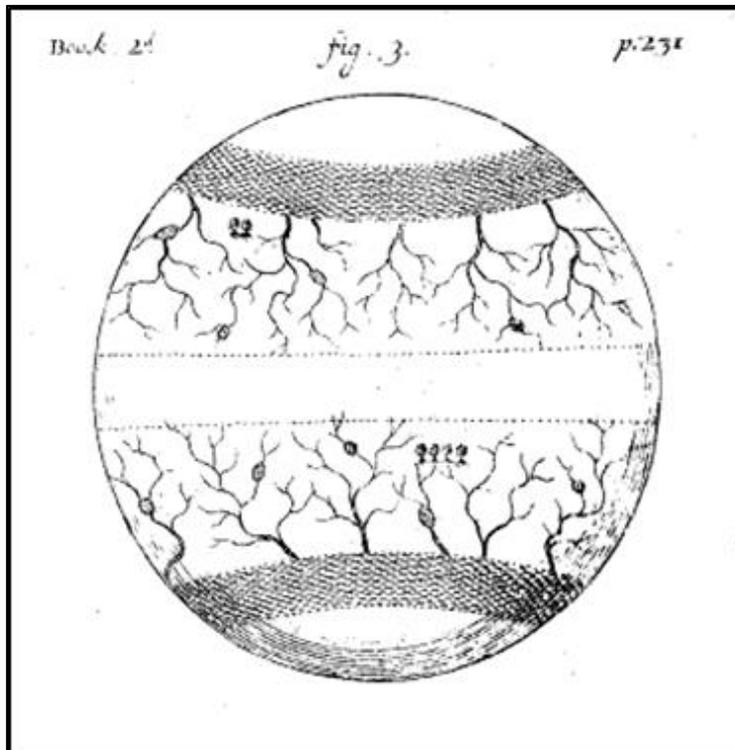


Fig. 8

Next, after some observations concerning the appearance of the rainbow after the Deluge, which he attributes to atmospheric changes brought about by the Flood, Burnet describes the different “Zones” of the antediluvian earth. In the centre was the torrid zone. Here, the sun shined directly at all times, rendering it both uninhabitable and unpassable. The torrid zone was flanked to the north and south by two temperate zones. This was the inhabited part of the earth and the part where the aforementioned rivers flowed. Finally, to the north and south of the temperate zones were two frigid zones. These, too, were uninhabitable. These zones gave the antediluvian earth if viewed from a distance an appearance similar to Jupiter, which is in its antediluvian state.¹³⁷

After brief discussion of some further characteristics of the antediluvian earth and civil life before the Deluge, Burnet turns to the widely debated issue of the location of Paradise.¹³⁸ Once again, as Harrison notes, the search for an earthly Paradise was ultimately a product of the Reformation. Medieval exegetes had largely – though not universally – adopted a spiritual interpretation of Paradise. And those who did adopt a historical, earthly Paradise were generally unconcerned with its location. In contrast, early-modern thinkers were at pains to determine the earthly location of Paradise. Here again, the Protestant literalism, the historicity of Moses, and the notion that Scripture contains philosophical knowledge played important roles. Crucially, following the Reformation, Moses’ description of Paradise came increasingly to be seen as imparting geographical information about its location on earth.¹³⁹ By the end of the seventeenth century, the most popular view was that Paradise was located in Mesopotamia, an opinion that Burnet dismisses as “a conceit and invention of some Modern Authors, which hath been much encouraged of late, because it gave Men ease and rest as to further inquiries, in an argument they could not well manage”.¹⁴⁰

¹³⁷ Burnet (1684), 231-3.

¹³⁸ Burnet (1684), 239-62.

¹³⁹ Harrison (1998), 126-7.

¹⁴⁰ Burnet (1684), 253. For further detailed and extensive discussion of early-modern thinking about the location of Paradise, see Duncan (1972), 89-287.

Instead, as Joseph Duncan has illustrated and as is already apparent to some extent in the above discussion of the antediluvian earth, Burnet revives a notion, last promulgated by the Spanish Jesuit Juan de Pineda in 1620, that not just a single garden but the *whole earth* was paradisiacal prior to the Deluge, and that the expulsion from Paradise was not a change of location but a change in the state of the earth.¹⁴¹ Though he does not deny that there was a particular place on the antediluvian earth called “Eden” where our first parents lived, he emphasises that the characteristics of this place were essentially no different from the rest of the habitable part of the earth. He also wants to dismiss the idea that Paradise can be located on the present earth, which of course in his is view radically different from the antediluvian earth. Wherever God placed Adam and Eve cannot have been on the present earth, since the present earth lacks the key features which make the essential characteristics of Paradise possible. The most important characteristic here of course is the earth’s situation relative to the sun, and since the entire earth was in this situation, so too the entire inhabited zones of the earth, rather than merely a single garden, were necessarily paradisiacal.¹⁴² As to the location of Eden, then, there was no reason on the basis of the theory to prefer any particular location over any other.¹⁴³ Assessing the evidence provided by the Church Fathers and pagan accounts of paradisiacal worlds, it seemed probable that it was in the southern hemisphere, and so not in Mesopotamia. Wherever it was, though, its characteristics did not differ from the rest of the habitable earth. It was simply wherever God placed the first humans, its location depending “rather... upon the Divine pleasure... than upon Natural causes and differences”.¹⁴⁴

Having given his account of the antediluvian earth and Paradise, Burnet next devotes a chapter to showing how his theory illuminates various ancient writings – I shall discuss this in the next

¹⁴¹ Duncan (1969), 182-6; (1972), 271-4.

¹⁴² Burnet (1684), 250-62.

¹⁴³ Burnet (1684), 250-1.

¹⁴⁴ Burnet (1684), 251-62 – quotation from 262.

chapter.¹⁴⁵ He then considers the peopling of America.¹⁴⁶ This latter problem had been a much-discussed topic for some time, and especially so since La Peyrère's unorthodox solution that there were humans before Adam.¹⁴⁷ Burnet's solution, though more acceptable than La Peyrère's, was nonetheless controversial. The people of America, he argues, originate from descendants of Adam who travelled west before the Deluge when there was no sea. Foreseeing that at the Deluge the crust would form two main continents, God saved a selection of humans in each part of the world. The people of America, then, are descendants of Adam, but not of Noah.¹⁴⁸ Following his discussion of the peopling of America, Burnet deals with the potential objection that, had there been such a marked change in the earth at the Deluge, then there would exist some human records of this change, to which he responds by arguing that the vast majority of ancient learning is no longer extant and promising to deal with the issue more fully in a later work – which I shall discuss in chapter four.¹⁴⁹ Finally, he concludes the book with two theological chapters on “the Author of Nature” and “Natural Providence” in which he addresses the existence of God and his role in the natural world – to be discussed in the next chapter.¹⁵⁰

1.5. Book three: The Conflagration

That the *Theory* was to have a second volume was implied in the full title of the first: *The theory of the earth: Containing an account of the original of the earth, and of all the general changes which it hath already undergone, or is to undergo till the consummation of all things. The two first books concerning the Deluge, and concerning Paradise*. In case there were any lingering doubts, Burnet makes clear at the end of the second book that “[w]e are next to enter upon new Matter and new Thoughts, and not only so, but upon a Series of *Things and Times to come*, which is to make the Second Part of this

¹⁴⁵ Burnet (1684), 263-70.

¹⁴⁶ Burnet (1684), 270-3.

¹⁴⁷ See Allen (1949), 113-37; Rossi (1984), 29-34, 132ff.

¹⁴⁸ Burnet (1684), 270-3.

¹⁴⁹ Burnet (1684), 275-87.

¹⁵⁰ Burnet (1684), 289-325.

Theory”.¹⁵¹ The eagerly anticipated second volume did not surface until nearly a decade after the first, the Latin edition appearing in 1689 and the English in 1690.¹⁵²

The publication of the second volume, then, coincides almost exactly with the Revolution of 1688-9, and as Jacob and Lockwood have observed, these developments are reflected in certain differences between the Latin and English editions. As Jacob and Lockwood explain, the Latin edition, though not published until after the Revolution, was written before it during the reign of King James II, a Catholic. At the time of writing, moreover, Burnet was involved in a dispute with the Crown over the appointment of a Catholic pensioner at the Charterhouse. As a result, the Latin edition contains passages expressing dissatisfaction with the political and religious order in England and the threat of Antichrist, which, as was common among Protestants at the time, Burnet identified with the Catholic Church. These passages and certain others (which I shall discuss below) which Burnet appears to have deemed inflammatory were removed from the English edition – which was dedicated to Queen Mary II – indicating his satisfaction with the Revolution Settlement and belief that the Catholic threat had been overcome.¹⁵³ Jacob and Lockwood conclude from this that the Latin version is “much more obviously” a millenarian text than the English.¹⁵⁴ As Johnston emphasises, however, it is important not to overstate the significance of these differences, as indeed Jacob seems to do in a later paper where she writes that this volume of the *Theory*, “if read in its original Latin text, is a millenarian document”.¹⁵⁵ As Johnston stresses, Burnet’s millenarian beliefs are still very much present in the English version. The overall aims and argument of the work are the same and are typical of millenarian thinking among Anglicans in the late-seventeenth century. “The argument of Burnet’s Anglican millenarianism”, writes Johnston, “did not dissipate simply because its tone had moderated”.¹⁵⁶

¹⁵¹ Burnet (1684), 326.

¹⁵² Burnet (1689c); (1690c).

¹⁵³ Jacob and Lockwood (1972), 271-9.

¹⁵⁴ Jacob and Lockwood (1972), 273.

¹⁵⁵ Jacob (1976), 337 [my italics]; Johnston (2011), 26 [note 66].

¹⁵⁶ Johnston (2011a), 26 [note 66].

As I noted in the introduction, the late-seventeenth-century Anglican millenarianism that Burnet's work typifies has its roots essentially in the Restoration of King Charles II in 1660. Following the Restoration, after some unsuccessful attempts to depose the King in the early 1660s, the threat from radical millenarian groups waned and a different kind of millenarian thinking emerged as moderates reacted to the radicalism of the Civil War and Interregnum.¹⁵⁷ As Johnston explains, there were at this time essentially three kinds of interpretation of prophecy: preterist, futurist, and historicist.¹⁵⁸ Preterism was pioneered by the Dutch scholar Hugo Grotius and adopted and developed in England by the Anglican clergyman Henry Hammond and the Presbyterian minister Richard Baxter. Preterists held that the prophecies in Scripture had all been fulfilled and that the Millennium had occurred in the past. On the opposite side of the coin, futurists believed that *none* of the prophecies had been fulfilled, placing their fulfilment and the Millennium far in the future.¹⁵⁹ Historicists of course maintained that *some* of prophecies had been fulfilled and that the millennium was not far off. Preterists and futurists were motivated essentially by a desire to avoid the political consequences that had resulted from historicist interpretations. Hammond and Baxter, troubled by the religious divisions in England, argued that the Millennium began at the conversion of the Romans under Constantine in the early fourth century and ended a thousand years later. The enemies of the Church depicted in Revelation represented earlier, pagan emperors and other early antagonists toward Christianity rather than contemporary opponents of Protestantism – both eschewed the identification of Antichrist with the Papacy.¹⁶⁰ Futurists sought likewise to counter the political threat of historicism. The Salisbury theologian Richard Hayter, for example, urged that the civil wars had been brought about by a misinterpretation of Revelation and endeavoured to remedy the situation by projecting the fulfilment of prophecies into the future and limiting the events to Asia.¹⁶¹

¹⁵⁷ Johnston (2011a), 67ff.

¹⁵⁸ Johnston (2011a), 27-37, 58-66.

¹⁵⁹ Johnston (2011a), 58-66.

¹⁶⁰ Johnston (2011a), 61-4.

¹⁶¹ Johnston (2011a), 60-1, 147.

Despite the apparent threat it posed, however, historicism remained the dominant mode of interpreting prophecy, and rather than resorting to preterism or futurism, exegetes sought instead to maintain a historicist interpretation while at the same time avoiding advocating – or being perceived to advocate – radicalism.¹⁶² This was the project in which Burnet was ultimately engaged in this second volume of his *Theory*. He wanted to maintain that some but not all of the prophecies have been fulfilled, that Antichrist is to be identified with the Catholic Church, that the Conflagration and Millennium are not far in the future, and that the millennial Kingdom of Christ is to be a physical Kingdom on earth, while at the same time providing an interpretation which could not be used as a pretext for political violence. This project was likely inherited in large part from More, who maintained a historicist interpretation of biblical prophecies while at the same time condemning those “enthusiasts” who had used them as a pretext for political violence and arguing at length that the Millennium will not be brought about via such means.¹⁶³

More influential on Burnet, however, as William Poole observes, was the apocalyptic vision of Joseph Glanvill, a Latitudinarian clergyman and FRS who himself was friendly with and heavily influenced by the Cambridge Platonists.¹⁶⁴ Glanvill addressed the Conflagration and Millennium in two short chapters at the end of his *Lux orientalis*, a work dealing primarily with the pre-existence of the soul. Published shortly after the Restoration, Glanvill’s model of the Conflagration and Millennium, like Burnet’s account of the Creation and Deluge, drew heavily on Cartesian physics and cosmogony. At the Conflagration, Glanvill held, the earth’s central fire will break out and engulf the surface. The righteous, upon the return of Christ, will ascend to heaven. The burning earth will turn into a comet and travel through space until it reaches another vortex. Here it will cool, and the vapours and ashes will descend and revitalise the surface, thereby transforming it into a second Paradise where the Kingdom of Christ will reign until the final consummation, which will result – possibly – from the

¹⁶² Johnston (2011a), 27-44, 80-247.

¹⁶³ Johnston (2011a), 86-90.

¹⁶⁴ Poole (2010), 159.

extinction of the sun (that is, the star at the centre of this other vortex).¹⁶⁵ For Burnet, Glanvill's theory served perfectly the purpose of maintaining a historicist reading of prophecy while at the same time providing no motive for political discord, for on this view, the Millennium will obtain *on earth*, but not on the *present* earth, thus negating any pretensions of radicals to be ushering in the Kingdom of Christ through violent uprisings. Burnet, as we shall see, disagrees with Glanvill on several details, but he substantially adopts his general model of the Apocalypse.

Turning now to the content of Burnet's second volume, then, whereas in the first volume he discusses the events in non-chronological order, explaining the Deluge via an account of the Creation in book one and then going back in time to discuss the antediluvian earth in book two, in the second volume, he discusses the events chronologically, dealing with the Conflagration in book three and turning to the formation of the new earth, the Millennium, and the final consummation in book four. At the beginning of book three, following a brief introductory chapter, he sets out at the beginning of the second chapter two initial principles of his theory of the Conflagration. First, the end of the world of which he is to give an account is only the end of the *sublunary world*, that is, the earth and its atmosphere. It does not extend to the universe in general or any other part of it. Second, only the *form* of the earth will be destroyed at the Conflagration, not its matter, for fire does not annihilate matter but only changes its form.¹⁶⁶

The aim of chapters two and three was to establish, firstly, that the earth will be *destroyed*, and secondly, that it will be destroyed *by fire*. To establish these things, he turns first to the ancient pagan philosophers and theologians. Various sects of ancient philosophers, he observes, the Stoics for example, as well as the Atomists and Ionians, maintained some notion of the dissolution – and restoration – of the earth. Ancient theologians, too, in their various myths and poems, expressed similar ideas. The majority of the ancients, then, apart from Aristotle and his followers, held that the

¹⁶⁵ Glanvill (1662), 175-92.

¹⁶⁶ Burnet (1690c), 5-6.

earth is perishable. And although they are less unanimous on this point than on the formation of the earth from a chaos, there were two important factors which needed to be appreciated. First was an ambiguity in the term “world”. In ancient writings, this term is used to refer to both the earth and universe. Thus, where the ancients claim that the world is immortal, they may plausibly be referring to the universe, thereby allowing the earth to perish. Second was the distinction mentioned above between form and matter. When the ancients say that the world will not perish, if this *does* pertain to the earth, it may refer only to its *matter*, thus allowing its *form* to perish. The destruction of the earth, then, was consistent with all ancient learning apart from that of the Peripatetics.¹⁶⁷ In keeping with his principle – to be discussed in the next chapter – of only accepting the testimony of the ancients if it is corroborated by Scripture, he turns now to the latter, quoting several Old and New Testament prophecies which confirm that the earth is to be subject to both a dissolution and restoration.¹⁶⁸

Having determined that the earth will be destroyed, he turns next to consider the manner of its destruction. Beginning again with a survey of the ancients, he notes first that the Romans widely believed that the earth will be destroyed by fire. The Romans evidently took this notion from the Greeks, and especially the Stoics, who in turn learned it from various more ancient Eastern peoples such as the Egyptians, Phoenicians, Persians, and Chaldeans. Northern and western cultures, too, such as the Celts and Scythians, held this view.¹⁶⁹ Once again, in keeping with his methodological principles, ancient learning had to be corroborated by Scripture and natural reason. The latter being dealt with at length in the rest of the book, he turns now to the former. As with the destruction of the earth more generally, its destruction specifically by fire was well supported by both the Old Testament Prophets and New Testament Apostles. That these two sets of sacred writers taught of the Conflagration at such different times and yet are in perfect agreement, moreover, clearly attests to

¹⁶⁷ Burnet (1690c), 6-10.

¹⁶⁸ Burnet (1690c), 10-13.

¹⁶⁹ Burnet (1690c), 13-19.

their having a common, divine source. That the earth will be destroyed by fire, then, was confirmed by virtually all ancient learning, and this learning was corroborated by the word of God.¹⁷⁰

Having ascertained both that the earth will be destroyed and that it will be destroyed by fire, Burnet devotes the next two chapters to the question of when the Conflagration will take place. He argues first that the time of the Conflagration cannot be predicted by considering natural causes. As he was to illustrate in subsequent chapters, natural causes – aided as we shall see by the ministry of angels – were sufficient to bring about the Conflagration. However, the various natural processes which will cause the Conflagration must be synchronised at the appropriate time by a divine – or angelic – power. Thus, on the basis of these causes alone, we cannot calculate when they will conspire in bringing about the Conflagration.¹⁷¹ Textual sources were equally unpropitious. As well as casting doubt on various calculations from Christian and Jewish writers, Burnet argues that the prophecies give us no indication at present as to the time of the Conflagration. The seven Seals, Trumpets, and Vials are “rather Historical Prophecies than Chronological”. They are signs of events leading up to the Apocalypse, but they do not tell us the times at which they are to occur. Others “may be call’d Chronological”, such as the reign of Antichrist and the preaching of the Witnesses, but we do not know when they began and so cannot determine when they will conclude.¹⁷² Ultimately in Burnet’s view the ability to predict the time of the Conflagration depends on the fulfilment of more prophecies. By examining them such that we can reliably apprehend their fulfilment, we will be able to use them to predict the time of the Conflagration. What is required at present, then, is

a judicious examination of these points: and according as we gather up the Prophecies of the Apocalypse, in a successive completion, we see how by degrees we draw nearer and nearer to the conclusion of all. But till some of these enlightning Prophecies be accomplish'd, we are as a Man that

¹⁷⁰ Burnet (1690c), 20-4.

¹⁷¹ Burnet (1690c), 24-31.

¹⁷² Burnet (1690c), 37.

awakes in the Night, all is dark about him, and he knows not how far the Night is spent: but if he watch till the light appears, the first glimpses of that will resolve his doubts.¹⁷³

On this subject, it is important to note a significant difference between the Latin and English editions of the *Theory*. Although the argument in the two chapters discussed above is essentially the same in both versions, there are, as Jacob and Lockwood point out, two passages elsewhere in the Latin text in which Burnet conjectures about the time of the Conflagration and which indicate that he believed it will occur in around two hundred years. These have been removed from the English version.¹⁷⁴ It is also noteworthy that in chapter five of the English text Burnet makes the point that we cannot determine the time of the Conflagration from prophecy slightly more forcefully than he does in the Latin version. In the final paragraph, for example, he stresses again the difficulty of calculating the time of the Conflagration from Prophecy and the dangers of attempting such calculations. He also notes the importance of prophecy being obscure as to such matters. “In a word”, he writes,

Tho the sum and general contents of a Prophecy be very intelligible, yet the application of it to Time and Persons may be very lubricous. There must be obscurity in a Prophecy, as well as shadow in a Picture. All its lines must not stand in a full light. For if Prophecies were open and bare-fac'd as to all their parts and circumstances, they would check and obstruct the course of humane affairs; and hinder, if it was possible, their own accomplishment. Modesty and Sobriety are in all things commendable, but in nothing more than in the explication of these Sacred Mysteries; and we have seen so many miscarry by a too close and particular application of them, that we ought to dread the Rock about which we see so many shipwrecks.¹⁷⁵

He concludes the chapter by noting again that, when more of the prophecies have been fulfilled, we will be better able to make the calculation: “But the Scenes will change fast towards the Evening of this long day, and when the Sun is near setting, they will more easily compute how far he hath to

¹⁷³ Burnet (1690c), 37-8.

¹⁷⁴ Jacob and Lockwood (1972), 274-5.

¹⁷⁵ Burnet (1690c), 42.

run”.¹⁷⁶ This paragraph is an entirely new addition in the English version which did not appear in the Latin text.

These differences are significant and highly interesting insofar as they highlight Burnet’s increased reticence to speculate about the time of the Conflagration after the Revolution compared with the period before it. They do not, however, in my view, justify Jacob and Lockwood’s contention that the Latin edition is significantly more millenarian than the English. Firstly, it is important to emphasise, as I have noted above, that the overall argument of this chapter – that we cannot determine the time of the Conflagration from prophecy – is the same in both texts.¹⁷⁷ Indeed, the title of the chapter in the English edition, “Concerning Prophecies that determine the end of the World; Of what order soever, Prophane or Sacred: Jewish or Christian. *That no certain judgment can be made from any of them, at what distance we are now from the Conflagration*”, is a straightforward translation of the Latin.¹⁷⁸ That he makes certain loose conjectures about the time of the Conflagration elsewhere in the Latin text but does not do so in the English, then, does not alter the fact that, when addressing the issue at length in this chapter, he came to the same conclusion in both versions. It is important also to note that in the English text he still exhibits the same historicist millenarian belief that the Conflagration *is near*, even if he no longer gives an indication of *how* near. Immediately following the above passage on the fulfilment of further prophecies, for example, he urges that

[w]e must have a little patience, and, I think, *but a little*; still eyeing those Prophecies... till by their accomplishment, the day dawn, and the Clouds begin to change their colour. Then we shall be able to make a near guess, when the Sun of righteousness will arise.¹⁷⁹

¹⁷⁶ Burnet (1690c), 42.

¹⁷⁷ Burnet (1689c), 32-42; (1690c), 32-42.

¹⁷⁸ Burnet (1690), 32 [my italics]. The Latin text reads: “De calculis Prophetis cujuscuque ordinis: Exotocis aut Sacris: issq’ Hebraeis aut Christianis. Ex his nihil praecisè definiri posse, quoad Mundi exitum” – Burnet (1689c), 32.

¹⁷⁹ Burnet (1690c), 38 [my italics].

Secondly, an unwillingness to speculate about the time of the Conflagration was not at all uncommon in seventeenth-century millenarian thinking. Indeed, such agnosticism was well supported by Scripture. In his 1627 work *An apologie of the power and providence of God in the government of the world*, for example, George Hakewill wove together passages from Matthew 24.37-9, Peter 2.3.10, and Thessalonians 1.5.2-3 in which it is stated that we will know nothing of the time of the Conflagration until the event is upon us.¹⁸⁰ And shortly after the publication of Burnet's second volume in 1692 and 1693, the naturalist John Ray in his *Miscellaneous discourses and Three physico-theological discourses* added testimony from Matthew 24.36 and Acts 1.17 to the same effect and, echoing Burnet's warning "that we ought to dread the Rock about which we see so many shipwrecks", listed several failed predictions concerning the time of the Conflagration which, he asserted, demonstrate how "ungroundedly and erroneously" such calculations are made.¹⁸¹

After dealing with the time of the Conflagration, Burnet turns at last to its causes. Here, he observes, the ancients are of little use, for they do not give causes in their accounts of the burning of the earth. The vast majority of modern authors were unhelpful too, for they typically ascribed the Conflagration purely to supernatural causes, something Burnet, in keeping with his maxim of appealing to miracles only when there is no adequate natural explanation, was unwilling to do.¹⁸² Here it is important to note that Burnet is motivated by similar concerns as in his theory of the Deluge. Crucially, he wants to make a universal Conflagration intelligible, that is, explicable in terms of natural processes, in order to show that allegorical and partial interpretations of the Conflagration are unwarranted. Here, though, the threat of such interpretations was political as well as religious, for such readings of the Conflagration had been used as a pretext for political violence. Most notably, the work of Cambridge academician Joseph Mede, who argued that there would be a partial Conflagration confined only to Italy prior to the Millennium and then a universal Conflagration after it, had been

¹⁸⁰ Hakewill (1627), 43.

¹⁸¹ Ray (1692), 181-6; (1693), 342-8 – quotation from (1692), 182 and (1693), 343.

¹⁸² Burnet (1690c), 43.

appropriated by radical millenarians earlier in the century.¹⁸³ By showing that the Conflagration was to be a literal and universal dissolution of the earth, Burnet aimed to demonstrate that the Millennium will not take place on the present earth and that those radicals who sought to institute the Kingdom of Christ on the present earth through violent means had no scriptural basis for doing so.

Burnet's discussion of the causes of the Conflagration closely mirrors his treatment of the Deluge. As with the latter where the principal problem was the difficulty of finding sufficient water to cover the entire surface of the earth, the key problem in this case was "the difficulty of setting the Earth on fire".¹⁸⁴ That is to say, there are various apparently insurmountable obstacles to the burning of the earth. The primary impediments, he notes, are: (a) the vast quantity of water; (b) the numerous rocky mountain ranges; (c) the various soils and clays in the earth which seem rather to quell than to fuel fire; and (d) the extreme cold at the poles. These phenomena, it seemed to many, will inevitably impede the spread of fire, rendering it impossible for the earth to be consumed in its entirety.¹⁸⁵ Having presented these impediments, he then briefly explains how they will be overcome at the conflagration. The amount of water on the earth will be greatly diminished by droughts. The mountains will be disintegrated during the Conflagration by earthquakes, enabling them to burn. Soils and clays will be altered by heat, turning them into fuel. And the earth's axis will return to its original position, making the polar regions warmer and more pervious to fire.¹⁸⁶

Although, as Burnet noted, most who believed in a literal, universal Conflagration held that it would occur via purely miraculous means, some, as we have seen above in the case of Glanvill, sought to account for it in terms of natural causes. The two theories with which Burnet was familiar were: (a) Glanvill's Cartesian-inspired notion of the central fire breaking out, a view that had also been argued around the same time by the Cambridge Platonist George Rust; and (b) More's also Cartesian-inspired

¹⁸³ Hutton (2001), 5-11.

¹⁸⁴ Burnet (1690c), 44.

¹⁸⁵ Burnet (1690c), 44.

¹⁸⁶ Burnet (1690c), 44-6.

theory, presented in his 1660 work *An explanation of the grand mystery of Godliness*, that the earth is moving closer to the sun and will eventually be engulfed by its heat.¹⁸⁷ Addressing the latter view, Burnet first notes that if we compare the calculations of the distance between the earth and sun in ancient and modern astronomers it appears that, if the distance is changing at all, then the earth is rather receding from than approaching nearer to the sun, since the moderns' calculations of the distance are greater than those of the ancients. More importantly, though, if the earth is moving closer to the sun, then the time of its orbit and consequently the length of the year would be becoming shorter, and there is no evidence that this is the case. The idea of the central fire breaking out seemed equally implausible. Though he acknowledges that such a fire very likely exists, its breaking out and engulfing the earth was highly improbable. Fire being the lightest, most volatile substance, the earth's central fire must necessarily be enclosed within an incredibly thick and strong shell which will prevent it from consuming the earth.¹⁸⁸

Having confuted the above theories, he devotes the next chapter to the issue of the extent of the Conflagration. Reiterating his earlier point that the Conflagration will be confined to the sublunary world and will "have nothing to do with the Stars and superior Heavens", he argues that the upper limits of the fire will be the top of earth's atmosphere. As to its inner limits, he claims that the fire will burn the entire exterior region of the earth to the depth of the ocean, thus destroying all but the inner core.¹⁸⁹ He then explicates the three causes of the Conflagration detailed above before discussing in more depth the dehydration of the earth's matter and plant life which will take place prior to the event.¹⁹⁰ After this, he considers to what extent miraculous causes will be involved in the Conflagration, arguing that the natural processes will be assisted and directed by the ministry of angels but ruling out any direct intervention from God – I shall return to this issue in the next chapter.¹⁹¹

¹⁸⁷ Rust (1661), 74; More (1660), 230-3, 239-41.

¹⁸⁸ Burnet (1690c), 47-52.

¹⁸⁹ Burnet (1690c), 52-3.

¹⁹⁰ Burnet (1690c), 53-69.

¹⁹¹ Burnet (1690c), 69-73.

Next, he discusses in detail the diminishing of the oceans by droughts prior to the Conflagration and the disintegration of mountains during it.¹⁹² He then devotes a chapter to explaining the beginning of the Conflagration in Italy and the complete dissolution of the earth that will result.¹⁹³

That the Conflagration will begin in Italy was of course very important. The identification of Antichrist with the Catholic Church had been the prevailing view among Protestant millenarians since the Reformation.¹⁹⁴ Thessalonians, the Book of Daniel, and the Book of Revelation, Burnet observed, all indicate that the Conflagration will commence at the seat of Antichrist, “that Antichrist, and the Seat of Antichrist, will be consumed with Fire, at the coming of our Saviour”. It was thus “very reasonable and decorous, that the Grand Traitor and Head of the Apostasie should be made the first example of the divine vengeance” and therefore highly convenient that the Papacy was situated in the volcanic centre of the Christian world, that as he puts it,

[n]ature hath sav'd us the pains of kindling a fire in those parts of the Earth, for, since the memory of man, there have always been subterraneous fires in *Italy*. And the *Romans* did not preserve their Vestal fire with more constancy, than Nature hath done her fiery Mountains in some part or other of that Territory.¹⁹⁵

After having dealt fully with all the physical causes and characteristics of the Conflagration, Burnet uses his theory to explain the various natural phenomena which, according to Scripture, will precede or accompany the event. These were: (a) earthquakes and the falling of mountains; (b) violent seas; (c) obscuring of the sun and moon; and (d) irregular motions of the heavens and falling stars.¹⁹⁶ Earthquakes and the falling of mountains he had explained already as resulting from droughts enlarging vacuities in the earth and releasing subterraneous gasses.¹⁹⁷ The commotion of the sea

¹⁹² Burnet (1690c), 74-82.

¹⁹³ Burnet (1690c), 82-90.

¹⁹⁴ Johnston (2011a), 44-9.

¹⁹⁵ Burnet (1690c), 83-4.

¹⁹⁶ Burnet (1690c), 93.

¹⁹⁷ Burnet (1690c), 93-4.

would also result from earthquakes and also from eruptions of volcanoes in the ocean.¹⁹⁸ The sun and moon would be obscured by fumes and vapours emitted by volcanoes, a phenomenon which had frequently been observed prior to eruptions.¹⁹⁹ The unusual motion of the heavens would result partly from the shaking of the earth by earthquakes, partly from the shift in the earth's axis, and partly from the irregular movements of the earth perturbing those of the moon and other planets.²⁰⁰ Finally, the "falling stars" were a combination of the aforementioned "fiery meteors" in the air and comets in the heavens.²⁰¹ He then concludes book three with a chapter on the coming of Christ and then a final chapter discussing who will burn and who will be spared at the Conflagration.²⁰²

1.6. Book four: The Millennium

In the opening chapter of the fourth and final book, Burnet addresses the notion that the earth will be annihilated at the Conflagration, a view which had been advanced earlier in the century by Hakewill.²⁰³ Against this view, he first adduces a philosophical argument from the conservation of matter. As he had stressed at the beginning of the previous book, Fire does not annihilate matter. Hence, if a complete annihilation of the earth were God's design, fire would have no effect whatsoever, for "smoak and ashes are at as great a distance from Nothing, as the bodies themselves out of which they are made".²⁰⁴ Following this, and ignoring Hakewill's arguments to the contrary, he argues that the idea of the earth being reduced to nothing at the Conflagration is inconsistent with scripture, for both the Old and New Testament prophets make frequent references to a new heavens and earth which are to follow the Conflagration. Allegorical interpretations of the new heavens and earth were also problematic, for if the new heavens and earth are to be understood allegorically, then

¹⁹⁸ Burnet (1690c), 94-6.

¹⁹⁹ Burnet (1690c), 96-7.

²⁰⁰ Burnet (1690c), 97-8.

²⁰¹ Burnet (1690c), 98-9.

²⁰² Burnet (1690c), 100-11.

²⁰³ Hakewill (1627), 441-53.

²⁰⁴ Burnet (1690c), 130.

the Conflagration, too, must be allegorical, for if the new heavens and earth are the same as the present, then the latter cannot have been destroyed. And to interpret the Conflagration allegorically was to contradict both Scripture and all ancient learning, which teach of a literal burning of the earth.²⁰⁵ He then returns to philosophy, invoking the impossibility of a vacuum, something that would necessarily be created by the matter of the earth being annihilated.²⁰⁶

In the subsequent chapter, he gives his account of the formation and structure of the new earth.²⁰⁷ He follows his description with evidence from Scripture which supports his account and which I shall discuss in the next chapter.²⁰⁸ The remaining chapters of the fourth book deal with the Millennium and Kingdom of Christ – terms which Burnet uses interchangeably. Mirroring his theory of the Deluge in book one, he bookmarks his theory of the Millennium with a series of “propositions”, the first being:

*That after the Conflagration of this World, there will be New Heavens and a New Earth; and that Earth will be inhabited.*²⁰⁹

That a new earth will follow the Conflagration was supported by Scripture, antiquity, and the Church Fathers. The new earth, he continues, must necessarily be inhabited, for God does nothing in vain and so would not create a new world only to leave it unpopulated.²¹⁰ As to who will inhabit this new earth, he argues on the basis of various passages of Scripture – to be discussed in the next chapter – that this will be the Martyred Saints, who will be resurrected and will reign on earth with Christ for a thousand years until the final consummation.²¹¹ He then gives further proof from the primitive Church Fathers from the Apostles to the Nicene Council, the vast majority of whom adhered to the literal sense of the

²⁰⁵ Burnet (1690c), 130-2.

²⁰⁶ Burnet (1690c), 132-3.

²⁰⁷ Burnet (1690c), 135-8.

²⁰⁸ Burnet (1690c), 138-41.

²⁰⁹ Burnet (1690c), 150.

²¹⁰ Burnet (1690c), 143-4.

²¹¹ Burnet (1690c), 144-73.

millennial Kingdom of Christ on earth, noting as I have discussed above that the doctrine of the Millennium was suppressed during the middle ages and revived at the Reformation.²¹² Following this, he states his second proposition:

*That there is a Millennial State, or a Future Kingdom of Christ and his Saints, Prophesied of and Promised, in the Old and New Testament; and receiv'd by the primitive Church as a Christian and Catholick Doctrine.*²¹³

Over the next two chapters, he addresses the issue of whether the Millennium will take place on the present or future earth.²¹⁴ This, as I have noted, is the central issue at stake in this second volume of the *Theory*, and the principal aim of the work is to establish the latter position. The final proposition of Burnet's theory of the Millennium, then, which he states at the beginning of the eighth chapter, is by far the most important:

*That the Blessed Millennium (properly so called) according as it is describ'd in Scripture, cannot obtain on the present Earth, nor under the present constitution of Nature and Providence; but is to be celebrated in the New Heavens and New Earth, after the Conflagration.*²¹⁵

This proposition he states at the beginning of the eighth chapter, having dealt with "[t]he truth of the Millennium, according to Characters taken from Scripture" and "some mistakes concerning it" in the seventh. It was these mistakes that in Burnet's view had led to the belief that the Millennium will obtain on the present earth. The eighth chapter is dedicated to refuting this view. Here, the parenthesised "properly so called" in the above proposition is important, for in this chapter, again mirroring the first book and his assault on the "vulgar Deluge", he makes a distinction between the true Millennium and the "vulgar Millennium", a characterisation of the view that the Kingdom of Christ

²¹² Burnet (1690c), 173-9.

²¹³ Burnet (1690c), 179.

²¹⁴ Burnet (1690c), 183-201.

²¹⁵ Burnet (1690c), 190.

will reign on the earth in its present state which for Burnet serves important rhetorical purposes. Against this “vulgar Millennium”, he advances a lengthy series of arguments. The resurrected Saints are said to live free of illness and death, something which is impossible in the present state of nature but will inevitably obtain on the new paradisiacal earth. St Peter states clearly that the righteous will inhabit a new earth. St John, too, claims that the Martyrs will inhabit the New Jerusalem, and situates the city on the new earth. Before the Kingdom of Christ can reign, the Antichrist must be destroyed, and this does not happen until the Conflagration. These and several other points taken together, he argues, clearly prove that the Millennium cannot take place on the present earth.²¹⁶

As Kubrin has observed, it is in this chapter that Burnet’s political motivations become clear, for here he makes a number of observations as to why the doctrine of the Millennium became suppressed in the middle ages.²¹⁷ Ultimately, he argues, the Church Fathers who adhered to a literal interpretation of the Kingdom of Christ on earth placed this Kingdom not on the present earth but on the new earth following the Conflagration.²¹⁸ Later exegetes, however, by neglecting this important point,

brought that doctrine [of the Millennium] into discredit and decay. For when they plac'd the Kingdom of the Saints upon this Earth, it became more capable of being abus'd, by fanatical spirits, to the disturbance of the World, and the invasion of the rights of the Magistrate, Civil or Ecclesiastical, under that notion of Saints. And made them also dream of sensual pleasures, such as they see in this life: Or at least gave an occasion and opportunity to those, that had a mind to make the doctrine odious, of charging it with these consequences. All these abuses are cut off, and these scandals prevented, by placing the Millennium aright. Namely, not in this present Life, or on this present Earth, but in the New Creation, where Peace and Righteousness will dwell.²¹⁹

²¹⁶ Burnet (1690c), 190-201.

²¹⁷ Kubrin (1968), 103.

²¹⁸ Burnet (1690c), 192-3.

²¹⁹ Burnet (1690c), 193. This passage is also noted by Kubrin (1968), 104.

Here of course Burnet is discussing developments in the early Church, but he is keenly aware of their relevance to his own century. He makes this explicit shortly afterwards at the end of his *Review of the theory of the earth*, an essay appended to the English edition of this volume of the *Theory* which I shall discuss in detail in chapter three. “We might now put an end to this Review”, he writes,

but it may be expected possibly that we should say something concerning the *Millennium*: which we have, contrary to the general Sentiment of the Modern *Millenaries*, plac'd in the *Future Earth*. Our Opinion hath this advantage above others, that, all fanatical pretensions to power and empire in this World, are, by these means, blown away, as chaff before the wind. Princes need not fear to be dethron'd, to make way to the Saints: nor Governments unhing'd, that They may rule the World with a rod of Iron. These are the effects of a wild Enthusiasm; seeing the very state which they aim at, is not to be upon this Earth.²²⁰

Turning back to the *Theory*, the penultimate chapter is dedicated to the question of how the resurrected Saints will occupy their time during the Millennium, their primary occupations according to Burnet being philosophical inquiry and the contemplation of and devotion to God.²²¹ In the final chapter, after answering some objections to his view, he directs his attention to the end of the Millennium. He first offers a possible explanation of the doctrine of “Gog and Magog”, who are said in the Book of Revelation to be led by Satan to rise up and attack the Saints in their city at the end of the Millennium. The nations of Gog and Magog, Burnet suggests, are a second race of humans “generated from the Slime of the Ground, and the Heat of the Sun” in the same way animals were before the Deluge. These humans, “increasing and multiplying after the Manner of Men, by carnal Propagation”, will grow numerous during the Millennium and, when Satan is freed, will be led by him in an attack on the Saints but will be consumed by “Fire and Lightning from Heaven”.²²²

²²⁰ Burnet (1690c), 50.

²²¹ Burnet (1690c), 202-14.

²²² Burnet (1690c), 218-22 – quotations from 220.

Finally, he considers the question of what will happen to the earth after the Millennium when the Saints have ascended to heaven. There is nothing explicit on this in Scripture, he observes. And the ancient philosophers have said little about it, too. The Stoics and earlier Greeks, however, taught of a “final Resolution of all things into Fire”, and like their doctrine of the Conflagration, they seem to have derived this notion from ancient Eastern learning.²²³ This final “Dissolution of the Earth into Fire”, he notes, may be understood in two ways: the earth being “dissolv’d into a loose Flame”, and its matter dissipated throughout space; or it being “dissolv’d into a fix’d Flame, such as the Sun is, or a fix’d Star”.²²⁴ He adopts the latter view, arguing that if the planets were once fixed stars, which he believes to be the case, then their returning to their original state “seems to be according to the Methods of Providence, which loves to recover what was lost or decay’d, after certain Periods”.²²⁵ He stresses, however, following Glanvill who was similarly noncommittal about his proposal of the expiration of the sun, that these observations on the doctrine of Gog and Magog and the final consummation are merely conjectures.²²⁶

1.7. Conclusion

Burnet’s theory was very much a product of its time. Its literalist approach to Scripture, treatment of sacred texts as historical documents, and use of natural philosophy and pagan writings in biblical exegesis are typical of post-Reformation Christianity. Burnet’s anti-Aristotelianism, adoption of the Cartesian philosophy, and attention to such issues as the longevity of the antediluvians and prolongation of human life, the earthly location of Paradise, and the peopling of America all embody significant currents in seventeenth-century thought. His anti-radical, historicist account of the Apocalypse, moreover, was a paradigm example of post-Restoration moderate Anglican millenarianism. In important respects, however, he was resisting as many of these currents as he was

²²³ Burnet (1690c), 222.

²²⁴ Burnet (1690c), 222.

²²⁵ Burnet (1690c), 223.

²²⁶ Burnet (1690c), 221-2, 224; Glanvill (1662), 189.

being carried by. He reacted strongly to the increasingly popular and acceptable notion of a local Deluge. His pessimism about the prolongation of life ran directly counter to the general optimism of the time. His insistence on Eden being located in the southern hemisphere contradicted the general agreement that it was in Mesopotamia. Most significantly, his account of the Creation, which, unlike Descartes, he presented as a true, historical account, but unlike More and others did not attempt to reconcile with the six days of Genesis, was quite radical and contrary to contemporary sensibilities. So too was his picture of the antediluvian earth as radically different from the present, of Paradise as the whole earth, of it being lost at the Deluge rather than the Fall, and of the Americans not being descended from Noah. As we shall see in later chapters, these and other points of the theory would become highly controversial. And Burnet's elaboration on them in later work would only serve to further expose their heterodox implications, thus rendering them even more radical than they appeared in the original *Theory*.

2. Reason, Scripture, and antiquity

2.1. Introduction

At the beginning of book one of the *Theory*, Burnet set out what were to be his three guides in constructing his history of the earth: reason, Scripture, and antiquity. These guides are explicitly prioritised in this order. “This Theory being chiefly Philosophical”, he writes, “Reason is to be our first Guide; and where that falls short, or any other just occasion offers it self, we may receive further light and confirmation from the Sacred Writings”. Both these sources of evidence, he emphasises, “are to be lookt upon as of Divine Original”, for as Scripture is divinely inspired, so too are our faculties created by God.¹ The writings of ancient philosophers, divines, historians, poets, and the like, in which we find information about past ages of the earth, may also be useful. But being the work of mere human rather than divine or divinely-inspired authors, they are ultimately less reliable than reason and Scripture and are of lesser consequence and should be appealed to only to the extent that they are corroborated by these more reliable sources. We cannot “depend wholly upon their credit, nor assert any thing upon the authority of the Ancients which is not first prov'd by Natural Reason, or warranted by Scripture”.²

The “Divine Original” of both reason and Scripture was for Burnet a central guiding principle, both in his *Theory* and elsewhere. This principle had been promulgated in the late sixteenth century by Richard Hooker and in the early seventeenth by William Chillingworth and the Great Tew Circle and was taken up later in the century by the Cambridge Platonists and Latitudinarians.³ Burnet almost certainly imbibed it from these latter two groups, with whom he was closely associated during his

¹ Burnet (1684), 6.

² Burnet (1684), 4.

³ Griffin (1992), 59.

earlier years at Cambridge and later life in London.⁴ A consequence of this principle that was especially important in Burnet's work was the impossibility of reason and Scripture being in conflict with one another. "He that made the Scripture made also our Faculties", he writes at the beginning of the *Theory*, "and twere a reflection upon the Divine Veracity, for the one or the other to be false when rightly us'd. We must therefore be careful and tender of opposing these to one another, because that is, in effect, to oppose God to himself".⁵ The truths of reason and the truths of Scripture both being divine, we must not interpret Scripture in a way that contradicts reason and philosophy, "lest Time, which brings all things to light, should discover that to be evidently false which we had made Scripture to assert".⁶ In matters concerning the natural world, therefore, our interpretation of Scripture must yield to our philosophical knowledge. If our natural knowledge appears to contradict Scripture, we must reinterpret the latter in light of the former.⁷ Reason, then, was to be the arbiter of biblical interpretation, and so in a "chiefly Philosophical" theory of the earth, reason must necessarily take precedence over Scripture. This is not to say of course that Scripture does not play a major role in Burnet's theory. As we saw in the previous chapter, one of the most important motivations for constructing the theory was to vindicate certain tenets of Scripture such as the universality of the Deluge and the millennial Kingdom of Christ on earth. And as we shall see here, passages of Scripture are frequently appealed in support of parts of the theory and also play significant foundational roles. Ancient texts, too, both Pagan and Judeo-Christian, play important confirmatory roles.

The purpose of this chapter is to explicate what Burnet's three "guides" – reason, Scripture, and antiquity – essentially consisted in and what roles they played in the theory. I shall devote the larger share of the chapter to the first of these, since this was in Burnet's view the most important of his three guides and is the most complex and interesting of the three. The most significant facets of

⁴ For Burnet's association with the Cambridge Platonists and Latitudinarians, see, e.g., Kubrin (1968), 87-8, 101-3; Gascoigne (1984), 9-11; (1989), 47, 66-7, 83; Mandelbrote (1994), 155-6; Poole (2008), 72-3; (2010), 56-7.

⁵ Burnet (1684), 6.

⁶ Burnet (1684), preface.

⁷ Burnet (1684), preface.

“reason” in Burnet’s theory, I argue, are his use of Cartesian philosophy and his rational theology. I shall devote the first two sections – by far the longest of the chapter – to these things. In the two remaining – shorter – sections, I discuss Burnet’s other two guides, section three focussing on Scripture and section four on antiquity.

2.2. Reason part one: Burnet’s Cartesianism

When Burnet entered Cambridge in the 1650s, the university had become known for its interest in the Cartesian philosophy.⁸ This was due in large part to the popularising efforts of the Cambridge Platonists, in particular Henry More, with whom Burnet would become colleagues at Christ’s.⁹ Burnet’s Cartesianism is in some ways similar to the “modified Cartesianism”, as Sarah Hutton refers to it, of the Cambridge Platonists from whom he inherited it.¹⁰ Like the Platonists, for instance, he eschewed Descartes’ rejection of final causes and theological voluntarism. In important respects, however, his philosophy is much closer than the Platonists’ to that of Descartes himself. Unlike More, who rejected Descartes’ identification of matter and extension and principle of a plenum, positing an “immaterial extension” in which material extension is contained, Burnet adopts the Cartesian definition of body and employs it at several points in his theory. His physics also differs markedly from the Platonists’ in being wholly mechanical. He does not posit any immaterial principle governing the physical world as we find in More’s “spirit of nature” or “hylarchic principle” and Cudworth’s “plastic nature”.¹¹ He takes care to distinguish his mechanistic physics from Epicureanism. Yet he does this not

⁸ Gascoigne (1989), 52;

⁹ Nicolson (1929), 361-8; Gabbey (1982), 171-3.

¹⁰ Hutton (2002), 309.

¹¹ For discussion of the Cambridge Platonists’ commitment to final causes and anti-voluntarism and More’s immaterial extension and his and Cudworth’s immaterial principles, see Hutton (2001), 62-7, 72-3; (2002), 309-10, 312-14; 316; (2015), 148-50.

by invoking any immaterial principle but by speaking in terms of material corpuscles set in motion and governed by God as we find in Descartes and other mechanical philosophers of the period.¹²

The most obvious and widely discussed aspect of Burnet's Cartesianism is his use of Descartes' cosmogony.¹³ In order to understand Burnet's application of it, we must first briefly outline this cosmogony as it appears in Descartes. Descartes' first fully developed version of his cosmogony appeared in 1644 in his *Principles of philosophy*, though he had written essentially the same cosmogony over a decade earlier in his *Treatise on light*, part of an unfinished work which he began in 1629 and abandoned upon hearing of Galileo's condemnation in 1633.¹⁴ The *Treatise on light* was published posthumously under the title *Le monde* in 1664.¹⁵ Both texts, then, would have been available to Burnet, and given his extensive use of Descartes' philosophy in the *Theory* and the fact that he is known to have taught Cartesian philosophy at Cambridge, it is highly likely that he was familiar with both.¹⁶ Since it is the most fully developed version, I shall focus on the *Principles*.¹⁷

In the *Principles*, the universe in the beginning was composed of particles of a single type of matter grouped together in large conglomerations: vortices. The particles rotated on their axes, causing small pieces of matter to be shaved off. These small particles constitute the first element: small, fast moving particles which appear luminous. The larger, rounded particles constitute the second element, which moves slower and appears transparent. The particles of the first element

¹² Burnet (1684), 289-95. For discussion of the notion of material corpuscles governed by God among seventeenth-century mechanical philosophers, see Wilson (2008), 90-5.

¹³ The two most important studies of Burnet's theory and the Cartesian cosmogony, which I shall discuss in some depth below, are Roger (1982) and Harrison (2000). For further discussion, see, e.g., Force (1985), 34-8; Gohau (1990), 47-8; Bowler (1992), 119-20; Vermij (1998), 153-9; Magruder (2006), 245-52; (2003), 32-4, 39; Poole (2010), 55-61.

¹⁴ Gaukroger (1995), 290-2; (1998), xxvi-xxviii; (2002), 19-21.

¹⁵ Gaukroger (1998), vii.

¹⁶ The biographer of the Latitudinarian Archbishop of York John Sharp relates that, while at Christ's, Sharp "heard lectures in natural philosophy from Dr. Thomas Burnet... who taught the Cartesian philosophy" – quoted in Gascoigne (1989), 65.

¹⁷ For the cosmogonical chapters in the *Treatise of Light*, see Descartes (1998 [1664]) 21-53. For discussion, see Gaukroger (1995) 237-57; (1998), xvi-xxi; (2002) 13-18; Wilson (2008), 98-9.

coalesced together in the centre of their vortices, forming stars. The particles of the second element were pushed outwards, forming the heavens.¹⁸ On the surface of stars, particles of the first element become pushed toward the axis of the vortex and attach to one another, forming a third element which appears opaque. These particles join together and form sunspots which grow larger and eventually cover the surface.¹⁹ Once a star is covered, the pressure the matter of the first element exerted on the vortex which prevented it being consumed by neighbouring vortices is contained within the crust, and the vortex, along with the star, is consumed by one or more of the adjacent vortices. Depending on its solidity, the star now becomes either a comet travelling between vortices, a planet orbiting the star at the centre of the vortex, or a satellite orbiting a planet.²⁰

Before reaching its point of equilibrium in the sun's vortex, the earth consisted of three concentric spheres: a fiery central core composed of particles of the first element; a solid shell of the third element; and an outer orb composed of a disordered combination of the second and third elements. After reaching its point of equilibrium, this outer orb divided into two, three, four, and five concentric sections. First, it split into an earthy inner orb surrounded by a gaseous sphere. Following this, a section of liquid formed in between these two orbs. A further earthy shell then formed on the surface of the liquid. Finally, another gaseous layer formed between the latter earthy section and the liquid beneath.²¹ The outermost sphere had numerous pores. When it formed, the sphere was in contact with the liquid and so the pores were filled with liquid particles. Once the gaseous section formed, the sphere was no longer in contact with the liquid, and so its pores were no longer filled with liquid particles and the empty spaces became pervaded by particles of the second element. The impetus of the particles widened the pores, causing fissures to form and the crust to break. The fragments descended into the gaseous and liquid sections beneath, coming to rest at various angles

¹⁸ Descartes (1982 [1644]), 107-11.

¹⁹ Descartes (1982 [1644]), 132-47.

²⁰ Descartes (1982 [1644]), 147-74.

²¹ Descartes (1982 [1644]), 181-201.

on the inner core, causing the gaseous and liquid sections to merge and forming the earth's mountains, seas, and other geological features.²²

Clearly Burnet's account of the Creation and Deluge was heavily indebted to Descartes. In the *Theory*, however, this debt is barely acknowledged. Burnet only discusses Descartes briefly in relation to the formation and dissolution of the crust, noting that "[a]n eminent Philosopher of this Age, *Monsieur des Cartes*, hath made use of the like *Hypothesis* to explain the irregular form of the present Earth" but criticising Descartes for not recognising the separation of the fluid into water and oil, which he believed was necessary for the crust's formation.²³ William Poole suggests that Burnet deliberately "understated his debt to Descartes" in an – ultimately unsuccessful – attempt to avoid the controversy associated with Cartesian doctrines.²⁴ This is plausible. Indeed, by the time of the *Theory*'s publication, Cartesianism had become widely viewed as atheistic.²⁵ It was on these grounds that More, once its most vocal proponent, had become one of its fiercest opponents.²⁶ And there was much concern about the spread of Cartesianism in English universities for the same reason.²⁷ It is important to remember, however, that the *Theory* contains very few references to *any* contemporary authors, and so Burnet's minimal citing of Descartes is perhaps better explained by a more general unwillingness to acknowledge the influence of his contemporaries rather than any concerted effort to obscure the obvious influence of Descartes.²⁸

²² Descartes (1982 [1644]), 201-3. For further discussion of Descartes' cosmogony as presented in the *Principles* and comparison with the *Treatise on light*, see Gaukroger (2002), 135-79; Wilson (2008), 99-100.

²³ Burnet (1684), 114. This criticism of Descartes appears in the Latin edition of the *Theory* – see Burnet (1681), 184-6. In the English edition, he mentions only that Descartes had "committed some great oversights" and refers the reader to the relevant chapter of Latin edition for more detailed discussion.

²⁴ Poole (2010), 57.

²⁵ Rogers (1985), 299-300; Henry (2013), 129-36.

²⁶ Nicolson (1929), 368-9; Gabbey (1982); Rogers (1985), 291-4; Henry (2013), 129-32.

²⁷ Rogers (1985), 299-300; Gascoigne (1989), 53-5; Henry (2013), 135-6.

²⁸ Including the above reference to Descartes, Burnet explicitly cites seventeenth-century authors at just nine points in the entire two volumes of the *Theory* – see Burnet (1684), 13, 28, 114, 157; (1690c), 47-8, 58-9, 75, 153, 218.

Despite the clear influence of the Cartesian cosmogony, there appear on the face of it to be important differences between the formation of the earth in Descartes and Burnet. Two closely related and apparently significant ones which have been noted respectively by Jacques Roger and Peter Harrison are that Descartes' earth formed from a star and Burnet's from a chaos and that Descartes' earth has fire at the centre whereas Burnet's seems to have a solid core.²⁹ Roger also notes that the elements in Descartes' cosmogony are his three kinds of corpuscle, whereas Burnet speaks in terms of common elements: earth, air, water, and oil.³⁰ These differences are certainly apparent in Burnet's description of the formation of the earth in book one. Here the matter of the chaos, which Burnet characterises in terms of the common elements mentioned above, descends in order of its density, and Burnet states explicitly that "the first change" in the chaos is "that the heaviest and grossest parts would sink down towards the middle of it", which seems to imply that the heaviest matter is at the centre and to preclude the possibility of the earth having fire at the centre.³¹ Shortly afterwards, however, things become less clear when he alludes to the ancient doctrine of the "mundane egg", for here he discusses the possibility of the earth having a central fire, "which though very reasonable, we had no occasion to take notice of in our Theory of the Chaos".³² And when he returns to this doctrine in book two, he claims that his account of the earth's Creation in the previous book is able to solve the "Riddle of the Mundane Egg", for "[w]e have show'd there, that the figure of it when finisht, was Oval, and the inward form of it was a frame of four Regions encompassing one another, *where that of Fire lay in the middle* like the Yolk and a shell of Earth inclos'd them all".³³

Burnet returns to the subject in the second volume of the *Theory* when discussing Rust's and Glanvill's theory of it engulfing the earth at the Conflagration. Here too he states that

²⁹ Roger (1982), 103; Harrison (2000), 171.

³⁰ Roger (1982), 103.

³¹ Burnet (1684), 30.

³² Burnet (1684), 64.

³³ Burnet (1684), 270 [my italics].

I am very well satisfied it is no imaginary thing. All Antiquity hath preserv'd some sacred Monument of it. The *Vestal* fire of the *Romans*, which was so religiously attended: The *Prytoneia* of the *Greeks* were to the same purpose, and dedicated to *Vesta*: and the *Pyretheia* of the *Persians*, where fire was kept continually by the *Magi*. These all, in my opinion, had the same origine and the same signification. And tho' I do not know any particular observation, that does directly prove or demonstrate that there is such a mass of fire in the middle of the Earth; yet the best accounts we have of the generation of a Planet, do suppose it; and 'tis agreeable to the whole Oeconomy of Nature; as a fire in the heart, which gives life to her motions and productions.³⁴

As I have discussed in the previous chapter, he rejects Rust's and Glanvill's theory. He nevertheless allows that as the sun dries the earth and widens its pores the heat from the central fire "may have a freer efflux, and diffuse it self in greater abundance every way; so as to affect even these exterior Regions of the Earth, so far as to make them still more catching and more combustible".³⁵

It is worth drawing attention also to his note in the above quotation that "the best accounts we have of the generation of a Planet, do suppose" a central fire. This strongly suggests that he has in mind the Cartesian theory of planets forming from dead stars. That he *does* have this theory in mind is intimated in the preface to book four. Here he suggests that in theorising about the earth, "(which I hope to conduct into a Fix'd star, before I have done with it), we give an instance of what may be in other Planets". The theory begins with the chaos,

because that was a known principle, and we were not willing to amuse the *Reader* with too many strange Stories: as that, I am sure, would have been thought one, TO HAVE brought this Earth from a Fix'd Star, and then carried it up again into the same Sphere. Which yet I believe, is the true circle of Natural Providence.³⁶

³⁴ Burnet (1690c), 49.

³⁵ Burnet (1690c), 66.

³⁶ Burnet (1690c), 126.

Later in the book, he conjectures that “what was before the Chaos, was but, in my opinion, the first remove from a Fixt Star”.³⁷ Both this and the above quotation from the preface indicate that he thinks the formation of the earth from a star and its formation from a chaos are compatible. And as we observed in the previous chapter, at the end of book four, after relating his conjecture about the earth turning into a star at the final consummation, he states that

if Planets were once fixt Stars, as I believe they were; their revolution to the same state again, in a great Circle of Time, seems to be according to the methods of Providence; which loves to recover what was lost or decay'd, after certain periods.³⁸

He returns to these points again in 1692 in the *Archaeologiae*. “It is probable”, he writes,

that the Planets were formerly fixed Stars, and that the Earth it self ought to be numbred in the same Rank. It will be no easy Matter for you to solve the Originals of the Planets by any other Hypothesis; at least, not if they have Fire in their Center, which it is very probable they have.³⁹

Here he also follows Descartes in citing sunspots as evidence that stars become crusted over and transformed into opaque bodies and arguing that comets, too, are former stars which, “not as yet composed to rest..., wander up and down through the various Regions of the Heavens”.⁴⁰

Yet in the first volume of the *Theory*, he had portrayed a creation from a chaos which resulted in solid matter coalescing in the centre. This seemed an unlikely scenario if the earth was a former star. It also appeared to preclude the possibility of the earth having a central fire. This apparent inconsistency in Burnet’s *Theory* was noted in 1690 by Erasmus Warren, who pointed out that Burnet’s model of the Creation seemed to rule out the earth having a central fire. If the chaos contained fire, he argued, then the fire would either have consumed or been quenched by other elements. And as

³⁷ Burnet (1690c), 210.

³⁸ Burnet (1690c), 223.

³⁹ Burnet (1736a [1692]), 36.

⁴⁰ Burnet (1736a [1692]), 36-7 – quotation from 37. He does not cite Descartes on these points.

Burnet himself had claimed, the chaos would separate according to its density. The densest matter, therefore, would subside first, forming a *solid* core.⁴¹ This ostensible ambiguity as to the composition of the earth's core and its origins is also reflected in historical studies of Burnet's theory. Roger, Harrison, Gabriel Gohau, and Rhoda Rappaport, for example, interpret Burnet as departing from the Cartesian cosmogony in positing a solid rather than fiery core.⁴² Poole and Paolo Rossi, on the other hand, construe him as following Descartes in placing fire at the centre.⁴³ Roger contrasts Burnet's formation of the earth from a chaos with the Cartesian view that it formed from a dead star, whereas James Force and Peter Bowler present him as having *adopted* Descartes' account of the stellar origin of planets.⁴⁴

Burnet's position on these issues becomes slightly clearer in his reply to Warren, for here he refers to the extent of the chaos as being only "from the bottom of the Abyss, upwards to the Moon", stressing that he did not affirm anything concerning the composition of the core.⁴⁵ This, too, implies that he thinks the formation of the earth from a star and its having a central fire is compatible with its forming from a chaos. Things become clearer still if we examine the formation of the new earth following the Conflagration in book four of the *Theory*. At this point in Burnet's history, the fire has destroyed the present earth from the top of the atmosphere to the bottom of the ocean. The central core, however, remains intact, and the chaotic matter descends to form a new globe around it.⁴⁶ Burnet only gives a very brief account of the separation of this second chaos, since "it is so much the same with that of the First; which is set down fully and distinctly in the Fifth Chapter of the first Book of this Theory. Nature here repeats the same work, and in the same method". He now informs us that the first chaos, like the second, had the same central core, and that "in forming the first Earth" he

⁴¹ Warren (1690), 86-8.

⁴² Roger (1982), 103; Gohau (1990), 47; Rappaport (1997), 141; Harrison (2000), 171.

⁴³ Rossi (1984), 34; Poole (2010), 57.

⁴⁴ Roger (1982), 103; Force (1985), 35; Bowler (2003), 32.

⁴⁵ Burnet (1690), 11.

⁴⁶ Burnet (1690), 135-6.

“suppos'd the Chaos or confus'd Mass to reach down to the Center... *only for the ease of our imagination*; that so the whole Mass might appear more simple and uniform”. The outer mass of chaotic matter only and not the central core was “the true Chaos, whose parts, when they came to a separation, made the several Elements, and the form of an habitable Earth betwixt the Air and Water”.⁴⁷

Burnet's tacit commitment to the earth having a central fire and having formed from a star can now be reconciled much more easily with his account of the Creation. He believes that the chaos surrounded a central core; that this core, along with the chaos, was likely a former star; and that, because it was probably a former star, the earth very plausibly has fire at the centre. The apparent difference between Descartes and Burnet, then, that Descartes' earth formed from a star and Burnet's from a chaos, which Roger argues is “significant”, is far less significant than Roger supposes, for it is not the case that Burnet believes the earth to have formed from a chaos *rather* than from a former star, but that it formed from *both* a chaos *and* a former star, or rather, from a chaos which *derived from* a former star.⁴⁸ As to Harrison's claim that Burnet's theory differed from Descartes' in placing earth rather than fire at the centre, although this appears to be the case in Burnet's initial exposition of the Creation and is not strictly *ruled out* insofar as he does not commit fully to a central fire, it seems unlikely to have been his view, for as we have seen, he confesses in book four to having simplified his account of the Creation for illustrative purposes and notes in several places in the *Theory* and also in the *Archaeologiae* that he believes on a number of grounds that the earth very likely has a central fire.

The foregoing interpretation of Burnet on the formation of the earth enables us to connect it more clearly with a specific phase of Descartes' cosmogony. It also illuminates an important difference between Burnet's theory of the earth and previous applications of the Cartesian cosmogony to Scripture. More, for example, had interpreted the biblical chaos as corresponding to the initial state

⁴⁷ Burnet (1690), 137 – my italics.

⁴⁸ Roger (1982), 103.

of the universe in Descartes' cosmogony, the point at which the universe consisted merely of bare particles and which Descartes had characterised in the *Principles* as an orderly conglomeration of particles and in the *Treatise on light* as a chaos.⁴⁹ In contrast, Burnet's interpretation of the biblical chaos pertains very explicitly to the earth and not the wider universe.⁵⁰ In terms of Descartes' cosmogony, then, Burnet's chaos corresponds to the state of the earth after it reaches its point of equilibrium in the sun's vortex. And because Burnet, like Descartes, supposes the earth to have formed around a central core which (probably, in the case of Burnet) has fire at the centre, Burnet's chaos corresponds only to the outermost of Descartes' three concentric spheres, the inner two spheres being the core around which earth's surface forms. This outer sphere in Descartes is composed of a disordered combination of particles of the second and third elements not unlike Burnet's chaos. And in both authors, this chaotic outer sphere divides into concentric sections of earth, air, and fluid.

That Burnet's chaos corresponds specifically to this phase of Descartes' cosmogony also explains why Burnet refers to common elements rather than material corpuscles. In the part of his cosmogony which is relevant to the formation and structure of the earth, which is what Burnet is interested in, Descartes, too, refers to common elements. That Burnet begins with these elements, then, is not indicative of any significant difference in the two authors' physics as Roger seems to imply.⁵¹ Indeed, elsewhere in the *Theory*, Burnet makes clear that he, like Descartes, subscribes to a corpuscular theory of matter.⁵² Rather, the point in the earth's history where Burnet's theory begins corresponds to a point in Descartes' cosmogony where his three kinds of material corpuscle are, at least as far as Burnet is concerned, no longer relevant for the purpose of explaining the formation and form of the primitive earth.

⁴⁹ More (1653), 135; Descartes (1982 [1644]), 107-8; (1998 [1664]), 23-4.

⁵⁰ Burnet (1684), 2, 5.

⁵¹ Roger (1982), 103.

⁵² Burnet (1684), 289-95.

There are of course still important differences in the physical details of the earth's formation in the two theories. The causes which separate the elements are more complex in Descartes than in Burnet. The composition and arrangement of the sections is also slightly different. Descartes has an extra section of air between the fluid and the crust. Burnet's fluid divides into sections of water and oil, which as we have seen he criticises Descartes for omitting from his cosmogony. Nevertheless, Burnet's view of the Creation, when considered in light of what he says elsewhere in the *Theory* and in the *Archaeologiae* about the earth being a former star and most likely having fire at its centre and his admission to having simplified his original account of the earth's formation for illustrative purposes, corresponds more closely to the formation of the earth in Descartes' cosmogony than Roger and Harrison suggest. That his theory of the Deluge and the form of the postdiluvian earth is derived from Descartes is so obvious as to require little comment. The two authors explain the breaking of the crust in different terms, Descartes in terms of microscopic processes involving the impetus of particles in the crust and Burnet in terms of macroscopic phenomena – the heat of the sun drying out the crust and agitating the water. Nevertheless, Burnet explicitly cites Descartes' explanation of the form of the present earth and clearly saw in his cosmogony a physical explanation of Moses' "breaking open of the fountains of the abyss". By adding the somewhat implausible supposition that the dissolution of the crust would agitate the waters such that they would cover the surface of the earth for an entire year, he arrived at his theory of the Deluge.

Other ostensible differences between Descartes' cosmogony and Burnet's theory of the earth pertain more to foundational issues than to physical details. These, too, have been discussed in some depth by Roger and Harrison. Roger argues firstly that Descartes' cosmogony was aimed ultimately not at understanding the *formation* of the universe but at understanding its *structure*. We can better understand the structure of something, he thought, if we consider how it might have come into being through natural processes. In his cosmogony, then, he constructed a hypothetical (in the *Treatise on light*) or counterfactual (in the *Principles*) account of how the universe (or one exactly like it) might have been created through natural processes in order to elucidate the structure of the actual universe.

Secondly, Roger argues, Descartes' cosmogony was atemporal. Although he presents the processes as occurring over time, time in his cosmogony is not *historical* time but *theoretical* time. The entire process can be reduced to an instant.⁵³ Those like More, Amerpoel, and Burnet who sought to reconcile the Cartesian cosmogony with Genesis, Roger contends, misinterpreted Descartes. They read him as having "written a kind of scientific commentary to the biblical account of the creation of the world".⁵⁴ The influence of Cartesian cosmogony on the theory of the earth genre, then, resulted not from "its genuine nature, but, on the contrary, thanks to a kind of brilliant misinterpretation. From a logical model, the theory of the earth evolved to a reconstructed history".⁵⁵ This "distortion of the Cartesian model", Roger argues, "is perfectly exemplified by Burnet's *Telluris theoria sacra*".⁵⁶

Responding to Roger, Harrison acknowledges that the distinction between the atemporality of Descartes' cosmogony and the historicity of Burnet's theory is an important one but argues that the difference between the two authors on this count is less significant than Roger suggests, observing for instance that in his private correspondence Descartes claimed that his cosmogony could be reconciled with Genesis and even toyed with the idea of effecting such a reconciliation himself. The application of Cartesian cosmogony to biblical exegesis, he argues therefore, "did not do great violence to the original intention of Descartes", and the difference between them is "not so much a fundamental difference of orientation, but rather a difference of emphasis".⁵⁷ Harrison also takes issue with Roger's construal of Burnet and other theorists as having misinterpreted Descartes by reading his cosmogony as a philosophical commentary on Genesis. For the theorists, Harrison argues, "Cartesian philosophy did not present a parallel creation narrative, but rather a means of interpreting Moses philosophically". The central comparison for such authors, moreover, was not between

⁵³ Roger (1982), 95-105.

⁵⁴ Roger (1982), 102.

⁵⁵ Roger (1982), 112.

⁵⁶ Roger (1982), 102-3.

⁵⁷ Harrison (2000), 178, 181-3 – quotations from 183 and 178.

Descartes and Moses but between Descartes and Aristotle, the key question being whether the Cartesian philosophy could illuminate Scripture more effectively than the Aristotelian.⁵⁸

This latter point is certainly correct and is worth underscoring. Burnet did not simply misinterpret Descartes and attempt to reconcile his misreading of Descartes with Scripture. Rather, he *applied* the Cartesian cosmogony – along with other aspects of the Cartesian system – to constructing a philosophical account of earth and sacred history. The theory is not a simple reconciliation. Burnet takes parts of Descartes’ system that are useful for his purpose but discards those which are not. His use of Descartes is determined by two things: (a) the scope of his theory; and (b) whether the Cartesian philosophy can account for the phenomenon under investigation. Burnet’s theory traces the history of the earth, not the wider universe, which he thinks is much older. As a result, everything prior to the formation of the earth in Descartes’ cosmogony is irrelevant. But it is not so much that “[i]n this way, Cartesian general cosmogony *becomes* merely a theory of the earth” as Roger characterises things, but rather that those aspects of Descartes’ cosmogony that are not relevant to the history of the earth are simply not considered.⁵⁹ Additionally, where Burnet sees the Cartesian cosmogony as wanting, as not serving his purpose, he introduces new hypotheses. When, for example, he thinks Descartes has not adequately accounted for the formation of the crust, he brings in his separation of the fluid into water and oil to fill the deficit. Interpreted in this way as applying Cartesian cosmogony to rather than reconciling it with Scripture, it becomes apparent that Burnet did not read Descartes as a “scientific commentary” on biblical history as Roger suggests but rather, as Harrison interprets things, as a purely philosophical theory that could be used – in part – to construct a philosophical account of the history of the earth and Scripture.

The historicity of Burnet’s theory compared with Descartes’ cosmogony, whether a radical difference of orientation as in Roger or a less radical difference of emphasis as in Harrison, is

⁵⁸ Harrison (2000), 179.

⁵⁹ Roger (1982), 103 – my italics

nevertheless important, and gives rise to some quite fundamental differences between the two authors. One important difference is epistemological or evidentiary. Descartes' cosmogony is derived largely a priori from axioms about matter and motion and assumptions about how God arranged matter in the beginning. Burnet's theory, by contrast, is largely empirical. In the first book, his account of the Deluge is arrived at both by reasoning from causes to effects and from effects – the present earth's geological phenomena – to causes. The second book is dedicated mainly to learning about the antediluvian earth by reasoning in the latter way from the effects, that is, the longevity of humans, the generation of animals from the soil, and a perpetual spring, which we know about from Scripture and other ancient texts, to their cause, which for Burnet consists principally in the perpendicularity of the earth's axis which was established in book one. Book three is based on Scripture and other ancient texts combined with physical evidence of the earth's combustibility. And in book four, after reasoning from the second chaos to the form of the new earth, Burnet's account of the Millennium is drawn principally from Scripture and the early Church Fathers. It is important to note also, as Roger points out, that even in the first book where Burnet appears to reason a priori from cause to effect, this reasoning has an empirical basis in that it is drawn from Scripture and other ancient sources which, in Burnet's view, tell us (a) that the earth formed from a chaos and (b) what the nature of the chaos was. This, Roger observes, "is clearly a shift from the Cartesian model and its most typical features, from a distinctly deductive science to a more empirical and historical type of knowledge".⁶⁰

As Harrison notes, the historicity and empirical basis of Burnet's theory plays an important role in determining its scope, which of course is clearly very different from that of Descartes' cosmogony.⁶¹ On the face of it, the scope of Burnet's theory appears to be determined predominantly by Scripture, and in an important sense it is. The theory begins at the Creation and ends at the final consummation. But the scope of the theory is not determined by Scripture merely for Scripture's sake.

⁶⁰ Roger (1982), 103.

⁶¹ Harrison (2000), 180.

Rather, the adherence to the biblical timeframe is parasitic on more fundamental evidentiary concerns. We have evidence from Scripture of the *earth's* history. We have no evidence of the history of the wider universe. So while it could form part of Descartes' ahistorical model, it has no place in a history. That is, it is outside the domain of history because there is no historical evidence of it. We do, however, have evidence of the earth's future. So this, for Burnet, falls within the domain of history, whereas it has no place in Descartes' model, which is concerned solely with the *generation* of the universe and earth.

The historicity and empirical nature of Burnet's theory also extend it in other directions which are different from those of the Cartesian cosmogony. Most notably, it includes human as well as earth history. For Burnet, as for most seventeenth-century thinkers, earth and human history were coeval with one another. Thus, a history of the earth was naturally also a history of humanity. Human history could also yield important insights into earth history. The longevity of the biblical Patriarchs and the postdiluvian shortening of the human lifespan constituted crucial evidence of environmental changes brought about at the Deluge.⁶² That people migrated to America indicated that the earth had no ocean in the beginning.⁶³ Yet human history for Burnet is not useful merely for the insights it provides into earth history but is also an end in itself. In book two, for example, he devotes considerable attention to civil life on the antediluvian earth in addition to its physical features.⁶⁴ In book four, he is concerned not merely with the formation and physical make-up of the new earth but with who will inhabit it and how they will spend their time during the Millennium.⁶⁵

One final important and quite fundamental difference to which I want to draw attention between Burnet's theory and both Cartesian cosmogony and Cartesian philosophy more generally is Burnet's use of final cause theorising. This is not discussed by either Roger or Harrison or, at least to

⁶² Burnet (1684), 180-1, 189-92, 199-201.

⁶³ Burnet (1684), 270-3.

⁶⁴ Burnet (1684), 246-9.

⁶⁵ Burnet (1690c), 142-7, 202-14.

my knowledge, any other historians. Indeed, Harrison even suggests at one point that along with the Copernican hypothesis and the corpuscular philosophy, “the Cartesian assertion of the futility of the search for final causes” was one of the “common features of the theories of the earth” which troubled seventeenth-century thinkers.⁶⁶ Here Harrison cites Burnet’s argument that mountains are relics of the Flood and devoid of any evidence of design and John Ray’s teleological defence of mountains against Burnet in his *Miscellaneous discourses*.⁶⁷ But it seems here that Burnet is not so much asserting “the futility of the search for final causes” as engaging in just such a search himself. In the mountains and other geological features of the present globe he finds no evidence of final causes and concludes that the earth was not designed by God in its present state. But it is not a Cartesian rejection of the search for final causes that leads him to this conclusion. On the contrary, it is a search for final causes, which as far as Burnet is concerned had failed to turn up any evidence of design in the present earth.⁶⁸

Not all of Burnet’s searches for final causes were unsuccessful, however. Indeed, in book two he devotes an entire chapter to arguing for the existence of God and against Epicureanism almost solely on the basis of final causes, of which he finds abundant evidence in the laws of nature and in human and animal bodies.⁶⁹ Here Burnet follows his Cambridge Platonist mentors Cudworth and More, for whom, as Harrison has noted elsewhere, one of the central problems with the Cartesian system was that the rejection of final causes deprives us of such arguments from design.⁷⁰ To be sure, on the subject of mountains and other features of the present earth, Burnet’s critics accused him of having given *inadequate* consideration to final causes.⁷¹ But inadequate consideration is very different from no consideration. And although he would make some recognisably Cartesian observations about

⁶⁶ Harrison (2000), 176.

⁶⁷ Harrison (2000), 188-9 [note 37].

⁶⁸ Burnet (1684), 101-51.

⁶⁹ Burnet (1684), 289-309.

⁷⁰ Harrison (2013), 138.

⁷¹ See, e.g., Keill (1698), 75-6.

the *limits* of final cause theorising when responding to one of these critics (I shall discuss this in the final chapter), even here he does not join Descartes in rejecting such theorising altogether.⁷²

2.3. Reason part two: Burnet's rational theology

Burnet's theology is essentially the same as that of the Cambridge Platonists and the younger generation of Latitudinarians with whom he was closely associated both during his time at Cambridge and in his later years in London. "Latitudinarian" or "latitude man" was originally a pejorative term invented during the Restoration by High Churchmen to describe a group of divines who had conformed to the Interregnum Church and had justified doing so on the grounds that they had only compromised on inessential doctrines while remaining true to the fundamentals of the Christian faith.⁷³ The term was intended to connote broadness, flexibility, and inclusivity in matters of doctrine, liturgy, and creed. As Glanvill, himself a prominent Latitudinarian, sympathetically summed it up, the Latitudinarians were

a sort of men, whose Antipathy to the Fanatical Genius of the Age was quickly noted, and no sooner known than branded with Nick-names very odious, as the Custom then was, and preach't against with the usual Vehemence and Fierceness. One of the most Common names given them was Latitudinarian from a word that signifies compass or largeness, because of their opposition to the narrow stingy Temper then called Orthodoxness.⁷⁴

The list of names associated with Latitudinarianism varies significantly across historical studies. The divines listed as the most prominent Latitudinarians in Martin Griffin's classic study of the topic are Gilbert Burnet, John Wilkins, John Tillotson, Edward Stillingfleet, Simon Patrick, Thomas Tenison, William Lloyd, Joseph Glanvill, and Edward Fowler. To these Griffin adds a number of less prominent

⁷² Burnet (1699a), 12-13, 16-18, 61.

⁷³ For discussion of the term and its origins and uses during the seventeenth century, see Spurr (1988), 62-8; Griffin (1992), 3-13.

⁷⁴ Quoted in Cope (1954), 271.

Latitudinarians.⁷⁵ Other authors have applied the term to a broader set of seventeenth-century thinkers.⁷⁶ The Latitudinarians were mostly educated in Cambridge but left the university to seek preferment in London, the vast majority of them taking up positions in the Church.⁷⁷ Widely regarded as heterodox during the Restoration, their fortunes changed following the Revolution of 1688-9 when a number of them, being the most vocal supporters of the Revolution among the clergy and having presented concerted opposition to James II's Catholicising policies, were promoted to Bishoprics.⁷⁸

During the Restoration, the term "Latitudinarian" was applied both to this younger generation and to the Cambridge Platonists. As the century progressed, it became increasingly applied exclusively to the former group.⁷⁹ This variation in application is reflected in historical studies, with some historians characterising the Platonists as Latitudinarians and some wishing to distinguish between the two groups.⁸⁰ Burnet, too, is sometimes presented as a Latitudinarian. Johannes van den Berg, for example, refers to "Thomas Burnet, master of the Charterhouse" as "a prominent Latitudinarian".⁸¹ John Gascoigne characterises the *Theory* as "the most thoroughgoing attempt by a Cambridge Latitudinarian to demonstrate the conformity of Scripture with the 'new philosophy'".⁸² And Richard Olsen describes it as "characteristic of seventeenth-century Latitudinarian natural theology".⁸³ David Sytsma is more circumspect, suggesting that, along with Patrick, Tillotson, Stillingfleet, and Glanvill, the "author of the controversial *Telluris theoria sacra...* probably also belonged to these second-generation Latitudinarians" – Wilkins and the Cambridge Platonists constituting the first generation.⁸⁴

⁷⁵ Griffin (1992), 14.

⁷⁶ See, e.g., Shapiro (1968); Gascoigne (1989), 40-51; Spellman (1993).

⁷⁷ Gascoigne (1989), 48-51.

⁷⁸ Griffin (1992), 14-32; Spellman (1993), 33-53, 132-55.

⁷⁹ Griffin (1992), 4-11.

⁸⁰ Gascoigne (1689), 41-8, for example, treats the Cambridge Platonists as Latitudinarians. Griffin (1992), 11-13, 99-102, 158-9, on the other hand, while noting the influence of the Cambridge Platonists on the Latitudinarians, argues that they should be considered distinct groups.

⁸¹ van den Berg (1999), 150.

⁸² Gascoigne (1989), 66.

⁸³ Olsen (2004), 238.

⁸⁴ Sytsma (2017), 36.

Scott Mandelbrote, on the other hand, suggests that the portrayal of Burnet as “a latitudinarian divine” is merely a result of confusion between his ideas and those of “his more famous namesake”, Gilbert.⁸⁵ And several important treatments of seventeenth-century Latitudinarianism – including a number of studies of seventeenth-century Latitudinarianism and *science* – do not mention him.⁸⁶

Mandelbrote is certainly correct to suggest that Burnet is often confused with Gilbert Burnet, and indeed, he cites several examples of such confusion.⁸⁷ Notwithstanding this, however, the characterisation of Burnet as a Latitudinarian is not entirely without warrant. As well as championing several core Latitudinarian principles, Burnet was close with Tillotson, under whom he studied at Clare Hall during the 1650s.⁸⁸ During the 1680s, he, like those divines who are more widely considered Latitudinarians, opposed King James II, becoming involved in a dispute with the Crown over James’ appointment of a Catholic Pensioner at the Charterhouse.⁸⁹ And following the Revolution, he partook in the Latitudinarians’ fortunes, being appointed Chaplain-in-Ordinary to King William III in 1689 and succeeding Tillotson as Clerk of the Closet when the latter was made Archbishop of Canterbury in 1691. It should be noted, however, that Burnet’s preferments resulted principally from Tillotson’s patronage and that when Tillotson died in 1694 Burnet’s prospects for further advancement came to an abrupt end, suggesting that the other Latitudinarians, who by now were heavily influential in the Church, had less truck with his heterodox ideas – he had by now of course published the hugely controversial *Archaeologiae*.⁹⁰

The minutiae of who was and was not a Latitudinarian are of course beyond the scope of this thesis. What is important for our purposes is that the Latitudinarians and Cambridge Platonists held

⁸⁵ Mandelbrote (1994), 155.

⁸⁶ Shapiro (1968); Mulligan (1973); Spurr (1988); Ashcraft (1992); Griffin (1992); Kroll (1992); Levine (1992); Rogers (1992); Spellman (1993).

⁸⁷ Mandelbrote (1994), 170 [note 24].

⁸⁸ Gascoigne (1989), 66.

⁸⁹ For Burnet’s account of this conflict, see Burnet (1689a). For discussion, see Porter (2009), 60-2.

⁹⁰ Gascoigne (1984), 10-11; (1989), 83.

several important theological commitments in common, and various of these are prominent in Burnet's work. The tenets of Latitudinarianism and Cambridge Platonism that are important for our purposes are: (a) an advocacy of the use of reason in religion; (b) an insistence on the compatibility of reason and religion; (c) an enthusiasm for the "new science" and for the application of natural philosophy for apologetic purposes; (d) an emphasis on the fundamentals of Christianity over inessential doctrines; (e) an emphasis on God's goodness and wisdom over his will and power; and (f) an anti-voluntarist conception of God.⁹¹ These things play several important and closely-interrelated roles in Burnet's theory. The use of reason in religion and the application of natural philosophy for apologetic purposes were of course precisely what Burnet was engaged in. He wanted to make biblical events explicable in terms of natural causes in order, among other things, to vindicate sacred history and to show that reason and philosophy are consistent with Scripture.

The essential compatibility of reason and Scripture also played important – and somewhat contradictory – foundational roles in Burnet's theory. On the one hand, it implied that reason and philosophy cannot contradict *Scripture*. This placed constraints on the theory insofar as it had to be consonant with certain core tenets of biblical history. The Deluge, for example, had to be universal. The Conflagration must destroy only the *form* of the earth in order that a new earth may arise from its matter. On the other hand, however, it implied that Scripture cannot contradict *reason and philosophy*. And this enabled Burnet to construct a rational theory of the earth which was to a large extent *free* from constraints imposed by Scripture. As I noted in the introduction, for Burnet, the necessary agreement between reason and Scripture entailed that a correct use of reason *cannot* contradict Scripture. This meant that truths arrived at through reason and philosophy which may *appear* to contradict Scripture do *not* in fact contradict Scripture. In such cases, rather, Scripture has been misinterpreted, and must be reinterpreted to conform with reason and philosophy. The core

⁹¹ For discussion of these views in the work of Cambridge Platonists and Latitudinarians, see, e.g., Cope (1954), 226-33; Shapiro (1968), 21-41; Gascoigne (1989), 63-8; Griffin (1992), 49-104, 123-4; Rogers (1992), 232-42; Spellman (1993), 11-32, 72-88; Hutton (2002), 310-17; (2015), 143-5; Krayer (2002), 291-5; Crocker (2003), 81-4.

guiding principle in conducting such reinterpretations for Burnet is derived ultimately from the above emphasis on the fundamentals of Christianity over inessential doctrines. Interpretations of Scripture must not contradict these fundamentals. And interpretations which *do* contradict the fundamentals cannot be correct, and the relevant passages must be reinterpreted to conform to them.

We shall see in the next chapter how the foregoing principles would be carried to their logical – and, many would believe, heretical – conclusion in Burnet’s *Archaeologiae*. For now, I want to focus on the Cambridge Platonists’ and Latitudinarians’ emphasis on God’s wisdom and goodness and their anti-voluntarism. Again, these two things are very closely related. The anti-voluntarist conception of God which the Platonists and Latitudinarians almost invariably adopted was first articulated in the early modern period by Richard Hooker in the first book of his *Of the lawes of ecclesiastical politie*, published in 1594. An emphasis on God’s wisdom and goodness implied for Hooker that God cannot act in a way that is contrary to these attributes. His will is governed by them. He has imposed a law upon himself, a “Law where-by his wisdome hath stinted the effects of his power in such sort, that it doth not worke infinitely”. This law does not *contradict* God’s will and power, for he freely chose to impose it on himself. He has voluntarily subordinated his will and power to his wisdom and goodness.⁹² This anti-voluntarist conception of God was pitted in the late sixteenth century by Hooker and during the mid-to-late seventeenth by the Cambridge Platonists and Latitudinarians against the Calvinist voluntarism that had been dominant since the Reformation.⁹³ It was taken up during the latter period by Burnet and plays a crucial role in his theory.

Burnet most likely imbibed his anti-voluntarism primarily from Cudworth and Tillotson, the respective Cambridge Platonist and Latitudinarian with whom he was most closely associated during his formative years at Clare Hall. Of all the Cambridge Platonists, writes Hutton, Cudworth provided

⁹² Hooker (1622 [1594]), 3-6 – quotation from 4-5.

⁹³ See, e.g., Cope (1954), 223-33; Crocker (1990), 8; (2003), 81-4; Griffin (1992), 123-4; 81-2; Hutton (2015), 132-3, 143-4.

“the most systematic statement of their anti-voluntarism”.⁹⁴ The Latitudinarians’ anti-voluntarism was heavily influenced by Cudworth and the Cambridge Platonists and is communicated liberally throughout Tillotson’s various sermons on the nature of God.⁹⁵ “[t]he Sovereignty of God”, he writes in one, “doth by no means set him above the Eternal Laws of Goodness, and Truth, and Righteousness”.⁹⁶ And in another:

we cannot, from the *sovereignty* of God, infer a right to do any thing that is unsuitable to the Perfection of his Nature; and consequently..., it would be little less than a horrid and dreadful Blasphemy, to say that God can, out of his Sovereign Will and Pleasure, do any thing that contradicts the Nature of God, and the essential Perfections of the Deity; or to imagin that the Pleasure and Will of the Holy, and Just, and Good God is not always regulated and determined by the essential and indispensable Laws of Goodness, and Holiness, and Righteousness.⁹⁷

The implications of this anti-voluntarism for Burnet’s theory, however, are most clearly prefigured in the work of Glanvill, the Latitudinarian who was closest, both intellectually and socially, to the Cambridge Platonists.⁹⁸ Glanvill’s influence on Burnet has been noted by Poole. Poole, however, has focussed on Glanvill’s influence in Burnet’s use of Cartesian cosmogony and in his model of the apocalypse.⁹⁹ What I want to draw attention to here is his influence on Burnet’s view of natural providence. On this issue, Glanvill’s and Burnet’s views are so similar that it is impossible not to conclude that Burnet was heavily influenced by him, despite his customary lack of acknowledgement. As with his assessment of Burnet’s scant citing of Descartes, Poole has argued that Burnet does not

⁹⁴ Hutton (2015), 143. See also, Hutton (2002), 315-7.

⁹⁵ See Tillotson (1699), 18, 70-4, 125-7, 197, 209-16, 325-8, 335, 372-81; (1700) 21-3, 26-7, 86, 139, 152-3, 187-8, 215-6, 269-89, 297, 426-7. These texts are posthumously published collections of sermons on the attributes of God preached at various points during Tillotson’s lifetime. For discussion of Tillotson’s anti-voluntarism and the influence of the Cambridge Platonists on his and other Latitudinarians’ anti-voluntarism, see Griffin (1992), 123-4.

⁹⁶ Tillotson (1699), 18.

⁹⁷ Tillotson (1699), 215-6.

⁹⁸ Griffin (1992), 20. For discussion of the Cambridge Platonists’ influence on Glanvill, see Hutton (2015), 150-2.

⁹⁹ Poole (2008), 72-3; (2010), 57, 159.

cite Glanvill in the first volume of the *Theory* because the book on which he primarily draws, Glanvill's *Lux orientalis*, was concerned principally with the pre-existence of souls, a controversial doctrine with which Burnet was wise not to associate himself.¹⁰⁰ This seems implausible, however, and as in the case of Descartes, Burnet's lack of any explicit reference to Glanvill is more likely merely symptomatic of his general unwillingness to acknowledge contemporary sources. Poole himself acknowledges that Burnet would later admit to believing in the pre-existence of souls in the second volume of the *Theory*.¹⁰¹ Here, though, Burnet does not merely *admit to believing* the doctrine but produces arguments for it which are clearly drawn from Glanvill and yet does not cite him here either.¹⁰²

Turning now to Glanvill's anti-voluntarism, as Jackson Cope has observed, Glanvill's anti-voluntarist conception of God effectively barred him from intervening directly in the world. God, for Glanvill, is bound by his nature to work through "second causes", and God's providence is therefore primarily *natural* providence.¹⁰³ Glanvill's statement of this is so similar to Burnet's that it warrants quoting at length. "There is an exact *Geometrical justice*", he writes in the *Lux orientalis*,

that runs through the universe, and is interwoven in the *contexture* of things. This is a result of that wise and Almighty *Goodness* that praesides over all things. For this *Justice* is but the *distributing* to every thing according to the requirements of its nature. And that *benign wisdom* that contrived and framed the natures of all beings, doubtlesse so provided that they should be suitably furnisht with all things proper for their respective conditions. And that this *Nemesis* should be twisted into the very *natural coustitutions* of things themselves, is methinks very reasonable; since questionlesse, *Almighty wisdom* could so perfectly have formed his works at first, as that all things that he saw were *regular, just*, and for the good of the *universe*, should have been brought about by those *stated Laws*, which we

¹⁰⁰ Poole (2008), 72-3; (2010), 57.

¹⁰¹ Poole (2008), 73.

¹⁰² Burnet (1690c), 127. Burnet argues that the soul of Christ pre-existed his physical incarnation, which implies that other human souls do, too; that Christ did not correct or reproach the Jews for believing in the doctrine; and that it is taught in virtually all ancient philosophies. All these arguments are made explicitly by Glanvill (1662), preface, 2-3, 33-4, 52-6, 112-13.

¹⁰³ Cope (1954), 230-1.

call *nature*; without an ordinary engagement of *absolute power* to effect them. And it seems to me to be very becomming the wise Authour of all things so to have made them in the beginning, as that by their own *internal spring and wheels*, they should orderly bring about what ever he intended them for, without his often *immediate* interposal. For this looks like a more magnificent apprehension of the *Divine power* and *Praeexistence*, since it supposeth him from everlasting ages to have *foreseen* all *future* occurrences, & so wonderfully to have seen and constituted the great *machina* of the *world* that the *infinite* variety of *motions* therein, should effect nothing but what in his *eternal wisdom* he had concluded *fit* and *decorous*: But as for that which was *so*, it should as certainly be compast by the *Laws* he appointed long ago, as if his *omnipotence* were at work every *moment*.¹⁰⁴

God's direct intervention, then, for Glanvill, is contrary to his wisdom:

to engage *gods absolute* and extraordinary *power*, in all *events* and *occurrences* of things, is meseems to think meanly of his *wisdome*; As if he had made the world so, as that it should need *omnipotence* every now & then to mend it, or to bring about those his destinations, which by a shorter way he could have effected, by his *instrument, Nature*.¹⁰⁵

In the *Lux orientalis*, this insistence on natural over extraordinary providence becomes, as it would in Burnet's *Theory*, an important methodological principle in explaining such things as the embodiment of souls. These, for Glanvill, must be explicated in terms of natural rather than miraculous causes, for as God's nature binds him to work through natural law rather than direct intervention, so too, when theorising about these processes, we must do so in terms of the former rather than the latter.¹⁰⁶

Burnet's similar emphasis on God's wisdom over his will and a similar anti-voluntarist conception of God give rise in the *Theory* to a view of providence which strongly echoes that of Glanvill and which underpins the entire work. For Burnet, as for Glanvill, the wisdom of God effectively prevents him from intervening directly in the natural world, for where other, subordinate means of

¹⁰⁴ Glanvill (1662), 124-6.

¹⁰⁵ Glanvill (1662), 126.

¹⁰⁶ Glanvill (1662), 183-8.

bringing about his will are available, it is contrary to his wisdom, and therefore contrary to his essential nature, to intervene directly rather than employ these means. "Wisdom", writes Burnet in book three, "consists in the conduct and subordination of several causes to bring our purposes to effect", and "what is dispatched by an immediate Supreme Power, leaves no room for the exercise of Wisdom".¹⁰⁷ The principal instruments of the divine will in Burnet's view, those most consonant with God's wisdom, are natural causes. God's providence, therefore, is, as for Glanvill, predominantly *natural* providence. Natural providence consists in "[t]he Form or Course of Universal Nature, as actuated by the Divine Power: with all the Changes, Periods, and Vicissitudes that attend it, according to the method and establishment made at first, by the Author of it".¹⁰⁸ In other words, the laws of nature, contrived by God in the beginning. Where God's will can be effected via natural law, then, it is contrary to his wisdom to employ a higher power. As in Glanvill, this rule to which God is bound by his essential nature becomes for Burnet an important methodological principle in constructing his theory. God does not intervene in nature where natural causes are sufficient. Neither, then, should we appeal to a miraculous power where natural causes are sufficient to explain a given phenomenon, for

if we would have a fair view and right apprehensions of Natural Providence, we must not cut the chains of it too short, by having recourse, without necessity, either to the First Cause, in explaining the Origins of things: or to Miracles, in explaining particular effects. This, I say, breaks the chains of Natural Providence, when it is done without necessity, that is, when things are otherwise intelligible from Second Causes... *The Course of Nature is truly the Will of God*; and, as I may so say, his first Will; from which we are not to recede, but upon clear evidence and necessity. And as in matter of Religion, we are to follow the known reveal'd Will of God, and not to trust to every impulse or motion of Enthusiasm, as coming from the Divine Spirit, unless there be evident marks that it is Supernatural, and cannot come from our own; So neither are we, without necessity, to quit the known and ordinary Will and Power of God establisht in the course of Nature, and fly to Supernatural Causes, or his extraordinary Will; for this

¹⁰⁷ Burnet (1690c), 73.

¹⁰⁸ Burnet (1684), 319.

is a kind of Enthusiasm or Fanaticism, as well as the other: And no doubt that great prodigality and waste of Miracles which some make, is no way to the honour of God or Religion.¹⁰⁹

This methodological principle, grounded in an anti-voluntarist conception of God inherited from Burnet's Cambridge Platonist and Latitudinarian contemporaries, is adhered to throughout the *Theory*, and the Creation, Deluge, Conflagration, and formation of the new heavens and earth explained predominantly – though not entirely, as I shall discuss shortly – in terms of natural causes. Burnet was evidently aware that in explaining biblical events in such terms he ran the risk of being perceived as having written providence out of sacred history and was anxious to avoid his readers coming to this conclusion. To this end, he stresses throughout the work that interpreting biblical events naturalistically does not thereby render them non-providential, for it was God who, in his infinite wisdom, contrived a series of natural causes which would bring the events about. That they would be effected in this manner is to be considered a more compelling mark of divine providence than his intervening directly in the world, since the ordinary course of nature affords greater evidence of his wisdom than does his direct intervention. The course of nature, Burnet emphasises, is not

less Providential, because constant and regular; on the contrary, such a disposition or establishment of second causes, as will in the best order, and for a long succession, produce the most regular effects, assisted only with the ordinary concurrence of the first cause, is a greater argument of wisdom and contrivance, than such a disposition of causes as will not in so good an order, or for so long a time produce regular effects, without an extraordinary concurrence and interposition of the First cause.¹¹⁰

Introducing a familiar seventeenth-century analogy, he adds that “[w]e think him a better Artist that makes a Clock that strikes regularly at every hour from the Springs and Wheels which he puts in the

¹⁰⁹ Burnet (1684), 314-5.

¹¹⁰ Burnet (1684), 106-7.

work, than he that hath so made his Clock that he must put his finger to it every hour to make it strike".¹¹¹

Likely anticipating the objections that were to be raised against it, Burnet was especially keen to emphasise the providential nature of his account of the Deluge. On the face of it, Burnet's anti-voluntarist interpretation of the Deluge appeared difficult to square with the event being brought about as a punishment for human sin, something which seemed to imply a voluntaristic act of God. To overcome this difficulty, Burnet posits a divine synchronicity between the "natural", "material", or "corporeal" world on the one hand and the "human", "moral", or "intellectual" world on the other. God, having foreseen human sin, contrived the physical world in the beginning such that the earth's crust would break and cause a universal inundation at precisely the moment of maximal human sinfulness. Understood in this way, the Deluge becomes not merely a punishment for human sin but also a remarkable instance of God's wisdom and prescience, far more consistent with his nature than the voluntarist picture of his observing sin and intervening in the world in order to punish it. Applying the above clock-maker analogy to the Deluge, Burnet observes that

if one should contrive a piece of Clock-work so that it should beat all the hours, and make all its motions regularly for such a time, and that time being come, upon a signal given, or a Spring toucht, it should of its own accord fall all to pieces; would not this be look'd upon as a piece of greater Art, than if the Workman came at that time prefixt, and with a great Hammer beat it into pieces?¹¹²

"I use these comparisons", he continues,

to convince us, that it is no detraction from Divine Providence, that the course of Nature is exact and regular, and that even in its greatest changes and revolutions it should still conspire and be prepar'd to answer the ends and purposes of the Divine Will in reference to the *Moral* World. This seems to me to be the great Art of Divine Providence, so to adjust the two Worlds, Humane and Natural, Material and

¹¹¹ Burnet (1684), 107.

¹¹² Burnet (1684), 107.

Intellectual, as seeing thorough the possibilities and futuritions of each, according to the first state and circumstances he puts them under, they should all along correspond and fit one another, and especially in their great Crises and Periods.¹¹³

God, then, does not punish or reward humankind merely according to his will, but, in accordance with his wisdom, synchronises earth and human history such that they corresponded perfectly with one another. And since in both

there are certain Periods, Fulnesses of Time, and fixt Seasons, either for some great Catastrophe, or some great Instauration, 'Tis Providence that makes a due harmony or Synchronism betwixt these two, and measures out the concurrent fates of both Worlds, so as Nature may be always a faithful minister of the Divine Pleasure, whether for rewards or punishments, according as the state of Mankind may require.¹¹⁴

Despite his emphasis on natural over extraordinary providence, Burnet does not want to rule out miracles altogether, for while he emphasises God's wisdom over his will, he does not want the latter "so to be bound up to second causes, as never to use, upon occasion, an extraordinary influence or direction".¹¹⁵ Indeed, he sees an outright denial of miracles as more problematic than having too ready appeal to them, "for to deny all Miracles, is in effect to deny all reveal'd Religion". He wants, then, to allow *some* miraculous intervention, "so as neither to make the Divine Power too mean and cheap, nor the Power of Nature illimited and all-sufficient".¹¹⁶ He also maintains that miracles were involved in the Creation and Deluge, and that they will play a role in the Conflagration. The specific role of miracles in Burnet's account of the formation and dissolution of the earth is somewhat vague, and I shall return to it shortly as the much clearer picture he gives of another miraculous element of the Deluge and of the miracles involved in the Conflagration will help to shed light on it. This other

¹¹³ Burnet (1684), 107.

¹¹⁴ Burnet (1684), 324.

¹¹⁵ Burnet (1684), 107.

¹¹⁶ Burnet (1684), 315.

miraculous element of the Deluge pertains to the protection of the ark. The violence of the waters, Burnet suggests, necessitated “an extraordinary and miraculous Providence” to prevent the ark from being destroyed. To this end, he proposes that it was protected by angels, a scenario he famously illustrates with an engraving of a submerged globe with the ark near the centre flanked by angels (Figs. 1-2).¹¹⁷



Fig. 1

¹¹⁷ Burnet (1684), 100-1 – quotation from 100.



Fig. 2

Like the protection of the ark, the role of miracles in the Conflagration consists in the ministry of angels. Here, though, their role is very different in that they are involved in actually bringing the event about. What is especially interesting about Burnet's discussion of the miracles involved in the Conflagration is that he distinguishes between two kinds of miracle: (a) "God's immediate Omnipotency", and (b) "the Ministry of Angels". Both are to be considered miraculous, because both proceed from divine or supernatural rather than natural causes. Yet the distinction between them is important, more important even than that between the natural and the miraculous, because the difference between an angelic and an omnipotent power is far greater than that between the natural and the angelic. Here Burnet introduces a new component of his anti-voluntarism: where God can bring about his will via the ministry of angels, he will not intervene directly in the world. Here again, this rule by which God himself is bound proceeds from his wisdom, to which it is contrary for him to employ an omnipotent power where a merely angelic power is sufficient.¹¹⁸

¹¹⁸ Burnet (1690c), 69-70 – quotations from 69.

Assessing the powers of angels, Burnet argues in the first place that they are endowed with a perfect understanding of nature. They are able, therefore, to intervene in the natural world in ways that are not only above our capacities but beyond our imagination. Additionally, where our souls can control only the motions of “spirits” within our bodies, theirs can manipulate external nature.¹¹⁹ Thus, their dominion and power over the natural world far exceeds ours, and hence nature is much more subject to their control than to our own. “From these considerations”, he observes, “it is reasonable to conclude, that the generality of miracles may be and are perform'd by Angels; It being less decorous to employ a Sovereign power, where a subaltern is sufficient”. From these observations, which again are grounded in an emphasis on God’s wisdom and a resulting anti-voluntarist conception of God, Burnet derives a second methodological principle which is exactly analogous to the first: just as we are not to appeal to miracles where natural causes are sufficient to explain a given phenomenon, so too, we are not to appeal to God’s direct intervention where the ministry of angels is sufficient. “[T]he reason in both Rules”, emphasises Burnet, “is the same, namely, because it argues a defect of Wisdom in all Oeconomies to employ more and greater means than are sufficient”.¹²⁰

Burnet now applies this rule to the Conflagration. Drawing on a range of biblical illustrations of the propensities and capacities of angels, he notes in the first place that the notion of “*Destroying Angels*” as “Executioners of the Divine Justice and Vengeance” is well preceded in Scripture, there being frequent instances in sacred history of God’s judgement being dispensed by an angelic hand. There was thus nothing “new or strange” in their being instruments of God’s wrath in his last great judgement upon the earth.¹²¹ As to their capacity to intervene in nature, it was evident that angels can order and coordinate the various natural causes that are to bring the Conflagration about; they can increase the amount of fire or “fiery materials” in the earth; intensify the power of the sun; adjust

¹¹⁹ Here Burnet is referring to the Cartesian notion of “animal spirits” which enable us voluntarily to move our limbs.

¹²⁰ Burnet (1690c), 70.

¹²¹ Burnet (1690c), 71.

the temperature of flames; alter the composition of physical bodies so as to make them more combustible. It was thus both “reasonable” and “sufficient” to suppose that the Conflagration would be brought about primarily via natural causes, but that these causes would be augmented by the ministry of angels.¹²² God’s direct intervention could be ruled out, since he will not intervene in nature where the ministry of angels is sufficient. As with his above defence of natural causes, Burnet was keen to emphasise the providential nature of angelic causes and does so once again in markedly anti-voluntarist terms. It is no “diminution of Providence”, he writes, “to put things into the hands of Angels”. On the contrary, “[t]is the true *rule and method* of it; For to employ an Almighty power where it is not necessary, is to debase it, and give it a task fit for lower Beings”.¹²³

Turning now to the miracles involved in the formation and dissolution of the earth, this as I have noted is rather vague in the first volume of the *Theory*. Following his explication of the earth’s formation from a chaos, Burnet notes that “we have propos’d the Natural Causes of it, and I do not know wherein our Explication is false or defective” yet immediately afterwards describes the structure of the primitive earth as “so marvellous, that it ought rather to be consider’d as a particular effect of the Divine Art, than as the work of Nature”. He then quotes a number of biblical passages and other ancient writings which indicate that other, non-physical powers were involved in this “piece of Divine Geometry or Architecture” – the “*Word of God*” or “*Spirit of God*” in Scripture and “*Mens or Amor*” in the ancients – but does not discuss what these powers may have consisted in.¹²⁴ Later in the book when discussing the Deluge, he relates that as “there was an extraordinary Providence in the formation or composition of the first Earth, so I believe there was also in the dissolution of it”, yet says nothing about what this extraordinary providence consisted in in either case.¹²⁵

¹²² Burnet (1690c), 71-3.

¹²³ Burnet (1690c), 73 – my italics.

¹²⁴ Burnet (1684), 65-6.

¹²⁵ Burnet (1684), 107-8.

Things become slightly clearer if we look at his two responses to Warren. Warren had objected to Burnet's account of the Creation on the grounds that the formation of the earth according to Burnet's principles would take far longer than the six days allotted by Moses.¹²⁶ Responding to Warren, Burnet argued that the formation of the earth may be understood either in terms of ordinary or extraordinary providence. If the former, then it would obviously take much longer than six days. If the latter, then the process may be expedited so as to occur in a shorter timeframe.¹²⁷ This, however, is clearly not his actual position. To begin with, he explicitly states that the argument is merely a *possible* "general Answer" to the objection.¹²⁸ We know, moreover, that he thinks the Creation *did* take longer than six days, and that the Mosaic six-day Creation is not to be understood literally. He stated this in 1680/1 in his correspondence with Isaac Newton and made his first public statement of it in the *Review of the theory of the earth* which was published the same year as this first reply to Warren.¹²⁹ This position is intimated toward the end of the latter, too, for here he expresses his intention to produce an account of the six-day Creation, and declares that this account "might have spar'd much of the Excepter's [Warren's] pains", since his objections are grounded largely in a "Vulgar" reading of Moses, with which the theory is obviously inconsistent – "a Child that had read the first Chapters of *Genesis*", he notes derisively, "might have observ'd this, as well as the Excepter".¹³⁰ He returns to this point in his second reply. Here, though, he is much more explicit, stating that "the Theorist hath no where asserted, that *Moses's Cosmopoeia*... is to be literally understood; and therefore what is urg'd against him from the letter of that *Cosmopoeia*, is improperly urg'd and without ground".¹³¹

Burnet's notion of the speeding up of the earth's formation, then, is not his view of the role of extraordinary providence in the Creation. His actual view of this and of the extraordinary providence

¹²⁶ Warren (1690), 48-51.

¹²⁷ Burnet (1690a), 4.

¹²⁸ Burnet (1690a), 2.

¹²⁹ Burnet to Newton, 13th January 1680/1, in Turnbull (1960), 323-6; Burnet (1690b), 43-6.

¹³⁰ Burnet (1690a), 66.

¹³¹ Burnet (1691a), 39.

involved in the Deluge becomes apparent in his second reply to Warren. In his first reply, Burnet had made certain appeals to extraordinary providence when answering Warren's objections.¹³² In his subsequent reply to Burnet, Warren took exception to this, and to Burnet's earlier appeals to extraordinary providence in the *Theory*. Firstly, he argued, Burnet was violating his own principles, for he had insisted on explaining the Creation and Deluge in terms of natural causes but had appealed to extraordinary providence in the *Theory* and was now appealing to it to deal with objections. Secondly, by appealing to extraordinary providence, Burnet had rendered his theory superfluous. One of the key motivations for the theory was to explain the Deluge without appealing to a miraculous creation and annihilation of water. By appealing to miracles himself, he had thereby rendered his theory no better than the traditional, miraculous interpretation of the event.¹³³ "To what purpose", asks Warren, "did he [Burnet] invent a Theory, and write a Treatise *with design* to shut out *one* Extraordinary Providence, the *creating of new Waters* to make the Deluge; when in this Treatise, and to uphold that Theory, he is constrain'd to let in *thus many?*"¹³⁴

It is in his response to these points that Burnet's view of the miracles involved in the Creation and Deluge becomes clearer, for here Burnet rebukes Warren for being "so injudicious... as to confound all extraordinary Providence with the *Acts of Omnipotency*". It is such acts, he explains, and not miracles more generally, that he did not allow in his theory. "The *Creation* and *Annihilation* of waters... is an act of pure Omnipotency". This, therefore, "[t]he Theorist did not admit of at the Deluge: and if this be his fault, as it is frequently objected to him he perseveres in it still".¹³⁵ Here, as in his discussion of the Conflagration, he contrasts such "*Acts of Omnipotency*" with the ministry of angels: "as for acts of Angelical power", he writes,

¹³² Burnet (1690a), 2-4, 30-1.

¹³³ Warren (1691), 8-12, 65-6, 89-90, 157-8.

¹³⁴ Warren (1691), 66.

¹³⁵ Burnet (1691a), 39.

“he [the Theorist] does every where acknowledge them in the great Revolutions... of the natural World. If the Excepter [Warren] would make the Divine Omnipotency as cheap as the ministry of Angels, and have recourse as freely and as frequently to that, as to this: If he would make all extraordinary Providence the same, and all miracles, and set all at the pitch of Infinite power, this may be an effect of his ignorance or inadvertency, but is no way imputable to the Theorist.¹³⁶

Burnet’s appeals to miracles, then, are to *lesser* miracles, those which can be effected by the ministry of angels and which do not require God’s direct omnipotence. Thus, he did not violate his principles or render his theory superfluous as Warren had claimed, for Warren’s argument proceeded from an erroneous conflation of these two very distinct kinds of miracle.

From the foregoing argument against Warren, his above assertion “that the generality of miracles may be and are perform’d by Angels”, the prodigious power over nature with which he believed angels to be endowed, and his clear antipathy with the idea of God intervening directly in the world, it seems highly likely that the miracles Burnet envisaged as being involved in the formation and dissolution of the earth at the Creation and Deluge, like those involved in the Conflagration, consisted in the ministry of angels. If this is correct, then Burnet’s anti-voluntarism dictates not only his view of ordinary providence, but also his conception of *extraordinary* providence. God’s direct intervention is theoretically possible, but in most cases God, in accordance with his wisdom, performs miracles not directly but via the medium of angels. This conception of extraordinary providence also appears to have been inherited in large part from Glanvill. Though Glanvill insists that God works via natural causes and does not intervene in the world and that we should endeavour to explain things in terms of natural processes rather than extraordinary providence, he maintains also that on occasions where natural providence falls short, and where a phenomenon cannot be explained in terms of natural processes, “we may have recourse to the Arbitrary managements of those invisible Ministers

¹³⁶ Burnet (1691a), 39.

of Equity and Justice, which without doubt the world is plentifully stored with". Here, again like Burnet, he points to scriptural evidence of angelic interventions in the world in support of his contention.¹³⁷

Burnet's conception of miracles is interesting to consider in relation to seventeenth-century English thinking about miracles more generally. At this time, the subject of miracles was being widely discussed by both theologians and philosophers. Here again, Harrison has some illuminating and highly relevant work. Harrison recognises two very distinct conceptions of miracles adopted by English philosophers and theologians from the middle decades to the end of the century. The first, held by earlier thinkers such as Stillingfleet, Robert Boyle, Thomas Sprat, and others, was essentially a modified version of a view developed by St. Thomas Aquinas during the middle ages. For Aquinas, miracles were events which could not be explained in terms of the powers of the objects involved in them. During the seventeenth century, this Aristotelian notion of objects possessing intrinsic powers became rejected in favour of inert matter governed laws of nature, and the Thomist definition of miracles became reconceptualised in these terms. From this reconceptualization emerges the familiar conception of miracles as violations of laws of nature which was famously attacked by David Hume during the following century. For the above thinkers, miracles were essentially violations of the laws of nature resulting from the direct action of God. The ordinary course of nature is caused *ultimately* by God, but not directly. Rather, it results from "second causes", laws contrived by God in the beginning. Miracles, however, are *direct* interventions from God, in which these laws are violated.¹³⁸

A very different conception of miracles, Harrison observes, emerged during the latter part of the century. This definition was derived ultimately from St. Augustine and was adopted by Newton and several of his followers. For Augustine, *all* of nature is essentially miraculous, and what we ordinarily refer to as miracles are to be understood not in terms of any essential difference between them and the ordinary course of nature but in terms of their effects on observers. They are events

¹³⁷ Glanvill (1662), 129-30 – quotation from 129.

¹³⁸ Harrison (1995), 533-7.

which are *unusual*, and therefore *appear* contrary to nature. Yet they are not in fact contrary to *nature*, but rather to *our knowledge* of nature. For Newton and Newtonians such as Richard Bentley, Samuel Clarke, and William Whiston, attraction and gravitation result from the continual, direct action of God. Since God for these thinkers is continually intervening directly in nature, miracles cannot be distinguished for the ordinary course of nature on the basis of God's direct intervention. The Newtonians therefore revived the Augustinian definition, reconceptualising it in seventeenth-century terms of laws of nature. Miracles for Newton and the Newtonians are events which are unusual. They *appear* to be violations of the laws of nature, yet this appearance is not due to their intrinsic nature but to our limited understanding of the world. Miracles, like other natural phenomena, are governed by the laws of nature, but we lack the requisite understanding of those laws to explain them. As Harrison observes, the crucial difference between these two definitions of miracles is that on the modified Thomist definition miracles are objectively and ontologically distinct from the laws of nature, whereas on the Augustinian-cum-Newtonian definition the distinction is subjective and epistemic. Miracles on the latter view are miracles only from our limited perspective. They can, therefore, *at least potentially*, be explained in terms of natural processes.¹³⁹

It is interesting to consider where Burnet's conception of miracles stands in relation to these two seventeenth-century definitions. Harrison suggests that Burnet's conception of miracles was similar to that of the Newtonians and discusses Burnet's theory alongside the Newtonians' endeavours to explain biblical miracles in terms of natural processes.¹⁴⁰ This is somewhat misleading. Harrison is right to suggest that Burnet's *treatment of biblical events traditionally conceived as miracles* is similar to that of the Newtonians in that he, like them, thinks these events can be understood in naturalistic terms. Burnet's *definition* of miracles, however, is very different from that of the Newtonians. Miracles for Burnet are not merely subjectively and epistemically but *objectively*

¹³⁹ Harrison (1995), 532-3, 537-53.

¹⁴⁰ Harrison (1995), 539-40, 544, 547.

and *ontologically* distinct from the laws of nature. They result either from (a) God's direct intervention (which Burnet effectively, though not theoretically, rules out) or (b) the ministry of angels. These are *divine* or *supernatural* causes, and as such, they are ontologically distinct from natural causes. Burnet of course subscribes to a Cartesian, mechanistic physics. Thus, neither God nor angels are continually intervening in nature. So their intervention, should it occur, is wholly distinct from the laws of nature. As to the biblical events which Burnet and the Newtonians sought to explain naturalistically, there is a very important distinction here, too. For the Newtonians, as Harrison notes and as I shall explore in more depth in chapter five when I discuss Whiston, unusual events in Scripture which can be explained in terms of natural causes are still in some sense *miraculous*.¹⁴¹ For Burnet, on the other hand, biblical events, to the extent that they can be explained in naturalistic terms, *are not miracles*. They are only miraculous insofar as they involve either direct intervention from God or the ministry of angels.

In the foregoing respects, Burnet's conception of miracles is closer to the Thomist definition than the Augustinian. For Burnet, as for Boyle, Stillingfleet and others, the miraculous is ontologically distinct from the natural. Miracles are something *other* than the laws of nature. In certain other respects, however, Burnet differs significantly from these authors, too. As I have noted above, those who adopted the modified Thomist definition conceptualised miracles primarily in terms of *violations of laws of nature* resulting from *God's direct intervention in the world*. There are two crucial differences between this view and Burnet's. The first difference is obvious. Burnet, at least in most cases, does not think God intervenes directly in the natural world, for in almost every conceivable case, this is not necessary and would therefore be contrary to his wisdom. Miracles for Burnet, then, are in virtually all cases not interventions *from God* but from *angels carrying out God's instructions*. The second difference is rather more subtle. Miracles for Burnet, while being angelic interventions which *alter the course* of nature, are not straightforwardly *violations* of the laws of nature. Rather, the picture we get from his account of miraculous intervention in the Conflagration – the only detailed

¹⁴¹ Harrison (1995), 537-41.

picture he gives of extraordinary providence – is of angels *working in concert with* the laws of nature, organising and coordinating natural processes, transmuting matter, manipulating causes and effects.¹⁴² Burnet’s “Angels of Wrath”, Poole astutely observes, “no longer strike us as supernatural beings effecting incomprehensible miracles”, but rather “as superior versions of human chemists”.¹⁴³

One final point I want briefly to discuss before moving onto Burnet’s use of Scripture is how his commitment to natural over miraculous causes has been characterised by historians. This commitment is typically framed as an essentially *Cartesian* principle. Martin Rudwick, for example, argues that Burnet sought physical explanations for the Deluge and other events which could “satisfy the text of Scripture and other ancient records..., and at the same time be framed within the Cartesian philosophy of nature, which permitted explanation only in terms of matter and motion”.¹⁴⁴ Poole claims that Burnet’s promotion of “a model of general providence (‘the laws of nature’) that would limit the need for the philosopher to appeal to special providence (‘miracles’)... was a Cartesian move, as Descartes too had insisted on the necessity for God’s general providence as the caretaker and conservator of Creation’s regular movements”.¹⁴⁵ Harrison notes that the aspect of Cartesianism to which critics of Burnet and other theorists objected was not the use of Cartesian cosmogony but “the Cartesian mode of explanation”, that is, the attempt “to describe all the features of the world in terms of secondary causes”.¹⁴⁶

It is true of course that Descartes had insisted on general rather than extraordinary providence in his cosmogony. “God will never perform a miracle in the new world”, he wrote in the *Treatise on light*.¹⁴⁷ And Harrison is certainly correct to say that Burnet’s and other theorists’ commitment to natural causes was *seen by their contemporaries* as essentially Cartesian. It is important to emphasise,

¹⁴² Burnet (1690a), 69-73.

¹⁴³ Poole (2010), 162.

¹⁴⁴ Rudwick (1976), 78.

¹⁴⁵ Poole (2010), 59.

¹⁴⁶ Harrison (2000), 178.

¹⁴⁷ Descartes (1998 [1664]), 32.

however, that the foundations of Burnet's commitment to ordinary providence were much more theological than philosophical. They were rooted, as I have argued, in an anti-voluntarist conception of God inherited from the Cambridge Platonists and Latitudinarians, something quite *un*-Cartesian – Cudworth, for example, had objected strenuously to Descartes' theological voluntarism.¹⁴⁸ It was this anti-voluntarism rather than Cartesianism that underpinned Burnet's commitment to natural over extraordinary providence. And as we have seen, it also placed strict limits on the latter. God does not intervene directly in the world in Burnet's theory not because Burnet is committed to a Cartesian style of explanation but because he sees God as being bound by the law of his essential nature to employ natural – or where that fails, angelic – causes.

2.4. Scripture

As will become clear in later chapters, the first volume of the *Theory* would attract far more attention than the second. As a result, Burnet would become seen primarily as a “world-maker” or “flood-maker” – two pejorative terms coined during the 1690s by critics of Burnet and other theorists – and the *Theory* viewed principally as a philosophical commentary on Genesis, and in particular on chapters 6-9, the Mosaic narrative of the Deluge.¹⁴⁹ Kerry Magruder has argued that this characterisation of Burnet as primarily a diluvial apologist is something of a distortion in that the most central biblical text in the *Theory* is not Genesis but St Peter's Second Epistle.¹⁵⁰ This is certainly correct. As we shall see, it is indeed St Peter and not Genesis that plays the most pervasive role in the *Theory* as a whole. Nevertheless, it is important not to understate the significance of Genesis 6-9 in the first book, for in this part of the *Theory* it is this text that plays the more foundational role.

There were essentially three core tenets of the Mosaic narrative that Burnet wanted to vindicate, and which underpin his theory of the Deluge. The first concerned the *extent* of the event.

¹⁴⁸ Hutton (2001), 72-3.

¹⁴⁹ Both terms appear in Keill (1698), 21, 14, 79. “world-maker” also appears in Nicholls (1698), 104.

¹⁵⁰ Magruder (2009), 456-70.

As we saw in the previous chapter, the Deluge for Burnet had to be universal, for as well as the various other problems with the increasingly popular notion of a local Deluge, Moses explicitly states that the Deluge was universal.¹⁵¹ The second concerned the event's *causes*. Moses mentions only two causes: the breaking open of the "Fountains of the great Abyesse" and the forty days rain. That Moses gives these and only these causes precluded in Burnet's view the possibility of any other causes such as a miraculous creation of water or a miraculous transmutation of other elements into water.¹⁵² The third concerned the *nature* of the event. Two things are important here. First, the onset and abatement of the Deluge in Moses' narration are gradual. The water increases and decreases by degrees.¹⁵³ This, too, ruled out any sudden creations, annihilations, or transmutations.¹⁵⁴ Second, and this was more controversial, the Mosaic history as Burnet interprets it does not present the Deluge as a standing pool of water as was traditionally believed but as a violent sea.¹⁵⁵ On this point, he cites chapter 8, verse 3 of the Hebrew text in which it is stated that the waters of the Deluge decreased by "going and returning" or "going and coming", which indicates a violent motion and gradual settling of the waters into the channels that had been created by the dissolution of the crust.¹⁵⁶ This was further supported by Psalm 104.6-8: "the waters... go up by the mountains; they go down by the valleys unto the place which thou hast founded for them".¹⁵⁷

Burnet's account of the Deluge for the most part corresponded closely with Genesis 6-9. There were, however, two noteworthy divergences which would prove controversial. The first of these concerned the causes of the event. Although Burnet purported to have remained close to the text in maintaining that the only two causes are those stated by Moses, the timing and relative significance

¹⁵¹ Burnet (1684), 24-6.

¹⁵² Burnet (1684), 13-14, 19, 70, 85 – quotation from 14.

¹⁵³ Burnet (1684), 19, 76, 80, 101-2.

¹⁵⁴ Burnet (1684), 19.

¹⁵⁵ Burnet (1684), 19, 76, 80-1.

¹⁵⁶ Burnet (1684), 19, 76, 80.

¹⁵⁷ Burnet (1684), 81. Burnet finds further evidence for his account of the nature and cause of the Deluge in Psalm 42.7 and Job 12.13-15 and 38.8-11 – see Burnet (1684), 89, 91-2, 99-100, 102.

of these two causes in the theory represented a significant departure from the Mosaic account. In Genesis 7.11-12, Moses appears to make the onset of the forty days rain occur at the same time as the breaking open of the abyss: "*the same day* were all the fountains of the great deep broken up, and the windows of heaven were opened. And the rain was upon the earth forty days and forty nights".¹⁵⁸ He also seems to give the breaking open of the fountains and the rain equal roles in the Deluge. In Burnet, on the other hand, the rain *precedes* the dissolution of the crust. And having calculated that forty days rain would supply only an insignificant proportion of the water required, he relegates it to a merely preparatory or subsidiary role. It softens the ground and weakens the crust, fills the pores of the crust such that the waters of the abyss become more volatized and exert greater pressure on it, and buoys up the ark to protect it in its descent into the abyss. It does not, however, constitute a significant proportion of the Flood waters as seems to be the case in the Mosaic account.¹⁵⁹

The second notable divergence from the Mosaic narrative was rather more controversial. This divergence is not apparent in Burnet's discussion of the Deluge in book one but is revealed in book two where he considers the peopling of America. Here, as I noted in the previous chapter, Burnet argued that the population of America are not Noah's descendants. Rather, their ancestors are descendants of Adam who migrated west prior to the Deluge. God, in another remarkable instance of his wisdom and prescience, foresaw that the broken crust would form two main continents and saved a selection of humans and animals in each hemisphere. Although the Deluge itself was universal, then, Moses' narration of it pertains only to Europe, Asia, and Africa. This Burnet saw as an elegant solution to the problem of the peopling of America, something which had perplexed scholars since the Renaissance and had given rise in his own time to such heretical notions as Isaac La Peyrère's pre-Adamite hypothesis.¹⁶⁰ Though nowhere near as controversial as La Peyrère's, Burnet's solution did nevertheless imply a significant departure from the Mosaic history, for although, as he pointed out,

¹⁵⁸ Genesis, chap. 7 ver. 11-12 – my italics.

¹⁵⁹ Burnet (1684), 97-9.

¹⁶⁰ Burnet (1684), 270-3.

there is nothing in Genesis stating that all humans descended from Noah but only from Adam, this was implied in Moses' narration of the Deluge in which it is stated repeatedly that all humans and land animals died apart from those on the ark.¹⁶¹

Other passages of Genesis which play an important foundational role in the theory are those that state the lifespans of the antediluvian and postdiluvian patriarchs and the ages at which they fathered children, Burnet's literal interpretation of these passages giving rise to his account of antediluvian longevity which I discussed in the previous chapter. A passage which is conspicuously *absent* from the *Theory* for the most part is Moses' narration of the Creation in Genesis 1. Apart from citing the text as evidence that the earth was created and is not eternal and that it formed from a chaos, Burnet makes no attempt in the *Theory* to reconcile his account of the Creation with this chapter of Genesis.¹⁶² "I have not mention'd *Moses's Cosmopoeia*", he writes in the English edition, "because I thought it deliver'd by him as a Lawgiver, not as a Philosopher".¹⁶³ He says slightly more in the Latin edition, arguing that Moses described the earth at the Creation not as it in fact was at that time but as it was at the time he wrote.¹⁶⁴ And as I noted above, he had made clear in his correspondence with Newton in 1680/1 that he did not believe the Mosaic six-day Creation to be a true account of the formation of the earth.¹⁶⁵

He did, however, find evidence for his theory of the Creation in other biblical texts. Here again he drew heavily on the book of Psalms, of which several passages appeared to him to refer to the formation of the earth's surface on a body of water and the enclosure of the abyss within the crust. Psalm 136.6 mentions God having "stretched out the Earth above the waters". Psalm 24.4 relates that "he founded the Earth upon the seas, and established it upon the Floods". And Psalm 33.7 says that

¹⁶¹ Burnet (1684), 272; Genesis, chap. 7 ver. 21-3.

¹⁶² Burnet (1684), 35, 44.

¹⁶³ Burnet (1684), 288.

¹⁶⁴ Burnet (1681), 253.

¹⁶⁵ Burnet to Newton, 13th January 1680/1, 323-6.

“he gathered up waters of the sea together, as in a bag, he layeth up the Abyesse in Storehouses”. Further notable examples come from the book of Proverbs. Chapter 8, for example, refers to a time when there were “no fountains abounding with water” and to God “set[ting] a Compass upon the face of the Deep” and “strengthen[ing] the fountains of the Abyesse”. The strengthening of the fountains of the abyss, Burnet argues, clearly refers to the enclosure of the abyss within the crust, “for the Fountains could be strengthened no other way than by making a strong cover or Arch over them”. The word translated in English as “compass”, he notes further, more properly signifies “a Circle or Circumference, or an Orb or Sphere”. Hence, “there was in the beginning of the World a Sphere, Orb or Arch set round the Abyesse... And this shews us both the form of the Mosaical Abyesse, which was included within the Vault, and the form of the habitable Earth, which was the outward surface of this Vault, or the cover of the Abyesse that was broke up at the Deluge”.¹⁶⁶

I turn now to the central biblical text in Burnet’s overall theory: St Peter’s Second Epistle, chapter 3. The centrality of this text in the theory and the extent to which he refers to it warrant quoting the relevant verses in full:

This second epistle, beloved, I now write unto you; in *both* which I stir up your pure minds by way of remembrance: That ye may be mindful of the words which were spoken before by the holy prophets, and of the commandment of us the apostles of the Lord and Saviour: Knowing this first, that there shall come in the last days scoffers, walking after their own lusts, And saying, Where is the promise of his coming? for since the fathers fell asleep, all things continue as *they were* from the beginning of the creation. For this they willingly are ignorant of, that by the word of God the heavens were of old, and the earth standing out of the water and in the water: Whereby the world that then was, being overflowed with water, perished: But the heavens and the earth, which are now, by the same word are kept in store, reserved unto fire against the day of judgment and perdition of ungodly men... the day of the Lord will come as a thief in the night; in the which the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be

¹⁶⁶ Burnet (1684), 86-7.

burned up. *Seeing then that* all these things shall be dissolved, what manner *of persons* ought ye to be in *all* holy conversation and godliness, Looking for and hasting unto the coming of the day of God, wherein the heavens being on fire shall be dissolved, and the elements shall melt with fervent heat? Nevertheless we, according to his promise, look for new heavens and a new earth, wherein dwelleth righteousness.¹⁶⁷

This is how the text is rendered in the King James Bible. Burnet, however, makes an alteration which has important consequences for his theory: he retranslates the fifth verse in line with Latin Vulgate, replacing “standing out of the water and in the water” with “Consisting of Water, and by Water”.¹⁶⁸

In book one, Burnet presents this text as proof of three central components of his theory: first, that the earth itself and not merely life on earth was destroyed at the Deluge; second, that the antediluvian earth was of a different constitution from the present earth; and third, that it was in virtue of this constitution that the antediluvian earth was destroyed at the Deluge.¹⁶⁹ That the physical world was destroyed at the Deluge was evident from the context of the passage. The “scoffers” to whom the apostle refers sought to cast doubt on the Old Testament prophecies about the Conflagration. The basis of their doubt was the apparent immutability of the natural world, the notion that “all things continue as *they were* from the beginning of the creation”. Here the scoffers clearly refer to the physical world, for it was the future destruction of the physical world that they doubted. To counter their scepticism, St Peter tells them that the earth was destroyed at the Deluge. He too must therefore refer to the physical world, for if he refers merely to the animate world, his argument cannot counter the scoffers’ scepticism. They claimed that the physical world had not changed since the Creation, and on this basis argued that it would not change in the future. He, therefore, must point

¹⁶⁷ Second Epistle General of St Peter, chap. 3 ver. 1-7, 10-13.

¹⁶⁸ Burnet (1684), 19, 46.

¹⁶⁹ Burnet (1684), 19, 25, 45-8, 62-3, 68-70, 85, 150, 163-6, 233-4, 238, 286.

to the destruction of the physical world at the Deluge in order to demonstrate that nature is not immutable and remove the grounds for their scepticism.¹⁷⁰

The second key tenet that was proved by this passage was of course the first “proposition” of the theory. That the antediluvian earth was of a different constitution from the present earth was clear in the first place from the explicit distinction St Peter makes between the two worlds: “the heavens... of old, and the earth” and “the world that then was” in the fifth and sixth verses and “the heavens and the earth, which are now” in the seventh. Had there been no difference between the two, there would be no need for St Peter to make this distinction, and the fifth verse would be superfluous. The sixth verse, moreover, being an inference from the fifth, would be without grounds. St Peter, however, does not merely tell us that the antediluvian earth was *different*. He also tells us what this difference consisted in. It is here that Burnet’s retranslation of verse 5 is crucial, for here, according to the Vulgate, St Peter informs us that “the Earth of old had a particular form and constitution as to Water”, that it had a “watery constitution” in that it “consist[ed] or subsist[ed] by water, or by the help of water”. This clearly denotes an important difference between the antediluvian and the present earth, since the present earth cannot be said to have such a constitution. It is, however, true of the antediluvian earth, for this earth may be “said to *consist by water*, because it was built upon it, and at first was sustain'd by it”.¹⁷¹ The different constitution of the heavens Burnet interprets as referring not to the celestial but to the “aerial” heavens, that is, the earth’s atmosphere. This too, he thinks, had a “watery constitution” before the Deluge in that it contained only “watery Meteors”, whereas the present atmosphere clearly has a very different, “fiery constitution” in that it contains various “fiery Exhalations and Meteors” – i.e., thunder and lightning.¹⁷²

The third and final tenet of book one of the *Theory* that was evidenced by St Peter, that it was in virtue of the antediluvian earth’s different constitution that it was destroyed at the Deluge, was

¹⁷⁰ Burnet (1684), 45-8.

¹⁷¹ Burnet (1684), 45-8.

¹⁷² Burnet (1684), 233-4.

clear in Burnet's view from the opening clause of the sixth verse. Here, having described this constitution of the earth in verse five, St Peter describes its destruction at the Deluge, beginning the verse with the connective "Whereby". This, he argues, clearly denotes a causal dependence between the antediluvian earth's constitution and its destruction. Here, then, St Peter is as important as Moses for understanding the Deluge, since he, too, tells us of its cause. Yet where Moses gives us its "immediate Causes", St Peter relates its "more remote and fundamental causes".¹⁷³

Insofar as he makes St Peter Moses' equal with regard to the causes of the Deluge, this part of Burnet's theory may be considered as much Petrine as Mosaic, since the evidence for it comes as much from St Peter as from Moses. As I have noted above, however, it is important to stress that it is the Genesis narrative that plays the more foundational role of the two texts in this part of Burnet's theory. Genesis 6-9 is the scriptural basis of Burnet's theory of the Deluge. It is the primary text with which he constructs his theory. The role of St Peter in the first volume is wholly confirmatory. Having constructed his theory of the Deluge primarily from reason and secondarily from the Mosaic narrative, Burnet finds in St Peter a wealth of confirming evidence for his view. This course of events is stated explicitly in book one. "[W]hen I had discover'd in my thoughts from the consideration of the Deluge, and other natural reasons, that the Earth was certainly once in another form", he relates, "it was a great assurance and confirmation to me, when I reflected on this place of *S. Peter's*; which seems to be so much directed and intended for the same purpose, or to teach us the same conclusion".¹⁷⁴

What is especially interesting about Burnet's analysis of St Peter and the other confirmatory evidence that he finds in Scripture for his account of the Creation and Deluge is that it embodies two important points that we discussed in the previous chapter. The first is the Protestant literalism. Burnet's literalism is often overlooked. This is ultimately because his non-literal interpretation of the first three chapters of Genesis in the *Archaeologiae* caused so much controversy, and this controversy

¹⁷³ Burnet (1684), 45-8.

¹⁷⁴ Burnet (1684), 48.

has obscured the important fact that his exegesis more generally is very much literal. Indeed, apart from these first chapters of Genesis – which he discusses much later in his debate with Herbert Croft and Erasmus Warren and in the *Archaeologiae* – virtually *all* the biblical texts interpreted by Burnet are interpreted literally. With regard to St Peter’s Epistle and the above passages of the Psalms and Proverbs, Burnet is keen to emphasise that he is giving a literal interpretation of passages which previously did not seem to allow such an interpretation.¹⁷⁵ Indeed, in the case of St Peter, the obscurity of the text and the fact that it seems to relate things which are contrary to common beliefs had led certain Church Fathers to doubt its authenticity.¹⁷⁶ These texts had been interpreted non-literally, or in the case of St Peter its authenticity doubted, because we lacked a philosophical theory of the earth that could make sense of them. It was a significant virtue of the theory, then, that it enabled us to give a literal gloss to these passages.

The second point is the notion that there are hidden philosophical truths in Scripture. These passages, Burnet believes, are designed to teach us something new about the world. He admits that they are obscure and capable of various interpretations but argues that this obscurity enhances rather than diminishes their evidentiary value. Where biblical texts appear unusual and contrary to common notions, he argues, this is a sign that they are intended to teach us something novel, for there can be no other reason for this contrariety. He illustrates this point with the example of heliocentrism. If there are several passage of Scripture, he argues, which refer to the motion of the sun, and just one that refers to the motion of the earth, the latter should be considered of greater evidentiary weight than the former, since the former are clearly not meant to teach us anything new about the world but merely to cohere with common beliefs, whereas the latter is evidently designed to teach us something novel.¹⁷⁷ Thus,

¹⁷⁵ Burnet (1684), 87.

¹⁷⁶ Burnet (1684), 163-4.

¹⁷⁷ Burnet (1684), 92-4.

what might otherwise be made an exception to some of these Texts alludg'd by us, viz. that they are too obscure, becomes an argument for us: as implying that there is something more intended by them, than the present and known form of the Earth. And we having propos'd another form and structure of the Earth, to which those characters suit and answer more easily, as this opens and gives light to those difficult places, so it may be reasonably concluded to be the very sence and notion intended by the holy Writers.¹⁷⁸

This was an interesting move. By introducing this criterion for distinguishing between passages of Scripture that contain philosophical truths and those that do not, Burnet was able, firstly, to elevate the evidentiary status of those passages that he believed supported his theory, and secondly, to discount passages which seemed to contradict it. Passages – like the Mosaic history of the Creation – which describe the earth in its present form before the Deluge and which therefore appear *prima facie* to constitute evidence against the theory do not in fact constitute such evidence. They are not designed to teach us anything about the physical world and therefore speak in terms of common beliefs. Expressions in Scripture which are contrary to common opinion, on the other hand, “are more remarkable and more proving; in that there is nothing could give occasion to such, but an intention to express the very truth”.¹⁷⁹

What also emerges from the above analysis is that these texts for Burnet do much more than straightforwardly confirm his theory in the sense of providing textual evidence that supports it. The ability of the theory to elucidate these obscure texts made it a powerful hermeneutical tool. It could provide a coherent explanation of several apparently disparate texts whose true meaning was impossible to uncover without it. For Burnet, this explanatory power that the theory possessed with regard to biblical exegesis was compelling evidence that it was correct. Here the confirming instances which he finds in St Peter, the Psalms, Proverbs, and other passages of Scripture function essentially as novel empirical successes. In modern times, we ordinarily think of such successes in terms of

¹⁷⁸ Burnet (1684), 94.

¹⁷⁹ Burnet (1684), 94.

explanations and predictions of physical phenomena. In Burnet's time, however, texts played an important role in natural philosophy, and a philosophical theory's ability to elucidate textual phenomena was viewed as just as compelling confirmation as its ability to explain and predict physical phenomena. Burnet's theory was derived primarily from reason. The above passages to which he applied it were not used in its construction. Yet it could give a unifying explanation of them. And it could do so without needing to be modified in any way. Though its empirical successes pertain to textual rather than physical phenomena, then, the logical form of these confirming instances is essentially the same as those more commonly associated with the notion of novel empirical success.¹⁸⁰

Turning now to the use of Scripture in the *Theory's* second volume, it should be noted in the first place that Burnet draws here on a much wider array of texts and refers to them much more extensively than he does in the first volume. As one would expect in an apocalyptic treatise, the volume abounds with references to the Book of Revelation and the Book of Daniel.¹⁸¹ It also contains several references to Job, various Psalms, Isaiah, Malachi, the Gospels of Matthew, Luke, and John, Acts, Romans, Corinthians, Thessalonians, Hebrews, and a number of other texts.¹⁸² The use of these texts in Burnet's account of the Apocalypse is highly complex, and a detailed exposition of it would take up far more space than I have here. I shall limit my discussion for the most part, then, to the central text in this volume of the *Theory*, that is, St Peter's Second Epistle.¹⁸³

In this volume, St Peter plays a much more foundational role than in the first. Here again Burnet is very explicit about this role. He states upfront in the preface to book three "that, in following

¹⁸⁰ For these criteria of novel empirical success, see Psillos (1999), 100-3. For discussion of novel success in the history of earth science, see Rosseter (2018), 4-8.

¹⁸¹ Burnet (1690c), 11-12, 23, 37-9, 41-2, 53, 64, 71-2, 81, 83, 85, 89-90, 101-2, 106, 130-1, 138-40, 144-6, 151-62, 168-73, 182, 184-9, 192-4, 196-201, 204-6, 215, 217-19, 223-4.

¹⁸² Burnet (1690c), 5-6, 8, 10-12, 14, 17, 22-4, 25, 36, 38-9, 53, 55, 63-4, 71-2, 79, 81, 83, 93-5, 98-9, 101-2, 104-13, 119-20, 127, 130-1, 133-4, 139-41, 143, 148, 159, 161-3, 165-70, 172-3, 185-6, 192, 196-7, 198-201, 204-5, 211, 215, 217-21, 223-4.

¹⁸³ Burnet (1690c), 4, 6, 8, 11-12, 14, 21-4, 36, 51-3, 63, 81, 99, 103, 107, 112, 121, 131-3, 144-5, 164-5, 169-70, 192, 197, 199, 201, 215.

S. Peter's Philosophy, I suppose, that the burning of the Earth will be a true Liquefaction or dissolution of it, as to the exterior Region. And that this lays a foundation for *New Heavens* and a *New Earth*". He refers in his account of the burning of the earth to "S. Peter, who is our chief Guide in the doctrine of the Conflagration" and in his theory of the formation of the new earth to "S. Peter, whose doctrine we have... followed".¹⁸⁴ The role of St Peter in this volume, then, is essentially very similar to that of Moses in the first. The dissolution of the earth at the Conflagration and the subsequent formation of a new heavens and earth and Millennium according to St Peter are, like the core aspects of the Deluge according to Moses in the first volume, taken essentially as axiomatic. And the purpose of this volume is analogous to that of the first in that Burnet wants to provide a philosophical theory of the burning and renovation of the earth in order to make St Peter's account of these events intelligible. Other texts, as I have noted, are discussed at length, but their role is predominantly to confirm and embellish Burnet's view of the events and the Petrine writings on which it is based.

There are essentially three main components of Burnet's theory of the Conflagration and Millennium that are drawn primarily from St Peter. The first is the *cause* of the Conflagration. This cause, like that posited by St Peter for the Deluge, is not the immediate cause of the event but its more fundamental cause. And again, like the cause of the Deluge, this cause is the earth's constitution. This Burnet had already noted in the first volume, and he repeats his argument in the second. As Burnet interprets him, St Peter, having stated that the antediluvian earth was destroyed as a result of its constitution, describes next the different constitution of the present earth and the different fate to which this constitution disposes it. "But the heavens and the earth, which are now", the Apostle writes, "are kept in store, reserved unto fire". This Burnet interprets as communicating that the present heavens and earth have a "fiery" constitution. They are disposed to destruction by fire. And it is in virtue of this different constitution and disposition that they will be destroyed at the Conflagration. This analysis of St Peter is central to Burnet's account of the Conflagration. It is the

¹⁸⁴ Burnet (1690c), preface, 81, 133.

present heavens and earth's constitution, in contradistinction to that of the antediluvian heavens and earth, that is the ultimate cause of the Conflagration. This text, then, provides a foundation for Burnet's inquiry into its immediate causes, which are to be found in his view not in such things as the central fire or the proximity of the earth to the sun but in the various geological and meteorological phenomena which answer to St Peter's description of the present earth's more general constitution.¹⁸⁵

The second core tenet of Burnet's theory of the Conflagration which is grounded in St Peter is its *extent*. There are two key points here, both of which are drawn primarily from St Peter. The first pertains to the bounds of the Conflagration. By comparing the destruction of the earth at the Conflagration with that at the Deluge, Burnet argues, St Peter sets the same bounds for both events. And since the earth at the Deluge was destroyed from the top of the atmosphere to the bottom of the ocean, this too will be the bounds of the Conflagration.¹⁸⁶ The second point concerns the extent of the destruction. St Peter states that "the heavens shall pass away with a great noise, and the elements shall melt with fervent heat, the earth also and the works that are therein shall be burned up". He says also that "all these things shall be dissolved". This implies for Burnet a total dissolution rather than superficial burning of the heavens and earth.¹⁸⁷ This was evident also in Revelation 15.2 where St John refers to the burning of the earth as a "*Sea of Glass, mingled with Fire*" and several other prophecies in which we hear of "*Lakes of fire and brimstone, a molten Sea mingled with fire, the Liquefaction of Mountains, and of the Earth it self*", clearly indicating that the earth will be dissolved rather than superficially burned. Here again, Burnet's literalism comes to the fore. Such "terms of Liquefaction and Dissolution cannot", he emphasises, "without violence, be restrained to simple devastation and superficial scorching. Such expressions carry the work a great deal further".¹⁸⁸ His theory could make such a dissolution intelligible, thereby vindicating the literal sense of the prophecies. "We need not

¹⁸⁵ Burnet (1684), 233-4; (1690), 22.

¹⁸⁶ Burnet (1690c), 52-3.

¹⁸⁷ Burnet (1690c), 6, 11-12, 21-2, 51, 81.

¹⁸⁸ Burnet (1690), 81.

now look upon these things as Hyperbolical and Poetical strains”, he affirms, “but as barefac'd Prophecies, and things that will literally come to pass as they are predicted”.¹⁸⁹

In addition to the above passages, St Peter says in his Epistle that a new earth will follow the destruction of the present earth. In his sermon to the Jews in Acts 3.21, moreover, he alludes to the return of Christ at the “restitution of all things”, which indicates that the new earth will form out of the remains of the present earth. This new earth is “wherein dwelleth righteousness”. This, too, implied a total dissolution of the present earth, for if the earth is to be merely superficially burned rather than completely dissolved, it will not provide a foundation from which a new earth may form, much less one that can provide suitable habitation for the righteous.¹⁹⁰ Another important point about the extent of the Conflagration that was entailed by the formation of a new earth was that only the *form* and not the matter of the earth will be destroyed, for a new earth cannot form if the matter is annihilated.¹⁹¹ This also ruled out Glanvill’s theory of the central fire breaking out, since the earth’s core must remain intact if it is to provide a foundation for a new earth.¹⁹² That a new earth will form from the present earth following the Conflagration and that only the form and not the matter will be destroyed was corroborated by various other texts. Matthew 19.28, for example, speaks of a “*Regeneration or Reviviscency*” which is to occur before the reign of Christ on earth.¹⁹³ St Paul in Corinthians 1.7.31 states that “[t]he figure of this World passes away”, that is to say, “the form, fashion and disposition of its parts” are destroyed “but the substance still remains”.¹⁹⁴

The third Petrine element of Burnet’s second volume pertains to the question of who will inhabit the new earth. It is important to note here that at this point in the *Theory* philosophy ceases to be Burnet’s principal source of evidence, for where philosophy can be employed in explicating the

¹⁸⁹ Burnet (1690c), 99.

¹⁹⁰ Burnet (1690c), 81.

¹⁹¹ Burnet (1690c), 6, 11-12, 133.

¹⁹² Burnet (1690c), 51.

¹⁹³ Burnet (1690c), 133.

¹⁹⁴ Burnet (1690c), 134.

formation of the new earth, it cannot in his estimation determine anything about its inhabitants. This must be done using Scripture – aided to an extent by the writings of Church Fathers. Burnet’s final ode to philosophy is worth quoting, for it underscores the extent to which he viewed the *Theory* up to this point in the fourth book as primarily a *philosophical* work and only secondarily a work of scriptural exegesis. It also reveals the regret with which he is forced to acknowledge philosophy’s limitations. “Farewel then, dear Friend”, he writes,

I must take another Guide: and leave you here, as *Moses* upon Mount *Pisgah*, only to look into that Land, which you cannot enter. I acknowledge the good service you have done, and what a faithful Companion you have been, in a long journey; from the beginning of the World to this hour, in a tract of time of six thousand years. We have travel'd together through the dark regions of a First and Second *Chaos*: seen the World twice shipwrackt. Neither Water, nor Fire, could separate us. But now you must give place to other Guides.¹⁹⁵

As to who will inhabit the new earth, here too “St. Peter answers this question for us”. He speaks, as we have seen, in the Second Epistle of a “new heavens and a new earth, wherein dwelleth righteousness”.¹⁹⁶ He talks also in the First Epistle, chapter 2.9 of “a chosen generation, a royal priesthood, an holy nation, a peculiar people”.¹⁹⁷ This indicates to Burnet that only a select class of just and pious individuals are to inhabit the new earth. That St Peter refers here specifically to the martyred saints is confirmed by other texts. In Revelation 20.4, St John relates that he “*saw the Souls of them... that were beheaded for the witness of Jesus, and for the Word of God... and They lived and reigned with Christ a thousand years*” and in 20.9 describes Gog and Magog besieging “*the Camp of the Saints, and the beloved City*”.¹⁹⁸ That the Millennium and Kingdom of Christ are to occur on the new earth rather than the present was clear from the above verse of St Peter’s Second Epistle. This too was corroborated by the book of Revelation, for here in 21.1 St John says that he “*saw a new*

¹⁹⁵ Burnet (1690c), 142-3.

¹⁹⁶ Burnet (1690c), 144.

¹⁹⁷ Burnet (1690c), 144.

¹⁹⁸ Burnet (1690c), 145-6.

heaven and a new earth. For the first heaven and the first earth were passed away”, taking notice also of one of the central features of the new earth according to the theory: that “there was no more Sea”.¹⁹⁹ It was evident also from Revelation 21.3-4 and from Isaiah 65.17-18 that the resurrected saints are to enjoy superior health and longevity, things which are impossible on the present earth but inevitable on the new earth, it once again being perfectly balanced and its axis perpendicular to the ecliptic as it was in the beginning.²⁰⁰

2.5. Antiquity

Burnet’s use of ancient texts in the *Theory* is essentially very similar to his use of Scripture. This similarity, as I have discussed in the previous chapter, was quite typical of seventeenth-century thinkers, by whom Scripture was treated in ultimately the same way as any other ancient source, its distinguishing feature being its greater degree of reliability rather than any difference of kind. This difference in degree of reliability, however, is clearly important to Burnet. And his rule of not appealing to the ancients unless they are corroborated by reason and Scripture is adhered to throughout the work. A result of the ancients’ inferior reliability and their consequent tertiary evidentiary status in the *Theory* is that non-sacred writers do not play the kinds of foundational role given to Moses in the first volume and St Peter in the second. Their role is wholly confirmatory.

The authors to whom Burnet refers collectively in the *Theory* as “the ancients” actually applies to two very distinct sets of writers. The first is the Church Fathers and other early Christian and Jewish writers. The second is the ancient pagan philosophers, theologians, historians, and poets. Burnet’s most extensive appeals to Judeo-Christian authors appear in his discussion of Paradise and in his history of the doctrine of the Millennium, which we have discussed in the previous chapter. He makes much more extensive use of pagan authors. We have seen in the previous chapter how he appeals to various pagan flood myths in arguing for the universality of the Deluge and as evidence of its cause.

¹⁹⁹ Burnet (1690c), 138.

²⁰⁰ Burnet (1690c), 139.

Also supported by pagan antiquity was Burnet's account of the antediluvian earth. The ancients, he notes, in their various descriptions of the Elysian Fields, Fortunate Islands, Gardens of Hesperides, and other paradisiacal worlds, consistently describe two key features of the antediluvian earth according to his theory: (1) a lack of seasonal variation; and (2) greater health and longevity of humans. This in Burnet's view indicated two things: (a) that the antediluvian earth's axis was at a right angle to the ecliptic; and (b) that there was a causal connection between the position of the earth's axis and consequent lack of seasonal variation on the one hand and the longevity of humans on the other.²⁰¹ Another central feature of the antediluvian earth that was supported by the ancients was the generation of animals from the soil, this having been taught by Epicurus, the Stoics, the Pythagoreans, and other more ancient cultures such as the Phoenicians and Egyptians.²⁰² Also important, and this as we shall see in later chapters would become a significant bone of contention between Burnet and his critics, was that several ancient philosophers taught of the earth's axis having shifted at some point in the past, which was further evidence of its former perpendicularity and alteration at the Deluge.²⁰³

The foregoing notions straightforwardly corroborated the theory in that they were doctrines taught by the ancients which cohered with it. Burnet's treatment of other ancient doctrines, however, is analogous to much of the confirmatory evidence he finds in Scripture. Like the above cases of St Peter and the Psalms and Proverbs, he sees his theory as being able to explain various obscure doctrines. And as in the case of those biblical passages, he views these explanations essentially as novel empirical successes and therefore as powerful confirming evidence for the theory. One such case was the strange but highly prevalent belief among the ancients that the torrid zone was uninhabitable and unpassable, a closely related and equally widespread doctrine being the ancients' notion of the southern hemisphere which they called "Antichthon", or "Opposite Earth", or "Other

²⁰¹ Burnet (1684), 173-202.

²⁰² Burnet (1684), 61, 182-3, 264-5.

²⁰³ Burnet (1684), 168-9.

World”, believing it to be inaccessible.²⁰⁴ Without the theory, these notions lacked grounds, for the obliquity of the earth’s axis entails that even the hottest regions have varying seasons and so the equatorial region is both habitable and passable and the southern hemisphere accessible. These things *were*, however, true of the primitive earth according to the theory, since its axis was perpendicular to the ecliptic and the sun shone perpetually on the equator. These notions could therefore be easily explained. They were simply derived from that time and continued to be believed after the Deluge when the original grounds for them had been removed until eventually being corrected by observation and experience. So although erroneous when applied to the present earth, these notions of the ancients concerning the torrid zone and southern hemisphere were, firstly, true of the primitive earth, and secondly, not without grounds.²⁰⁵

Another example was the ancients’ obscure characterisations of the chaos. Rather than describing it in terms of natural principles, they used moral terms. They spoke on the one hand of strife, discord, hatred, and disaffection, and on the other of love, friendship, kindness, and union, claiming that in the beginning the former prevailed before the latter gained the upper hand and united the chaos into a habitable world. Or they described the formation of the earth in genealogical terms, of the chaos being the parent of all things, giving birth to “Nox” or “Night” and “Oceanus” or “Tartarus”; of Night giving birth to ether and the earth; and of the earth under the influence of the ether conceiving and bringing forth life.²⁰⁶ Such accounts appeared *prima facie* to be “Poetical fiction[s] rather than Philosophy”, yet when considered in light of the theory, they become intelligible accounts of the formation of the earth and of life. The notions of strife, discord, etc. refer simply to the disorder of the elements before the division of the chaos, whereas love, harmony, and so on pertain to the rising of the oily parts of the liquid and the union of the particles on its surface.²⁰⁷ Nox

²⁰⁴ Burnet (1684), 241-2.

²⁰⁵ Burnet (1684), 266-7.

²⁰⁶ Burnet (1684), 264.

²⁰⁷ Burnet (1684), 265-6.

and Oceanus refer to the initial two regions of the chaos: the dark, impure air and the body of liquid. The former separated into the earth below and ether above, and the earth being impregnated by the seminal principle in the ether conceived and generated animals.²⁰⁸

One further puzzling doctrine of the ancients which I have noted in my discussion of Burnet's Cartesianism was the peculiar "doctrine of the mundane egg". This, Burnet observes, "seems to be a mean comparison, the World and an Egg, what proportion, or what resemblance betwixt these two things? And yet I do not know Symbolical doctrine or conclusion that hath been so universally entertain'd by the Mystae, or Wise and Learned of all Nations".²⁰⁹ This obscure doctrine, however, was easily accounted for by his model of the primitive earth, for the primitive earth according to the theory was oval, its circumference slightly extended at the poles. It was composed of concentric orbs: a fire at the centre surrounded by a solid membrane resembling the yolk of an egg; an abyss of water resembling the white; and a solid crust resembling the shell. To this apparently obscure notion, then, the theory "gives a solution so easie and natural, and shows an aptness and elegancy in the representation, that one cannot doubt upon a view, and compare of circumstances, but that we have truly found out the Riddle of the Mundane Egg".²¹⁰

It is clear from the above examples that Burnet not only thinks the application of his theory as a hermeneutical tool in these cases provides confirmation of the theory itself but also that it vindicates ancient learning. The ancients' belief in the uninhabitability of the torrid zone and inaccessibility of the southern hemisphere was not without grounds. They understood the separation of the chaos. They knew about the structure of the primitive earth. Crucially, Burnet believed his theory to have uncovered important truths about the formation and early history of the earth. It could therefore be

²⁰⁸ Burnet (1684), 264-5.

²⁰⁹ Burnet (1684), 269.

²¹⁰ Burnet (1684), 270.

used to assess the ancients' knowledge of nature. As he surmised at the beginning of the chapter dedicated to the above doctrines,

[w]e have drawn this Theory chiefly to give an account of the Universal Deluge, and of *Paradise*; but as when one lights a Candle to look for one or two things which they want, the light will not confine it self to those two objects, but shows all the other in the room; so, methinks, we have unexpectedly cast a light upon all Antiquity, in seeking after these two things, or in retrieving the Notion and Doctrine of the Primaeval Earth, upon which they depended. For in ancient Learning there are many Discourses, and many Conclusions deliver'd to us, that are so obscure and confus'd, and so remote from the present state of things, that one cannot well distinguish, whether they are fictions or realities: and there is no way to distinguish with certainty, but by a clear Theory upon the same subjects; which showing us the truth directly, and independently upon them, shows us also by reflection, how far they are true or false, and in what sence they are to be interpreted and understood. And the present Theory being of great extent, we shall find it serviceable in many things, for the illustration of such dubious and obscure doctrines in Antiquity.²¹¹

In subjecting the ancients to this test, he could show that, notwithstanding the apparent obscurity of their doctrines, the ancients possessed a superior knowledge of the natural world.

This of course was exactly analogous to the hidden philosophical truths which Burnet held were present in Scripture and which he believed his theory to have uncovered. Again we see an instance of Scripture and other ancient writings being treated in essentially the same way. This notion of *prisca sapientia*, the view that the ancients possessed superior wisdom and that there is hidden philosophical knowledge in ancient texts, was widespread in the seventeenth century, its most famous adherent being Isaac Newton. As Magruder argues, Burnet most likely imbibed this notion from More and Cudworth, with whose efforts to uncover the *prisca sapientia* in both Scripture and other ancient sources he was undoubtedly familiar.²¹² His view of the ultimate source of the ancients' superior

²¹¹ Burnet (1684), 263-4.

²¹² Magruder (2008), 460.

wisdom, however, is quite different from that of More and Cudworth in that where they trace the ancients' knowledge back to Moses, Burnet, like Newton, believes it can be traced back further, that is, to Noah.²¹³ This view he discusses at some length in 1692 in a chapter of the first book of the *Archaeologiae* on "*the Origin of the Barbaric Philosophy*", but it is already present in the *Theory* in his discussion of the ancients' views on the Conflagration.²¹⁴ Here, as we saw in the previous chapter, he conducts a survey of the doctrine of the Conflagration among various sects of ancient philosophers. The doctrine's main proponents among the ancient pagans, he observes, were the Stoics. They, like other Greeks, had evidently taken the notion from one of the more ancient eastern cultures who had taught it. In the case of the Stoics, this was most likely the Phoenicians, since Zeno, the founder of the Stoics, was of Phoenician descent. And the Phoenicians and other ancient cultures likely derived the doctrine from Noah, who possessed a secret philosophy of nature which he passed down to his progeny.²¹⁵ As with the above passages of Scripture, Burnet's notion of *prisca sapientia* and the ability he believes his theory to possess in uncovering it serves to elevate the evidentiary status of ancient pagan sources. What emerges here for Burnet is essentially a kind of virtuous circle. In elucidating the obscure writings of the ancients, the evidence confirms the theory and the theory confirms the evidence. The evidence thus becomes more powerful evidence for the theory, and so on.

2.6. Conclusion

These, then, are what the three bases of Burnet's theory – reason, Scripture, and antiquity – essentially consisted in and the roles they played in his history of the earth. One of the principal aspects of the theory that comes under the head of reason, as is well known, was the Cartesian cosmogony, and as I have argued, the physical details of Burnet's theory of the Creation and Deluge

²¹³ For discussion of More's, Cudworth's, Burnet's, and Newton's views of the source of ancient learning, see Gascoigne (1991).

²¹⁴ Burnet (1736b [1692]), 237-46.

²¹⁵ Burnet (1690c), 13-24. For discussion of Burnet's view of Noah as the source of ancient learning, see Rossi (1984), 38-9.

correspond closely with this cosmogony, more closely even than historians have suggested. There are important foundational points on which Burnet diverges from Descartes, however, such as the scope of the theory, its empirical basis, and its substantial use of final cause theorising. It is also important that Burnet's account of the Conflagration owes little to Descartes. This, rather, is guided principally by St Peter, who directs Burnet to the constitution of the earth, and specifically to those features of the present earth which distinguish it from the antediluvian. The second core foundation of the theory that comes under the head of reason is Burnet's rational theology, which derives ultimately from the Cambridge Platonists and Latitudinarians. It is this rational theology, I have argued, and not Burnet's Cartesianism as many have suggested, that underpins his commitment to natural over extraordinary providence and also his closely-related commitment to angelic over direct providence. As to Scripture, the most important thing to note here is that Burnet's interpretation of the texts, apart from his brief remark about the six-day Creation, is literal, and as we have seen, this literalism is extended to texts which had previously been interpreted hyperbolically or poetically, and the ability to vindicate the literal sense of these texts is seen as a significant virtue of the theory. This literalism of Burnet's has not been adequately appreciated in the literature. This, as I have argued, is essentially because the aforementioned brief remark on the six-day Creation and his later extensive elaboration on it attracted so much attention. I shall trace this elaboration and its origins in the next chapter. There we shall see also how Burnet's use of antiquity, which played a limited but important role in the theory, becomes far more prominent and extensive when defending the theory against his critics.

3. A prologue to a controversy: Croft, Warren, and the *Archaeologiae*

3.1. Introduction

Though it was to become the subject of intense controversy during the 1690s, the *Theory* was generally well received in the decade of its publication. Isaac Newton read the work in manuscript and was largely sympathetic. “Of our present sea, rocks, mountains &c”, he wrote to Burnet in 1680/1, “I think you have given the most plausible account”.¹ The book was “discoursed of and well approved of” by the Fellows of the Royal Society in 1681.² King Charles II was impressed and encouraged Burnet to produce an English edition, a request to which Burnet obliged, translating the book himself and dedicating the new edition to the King in 1684.³ That same year, John Evelyn wrote to Samuel Pepys informing him that he had read the Latin edition “with greate delight” and found the English version “still new, still surprizing, and the whole hypothesis so ingenious and so rational, that I both admire and believe it at once”.⁴

Notwithstanding this general approval, the *Theory* in the 1680s was not without its critics. While praising Burnet and the *Theory* in his letter to Pepys, Evelyn noted disapprovingly that “some peevish and odd men” believed the work to “derogate from the Holy Scriptures”.⁵ Newton, who had praised much of the work, nevertheless expressed misgivings about its implications for Scripture. “[I]n ye third day for Moses to describe ye creation of seas when there was no such thing done neither in reality nor in appearance”, he wrote to Burnet, “is something hard”.⁶ Newton’s friend John Locke,

¹ Newton to Burnet, Jan 1680/1, in Turnbull (1960), 329. For discussion of Burnet’s correspondence with Newton, see Kubrin (1968), 135-42; Mandelbrote (1995); Janiak (2012), 422-6; Iliffe (2017), 240-4.

² Birch (1757), 83.

³ Burnet (1684), dedication.

⁴ Evelyn to Pepys, 8th June 1684, de la Bédoyère (1997), 145.

⁵ Evelyn to Pepys, 8th June 1684, 145.

⁶ Newton to Burnet, Jan 1680/1, 332.

when asked his opinion of the work in 1686 by the political theorist and historian James Tyrrell, noted several issues which he believed rendered the *Theory* irreconcilable with either “philosophy, scripture, or itself”.⁷ An apparent internal inconsistency was that Burnet seemed to make the earth spherical in the first volume and spheroidal in the second without any argument or explanation.⁸ Following Newton, he took issue with there being no sea on the antediluvian earth, for if this was the case there would be no place for the whales mentioned in Genesis 1.⁹ Another problem was the abundance of land in the torrid zone, which would surely not be the case if the crust had broken at the equator. Indeed, if had it broken at all, it would appear that it did so in precisely the opposite direction.¹⁰ “I imagine”, he wrote in conclusion, “that if I should trouble you with my fancies, I could give you an hypothesis would explain the deluge without half the difficulties, which seem to me to cumber this”.¹¹

By this time, more sustained attacks on the *Theory* had begun to appear. The first was the Leipzig pastor Christian Wagner’s *Animadversiones in T. Burnetii telluris theoriam sacram*, a sixty-four-page pamphlet published in 1683 in which Wagner took issue with the *Theory*’s incompatibility with Scripture.¹² A similar set of objections was composed the following year by the politician and FRS Sir Robert Southwell in his “C & S Discourse of Mr Burnetts Theory of the earth”, a dialogue which remained unpublished at the time but is now available together with insightful scholarly analysis thanks to the efforts of William Poole.¹³ The first published, book-length attack on the *Theory* came in 1685 from Herbert Croft, the Bishop of Hereford. The second arrived five years later from Erasmus Warren, the Rector of Worlington in Suffolk. Croft’s *Animadversions upon a book intituled, the theory of the earth* and Warren’s *Geologia, or, a discourse concerning the earth before the deluge* were

⁷ Tyrrell to Locke, 26th December 1686, in de Beer (1978b), 92; Locke to Tyrrell, 14th/24th February 1687, in de Beer (1978b), 139. For discussion of Locke’s early comments on Burnet’s theory, see Anstey (2011), 97-9.

⁸ Locke to Tyrrell, 14th/24th February 1687, 139. Locke had read the English edition and therefore would not have seen Burnet’s argument for the spheroidal form of the earth, which was only present in the Latin edition.

⁹ Locke to Tyrrell, 14th/24th February 1687, 139.

¹⁰ Locke to Tyrrell, 14th/24th February 1687, 139-40.

¹¹ Locke to Tyrrell, 14th/24th February 1687, 140.

¹² Wagner (1683).

¹³ Poole (2008).

essentially similar to Wagner's *Animadversiones* and Southwell's "Discourse" in that their authors' principal concern was the *Theory's* incompatibility with Scripture. Croft's main issue, as we shall see, was with those passages which Burnet had adduced as evidence for his theory and which Croft believed he had misinterpreted. Warren's, on the other hand, was with certain passages that Burnet had *not* discussed, and which Warren believed contradicted his theory.

Burnet replied to both critics, though only explicitly to Warren. Burnet's reply to Warren elicited a further rejoinder and so ensued what would become a hostile exchange of pamphlets. Shortly after this, Burnet published his controversial *Archaeologiae philosophicae*, thus beginning the "Burnet controversy" of the 1690s. The controversy will be examined in the next chapter. Here I shall discuss this earlier phase in the public life of the *Theory*, looking in detail at Croft's and Warren's objections, Burnet's replies, and the *Archaeologiae*, and considering the relationship between this latter work and these earlier debates between Burnet and Croft and Warren. The chapter consists of three main sections. The first focusses on Croft's *Animadversions* and Burnet's *Review of the theory of the earth*, a fifty-two-page essay appended to the English edition of the *Theory's* second volume which, I shall argue, was evidently a surreptitious reply to Croft. The second section examines Warren's *Geologia* and the series of objections and replies that followed in the first three years of the 1690s. The third and final section explores the *Archaeologiae* and the relationship between this work and these earlier debates.

3.2. Some *Animadversions* and a *Review*

Croft's *Animadversions* has attracted little attention from historians. Though often discussed cursorily in work on Burnet's theory, no one has yet examined it in any depth.¹⁴ This may be due in part to Marjorie Nicolson's dismissive assessment of the work in her hugely influential study of Burnet and

¹⁴ Brief discussions of Croft's attack on Burnet appear in Macklem (1958), 27-8; Nicolson (1959), 237, 259; Porter (1977), 24, 84; Hunter (1981), 174; Mandelbrote (1994), 153, 157; Rappaport (1997), 143, 148; Poole (2008), 73, 80; (2010), 46, 59, 62-3; Gaukroger (2010), 36n, 55; Levitin (2015), 183n.

his critics. “There is nothing original in the general argument”, she writes of Croft’s work, “the orthodox churchman opposed to Burnet’s liberal science his own belief in miracle and disputed Burnet’s learning by insisting on a more literal interpretation of Genesis”.¹⁵ She also claims that “[s]o far as published record shows, Burnet paid no attention to an answer of Herbert Croft, Bishop of Hereford, and issued no reply to any other early [i.e., earlier than Warren’s *Geologia*] document in which his theory may have been challenged”.¹⁶

Neither of these statements is quite right, however. Firstly, Croft was no orthodox churchman. Indeed, one recent historian has described him as a decidedly “unorthodox cleric”.¹⁷ Most notably, he had caused significant controversy during the previous decade with his 1675 pamphlet *The naked truth, or, the true state of the primitive church*. *The naked truth* was a plea for “comprehension”, that is, a broadening of the church to include nonconforming Protestants. In it, Croft had argued that the established Church should make certain concessions in order to accommodate dissenters.¹⁸ The pamphlet was praised by nonconformists and attacked by high churchmen and moderates, even Latitudinarians like Gilbert Burnet who, while in favour of comprehension, felt that the concessions proposed by Croft were too contrary to Anglican beliefs.¹⁹ Secondly, as I will argue below, while it is true that Croft insisted on a more literal reading of *some* chapters of Genesis, this is not the case with *all* chapters. On the chapters dealing with the Deluge, it is arguably Burnet rather than Croft who wants to maintain the more literal interpretation. Certainly this was how Burnet saw things. Genesis, moreover, is not Croft’s primary concern. His main focus rather is on those other texts that Burnet had appealed to in support of his theory. And in the case of these texts, it is *very clearly* Burnet and not

¹⁵ Nicolson (1959), 259.

¹⁶ Nicolson (1959), 236-7.

¹⁷ Claydon (2007), 300.

¹⁸ Croft (1675).

¹⁹ Burnet (1676). For discussion of this controversy, see Kirby (1938); Key (1990), 201-8; Dixon (2003), 99-101; Claydon (2007), 300-1.

Croft who is the literalist. Thirdly, and this will also be discussed below, there is good reason, on the basis of published record, to believe that Burnet *did* pay attention to Croft's objections.

Croft's main emphasis in the *Animadversions* was on Burnet's interpretation of St Peter.²⁰ There were essentially four main problems which Croft pinpointed. The first two derived in his view from Burnet having paid inadequate attention to the other chapters of the Epistle. The first consequence of this was his failure to take note of a passage from the previous chapter which in Croft's view indicated that St Peter refers only the animate world, for here in verse 5 he describes God "bringing in the flood upon the world of the ungodly", "of the ungodly" indicating that he does not mean to refer to the physical world but merely to life on it, and in particular those "ungodly men" to whom he refers elsewhere in the Epistle.²¹ The second consequence was a more fundamental misunderstanding of the text as a whole. When viewed within the context of the Epistle, it was clear that the passages Burnet had cited are not designed to teach us about any difference between the antediluvian and present earth or of the earth's destruction at the Deluge but about the dangers of sin. This is why St Peter refers to several other instances of God punishing the wicked. By taking the chapter out of context, Burnet had interpreted St Peter as being concerned solely with the Deluge and Conflagration. This had led him to misunderstand the basis of St Peter's argument, which was not derived from the scoffers' claim about the immutability of nature, but from the word of God. The Apostle was teaching the scoffers to heed God's word, for as with those other punishments, God's word had been fulfilled at the Deluge and would be fulfilled at the Conflagration. The commonality between the two judgements was not the destruction of the earth but that both resulted from the word of God. And the opposition St Peter makes between them is not meant to convey any difference between the two worlds but between the two judgements, the one being a Deluge and the other the burning of the earth.²²

²⁰ Croft (1685), 2-42.

²¹ Croft (1685), 7-8, 18-20.

²² Croft (1685), 7-15.

The third issue Croft raised with Burnet's interpretation concerned his retranslation of the passage from verse 5. More virulently anti-Catholic than Burnet, Croft naturally took issue with Burnet's use of the Vulgate, retranslating the passage himself from the Greek Septuagint as "situated out of the Water and by the Water", which, he argued, clearly shows that the earth before the Deluge was of the same form as the present earth.²³ The final issue pertained to the Scoffers' ignorance. The scoffers in chapter 3 verse 5, Croft pointed out, were *willingly* ignorant. Burnet had argued that they were ignorant of the physical earth being destroyed at the Deluge. Yet this cannot have been what they were ignorant of, for if they were ignorant of this, they cannot be said to have been *willingly* ignorant, for this had not been taught. What they were ignorant of was the Deluge itself. Moses had taught of the Deluge, so of this they may be said to have been willingly ignorant. They were willingly ignorant because they had not paid due attention to the Old Testament.²⁴

Croft's overall contention was that Burnet had misinterpreted these passages of Scripture, and probably deliberately so, in order to manufacture evidence for his theory and to give what was essentially an atheistic or deistic account of earth history some semblance of being grounded in Scripture.²⁵ He had done the same with other passages. In the case of Psalms 24.2 and 136.6, for example, in which God is said to have "founded it [the earth] upon the seas, and established it upon the floods" and "stretched out the earth above the waters" and which Burnet had presented as evidence for his account of the formation of the crust on the abyss, he had simply exploited certain translational ambiguities, for in these passages "upon" and "above" can equally be translated as "by" or "near". Even on the former translation, they were more plausibly interpreted as figurative or

²³ Croft (1685), 11. For discussion of Croft's anti-Catholicism, see Kirby (1938), 46-51; Key (1990), 201-8; Dixon (2003), 100-1; Marshal (2008). On Protestant opposition to the authority of the Vulgate, see Harrison (1998), 94-5.

²⁴ Croft (1685), 24-5.

²⁵ Croft (1685), preface.

hyperbolic expressions designed to express wonder at God having created land above sea level, or they may simply refer to underground caverns of water.²⁶

Though Croft's main concern was with Burnet's interpretation of St Peter, he is also keen to emphasise the theory's incompatibility with Genesis 1. This text was straightforwardly contradicted by the theory. Moses teaches in chapter 1.9-10 that the earth in the beginning was covered with water and that God gathered it up, making dry land appear, and called the land "Earth" and the water "Seas". Yet on Burnet's view, there was *only* dry land in the beginning, and no sea until after the Deluge.²⁷ In 1.11-12, the earth is complete and fully populated with plant life by the end of the third day of Creation, yet Burnet described a gradual separation of the chaos, which would surely take much longer.²⁸ Even if the earth had formed within three days, there were further difficulties. In chapter 1.20-1, God creates "great whales" and other marine life. Yet it seemed highly implausible that such creatures could live in his enclosed sea. Birds, too, are said in 1.20 to have been brought forth by the sea, which is surely impossible if it was wholly contained within the crust. There was also the Creation in 1.16 of the sun, moon, and stars which Burnet had ignored altogether.²⁹

Turning now to the Deluge, Nicolson is certainly correct to say that Croft ultimately defends a miraculous interpretation of the event. God in the beginning, he emphasised, created everything from nothing. He could therefore create water for the Deluge. It is not clear, however, that in interpreting the Deluge in this way Croft is thereby insisting on a more literal interpretation of Genesis as Nicolson seems to suggest. As we shall see below, Burnet certainly believed his interpretation of the Deluge to be more in keeping with the literal sense of Genesis than Croft's miraculous interpretation. Furthermore, the motivation behind Croft's attack on Burnet's account of the Deluge was not so much scriptural as theological. That is, his primary concern was not whether Burnet's explanation cohered

²⁶ Croft (1685), 48-52.

²⁷ Croft (1685), 42-8.

²⁸ Croft (1685), 146-8.

²⁹ Croft (1685), 148-56.

with the literal sense of Genesis but with the fact that he insisted on explaining it in terms of natural processes. What troubled Croft was not that Burnet had strayed from the literal sense of Moses, but that he seemed to rule out the possibility of miraculous intervention. Which interpretation of the Deluge was more consistent with a literal reading of Genesis was not his main concern.³⁰

I turn now to Nicolson's claim that Burnet "paid no attention to" Croft's objections. It is true that Burnet did not respond explicitly *to Croft* as he did with Warren. There is, however, significant evidence to suggest that he paid close attention to Croft's attack and that his *Review of the theory of the earth* was essentially intended as a reply to Croft. There are three important things to consider here. The first is that Croft relates at the end of the preface to the *Animadversions* that he had written to Walter Kettibly, Burnet's publisher, "to enquire what kind of Person the Author [of the *Theory*] was". Kettibly had then informed Burnet of this, and Burnet had written a letter to Croft, to which Croft replied, thereby initiating "some correspondency with him in Letters" in which he attempted to "reclaim him from his Errours" but, finding him "so stiff and pertinacious in them..., was soon out of all hopes to do any good".³¹ Burnet, then, even if he did not read the *Animadversions*, certainly knew Croft's objections to his theory and had discussed them with him.

The second thing to consider is that, when responding to Warren's attack in 1690, after rebuking Warren for unfairly describing the theory as an "affront to Scripture", Burnet notes nevertheless that "he is a very Saint in comparison of another Animadverter, who hath writ upon the same subject, but neither like a Gentleman: nor like a Christian: nor like a Scholar".³² Here already it is likely that he is referring to Croft, since Croft's book was the only major attack on the theory to have been published in England prior to Warren's. In his response to Burnet, Warren writes that he knows not "[w]ho that Animadverter is, of whom he [Burnet] complains... I have seen no other Writings or Animadversions upon the Subject he speaks of, but the Lord Bishop of *Hereford's*. And I own that his

³⁰ Croft (1685), 63-7, 73-9.

³¹ Croft (1685), preface.

³² Burnet (1690a), 85.

Lordships publishing *his Animadversions*, was good encouragement to me to Print *my Exceptions* at first, and to Defend them now”.³³ By this time, as we shall see in more detail in the next section, the debate had become increasingly hostile, and in his next reply, immediately after having referred to Croft, Burnet writes that he “was so civil to him [Warren] in the Answer [his previous response to Warren], as to make him a Saint in comparison of that former Animadverter: but, by the style and spirit of this last Pamphlet, he hath forfeited with me all his saintship, both absolute and comparative”.³⁴ That he refers to “that former Animadverter” immediately after discussing Croft seems to indicate that the “Animadverter” to whom he refers is Croft, and therefore that he refers to Croft in his previous reply to Warren, too. If this is correct, then given that he describes this “Animadverter’s” writing in his initial reply to Warren, it seems highly likely that he had at this point read not only Croft’s letters but also the *Animadversions*.

My third point is the most important and is ultimately the subject of the remainder of this section. This is that the content of Burnet’s *Review* is such that, even in the absence of the above connections between Burnet and Croft, we could reliably infer that it was intended as a response to the *Animadversions*. That Burnet did not present it explicitly as such as he did with his replies to Warren is easily explained. Warren was a provincial rector. Attacking him in public therefore would not present any threat to Burnet’s career. Croft, on the other hand, was a Bishop, and one who was known to have considerable political influence.³⁵ An explicit response to the *Animadversions* would hence have been unwise from someone like Burnet who was trying to progress in his ecclesiastical career.

The full title of the *Review* is *A review of the theory of the earth and of its proofs, especially in reference to Scripture*. This final clause is important to emphasise, for the vast majority of the essay is dedicated to Scripture. This emphasis is stated up front in the introduction. The purpose of the work,

³³ Warren (1691), 215.

³⁴ Burnet (1691a), 38.

³⁵ See Key (1991).

he writes, is to “recollect the general proofs of that explication [the *Theory*], from reason and nature: but more fully and particularly shew how it is grounded upon Scripture”.³⁶ The particular texts that Burnet discusses, the extent to which he discusses them, and the specific interpretations that he aims to confute, make it clear that he is responding to Croft, for all these things correspond exactly to the content of Croft’s book.

As we have observed, Croft’s chief concern in the *Animadversions* was Burnet’s interpretation of St Peter. Accordingly, then, the *Review* was dedicated mainly to defending this interpretation. The Second Epistle, and principally the third chapter, was “the Sacred Basis upon which the whole Theory stands”.³⁷ Given its importance, it was necessary “to free it from those false glosses or misinterpretations, that lessen the force of its testimony, or make it wholly ineffectual”.³⁸ The “false glosses” to which Burnet refers are essentially those proposed by Croft. They consist principally in Burnet’s view of two key assertions. The first is that St Peter refers only to the animate world. The second is that he communicates no difference between the antediluvian and postdiluvian earth.³⁹

Burnet sets about confuting these two claims in turn, reiterating and expanding upon his earlier point that St Peter must necessarily have referred to the natural world in order to confute the scoffers’ argument. In response to the claim that the scoffers were ignorant of the Deluge, he argues in the first place that the scoffers were Jews, and Moses had taught the Jews of the Deluge. They were clearly educated, too, for they advanced a *philosophical* argument, casting doubt on the Conflagration by appealing to the immutability of nature. This indicated that they were likely either followers of Maimonides or Aristotle, both of whom subscribed to the view that the natural world is unchanging. Certainly they were not “the vulgar” and would therefore have been familiar with the teachings of Moses. Croft’s claim that they had not attended to the Old Testament was especially implausible, since

³⁶ Burnet (1690b), 2.

³⁷ Burnet (1690b), 8.

³⁸ Burnet (1690b), 13.

³⁹ Burnet (1690b), 13.

they clearly refer to it in the clause “since the fathers fell asleep”. They could not, then, have been ignorant of the Deluge.⁴⁰

A further issue with Croft’s reading was that interpreting St Peter as referring only to the animate world rendered much of the Epistle either obscure or redundant and therefore most unbecoming of a sacred writer. If, for example, he was referring only to the animate world, then the constitution of the earth was irrelevant and his mentioning it superfluous. Furthermore, he had already mentioned that the animate world perished in the previous chapter, verse 6, and so were he not referring to something more in the following chapter, he would have been repeating himself unnecessarily. Had he meant nothing more than the animate world, moreover, he surely would not have rendered himself ambiguous by *appearing* to say more, for surely, *at the very least*, there is such an appearance.⁴¹ And the juxtaposition between “destroyed by water” and “destroyed by fire” must refer to the same thing, since nothing in the text indicates that the former is restricted in any way. Croft’s interpretation of the supposed qualification “of the ungodly” in the previous chapter was forced, for nothing in this phrase limits the scope of the Deluge. And given the context both before and after the phrase and in the following chapter the “world of the ungodly” most plausibly refers to the natural world, too.⁴²

Turning to the claim that St Peter communicated no difference between the antediluvian and present earth, Burnet notes that he makes a clear antithesis between the two, with the adversative “but” clearly denoting opposition.⁴³ In the sixth verse, he argues moreover, expanding upon his earlier argument in the *Theory*, the connective “whereby” clearly indicates a causal dependence, for it implies that the world was overflowed with water and perished *in virtue* of something. This must be the thing mentioned before the connective, which was the world’s constitution, that is, its “consisting of water

⁴⁰ Burnet (1690b), 14-15.

⁴¹ Burnet (1690b), 15-16.

⁴² Burnet (1690b), 16-17.

⁴³ Burnet (1690b), 18.

and by water".⁴⁴ Here he takes issue with Croft's retranslation. The correct translation from the Greek, he notes, that which is most in keeping with the true sense of the words, is in line with the Vulgate. The received translation that Croft had effectively replicated was obviously rendered merely to cohere with the features of our present earth rather than the natural sense of the words.⁴⁵

Having stated the above arguments, Burnet next invokes the authority of Church Fathers and theologians, several of whom had interpreted St Peter in this way.⁴⁶ He also appeals to other sacred writers. Drawing on his earlier observations in the *Theory*, he notes that St John refers in Revelation 21.1 to the future earth following the Conflagration having no sea. Other sacred writers had referred to the new earth as a restitution or renovation, indicating a return of the earth to its antediluvian state. If the new earth is to be a restitution of the antediluvian earth, and if the future earth is to have no sea, then the antediluvian earth of which the new earth is to be a restitution must also have had no sea. St Paul, too, spoke of a former earth which had been subjected to vanity, and a future earth which would no longer be subject to vanity. Thus, like in St Peter, we find in St Paul a "threefold" state of the earth: a paradisiacal earth which was *subjected* to vanity; a present earth *in subjection* to vanity; and a future earth which is *no longer* subject to vanity.⁴⁷

Following his lengthy analysis of St Peter, Burnet turns his attention to some other points raised by Croft in the *Animadversions*. Here he pays particular attention to the Psalms, in which Croft argued that he had exploited an ambiguity. To this, he replies that these Psalms were expressing wonder at the Creation. What wonder, he asks, is there "in this; that the shores lie *by* the sea-side; where could they lie else?". Likewise, if God "stretched out the Earth *near* the Waters, How is that one of God's great wonders? as it is there represented to be". More importantly, translating Psalm 24.2 in this way removes the very reason for the earth being "the Lords, and the fullness thereof" as it is

⁴⁴ Burnet (1690b), 19.

⁴⁵ Burnet (1690b), 20-1.

⁴⁶ Burnet (1690b), 22-6.

⁴⁷ Burnet (1690b), 10-11 – quotation from 11.

stated to be in the preceding verse, for his founding it by or near the seas does not evoke his great power and wisdom. “But if he founded it *upon* the Seas, which could not be done by any hand but his, it shows both the Workman and Master”, thereby justifying his ownership of the work.⁴⁸ Croft’s argument that the passages may relate merely to land being above sea level or to underground caverns was weak, too. “Because a Rock hangs its nose over the Sea”, he implores, “must the body of the Earth be said to be *stretched over the waters*? Or because there are waters in some subterraneous cavities, is the earth therefore *founded upon the Seas*?” When we have no better way of making sense of Scripture, he allows, such hyperbolic interpretations are permissible, “but when an explication is offer’d, that answers the propriety, force, and extent of the words, to reject it, onely because it is not fitted to our former opinions..., is to take an ill method in expounding Scripture”.⁴⁹

Clearly in the case of these passages it is Burnet rather than Croft who wants to maintain a literal reading of Scripture. Croft had claimed that these expressions, if rendered according to the received translation to which Burnet appealed, did not support his theory, for they are more plausibly figurative or poetic expressions and are not meant to convey a literal formation of the crust on a body of water. Burnet, on the other hand, wants to insist on a literal interpretation. The same is true of his interpretation of St Peter. Where Croft wants to maintain that in referring to “the world” perishing at the Deluge St Peter does not literally mean *the world* but the world in a restricted sense, Burnet wants to adhere to the literal sense of the Apostle’s words.

Precisely the same insistence on a literal interpretation is at work in Burnet’s defence of his theory of the Deluge. The miraculous creation of new waters at the Deluge, he asserts against Croft, departs from the literal sense of Genesis. Here he pairs Croft’s view with the notion of a partial Deluge. Moses’ account, he stresses, makes two principal points: one concerning the extent of the Deluge; and one concerning its causes. Regarding the extent, Moses makes the Deluge universal. As to its

⁴⁸ Burnet (1690b), 29-30 – quotation from 29.

⁴⁹ Burnet (1690b), 30.

causes, Moses assigns two: the rupture of the abyss; and forty days rain. Both the extent and causes in the Mosaic account, then, cohere with the theory, for both render the Deluge universal and both identify the same two causes. Croft's view and the notion of a local Deluge stray from the Mosaic account, for as the latter conflicts with Moses as to the extent of the Deluge, the former conflicts with him as to its causes, since he assigned only two and mentioned nothing of the creation of new waters.⁵⁰

In answering Croft's objections about the above passages and the Deluge, then, Burnet wants to demonstrate that his interpretation of sacred texts is correct and that the theory is supported by a *literal* reading of Scripture. Croft's hyperbolic, figurative, or restricted interpretations of these texts and his miraculous interpretation of the Deluge, on the other hand, are untenable, for they contradict this literal reading. Nicolson's assessment that Croft is "insisting on a more literal interpretation of Genesis" is thus not entirely correct, at least not as far as Burnet is concerned with respect to Genesis 6-9, for here Burnet is insisting on such an interpretation *in opposition* to Croft. Nicolson's assessment is correct, however, with regard to Genesis 1, for here Croft had appealed to a literal reading in order to confute Burnet's account of the Creation. And on this chapter Burnet's response is not, as it was in the above cases, to show that that his account is consistent with such an interpretation. Rather, he concedes that it is not, and argues instead that this text should not be interpreted literally.

In arguing this, Burnet adopts the principle of accommodation, or condescension, the notion that sacred writers sometimes accommodate their teachings to the limited capacities and mistaken apprehensions of their intended audience. Moses, he argues, very clearly in this case, "accommodated his Six-days Creation to the present form of the Earth, or to that which was before the eyes of the people when he writ" in order to adapt the account to the limited understanding of the Jews. He did not present a true account of the Creation. When interpreting the Creation, Burnet emphasises, we must not ascribe to Moses opinions that contradict other sacred writers. Neither, he added, should

⁵⁰ Burnet (1690b), 42-3.

our interpretation be “repugnant to clear and uncontested science”, for in passages of Scripture pertaining to the natural world, science must always be considered. If interpreted literally, the Mosaic account of the Creation renders Moses contrary to both Scripture and nature, “but is easily reconcilable to both, if we suppose it writ in a Vulgar style, and to the conceptions of the people”.⁵¹

A “Vulgar style”, Burnet notes further, is frequently employed in Scripture. Talk of God, for example, is often accommodated in this way. We find, for example, references to his limbs, passions, and local motions, “things that do not belong, or are not compatible with the Divine nature”. So, too, with the natural world. The sun’s motion, for example, and the figure of the earth and heavens are frequently described “according to the appearance of sense and popular credulity; without any remorse for having transgressed the rules of intellectual truth”. This evident use of accommodation or “the Vulgar style”, when interpreted literally, had led to numerous errors concerning both God and the natural world. The “anthropomorphites”, for instance, believed God to have a human form. More recently, the motion of the earth was denied. All this had resulted from a literal reading of passages which were clearly not expressing the truth about the world but were accommodated to the limited capacities of their audience. In these cases, “reason, at length, got the upper hand of Literal authority”. Yet just as the motion of the earth was denied in the previous century, so too

[t]he original or the Earth from a Chaos, drawn according to the rules of Physiology, will not be admitted: because it does not agree with the Scheme or the Six-days Creation. But why may not this be writ in a Vulgar style, as well as the rest? Certainly there can be nothing more like a Vulgar style, than to set God to work by the day, and in Six-days finish his task: as he is there represented. We may therefore probably hope that these disguises of truth will at length fall off, and that we shall see God and his Works in the pure and naked Light.⁵²

⁵¹ Burnet (1690b), 43-5.

⁵² Burnet (1690b), 45-6.

The foregoing argument in the *Review* was Burnet's first in-depth, explicit, public statement of his rejection of the literal interpretation of the Mosaic Creation. As I noted in the previous chapter, he briefly alluded to this view in the Latin edition of the *Theory*, suggesting that, in his account of the Creation, Moses described the earth not as it in fact was at that time but as it was at the time he wrote. In the English edition, he stated that Moses' account of the Creation was "deliver'd by him as a Lawgiver, not as a Philosopher", and that this was something he "intend[ed] to show at large in another Treatise" – a promise he repeated in the *Review*.⁵³ The argument articulated in the *Review* was nevertheless fully formed when he wrote the *Theory*, for in his correspondence with Isaac Newton in 1680/1, he offered an explication of the six-day Creation which closely resembled that given in the *Review* and advanced many of the same arguments for rejecting a literal interpretation as would later appear in this work. He also rejected a number of suggestions from Newton as to how his theory may be made to cohere with the Mosaic account, resolutely adhering to the view that "Moses his hypothesis of 6 days work is but ye Idea of a creation accommodate to ye people & to ye present forme of ye Earth".⁵⁴ As we shall see in the remainder of this chapter, this assessment of Moses would resurface again at various points in his debate with Warren before being developed further and explicated at length in that "other Treatise" he had promised to produce, that is, the *Archaeologiae*.

Before concluding this section, there are two things I want briefly to discuss. The first is the foundation of Burnet's rejection of the literal interpretation of the Mosaic six-day Creation. Burnet does not reject this interpretation simply because it conflicts with his theory. Indeed, he likely rejected it long before he even conceived of the theory. This is likely true also of his rejection of the literal sense of the Mosaic doctrine of Paradise in Genesis 2-3, which is not yet apparent in his response to Croft but comes out later in the *Archaeologiae*. Rather, his rejection of the literal sense of these chapters is grounded in a number of those core Cambridge Platonist and Latitudinarian principles discussed in

⁵³ Burnet (1681), 253; Burnet (1684), 288-9; (1690b), 44.

⁵⁴ Burnet to Newton, 13th Jan (1680/1), in Turnbull (1960), 323-6 – quotation from 326.

chapter two. One of these is the essential compatibility of reason and religion. On this principle, Scripture must not be interpreted in a way that contradicts reason and philosophy, for reason and Scripture, being divinely instituted, are necessarily consistent with one another, and if true reason and philosophy appear to conflict with Scripture, then our interpretation of the latter must be incorrect. More fundamentally, however, Burnet's rejection of these texts, like his insistence on natural over miraculous and angelic over omnipotent causes, is underpinned by his emphasis on God's wisdom and his anti-voluntarism. This is evident in the above quotation. It is "Vulgar", beneath God's wisdom, "to work by the day, and in Six-days finish his task".⁵⁵ It is contrary to his nature and therefore not something he is permitted to do. Underpinning this further is another core tenet of the Cambridge Platonists' and Latitudinarians' theology, that is, their emphasis on the fundamentals of Christianity over inessentials. For Burnet, the most fundamental tenet of Christianity is the nature of God, and in particular the *wisdom* of God. Where inessential doctrines such as a literal interpretation of Genesis 1-3 conflict with this fundamental tenet of the Christian faith, they must be abandoned, and the relevant passages of Scripture must be reinterpreted so as to conform to it.

My final point concerns the issue, which has been discussed at various points in this section, of literal and non-literal interpretations of Scripture. What emerges from Croft's attack on Burnet in the *Animadversions* and Burnet's response in the *Review* is not so much a simple picture of literalism versus non-literalism but rather, as Kerry Magruder has characterised the debate between Burnet and his critics on biblical interpretation, a disagreement about which texts are and are not to be interpreted literally.⁵⁶ Underpinning this was the fact that this was something about which one was faced with a choice. Not all biblical texts can be interpreted literally, since literal interpretations of different texts are often incompatible with one another. Magruder argues that in interpreting St Peter

⁵⁵ Burnet (1690b), 45.

⁵⁶ Magruder (2008), 485-6.

literally, Burnet was forced to abandon the literal truth of Moses. Critics like Croft, however, did not want to abandon the latter, and so had to reject Burnet's literal interpretation of St Peter.⁵⁷

Magruder makes an important observation here about the logic of these authors' biblical interpretations. In the case of Burnet and Croft, however, a finer-grained analysis is required. Most significantly, there is an important distinction to be made between the different chapters of Genesis. It is not a literal reading of *Moses* that Burnet has to abandon in order to interpret St Peter literally, only the first chapters of Genesis. This is important because it is not only his reading of St Peter that forces him to abandon a literal reading of these chapters, but also, and equally, his reading of Genesis 6-9. In order to maintain a literal interpretation of Genesis 6-9, Burnet has to suppose that the antediluvian earth was of a radically different form, a form which contradicts a literal reading of these earlier chapters. He would rather do this than suppose that God miraculously created water. Of course, part of his motivation for this as we have seen is the various philosophical and theological problems with such a creation. But another important part of it is a desire to stay close to the letter of Moses on the Deluge. He prioritises the literal sense of these later chapters of Genesis over that of the earlier chapters. Croft, on the other hand, is less concerned than Burnet with adhering closely to the literal sense of Genesis 6-9, and so is willing to posit a miraculous creation of water, even if this not explicitly stated in the Mosaic narrative.

What is also important to note is that in Burnet's debate with Croft, the authors' different interpretations of other biblical texts is governed by the same logic. Burnet is able to interpret the Psalms literally because they cohere with his literal interpretation of Genesis 6-9 and St Peter. That they conflict with the literal sense of earlier chapters of Genesis is no problem for him because he has abandoned the literal interpretation of these texts. For Croft, on the other hand, they, like St Peter,

⁵⁷ Magruder (2008), 481-3.

cannot be interpreted literally, because he has *not* abandoned the literal reading of these chapters of Genesis.

3.3. The *Geologia*, an Answer, a Defence, a Short consideration, and some Reflections

Published nearly ten years after the first Latin edition of the *Theory*, Warren's *Geologia* was only the second major attack on Burnet to be published in England. Warren's book and subsequent debate with Burnet have received slightly more scholarly attention than Croft's *Animadversions*. Like the *Animadversions*, it is often discussed briefly in work on Burnet's theory and the debate surrounding it.⁵⁸ More extensive discussions appear in work by Nicolson, Katherine Brownell Collier and H.V.S. Ogden. Nicolson's and Ogden's discussions concern Warren's arguments from the aesthetics of mountains and other geological phenomena in response to Burnet's assessment of the present earth.⁵⁹ Collier's analysis attends mainly to his philosophical arguments.⁶⁰ What I want to focus on here is his arguments from Scripture, since these are by far the main emphasis of the work and receive a much larger share of Warren's attention and yet have seen relatively little discussion from historians.

Warren's book was similar in certain ways to Croft's in that his main concern was the theory's incompatibility with Scripture. In important respects, however, Warren's attack on Burnet was quite different from Croft's. The crucial difference between them, as Stephen Gaukroger has observed, is that where Croft "set out to show that Burnet had misinterpreted biblical passages", Warren "sought to refute Burnet simply by pitting scriptural passages against his claims".⁶¹ In other words, as I have stated above, Croft focussed predominantly on those passages of Scripture that Burnet *had* cited as evidence for his theory and argued that they do not in fact support it, whereas Warren attended

⁵⁸ See, e.g., Taylor (1948), 109; Tuveson (1950), 62-3; Macklem (1958), 28-9; Kubrin (1968), 333; Porter (1977), 24, 26, 80, 84; Rossi (1984), 71; Malusa (1993 [1981]), 334; Mandelbrote (1994), 153, 169 [note 17]; Rappaport (1997), 143; Magruder (2000), 498-500; (2009), 58-9; Pleins (2003), 75; Wragge-Morley (2009), 78; Coppola (2010), 129-30; Poole (2010), 62; Levitin (2015), 196-7, 183 [note 359].

⁵⁹ Ogden (1947), 142-5; Nicolson (1959), 237, 263-9.

⁶⁰ Collier (1934), 81-8.

⁶¹ Gaukroger (2010), 36.

mainly to passages which Burnet had *not* discussed and which he believed contradicted the theory. Croft did of course discuss the early chapters of Genesis. Likewise, Warren discussed St Peter and Genesis 6-9. Nevertheless, Gaukroger's assessment holds true for the most part and played a significant role in determining which passages of Scripture were the main focus. In Croft, we have observed, the main emphasis was on St Peter, the text which in his view Burnet had most egregiously misinterpreted. In Warren, unsurprisingly, the principal focus was on those texts which were most conspicuously absent from the theory and which seemed to constitute the most compelling evidence against it, namely, the first three chapters of Genesis.

Of these three chapters, Warren devotes most space to Genesis 1, citing numerous passages which appear to conflict with Burnet's theory. In the Mosaic account of the Creation, for example, it is the entire universe that is created in six days, not merely the earth. Light was visible on the first day, which is surely impossible if the air was filled with particles. The separation of Burnet's Chaos according to natural principles would take too long for the earth to be fully formed on the third day.⁶² The formation of rivers, too, would certainly take longer than a day, for the sun, having been created only on the fourth day, could not raise sufficient vapours from the crust to supply the earth with rivers. And yet there must be rivers by the fifth day, for it is at this time that fish were created.⁶³ At the time Warren was writing the *Geologia*, Burnet had not yet published his *Review* and so Warren was not aware of Burnet's position on the six-day Creation. He nevertheless anticipates to some extent (perhaps on the basis of Burnet's brief allusion to the issue in the *Theory*) Burnet's later arguments about the untenability of a literal interpretation of the Mosaic six-day Creation. He notes with Burnet the importance of the principle of accommodation but argues that there is nothing in Moses' account to suggest that it has been accommodated in the way Burnet was soon to suggest. Moses very clearly presents his narrative as a *history* of the Creation and is very explicit about the earth being created in

⁶² Warren (1690), 73-85.

⁶³ Warren (1690), 106-20.

six literal days, stating that the days consisted of an evening and a morning which clearly implies that they are of the same length as our days.⁶⁴

Genesis 2 and 3 are invoked by Warren primarily to confute Burnet's account of the antediluvian earth and the dissolution of the crust at the Deluge. The most interesting point in Warren's discussion of Genesis 2 is that the subject would resurface in subsequent rejoinders between him and Burnet and again in Burnet's *Archaeologiae* pertained to Moses' description of the rivers of Paradise in verses 10-14. The four rivers described by Moses, Warren argues, show that Eden was located not in the southern hemisphere as Burnet had claimed but in Mesopotamia. These rivers, he argues further, are extant today. If, however, the crust had collapsed at the Deluge as Burnet had contended, then they would surely have been destroyed. Burnet had argued that the rivers described by Moses did not match the description of any four rivers on the present earth and that this was evidence that the crust, and therefore also the rivers, had indeed been destroyed at the Deluge. For Warren, this conclusion was untenable, for it implied that Moses' description of these rivers was both superfluous and false, and to affirm this would be a severe censure not only on Moses but also on God, since Moses' description of Paradise was divinely inspired.⁶⁵

The most significant aspect of Burnet's theory that Warren saw as incompatible with Genesis 3 was the notion of a perpetual spring on the antediluvian earth. God's curse on the ground in verses 17-18, he points out for example, is surely inconsistent with such a temperate and immutable climate. In such an environment, moreover, God's making coats for Adam and Eve in verse 21 was surely unnecessary.⁶⁶ Burnet's notion of a perpetual spring was of course a result of his theory of the antediluvian earth's axis. On this point, Warren also devotes much attention to Burnet's use of ancient texts. This, too, as we shall see below, would be debated at length in subsequent rejoinders and dealt with extensively by Burnet in the *Archaeologiae*. Warren's main argument here is that, if there was a

⁶⁴ Warren (1690), 53-72.

⁶⁵ Warren (1690), 262-86.

⁶⁶ Warren (1690), 158-71.

change in the earth's axis, there would surely be abundant evidence of it in human history, as there is in the case of much less significant events. He is unconvinced by Burnet's appeals to ancient philosophers on this point and examines these philosophers at some length in order to confute Burnet's claim. Here he articulates two principal objections. The first is that these philosophers all assigned very different causes than Burnet for the change in the earth's axis. Thus, even if such a change had occurred, their testimonies did not support Burnet's contention about the axis becoming oblique to the ecliptic due to an imbalance caused by the dissolution of the crust. The second is that these philosophers mention only a *change* in the earth's axis. They say nothing of its former position. Hence, even if they are to be taken seriously (which Warren also doubts), all that is implied by their testimony is that the earth's axis was *altered*, not that that it was perpendicular to the ecliptic prior to the Deluge.⁶⁷

Turning now to Warren's response to Burnet's account of the Deluge, what is interesting here is that, like Croft's objection, Warren's dissatisfaction with Burnet's theory was much more theologically than scripturally motivated. Warren's issue was similar to Croft's in that it concerned Burnet's positing natural rather than miraculous causes. The conclusion he drew from it, however, was very different. Where Croft had worried that Burnet's unwillingness to appeal to miracles amounted to a kind of deism, Warren was much more concerned with how such an explanation reflects on God. The purpose of the Deluge was to punish sin. If, however, in order to punish sin, God had, as Burnet supposed, made the constitution of the earth such that the Deluge will occur inevitably via natural causes, then had the people not sinned or had they repented, the Deluge would have occurred anyway and thus God would have punished the innocent.⁶⁸

What is most interesting here is that underlying this disagreement between Burnet and Warren is the question of which aspect of God's nature is to be emphasised over others and what this

⁶⁷ Warren (1690), 176-85.

⁶⁸ Warren (1690), 121-7.

emphasis implies for God's role in the natural world. As we saw in chapter two, Burnet's emphasis on God's wisdom implied an anti-voluntarist conception of God and a view of providence which consisted primarily in natural – and secondarily, angelic – providence. God does not intervene in the world because it is contrary to his wisdom. Warren, in common with Burnet's mentor Ralph Cudworth, emphasised God's goodness over his wisdom. Yet unlike Cudworth for whom God's goodness, like his wisdom for Burnet, entailed an anti-voluntarist conception of God, God's goodness for Warren implied a certain degree of voluntarism. The Deluge for him must be a voluntaristic act, because people might not have sinned or they might have repented, and had this been the case, a non-voluntaristic God would have punished them unfairly, and such unwarranted punishment is contrary to God's nature.

It is also interesting here to compare the different implications that Burnet's account of the Deluge has for Croft on the one hand and Warren on the other. Croft thinks ultimately that Burnet's explanation of the Deluge amounts essentially to deism, for Burnet seems to him to deprive God of any role in the natural world beyond the creation of matter *ex nihilo*. It is for this reason that he assesses in the preface that Burnet "seems to be a kind of Deist, acknowledging God as the supream Origin of all: But after his first Creation, he takes all out of his hands, and would have Nature only to act by a constant course in all things contained in this sublunary World".⁶⁹ Warren is ultimately less hostile than Croft – indeed, at this stage in the debate at least "he is a very Saint in comparison". He does not think Burnet's explanation of the Deluge *amounts* to deism or atheism. He does, however, think it is *conducive* to such heterodoxies in that he believes Burnet's theory will please deists and atheists and provide them with arguments in favour of their heretical beliefs. This concern was well founded. The notorious deist and freethinker Charles Blount, whose popularising efforts were soon to help destroy Burnet's career and reputation, had in 1683 quoted from the *Theory* in his controversial pamphlet *Miracles, no violations of the laws of nature*.⁷⁰ The central focus of Warren's concern here

⁶⁹ Croft (1685), preface.

⁷⁰ Blount (1683), 30.

is also very different from that of Croft. Both are concerned with the threat of deism and atheism, but where for Croft it is Burnet's more general unwillingness to admit miraculous intervention that is the problem, this is not the case for Warren. For him, it is not Burnet's use of natural causes *as such* that is problematic but rather how this use of natural causes *in the case of the Deluge* reflects on God. Here again, the central problem is the possibility that God might have punished the innocent. This, he thinks, will be pleasing to atheists and deists:

For what can more encourage so wicked a person, than to disparage and lessen GOD's Goodness and Equity? And how can those Attributes be more disgraced and diminished... than by supposing that in the Works of His Providence... He laid a cruel Train of unavoidable Death, for Millions of his Innocent or Penitent Creatures.⁷¹

In his reply to Warren, Burnet objected strongly to the above argument that God, on his view, might have punished the innocent. His response to it was to argue that human sin was predetermined. Scripturally, this was unproblematic, since many events in Scripture are predetermined. If human sin was predetermined, then God's punishing it via natural causes orchestrated in the beginning was not contrary to his goodness and is therefore consistent with his nature, since things could not have been otherwise. The alternative scheme of God voluntaristically intervening in nature, however, was *not* consistent with God's nature, for such intervention is contrary to his wisdom. Here, then, while Burnet still places greater emphasis on God's wisdom, he is careful not to do so at the expense of his goodness, and the predetermination of human sin allows him to do this. God's synchronicity between the natural and moral world, therefore, "as it is more to the honour of his Wisdom, so it is in no way to the prejudice of his... Justice".⁷²

Burnet also reacted strongly to Warren's claims about the theory's conduciveness to atheism. His response to this was to reassert his maxim of the essential compatibility of reason and Scripture.

⁷¹ Warren (1690), 125

⁷² Burnet (1690a), 17-19 – quotation from 19.

Warren, he thought, was guilty of opposing the two, and this in his view was far more conducive to atheism than positing natural explanations for biblical events, for if our interpretation of Scripture conflicts with reason and philosophy, this more than anything else exposes it to the ridicule of atheists. This, he argues as he had in the *Theory*, is especially the case with regard to passages of Scripture concerning the natural world. In such passages, reason and philosophy should govern our interpretation of Scripture rather than the other way around, for Scripture being opposed to philosophy in such things is prejudicial to the former and therefore conducive to atheism.⁷³

This response from Burnet to Warren appeared during the same year as the *Geologia*. As I have noted above, Burnet's response to Croft in the *Review* was surreptitious. He did not name his adversary, likely because of his influential position in the Church. Here, however, he was dealing with a little-known rector of an obscure parish and could therefore present his defence of the theory explicitly as a reply to Warren. This work, then, entitled *An answer to the late exceptions made by Mr. Erasmus Warren against the theory of the earth*, was Burnet's first explicit, published reply to any of his critics. Croft's main emphasis in the *Animadversions* had been Burnet's interpretation of St Peter. As a result, Burnet had devoted most of the *Review* to defending this interpretation. In contrast, the principal focus of Warren's *Geologia* was the theory's conflict with the first chapters of Genesis. Consequently, it is this alleged conflict that constitutes the main emphasis of Burnet's *Answer*.

Burnet's discussion of these chapters of Genesis in the *Answer* consists essentially of two very different and seemingly contradictory approaches. In several places, he adheres to the position advanced earlier that year in the *Review* concerning the importance of adopting a non-literal interpretation of the six-day Creation and to the view that he would soon articulate at length in the *Archaeologiae* on the need for a similar interpretation of the doctrine of Paradise. He concedes that his *Theory* contradicts the literal sense of Moses but stresses that it does so only in relation to passages which pertain to "natural things". Expanding on his earlier point about the importance of consulting

⁷³ Burnet (1690a), 17-19.

science when interpreting passages of Scripture concerned with the natural world, he stresses that in “matters of pure revelation”, where we have no other source of knowledge than God’s word, we must adhere to the literal sense of the texts. In moral, theological, and natural things, however, we can use reason and philosophy, and therefore are allowed latitude in how we interpret Scripture. Warren’s censure of the theory for departing from the letter of Scripture, then, was unreasonable. For merely *departing* from the literal sense is not by itself blameworthy. It is only blameworthy if one departs from it *without good cause*. He points out that at numerous points in the *Geologia*, Warren himself departs from the literal sense of Scripture, for example in stating that the earth is not at the centre of the universe and that it moves. In such cases, departing from the literal sense is permissible, for where Scripture pertains to the natural world, we are allowed, indeed *required*, to use reason and philosophy in our interpretation.⁷⁴

Elsewhere in the *Answer*, however, Burnet takes a different tack entirely and endeavours to show how his theory was – or at least could be made – compatible with a literal interpretation of these chapters of Genesis. In order to do so, moreover, he often appeals to extraordinary providence, apparently violating, as Warren would point out in his reply, his own maxim of not having too ready appeal to miraculous intervention from God. Answering Warren’s objection about the separation of the chaos taking too long for the earth to be fully formed on the third day, for example, he argues that God’s extraordinary providence could accelerate the process. It could also speed up the production of rivers, another of Warren’s concerns. Here, quoting parts of the *Theory* where he had noted the involvement of miracles in the Creation, he reminds Warren that “’tis plain that the Theorist never excluded an extraordinary Providence in the formation and construction of the Earth”.⁷⁵

We have already seen in chapter two that the above arguments were not intended to communicate Burnet’s true position but merely to suggest *possible* ways that the theory might be

⁷⁴ Burnet (1690a), 78-85.

⁷⁵ Burnet (1690a), 2-4, 12-16 – quotation from 3.

reconciled with the literal sense of the Mosaic Creation, his actual view being that which he had articulated in the *Review* and in his earlier correspondence with Newton. Other examples are less clear-cut, however, and it is not easy to tell whether Burnet is presenting merely *possible* arguments or his actual position. One intriguing example which as we shall see contrasts in interesting ways with his later interpretation of the doctrine of Paradise in the *Archaeologiae* is his response to Warren's argument concerning the rivers of Paradise. Here he emphasises that his theory is actually the best way to vindicate a literal interpretation of Moses' description of the rivers. Warren's supposition that these rivers are still extant, on the other hand, renders Moses' description inadequate, for there is nowhere on the present earth that answers to Moses' description. If, however, the earth was radically altered at the Deluge, then Moses' description of the rivers may be considered an adequate representation of part of the former earth as opposed to an inadequate depiction of an area of the present earth. Indeed, the inadequacy of Moses' description of the rivers with respect to the present earth was a compelling argument for the truth of the theory. Moses' description does not represent anywhere on the present earth. So, either Moses' description is deficient, or the earth has changed. To suppose the former would be to censure Moses, and indeed God, by whom his description was inspired. Hence, the earth must have changed. The theory, therefore, "makes the fairest Apologie for... Moses... in this particular".⁷⁶

The final thing that is important to discuss from Burnet's *Answer* is his response to Warren's arguments against the position of the antediluvian earth's axis. Here Burnet takes issue primarily with Warren's observations concerning the ancient philosophers he had cited in the *Theory* as evidence of a change in the earth's axis. To Warren's first point, Burnet stressed simply that whether these authors assigned the correct cause of the change in the position of the earth was irrelevant. That they had knowledge of the event having occurred was sufficient evidence that it did occur. In response to the second point, he appealed to further evidence from various other ancient writers which suggested not

⁷⁶ Burnet (1690a), 59-61 – quotation from 61.

only that a change in the earth's axis had occurred but also that its previous situation was indeed as he had supposed. As we shall see in the next section, he would expand upon this latter point at length two years later in the *Archaeologiae*.⁷⁷

Warren replied to Burnet the following year in a lengthy pamphlet entitled *A defence of the discourse concerning the earth before the Flood*. As I have discussed in the second chapter, one of Warren's principal objections in the *Defence* concerned Burnet's appeals to extraordinary providence, which Warren believed contradicted his commitment to natural providence and rendered his theory superfluous.⁷⁸ Another important issue for Warren was Burnet's purported license to contradict Scripture "in natural things". This was dangerous, for as with Burnet's account of the Deluge, contradicting Scripture, even in this restricted sense, frequently reflects unfavourably on God, and this is conducive to irreligion. Certainly it does in the case of Burnet's theory. If, for example, God promised humans dominion over the fish in the sea at the Creation despite the seas being enclosed within the earth and therefore inaccessible to humans until after the Deluge, then it would seem that we cannot trust God's promises. Here, then, contradicting Scripture "in natural things" "turns the most solemn Grants of Heaven, into shameful Mockeries; and besides the dishonour it brings to GOD, lets in fatal despondency upon men". Warren agrees with Burnet that departing from the literal sense of Scripture is permissible if the literal sense implies absurdity. References to the sun's motion, for instance, are evidently absurd and therefore should not be interpreted literally. Burnet, however, had in Warren's view not applied this principle correctly in his theory and had strayed from the literal sense of Scripture in passages which, if interpreted literally, implied no absurdity.⁷⁹

One other issue which is important to discuss in the *Defence* because it resurfaces in Burnet's *Archaeologiae* is Warren's response to Burnet's point concerning the rivers of Paradise. Here again Warren attacks Burnet's view of Eden being in the southern hemisphere. The doctrine of Paradise, he

⁷⁷ Burnet (1690a), 27-38.

⁷⁸ Warren (1691), 8-12, 38-9, 148-9.

⁷⁹ Warren (1691), 197-215.

argues, had been obscured by the very writers that Burnet had cited on the question. This testimony of philosophers, Church Fathers, and poets should be disregarded, the only authority on Paradise being Moses. And Moses, in describing the rivers of Paradise, evidently placed it not in the southern hemisphere as Burnet supposed but in Mesopotamia, the rivers Moses describes being located around this area. To Burnet's contention that either the earth has changed or Moses' description of Paradise is inadequate, Warren concedes that the course of the rivers must inevitably have altered to some extent. This was why we could not pinpoint the *exact* location of Paradise. Moses' description was nevertheless adequate at the time he wrote.⁸⁰

Burnet issued one last reply the same year, *A short consideration of Mr. Erasmus Warren's defence of his exceptions against the theory of the earth*. There is little of interest in this pamphlet. Burnet largely just restates the arguments advanced in the *Answer*. Two things are noteworthy, however. The first is his response to Warren concerning his use of extraordinary providence in which he distinguishes between direct omnipotence and the ministry of angels. This of course has been discussed in depth in chapter two. The second is his position on the six-day Creation. Here, he does not attempt to show how his theory may be reconciled with the literal sense of Moses as he did in the *Answer*. Rather, he develops and makes more explicit his other line of argument about adopting a non-literal interpretation. He also cites pages in both the Latin and English editions of the *Theory* where he had indicated that this was his view as well as his discussion of the issue in the *Review*. Warren's arguments concerning the theory's incompatibility with Genesis 1, he argues now, are without any grounds or force, for "the Theorist hath no where asserted, that Moses's Cosmopoeia... is to be literally understood". There are, he emphasises, "as good reasons, and better Authorities, that Moses's six-days Creation should not be literally understood, than there are, why those Texts of Scripture that speak about the motion of the Sun, should not be literally understood".⁸¹ In trying to

⁸⁰ Warren (1691), 122-37.

⁸¹ Burnet (1691a), 39-40.

adhere to philosophy on the one hand and maintain a literal interpretation of Genesis 1 on the other, Warren had adopted an incoherent position, and had therefore failed both in his attempt to accord with philosophy and in his effort to vindicate Scripture. “This Gentleman”, writes Burnet,

hath a mind to appear a *Virtuoso*: for the new Philosophy, and the Copernican *Systeme*: and yet would be a Zealot for orthodoxy, and the Church-way of explaining things. Which two designs do not well agree, as to the natural World; and so betwixt two Stools he falls to the ground, and proves neither good Church-man, nor good Philosopher.⁸²

Warren’s final reply to Burnet appeared the following year. Its cumbersome title, *Some reflections upon the short consideration of the defence of the exceptions against the theory of the earth*, is highly illustrative of how protracted the debate had become. As is evident in the foregoing quotation from Burnet, it had also become increasingly hostile. Chaplain to the King at the time the debate began and now Clerk of the Closet, Burnet seemed greatly offended that someone so much his inferior in the Church would attack his theory. He had repeatedly chided the provincial rector for his “Country-Rhetorick” and “rustical wit”.⁸³ In return, Warren levelled further accusations of “horrid blasphemy” and “Contradictions to Scripture”.⁸⁴ Like Burnet’s *Short consideration*, Warren’s *Reflections* contains little of interest, consisting largely of arguments advanced in his previous replies. Ultimately, he remained unconvinced that Burnet’s departure from the literal sense of Moses was justifiable. In his view, the literal interpretation of the six-day Creation implied no absurdity, and Burnet had not shown anything to the contrary. His objections concerning the conflict between Burnet’s theory and Genesis 1, therefore, had both grounds and force.

⁸² Burnet (1691a), 34.

⁸³ Burnet (1691a), 1, 16.

⁸⁴ Warren (1692), 33, 42.

Toward the end of the *Reflections*, Warren issued the following challenge. If the literal sense of Moses' six-day Creation implies any absurdity, and should, in light of this absurdity, be abandoned, then Burnet must demonstrate that this is the case. If, writes Warren,

Moses's Cosmopoeia be not to be *literally* understood... let him [Burnet] speak it out and prove it; that so they who believe it to be an history of the Creation, may be undeceived. And by his Arguments may be throughly convinc'd, that it is but a System of Philosophic Notions, or the like, symbolically delivered".⁸⁵

Burnet issued no further reply to Warren. He did, however, produce a work, promised in both the *Theory* and the *Review* and in his replies to Warren, in which he explicated and defended his interpretation of Moses' six-day Creation. In this work, he also dealt extensively with Warren's and Croft's objections concerning Paradise and the antediluvian earth and took up Warren's challenge, demonstrating at length not only the absurdity of a literal interpretation of the Mosaic six-day Creation but also, and more controversially, the Mosaic doctrine on Paradise.

3.4. The *Archaeologiae*

The work Burnet had promised throughout the 1680s and early 1690s on the Mosaic six-day Creation finally appeared in 1692, Burnet not wanting to produce the work until after the second volume of the *Theory* was complete.⁸⁶ This work, however, the *Archaeologiae philosophicae: sive doctrina antiqua de rerum originibus*, is a great deal more than just an account of the Hexameron. Indeed, it consists of two books, and only the final three out of ten chapters of the second book deal with the Hexameron. The preceding chapter discusses the Mosaic doctrine of Paradise in Genesis 2-3, and the first six are dedicated to corroborating different parts of the theory from other sacred, Judeo-Christian, and pagan texts. The first book is a general history of ancient philosophy. As Burnet had promised, the

⁸⁵ Warren (1691), 39.

⁸⁶ Burnet notes that he was waiting until after the completion of the entire *Theory* to produce this work in his first reply to Warren – see Burnet (1690a), 66.

Archaeologiae was published in Latin, the subject in his estimation not being “proper for the Vulgar Tongue”.⁸⁷ A full English translation did not appear until after his death, though as I shall explain in the next chapter, two chapters of the second book were translated into English and published in 1693.⁸⁸ The first book is an extensive survey of ancient philosophy, and in particular ancient doctrines concerning the origin and history of the earth, beginning in chapter two with “*the Scythians, Celts, and Aethiopians*” and concluding in the penultimate chapter with “*the Platonics, Aristotelians, and Epicureans*”.⁸⁹ This part of the *Archaeologiae* has been discussed at length by Luciano Malusa and Dimitri Levitin, so rather than go into too much detail on this subject I refer the interested reader to their more extensive treatments.⁹⁰ What I want to discuss for the most part in this section is the second book, which has received less sustained attention from historians.⁹¹

The final chapter of the first book, however, “*Concerning the Origin of the Barbaric Philosophy*”, and Burnet’s overall intentions in producing his extensive history of philosophy, are important to outline briefly. As I noted in chapter two, it is in this last chapter that Burnet articulates at length his view of Noah as the fountain of ancient learning. He first notes that the origins of Greek philosophy are uncontroversial, for it was well established that they derived their learning partly from other, more ancient cultures and partly from their own inquiries.⁹² The origins of these earlier peoples’ learning, however, was less clear. The two most common views about this were, firstly, “that it was found out by the Wit and Industry of those Nations themselves”, and secondly, that it was “derived from the Jews to other Nations; namely from *Moses or Abraham*”.⁹³ The first of these views was highly implausible, for these cultures delivered their philosophy not on the basis of reasoning, argument, or

⁸⁷ Burnet (1684), 289.

⁸⁸ My references are to the English edition, which consists of three parts – Burnet (1736a [1692]); (1736b [1692]); (1736c [1692]).

⁸⁹ Burnet (1736b [1692]), 5-237.

⁹⁰ Malusa (1993 [1981]), 334-69; Levitin (2015), 183-7.

⁹¹ The best treatment of this book of the *Archaeologiae* is in Almond (1999), 210-14.

⁹² Burnet (1736b [1692]), 237-8.

⁹³ Burnet (1736b [1692]), 238.

experimentation, but plainly and factually on the basis of authority.⁹⁴ The second view was also implausible. It was evident from Scripture that Egyptian learning predates Moses, and that Moses learned his philosophy from them rather than instructing them in it. The Arabian philosophy, too, was clearly older than Moses, since we find examples of it in Job, who certainly lived before Moses, for among other things he lived over two hundred years, which places him most likely in the third generation after the Flood.⁹⁵ As to Abraham, it was highly implausible that the Egyptians could have learned their philosophy from him, for he was in Egypt less than two years, surely too short a time for someone who spoke a different language to have instructed a wholly ignorant nation. Thus, the Egyptians' philosophy must also predate Abraham.⁹⁶

We must, therefore, affirms Burnet, “ascend higher in search after the Original of the Barbaric Philosophy”, beyond Moses and Abraham and to Noah, “the common Father of *Jews* and *Gentils*; a great Man, a sincere Worshiper of the Deity..., whose Knowledge extended to both Worlds” – that is, the antediluvian and the postdiluvian.⁹⁷ Noah, notes Burnet, is known to have taught moral philosophy to his progeny, the so-called “precepts of Noah”. He therefore most likely taught natural philosophy and theology, too, for doctrines concerning the natural world, its origin, its fate, the soul, the afterlife, and other doctrines which we find in ancient philosophy and theology, are of equal importance.⁹⁸ Given their long lives, it was reasonable to suppose that the antediluvian fathers possessed superior philosophical and theological wisdom, which Noah, being six hundred years in their company, surely imbibed. “*This Inhabitant of both Worlds*”, then, likely transmitted the antediluvian learning to his offspring, and from there it spread throughout the postdiluvian world.⁹⁹

⁹⁴ Burnet (1736b [1692]), 238-40.

⁹⁵ Burnet (1736b [1692]), 241-3.

⁹⁶ Burnet (1736b [1692]), 243-4.

⁹⁷ Burnet (1736b [1692]), 244.

⁹⁸ Burnet (1736b [1692]), 244-5.

⁹⁹ Burnet (1736b [1692]), 245-6.

The philosophy of Noah, then, was the basis of all ancient learning from the Deluge to Ancient Greece. And much of the Greeks' philosophy was derived from those earlier "Barbaric" tribes who inherited theirs from Noah. Burnet believed of course that this philosophy of Noah had been significantly corrupted, "strained with many Blots..., mixed with many Impurities".¹⁰⁰ Yet "Truth having been discovered another Way, it is not very difficult to wash away these Stains".¹⁰¹ This other way of course was the philosophical inquiry of Burnet's own time. This, he argued, was essential, since the corruption of Noah's philosophy was such that it could not be rediscovered merely through antiquarian studies.¹⁰² It will not, as Burnet put it, be "restored from ancient Monuments, but rather all Things are to be renewed by the Principles of Nature and clear Reason, and amended and established by solid Theories".¹⁰³ One of the "solid Theories" Burnet has in mind here of course is his own. His theory could help to re-establish the lost knowledge of Noah. Firstly, it could rediscover the truths about the earth which Noah knew and taught. Secondly, as we have observed in the second chapter, it constituted a powerful hermeneutical tool which could be used uncover the true Noachian philosophy in those ancient writings which were essentially heavily corrupted versions of it.

As Levitin correctly notes, the purpose of this first book is ultimately to show that the central tenets of the theory are grounded in a tradition which dates back to antediluvian times. As Levitin observes, however, the evidence Burnet advances for this is presented in this book in a highly intelligent and compelling way. He does not, as one might expect, focus on specific examples of ancient doctrines which support his theory or which his theory can illuminate and explicitly connect these doctrines with the theory. Rather, he conducts a thorough, extensive, critical study of the history of ancient philosophy.¹⁰⁴ There are numerous instances in this history of ancient doctrines which support the theory. We read of examples of the earth being formed on a body of water, a great abyss,

¹⁰⁰ Burnet (1736b [1692]), 245.

¹⁰¹ Burnet (1736b [1692]), 245.

¹⁰² Burnet (1736b [1692]), 245-6.

¹⁰³ Burnet (1736b [1692]), 246.

¹⁰⁴ Levitin (2015), 185-7.

the primitive earth's egg-like structure, successive periods of the earth, different states of the earth punctuated by destructions resulting from water and fire, renovations of the earth, and so on.¹⁰⁵ Yet at no point in this history of the ancients are these examples explicitly connected with the theory. Rather, they are embedded within a comprehensive, impartial intellectual history and the evidence which they present for the theory is left to speak for itself.

It is not until the first six chapters of the second book that Burnet explicitly applies the ancient pagan philosophy and theology that he had surveyed in the first book, along with numerous biblical texts and writings of Church Fathers and Jewish and Christian theologians, to the theory. This purpose is stated up front in the opening chapter. "THE THEORY *of the* EARTH", he writes, "having been lately published, entirely drawn from its own Causes, as from the Bowels of Nature: It is now thought proper to confirm it by the Authority and Testimonies of the Ancients, that so nothing may be wanting to the Work which we have proposed".¹⁰⁶ This first chapter is dedicated to showing how his theory of the Chaos and its separation coheres both with discussions of the chaos in Scripture and those of ancient pagan philosophers.¹⁰⁷ The next two chapters are devoted to the form of the primitive earth, the difference between it and the present earth, and the "threefold" state of the earth. These two chapters consist largely of further detailed exegesis of St Peter.¹⁰⁸ Burnet makes clear at the beginning of chapter two that his target is those critics – i.e., Croft and Warren – who had argued against his theory on textual grounds. The different form of the antediluvian earth, he remarks, is the central tenet of the theory:

On this single Point, the whole System depends; and when this Conclusion is proved, the Cause remains impregnable: we shall not now attempt to prove it by Physical Reasons, for that is already done..., our Design is therefore different, namely, to show that this Opinion has been delivered by ancient wise

¹⁰⁵ See, e.g., Burnet (1736b [1692]), 10, 13, 20, 32, 99-100, 150, 164, 172-3, 218, 239, 259.

¹⁰⁶ Burnet (1736c [1692]), 3. It is important to note here that in this quotation Burnet refers to the "Ancients" in a broad sense, that is, to include pagan, Sacred, and Judeo-Christian writers.

¹⁰⁷ Burnet (1736c [1692]), 3-15.

¹⁰⁸ Burnet (1736c [1692]), 15-39.

Men; that there are plain Footsteps of this Doctrine extant, not so much in the Books, as in the Fragments, of the Ancients, or small Extracts from them.¹⁰⁹

“We do not undertake this Task”, he continues, clearly alluding to Croft and Warren,

as though it were necessary for the Support of the... Theory, which stands, firm on its own Foundation; but to remove every Objection against Providence, and comply a little with their Obstinacy, who will not receive the Truth it self, unless delivered and recommended to them by their Ancestors.¹¹⁰

To this end, Burnet conducts much the same kind of defence of the literal sense of St Peter that we saw in the *Review*, yet greatly expands it, showing in more detail how this reading of St Peter is vindicated by other biblical texts and the interpretations of the Fathers and adding also the testimony of several ancient pagan philosophers who had taught of the same doctrines.¹¹¹

The fourth chapter deals with the Deluge, showing how a literal interpretation of Moses and St Peter corresponds to the theory and how this literal sense of the texts is supported by other passages of Scripture and various ancient pagan expositions of deluges.¹¹² The fifth and sixth chapters are especially interesting. They discuss at length the position of the antediluvian earth, something which, as we have seen, was especially troubling for Warren, and for which Burnet had presented further evidence from ancient texts in response. These chapters of the *Archaeologiae* are essentially a continuation on this response in that they consist entirely of further evidence from ancient sources for his theory about the primitive earth’s axis. The first of these chapters is devoted solely to Plato, whose writings concerning the ages of Saturn and Jupiter clearly implied a right situation of the axis during the former period. The earth during the age of Saturn in Plato, Burnet points out, had spontaneous fertility, purer air, equality of seasons. Its inhabitants enjoyed great health and longevity, all things which follow from a right situation of the earth. Plato also supported the view that the

¹⁰⁹ Burnet (1736c [1692]), 16.

¹¹⁰ Burnet (1736c [1692]), 16-17.

¹¹¹ Burnet (1736c [1692]), 17-39.

¹¹² Burnet (1736c [1692]), 40-63.

change in the earth's position was brought about at the Deluge in that he described a great disaster at the transition from the age of Saturn to the age of Jupiter in which life on earth was all but extinguished. Other aspects of Burnet's antediluvian earth were corroborated by Plato, too, in that he mentioned also a uniform, unbroken surface and subterraneous waters. He also supported a literal interpretation of St Peter on the threefold state of the earth and a "restitution" of the antediluvian state, since he wrote of a future earth similar to the first.¹¹³

The final chapter of the book continues in the same vein, referring to various other ancient writings and secondary literature in support of this antediluvian axis. Here Burnet cites several discussions of the Golden Age or Age of Saturn which refer to an equality of seasons. In Ovid, for example, we read that "[w]hen good old Saturn, banished from Above, was driv'n to Hell, the World was under Jove. Then Summer, Autumn, Winter did appear; And Spring was but a season of the Year". Ancient writings on the Elysian Fields pointed to similar characteristics, that is, a perpetual spring, spontaneous fertility, longevity, equality of day and night, all things which indicate a perpendicular axis. Various Jewish, Arabic, and Christian writers had described a perpetual spring in their accounts of Paradise. Cardinal Robert Bellarmine, for example, the inquisitor most famous for his role in the Galileo affair, had argued against the notion of Paradise being situated in Mesopotamia on the basis of several Church Fathers who had taught of a perpetual spring in Paradise. This, Bellarmine had argued, showed that none of the proposed locations of Paradise could be correct "unless the Course of the Sun had been different from what it is at present". Transposing Bellarmine's observation into the heliocentric system of his time, Burnet emphasises that this characteristic of Paradise can only be explained by supposing that "the Course of the Sun had been different from what it now is; or, which comes to the same Thing, there had been another situation of the Earth".¹¹⁴

¹¹³ Burnet (1736c [1692]), 63-76.

¹¹⁴ Burnet (1736c [1692]), 86-9 – quotations from 89.

By far the most interesting part of the *Archaeologiae*, and the part to which I shall devote the remainder of this section, is the last four chapters of this second book. It is here that we receive Burnet's frequently promised explication of the Mosaic six-day Creation and what would be an immensely controversial exposition of the Mosaic doctrine of Paradise. His position on the former of course had already been made public two years earlier in the *Review*. His discussion in the *Archaeologiae*, however, is much longer and much more inflammatory in that he is far more intent on exposing the absurdity of a literal interpretation of Genesis 1. Indeed, his examination of Moses' six-day Creation in the *Archaeologiae*, consists essentially in demonstrating, as Warren had challenged him to do, that the Hexameron, if interpreted literally, implied numerous absurdities. Burnet's objections to the literal sense of Moses fell essentially into two categories. The first set of objections pointed to various discrepancies between the Hexameron and our philosophical knowledge of the natural world. The second set emphasised various internal inconsistencies in the Mosaic account.

In the *Review* and in his replies to Warren, Burnet had repeatedly compared the six-day Creation with passages of Scripture that referred to the motion of the sun. Even the most orthodox divines, he had stressed, agree that the true philosophy and the heliocentric system of the world have amply demonstrated that such passages are not to be understood literally. Here too he appeals at length to the heliocentric system. Here, though, his appeals are rather different from those earlier appeals. In responding to Croft and Warren, he had invoked the heliocentric system primarily in order to give an example of passages of Scripture which are inconsistent with reason and philosophy and which it is generally agreed are not to be interpreted literally in order to show that it was unproblematic to recede from the literal sense of Scripture in such cases. In the *Archaeologiae*, however, he appeals to the heliocentric system as the central philosophical doctrine with which the six-day Creation is inconsistent.

According to the literal sense of Moses, he notes, the entire universe was created around 6,000 years ago. Light was created prior to the sun or any other heavenly body. The earth was created

before the sun and stars. The latter were created solely to serve the earth. Both the earth and the sun and stars were formed from a single chaos. And this chaos filled the entire universe. This, he emphasises, “is what the very Letter of the Hexameron seems to import”.¹¹⁵ Yet according to the heliocentric model, the sun is at the centre of the planetary system, which would surely not be the case if the earth was the first body to have formed out of the chaos. If the earth was the first body to have formed and the chaos extended to the entire universe, moreover, then it would surely be much larger than it is. On the heliocentric model, the sun and stars are noble bodies. They were not created merely to serve the earth. Each star is located at the centre of its own vortex (as will become clear in the final chapter, Burnet never abandons the Cartesian philosophy), and so are highly unlikely to have been created from a single chaos. The appearance of new stars, moreover, indicates that their formation is wholly independent of the earth. And given the vast periods of comets, the idea that the entire universe was created only 6,000 years ago is implausible. And there can have been no light before the creation of the sun, for light must necessarily have a source.¹¹⁶

The internal inconsistencies in the Hexameron pertained mainly to the disproportionate amount of work that God purportedly completed on the various days of Creation. The work done on the first and second days, for example, was wholly disproportionate to the time taken and to the work done on the third day. The notion of super-celestial waters and the division of these from terrestrial waters was obscure. Typically, this was made sense of by supposing that the waters above the firmament referred to the clouds. Yet this, too, was problematic, since it implied that God spent an entire day merely creating a small amount of space. The amount of work completed on the fourth, fifth, and six days, on the other hand, was implausibly large. The creation of the sun, moon, and stars would surely take far longer than a day. The moon, moreover, should more plausibly have been created on the same day as the earth and other planets, since it, too, is a planet and not a star. And

¹¹⁵ Burnet (1736a [1692]), 28-30 – quotation from 29.

¹¹⁶ Burnet (1736a [1692]), 27-48.

given the perfect design of animal bodies, it was highly implausible to suppose that the entire animate world could be created in merely two days.¹¹⁷

From these two sets of objections, Burnet arrived at two sets of conclusions. The first concerned how the earth was in fact formed. This of course was the formation of the earth according to the theory. The Mosaic Epoch of roughly 6,000 years applies only to the earth, not the entire universe, the sun and the stars evidently being much older than the earth and therefore already extant at the time of the earth's formation. The earth and other planets formed separately from their own chaoses in the manner described in the *Theory* and are very likely former stars and thus probably have fire at the centre.¹¹⁸

His second set of conclusions is especially interesting from an exegetical point of view and concerns the reasons why Moses gave this particular account of the formation of the world. Appealing again to the principle of accommodation, Burnet argues that Moses adapted his account, firstly, to suit the limited capacities of his audience, and secondly, to suit the purpose for which he was giving an account of the Creation. Moses' account was not designed to teach the people, who were incapable of receiving a philosophical account of the Creation, about the true physical formation of the world, but to instil in them a belief in the true religion. The various aspects of the six-day Creation were contrived precisely for this end. That God created light on the first day is taught simply because the people were incapable of imagining how God could work in the dark. The separation of the waters above and below the firmament was not designed to impart knowledge of super-celestial waters but contrived to accommodate the mistaken apprehensions of the Jews who had no understanding of the natural processes that produce rain and believed it to be sent from heaven by some divine being. Condescending to such notions, Moses fabricated the idea of super-celestial waters in order to convey an appearance of God's omnipotence. He spoke of the moon being created on the same day as the

¹¹⁷ Burnet (1736a [1692]), 27-48.

¹¹⁸ Burnet (1736a [1692]), 27-48.

sun and the stars to suit the “philosophy of the vulgar” which associates the moon with these other bodies. He made the sun, moon, and stars subservient to the earth to prevent idolatry. He did not distinguish between the earth and the wider universe because the “vulgar” did not distinguish between them. He made God rest on the seventh day in order that people observe the Sabbath. Most importantly, he described the earth at the Creation not as it actually was at that time but as it was at the time he wrote, for owing to their limited capacities, the Jews would have found the true form of the antediluvian earth wholly unintelligible.¹¹⁹

Following the above explication of the six-day Creation, Burnet devotes a chapter to anticipating and answering objections.¹²⁰ The one to which he devotes most attention is the notion that Moses would not depart from the truth because truth is sacred. Burnet’s answer to this objection was an important part of what made the *Archaeologiae* so controversial, for here he states explicitly that Moses’ account of the Creation was expressly designed to deceive the Jews. This would seem to many to go beyond mere accommodation, for on this view, Moses was not merely condescending to the capacities of the Jews but actually *lying* to them. Burnet acknowledges that truth is sacred and admits that Moses departed from it. He argues, however, that there are many sacred things besides truth and that sacredness admits of degrees. Things are not simply sacred or not sacred but have greater and lesser degrees of sacredness in different contexts. Inevitably, in some contexts, different sacred things may conflict with one another. In such cases, the thing that possesses the greater degree of sacredness must be given priority. Truth is sacred, but so is preventing harm. If truth is harmful, then deception is necessary for preventing harm. In such cases, then, deception may be more sacred than truth. Applying this maxim to Moses, he argues that the physical truth about the formation of the earth would have been harmful, for had Moses told the truth about the formation of the earth, the people, not having the capacity to understand, would have dismissed and ridiculed him rather

¹¹⁹ Burnet (1736a [1692]), 37-48.

¹²⁰ Burnet (1736a [1692]), 48-66.

than seeing him as a prophet and thus would have not been led to believe in the true religion. Moses made a kind of utilitarian calculation and gave the Jews the account of the Creation that would most benefit them, and this necessarily involved deceiving them.¹²¹

A further rejoinder that Burnet anticipates here is that if Moses was to instruct people incapable of receiving the truth about the Creation, then he would have been wiser to remain silent on the issue rather than deceiving them. Here again Burnet conceives of Moses' decision to deceive the Jews in utilitarian terms. Not treating the issue at all, he contends, would have been more harmful even than giving a true account of the Creation. Here he draws on his history of ancient learning from the first book. The various pagan traditions to which the Jews had been exposed, he notes, all connected creation myths to their theogonies, and hence a system of religion was expected to include an account of the creation. Had Moses given no account of the Creation, then, the religion he was trying to teach would have appeared inadequate, and the people would instead have followed one of these other traditions. These traditions' accounts of the creation were more contrary to the true religion than Moses'. Thus, he could "not pass by the Doctrine concerning the Original of the World, though in its Purity it cannot be explained to the Vulgar; but he digested and unfolded it in such a Method as might be most serviceable to Religion, and least burdensome to the Understanding of the People".¹²²

Turning now to Burnet's controversial discussion of Genesis 2-3, one of the principal concerns here, as in his debate with Warren, was the rivers of Paradise. What is interesting here is that Burnet departs quite radically from his previous argument against Warren. There, as we have observed, he had argued that the rivers were destroyed at the Deluge and that the theory therefore vindicates a literal interpretation of Moses' description of them because his description does not correspond to any rivers on the present earth. Here, in contrast, he claims that Moses' description is entirely fictional.

¹²¹ Burnet (1736a [1692]), 51-6 – quotation from 56.

¹²² Burnet (1736a [1692]), 56-8 – quotation from 57-8.

The Church Fathers and theologians who had identified the four rivers Moses' describes with the Ganges, Tigris, Nile, and Euphrates, he argues, contradicting his earlier position, were correct to do so. Yet this is not because they were the actual rivers of Paradise, but because Moses, giving a wholly fictional account of Paradise, simply named "four of the most celebrated and most fertile Rivers" on the present earth by way of illustration. Also interesting here is that Burnet invokes an argument made earlier by both Croft and Warren against the theory and brings it to bear on Moses' description of the rivers. Moses' description, he argues, must be fictional, because it would take time for rivers to form from vapours raised from the crust and so there could be no rivers this soon after the Creation.¹²³

As with his exposition of the Hexameron, Burnet is intent here on showing conclusively that a literal interpretation of the Mosaic doctrine of Paradise in Genesis 2-3 is absurd. His main issues with a literal interpretation of Genesis 2 are the notion of Paradise being a single garden rather than the entire earth and the creation of Eve from Adam's rib. The idea that a single small garden could be paradisiacal and the rest of the earth not was highly implausible, since the physical environment depends on the state of the air, which could not be restricted to a small area. As to the Creation of Eve, he maintains that this is highly counterintuitive if interpreted literally. If, in the beginning, Adam had the requisite number of ribs, then God must have maimed him by creating Eve, since the body is perfectly designed and therefore contains nothing superfluous. If, on the other hand, Adam had an extra rib from which God created Eve, then he was like a monster in the beginning when all things are said to have been perfect. A single rib, moreover, does not contain enough matter to create a woman. And yet if the rest of the matter used to create Eve was taken from elsewhere, then she cannot be said to have been made principally from Adam's rib.¹²⁴

Burnet's assessment of Genesis 3 was much more scathing and would prove highly controversial. To begin with, he summarises the chapter, retelling the story in an especially sarcastic

¹²³ Burnet (1736a [1692]), 2-3, 13-17 – quotation from 14.

¹²⁴ Burnet (1736a [1692]), 11-13.

tone which amounts effectively to a satirical treatment of a sacred text. The part that would be deemed most offensive, not just in his paraphrase of Genesis but in the entire volume, is his summary of Eve's dialogue with the serpent and God's punishment. "Eve sitting solitary under the Tree without her Husband", he writes, "there came to her a Serpent or Adder; which, though I know not by what means or power, civilly accosted the Woman".¹²⁵ "What do I hear!", exclaims the serpent, "who is that God that envies his Creatures, the innocent Delights of Nature? Nothing is sweeter, nothing more wholesome than this very Fruit; why then should he forbid it, unless he were in jest?".¹²⁶ Upon eating the apple, Burnet continues, Adam and Eve "became both (I know not how) ashamed of their Nakedness, and sowing together Fig-leaves, made them a sort of Aprons to cover their *punenda*".¹²⁷ Next comes God's wrath, which is portrayed in a somewhat comedic manner reminiscent of an overly strict parent or schoolmaster scolding children and imposing unreasonably harsh punishments for what was ultimately a rather trivial transgression:

You have finely ordered your Business, you and your Wife!... This Apple shall cost you dear, and not only you, but your Posterity, and the whole Race of Mankind. Moreover, for this Crime, I will curse and spoil the Heavens, the Earth, and the whole Fabrick of Nature. But thou, in the first place, vile Beast..., [h]ereafter thou shalt go creeping on thy Belly, and instead of eating Apples, shalt lick the Dust of the Earth. As for you Mrs. *Curious*, in Sorrow shall you bring forth Children...¹²⁸

The above relation of Genesis 3 would be widely censured. Just as scathing, however, and therefore seen as equally heretical, was Burnet's assessment of the literal sense of the text. Here every verse of the chapter is attacked. Serpents, he argues, cannot speak. Thus, Eve, rather than entering into dialogue with it, would surely have been greatly perturbed by its use of language. Or if serpents had this ability before the Fall, then their loss of language was surely a greater punishment than their

¹²⁵ Burnet (1736a [1692]), 5.

¹²⁶ Burnet (1736a [1692]), 6.

¹²⁷ Burnet (1736a [1692]), 6-7.

¹²⁸ Burnet (1736a [1692]), 7.

crawling on their bellies, and would surely have been mentioned by Moses.¹²⁹ “[G]reat Sticklers for the literal Interpretation” typically dealt with these issues by supposing that the body of the serpent was merely a vehicle for the devil or some evil spirit. Yet there was no authority for such a reading, since nothing is mentioned of this in the text to whose literal sense they wish to adhere. Moreover, if the serpent was merely a medium through which the devil or an evil spirit acted, then the punishment inflicted on the serpent was surely unjust.¹³⁰ God’s threat to Adam and Eve and his punishment made little sense, too. They were forbidden from eating from the tree on pain of death. Yet the warning of such a consequence could have no effect on their actions, for they had no experience of death and hence could not have known what it was.¹³¹ Upon eating the fruit, they sewed together fig leaves. Yet they could have had no needles or thread, “since the Thread-maker’s Art was not yet found out, nor yet the Art of working in Iron”.¹³² Perhaps most importantly, the consequences inflicted by God, not merely on our first parents but the entire human race, were wholly disproportionate to the crime committed.¹³³

From these and numerous other absurdities in the literal interpretation, Burnet concludes that the Mosaic doctrine of Paradise, like the Hexameron, is essentially a fictional account delivered by Moses in a style suited to the capacities of his audience and was designed for purposes other than giving a true account of events in the beginning. One of the most interesting things about Burnet’s assessment of these chapters of Genesis is that, for all its heterodoxy, he was ultimately engaged in a practice which, as I have noted in chapter one, was widespread and quite uncontroversial in the seventeenth century. That is, he was engaging in a critical reading of Scripture, assessing sacred texts in essentially the same way as one would assess any other historical document. He is quite explicit

¹²⁹ Burnet (1736a [1692]), 17.

¹³⁰ Burnet (1736a [1692]), 17-19 – quotation from 17.

¹³¹ Burnet (1736a [1692]), 19.

¹³² Burnet (1736a [1692]), 21.

¹³³ Burnet (1736a [1692]), 26.

about this. In any other author, he notes, we would not accept such absurdities uncritically. “Great is the Force of Custom and a pre-conceived Opinion, over human Minds”, he laments,

[w]herefore these short Observations or Accounts of the first Originals of Men and Things, which we receive from the Mouth of Moses, are embraced without the least Demur or Examination of them. But had we read the same Doctrine in another, for Example, in a Greek Philosopher, or in a Rabbinical or Mahometan Doctor, we should have stopped at every Period with our Mind full of Objections and Scruples.¹³⁴

We are uncritical of Moses, he assesses, because he was divinely inspired. His being divinely inspired, however, is not a sufficient reason to interpret him literally. We need not doubt that Moses was divinely inspired to question the intent and style of his account. Numerous other passages in Scripture are evidently adapted to the capacities of their audience and are clearly intended for purposes other than giving a true account of things. “And if in this Rank you place the Narration we have now in Hand, preserving always the good Name and Honour of the Author, I shall not think it amiss”.¹³⁵

Although he is arguing for a non-literal reading of the text, then, his methods are very much derived from the Protestant literalism discussed in chapter one, for he is treating Scripture as a historical document, assessing it on the basis of such considerations as the intent of the author and the nature of his intended audience. As with the conclusions he draws from his examination of the six-day Creation, it is these two concerns that guide his assessment of why Moses gave this fictional account of Paradise. The excessive punishment for Adam’s seemingly insignificant crime, he suggests for example, was likely contrived by Moses in order to instil deference to his laws.¹³⁶ Eve being created from Adam’s rib was most plausibly invented to create a stronger bond between the sexes in order to recommend the institution of marriage.¹³⁷ Most important for Burnet’s theory, however, was the

¹³⁴ Burnet (1736a [1692]), 10.

¹³⁵ Burnet (1736a [1692]), 10-11 – quotation from 11.

¹³⁶ Burnet (1736a [1692]), 26.

¹³⁷ Burnet (1736a [1692]), 13.

question of why Moses described only a single garden rather than the entire earth as being paradisiacal. Again, his answer to this question derives from his consideration of Moses' intentions and certain facts about his audience, for whom a discussion about the different constitution of the earth in the beginning would have been unintelligible and would have hindered his purpose. Rather than teach them that the entire earth in the beginning was of a different constitution, then,

Moses puts the Part for the Whole, and laid one Example before the Eyes of the People, instead of a greater Number; because it was more suitable to the Genius and Understanding of the Vulgar, to conceive a pleasant Garden or single Field, than that, the whole Globe of the Earth should put on a new Face and new Nature entirely different from what we now enjoy.¹³⁸

The final chapter of this final book of the *Archaeologiae* is dedicated to justifying the above arguments against a literal interpretation of the Hexameron and Paradise. Here Burnet makes four key points. The first concerns the style of both scriptural and other ancient writers. Pagan, sacred, and Judeo-Christian writers, he notes, have frequently observed a "twofold" doctrine of teaching the learned and the common people in different styles. Varro, for example, divided ancient theology into three parts, the fabulous, civil, and philosophical, advocating the civil method for teaching the common people as a middle way between the fabulous, which was harmful, and the philosophical, which was of no use to the multitude.¹³⁹ Pythagoras taught two different systems of philosophy depending on his pupils' capacities.¹⁴⁰ The same twofold practice had been employed in Christian teaching. The primitive Church, for instance, distinguished between the Catechumen and the learned, employing different methods for each in their teachings.¹⁴¹ The Apostles made similar distinctions when teaching Doctrine. And Christ kept things from his disciples which he deemed to be beyond their understanding.¹⁴² An interesting aside here is that Burnet was consciously employing this method

¹³⁸ Burnet (1736a [1692]), 9-10.

¹³⁹ Burnet (1736a [1692]), 68-9.

¹⁴⁰ Burnet (1736a [1692]), 69-70.

¹⁴¹ Burnet (1736a [1692]), 70.

¹⁴² Burnet (1736a [1692]), 70.

himself in this very work, which he insisted on writing only in Latin because the subject was unsuitable for the “Vulgar”. This, as Peter Harrison points out, is evident in Burnet’s other work.¹⁴³ In a posthumously published essay entitled *Hell torments not eternal. Argumentatively proved, from the attribute of divine mercy*, for example, in which he argues that eternal damnation is contrary to the nature of God, he warns that “the People, too easily prone to Vice, but not so easily terrified from Evil, must have... the commonly received Doctrine”.¹⁴⁴ As Harrison argues, Burnet “was committed to the view that the masses required traditional, if erroneous religious beliefs to keep them from straying from the path of virtue”.¹⁴⁵ Moses, in his view, shared this principle, and gave the Jews a false story of the Creation and first humans because a true account would have been harmful.

The second point Burnet makes concerns the capacities of the Jews. These, he argues, had been affected by four hundred years of servitude. They had also been schooled in the idolatry of a heathen nation, lessons which they needed to unlearn. They were thus wholly incapable of receiving the truth about natural and divine things and it would have confounded Moses’ purpose to deliver it to them. It was for the same reason that he did not teach them of the immortality of the soul, something of which he was surely not ignorant. “If Moses”, then,

(for fear of Disdain and Contempt) durst not open the Springs of a future Life and Immortality which it so much concerns all Men to know; how much less had it become a wise Man to expose himself and his Laws to the same Inconveniences and Dangers upon the Account of some philosophical Doctrines which were not necessary, and would have been, odious to the People.¹⁴⁶

Burnet’s third point consists of a brief survey of how the Church Fathers had interpreted Moses on these issues. Many, he notes, had interpreted Moses in precisely the same way. Eusebius, for example, had stated likewise that a true account of the origin of things would not have served

¹⁴³ Harrison (1990), 95.

¹⁴⁴ Burnet (1739), 24.

¹⁴⁵ Harrison (1990), 95.

¹⁴⁶ Burnet (1736a [1692]), 71-3 – quotation from 71.

Moses' purpose, that his public teachings were adapted for the common people, and that he privately related a true, philosophical account of these things to the learned. Responding to Celcus' objections concerning the implausibility of Christian teachings, Origen had answered that Moses taught the common people in accordance with their capacities, concealing higher matters which he reserved for those better equipped to receive them. And countering Julian's preference for the Platonic account of the Creation over the Mosaic account, Celsus urged that Moses was prevented by the capacities of his audience from giving a true, philosophical account, and that he adapted his account for his purpose, which was not to teach them of the true origin of things but to instil belief in a single God distinct from all things in order to combat idolatry.¹⁴⁷

Burnet's final point deserves special attention, for it relates in interesting ways both to his debate with Croft and Warren and to certain of Burnet's Cambridge Platonist and Latitudinarian principles discussed in chapter two. Both Croft and Warren had claimed that departing from the literal sense of Moses was conducive to irreligion. In his *Review* and responses to Warren, Burnet's main line of defence was to argue that interpreting Scripture in ways that conflict with reason and philosophy is for more conducive to irreligion than leaving the literal sense of the texts. At the end of the *Archaeologiae*, Burnet introduces a new and decidedly Cambridge Platonist- and Latitudinarian-inspired argument from the nature of God. God, he notes, is infinitely perfect. When interpreting Scripture, then, we must admit of anything that is unworthy of an infinitely perfect being. If understood literally, many of God's actions in both the Hexameron and the Mosaic doctrine of Paradise are unbecoming of such a being. The disproportionate assignment of tasks to days in the Hexameron, for instance, is contrary to his wisdom. The disproportionate punishment for Adam's sin is unworthy of his goodness.¹⁴⁸

¹⁴⁷ Burnet (1736a [1692]), 73-85.

¹⁴⁸ Burnet (1736a [1692]), 86-90.

By interpreting these chapters of Genesis literally, then, we impute actions to God that are unworthy of his nature. *This* in Burnet's view is conducive to irreligion. In arguing this he points to several examples of early opponents of Christianity who had used a literal interpretation of Moses to argue that the Christian God's actions are unbecoming of an infinitely perfect deity. Simplicius and Celcus, for example, had argued that the Creation according to the Mosaic account seemed most inept and unbecoming a supposedly divine intelligence. Regarding the doctrine of Paradise, Julian had urged that Eve's dialogue with a serpent and numerous other aspects of the Mosaic doctrine were no different from Greek fables, and that the expulsion of Adam from Paradise was unjust and unworthy of the Christian God's supposed divine nature.¹⁴⁹ "You see here", Burnet emphasises,

what Offence is taken by the Heathen Philosophers at those Things, because they supposed them to be unworthy of God, and of a Religion which came from Heaven; that is, if we adhere to the Skin or Bark of the Words. Therefore, I think, that Interpretation ought to be commended which removes this Odium, these Scandals from our Religion.¹⁵⁰

Underpinning both this argument and this book of the *Archaeologiae* more generally are various notably Cambridge Platonist and Latitudinarian principles. This particular argument exemplifies the emphasis on God's wisdom and goodness and the anti-voluntarism that results from this emphasis. It is simply not possible in Burnet's view for God to act in the ways that are implied by a literal interpretation of Genesis 1-3. The law of God's wisdom and goodness prevents it. Also important here is the emphasis on the fundamentals of Christianity and their priority over inessential doctrines. The chief fundamental tenet of the Christian religion for Burnet is this conception of God's nature. Literal interpretations of these chapters of Genesis are inessentials, and to the extent that these inessentials conflict with the fundamentals, they must necessarily be abandoned. Important here also is the use of reason in religion, for this conception of God's essential nature is derived not

¹⁴⁹ Burnet (1736a [1692]), 87-8.

¹⁵⁰ Burnet (1736a [1692]), 88.

merely from revelation but equally from rational reflection about God's essential attributes. This tenet of Cambridge Platonism and Latitudinarianism is of course exemplified throughout the work. So, too, is the essential compatibility of reason and Scripture. Indeed, this principle is taken much further here than in the work of any Cambridge Platonist or Latitudinarian. For Burnet, a consistent application of this principle resulted in a conclusion that few Christians would be willing to accept, for in order to reconcile Scripture with reason in his view, the literal truth of the first three chapters of Genesis had to be abandoned.

The final thing to discuss before concluding this section is the influence of Burnet's debate with Croft and Warren on the *Archaeologiae*. Although it is not easy to discern the precise extent of this influence, it appears arguably to have been quite considerable. Many of the points that Burnet discusses at length in the work seem to have been motivated in large part by this debate. Burnet's literal interpretation of St Peter, which he goes to great lengths to vindicate in chapters two and three of the second book, had been disputed by Croft. The perpendicularity of the antediluvian earth's axis, for which he adduces a wealth of new textual evidence in the final two chapters of the same book, had been attacked by Warren, who had argued that Burnet's view on this was not well supported by human history. And he alludes to both Croft and Warren at various points in this book, referring for example to Croft's interpretation of St Peter and Warren's argument concerning the ancients' ignorance of the cause of the change in the earth's axis.¹⁵¹ As to the first book, this as Dimitri Levitin has argued was evidently the result of an extensive program of reading in the history of philosophy and theology in the first years of the 1690s, which as Levitin shows is evidenced by Burnet's heavily self-annotated copy of the 1689 Latin edition of the *Theory*.¹⁵² The application of this reading in the second book of the *Archaeologiae* to the problems posed by Croft and Warren may be an indication

¹⁵¹ Burnet (1736c [1692]), 19, 34, 36-7 76-7.

¹⁵² Levitin (2015), 183-4.

that he was motivated in part by these debates to engage in such research, but this must remain a matter of conjecture.

Assessing the influence of these debates on those inflammatory final few chapters of book two is also difficult. We know of course that both Burnet's interpretation of the six-day Creation and his intention to produce a treatise on the subject predate Croft's and Warren's attacks. Nevertheless, in his treatment of this topic, Burnet is very much intent on demonstrating the absurdity of a literal reading of Moses, something Warren had explicitly challenged him to do. So while his interpretation of Genesis and his producing the work do not result from this debate, this particular aspect of it was likely motivated in part by Warren's challenge. It is likely that Burnet's view of the Mosaic doctrine of Paradise also predates this debate, for as we have seen, this interpretation was based on principles that he had held for a long time. His intention to write about the topic, however, is not stated either in the *Theory*, the *Review*, or his replies to Warren, and so his treatment of this topic in the *Archaeologiae* may have been influenced in part by Warren's frequent appeals to these chapters of Genesis in the *Geologia* and in his subsequent rejoinders to Burnet's replies. This too, however, is merely a plausible conjecture. We cannot be sure of Warren's influence here. What can be reliably inferred, however, is that the general tone of this book of the *Archaeologiae* was heavily coloured by this debate with Warren. Throughout this debate, we witness Burnet becoming steadily more impatient with Warren's appeals to a literal interpretation of these chapters of Genesis, and this frustration is clearly evident in the caustic tone of this book. It was this tone as well as the book's content that made it so controversial, and so this increasingly hostile dispute in which Burnet was engaged while writing the work surely had an effect on the finished product itself and consequently on its reception among the reading public and therefore played an important role in bringing about the controversy which was to follow its publication.

3.5. Conclusion

These early debates with Croft and Warren, then, are important for understanding the controversy that I shall be discussing in the next chapter, for these debates played important roles in shaping the *Archaeologiae*, the work which ultimately uncovered the heterodox implications of Burnet's theory and exposed it to much wider and more thorough scrutiny than it had received during the decade of its publication. The central motivation for this scrutiny and the attacks on the theory which it engendered would be Burnet's interpretation of Genesis 1-3 and his unpalatable conclusion that Moses essentially lied to the Jews about the Creation and Paradise. As we shall see, this interpretation would not only be attacked but would inspire a number of new theories in which authors endeavoured to give a philosophical account of the earth's history which would vindicate a more literal interpretation these chapters.

In interpreting these chapters as he did, Burnet very much embodied the post-Reformation approach to Scripture in that he treated Moses' account as any other historical document, assessing the author's intentions and the audience for which the texts were written, and concluding from this assessment that they are not a true account of the Creation and Paradise. Also important to note is that, although Burnet argues for a non-literal interpretation of these texts, this interpretation nevertheless embodies the Protestant literalism in Harrison's broad sense of "determinacy of meaning". There was in his view a single, correct interpretation of these texts, and this was a fictional one. The six-day Creation and the doctrine of Paradise were *literally* fictions. This in his view was the only way these texts could be reconciled with reason, the nature of God, and other texts of Scripture and the numerous pagan writings which he wanted to interpret literally in a narrower sense and which he believed contained important philosophical truths. This view that there was philosophical knowledge in numerous other ancient texts, not only sacred but also heathen, but not in Moses, would prove highly controversial. As John Woodward, whose alternative theory of the earth I shall discuss in

the next chapter, would point out, Burnet seemed to believe “*that all the antient nations... were possessed of some sort of wisdom, but he will not allow any thing of the like for the Jews*”.¹⁵³

¹⁵³ Woodward (1777), 65.

4. The Burnet controversy

4.1. Introduction

The appearance of the *Archaeologiae* saw Burnet become the subject of increased attention and marked the beginning of the “Burnet controversy” which lasted from its publication until the first decade of the eighteenth century. It should be noted here that many historians define the controversy rather differently as beginning essentially with the publication of the *Theory*'s first volume and consider the pre-*Archaeologiae* attacks of Croft and Warren to have been part of it. Marjorie Nicolson, Rhoda Rappaport, and Kerry Magruder, for example, discuss these works under the head of the Burnet controversy.¹ Michael Macklem, too, in his list of contributions to the controversy, includes these early attacks.² Yet as I discussed at the beginning of the previous chapter, the general opinion of Burnet's theory at this earlier time was largely positive, and the relatively few attacks published before the *Archaeologiae* hardly warrant the title of “controversy”. Macklem's list is in fact highly illustrative of this, for if we discount works by Burnet himself, only seven of the remaining twenty-nine titles were written before the *Archaeologiae*.³ One of these is Newton's letter to Burnet which, though characterised by Macklem as purely critical, was largely sympathetic and part of what is better described as a cordial exchange of letters than anything controversial. Another is a 1686 paper by Edmond Halley which has nothing at all to do with either Burnet or the *Theory*.⁴ This takes the total

¹ Nicolson (1959), 225-70; Rappaport (1997), 139-49; Magruder (2009), 55-62.

² Macklem (1958), 97-9.

³ Macklem (1958), 97-8.

⁴ See Halley (1686). The papers in which Halley does engage in the debate surrounding Burnet were read to the Royal Society in 1694 – that is, after the publication of the *Archaeologiae* – but not published until 1724 – see Halley (1724a); (1724b).

down to just five out of twenty-seven. Macklem's list, moreover, omits many post-*Archaeologiae* works involved in the controversy – several of these will be discussed below.⁵

The controversy has been well documented, historians having examined at length many of the major contributions to it in a variety of contexts.⁶ What is lacking, however, is a broad, concise, and comprehensive (that is, as comprehensive as is possible in the space of a single chapter of a PhD thesis) overview of the controversy, and this is what I aim to provide here. To this end, I discuss all the major contributions to the debate as well as some of the more minor ones and some which have been overlooked by historians. My approach here is broad-brushed, the aim being to give the reader an idea of the extent of the debate rather than discuss the numerous contributions in detail, something that would require much more space than I have here, and I refer the reader to more detailed discussion in secondary literature where such literature is available. The only exceptions here are two texts which I examine in some detail in the penultimate and final sections. The first is a manuscript in the Royal Society archives which has received almost no attention from historians and which is particularly important in that it contains an especially novel objection to Burnet's theory and elicited a reply from Burnet himself. The second is an apocalyptic work by Edward Waple which draws heavily on Burnet's theory of the Conflagration and illustrates nicely how the *Theory's* second volume was ultimately far less controversial than the first. The most important contributions to the controversy for our purposes are those of the Newtonians William Whiston and John Keill. The importance of Whiston's *New theory of the earth* lies in the extent to which it was influenced by Burnet, something which has not been sufficiently appreciated by historians. Keill's work is significant because it is the only post-*Archaeologiae* attack on Burnet to have elicited a published reply from him. It is also widely regarded to have brought the controversy to a close. These will be mentioned only briefly in this chapter and discussed extensively in the next two chapters.

⁵ Macklem does not list, for example, works by Nicholl, Witty, Edwards, Locke, and the Royal Society manuscript.

⁶ See, e.g., Collier (1934), 68-134; Nicolson (1959), 225-70; Kubrin (1968), 183-337; Levine (1977), 31-92; Force (1985), 32-62; Rappaport (1997), 139-49; Magruder (2009), 55-62; Lynall (2012), 50-88.

The chapter consists of six main sections. In the first section, I discuss the reception of the *Archaeologiae* and the main published attacks on the work that appeared in the 1690s and early 1700s. In section two, I turn my attention to the major attacks on the *Theory* that followed the publication of the *Archaeologiae*. In the third section, I attend to some alternative theories of the earth proposed during this time by some of Burnet's critics and to various authors' responses to these theories. Section four is dedicated to briefly discussing some works which were not primarily dedicated to Burnet or theories of the earth but in which discussion of these topics appears. In the fifth section I examine some unpublished writings on the subject. Many such writings exist, and so I limit my attention to the aforementioned Royal Society manuscript and to the correspondence of John Locke which, I argue, is illustrative of the general interest of late-seventeenth-century thinkers in Burnet and theories of the earth among authors who had little public involvement in the debate. Finally, section six is devoted to the reception of the *Theory's* second volume and the question of why this volume, unlike the first, did not elicit any significant controversy.

4.2. The reception of the *Archaeologiae*

Unlike the *Theory*, the *Archaeologiae* was immediately highly controversial. Facing heavy criticism, Burnet attempted to recant his views in a letter – probably written to his patron and Archbishop of Canterbury John Tillotson – pleading that “if I have expressed myself either in so crude or sharp a Manner, as to offend the wise and pious, I am willing that all such Passages should be looked upon as retracted”.⁷ He also wrote to his bookseller, requesting that the offensive parts be removed from future editions. Burnet had apparently been favoured by Tillotson as his successor as Archbishop. The controversy over the *Archaeologiae*, however, was such that when Tillotson died in 1694 and Burnet was considered for the Archbishopric, several Bishops intervened protesting that his ideas were too heterodox and another divine, the Latitudinarian Bishop of Lincoln Thomas Tennison, was appointed

⁷ Quoted in Kubrin (1968), 148.

instead. Shortly after this, Burnet was forced to resign as Clerk of the Closet and returned to his position at the Charterhouse.⁸

By this time, Burnet's name had become thoroughly associated with heterodoxy. This was largely due to the actions of the notorious deist and freethinker Charles Blount. As I noted in the previous chapter, Blount had earlier quoted Burnet alongside such heterodox thinkers as Thomas Hobbes and Baruch Spinoza in his controversial pamphlet *Miracles, no violation of the laws of nature*.⁹ In the year following the publication of the *Archaeologiae*, he published a collection of letters entitled *Oracles of reason* in which he included both a defence of Burnet and English translations of the *Archaeologiae*'s controversial chapters on the Hexameron and Paradise. Here Burnet's views were translated and defended alongside defences of pre-Adamism, Epicureanism, materialism, eternalism, and various other heretical ideas.¹⁰

The first published response to the *Archaeologiae* came from John Edwards, an Anglican clergyman and vocal opponent of the heliocentric system who in the opening chapter of the second volume of his 1693 book *A discourse concerning the authority, stile, and perfection of the books of the Old and New-Testament* launched a brief, polemical attack on Burnet in which he highlighted various dangers of departing too radically from the literal truth of the Mosaic history of the Creation and Paradise.¹¹ Especially troubling for Edwards was Burnet's appeal to the interpretations of the Church Fathers in justifying his own, for where the Fathers had indeed allegorised certain passages, they had paired their allegorical readings with historical ones.¹² Burnet, on the other hand, had claimed explicitly and unambiguously that there was no truth whatsoever in the Mosaic history, that it was merely a fable designed to deceive the Jews. While Edwards allowed that the Sacred writers

⁸ Kubrin (1968), 145-50.

⁹ Blount (1683), 30.

¹⁰ Blount (1693). For discussion of Blount's *Oracles*, see Hudson (2009), 67-75.

¹¹ Edwards (1693), 33-42.

¹² Edwards (1693), 37-8.

sometimes accommodate their teachings to the limited capacities and mistaken apprehensions of their audience, Burnet had in his view stretched the principle too far in denying the truth of what was clearly intended as a *history* of the formation of the earth and the first humans.¹³

A more substantial and considered response to the *Archaeologiae* appeared three years later in the first volume of the theologian and Rector of Selsey William Nicholls' *Conference with a theist*, a three-part dialogue in which a character named Philologus presents Nicholls' mouthpiece Credentius with various heterodox arguments which are promptly confuted by the latter. Parts two and three of this volume deal with the Creation and Fall and consist almost entirely of Philologus advancing precisely the same arguments that Burnet had put forward in the *Archaeologiae* concerning the apparent absurdity in a literal reading of Genesis and Credentius removing the various difficulties in order to maintain such a reading.¹⁴ On the creation of Eve from Adam's rib, for example, Philologus repeats almost verbatim Burnet's argument in the *Archaeologiae*, noting, for instance, the difficulty of Adam either being deformed in the beginning or maimed following the creation of Eve and the insufficient quantity of matter in a single rib.¹⁵ Against Philologus – and ultimately Burnet – Credentius replies that had Adam lacked a rib following Eve's creation, then God could have furnished him with another. Neither did his having an additional rib in the beginning imply that he was deformed, for the rib was not superfluous but necessary for the creation of Eve.¹⁶ As to the problem regarding matter, Credentius appeals to the creation of plants from seeds: "if you will be pleased to think but of an Acorn, or Mustard-seed", he tells Philologus, "you will never use that Argument more".¹⁷

A similar approach to the *Archaeologiae* was taken by John Witty in his 1705 work *An essay towards a vindication of the vulgar exposition of the Mosaic history of the fall of Adam*. Witty's *Essay*

¹³ Edwards (1693), 33-5.

¹⁴ Nicholls (1696), 95-265.

¹⁵ Nicholls (1696), 165-7.

¹⁶ Nicholls (1696), 167-9.

¹⁷ Nicholls (1696), 169.

is not a dialogue like Nicholls' *Conference* but consists of a series of letters. It also has a narrower remit in that it deals only with the Fall and not the Creation and discusses fewer issues and does so in greater depth. The work is nevertheless very similar in that it consists principally of Witty introducing specific objections to the literal interpretation of Genesis 3 and answering those objections in order to defend that interpretation. Like Nicholls, the objections Witty introduces are taken primarily from the *Archaeologiae*, and the answers that he gives are the largely same.¹⁸ In answering Burnet's objections concerning Eve's dialogue with the serpent, for example, both authors insist that the serpent was the devil, and both cite the same passages of Scripture in support of their claim and against Burnet's assertion that there is no scriptural support for this interpretation.¹⁹

The primary motivation for these authors' responses to the *Archaeologiae* was the appearance of Burnet's chapters on the Creation and Paradise in English translation and the defence of Burnet in Blount's *Oracles*. Edwards even went so far as to attribute Blount's death that year to his having promoted Burnet's views: "a remarkable Example of the Divine Justice!", he noted,

on the bold Gentleman who lately englished that part of the Doctor's Book which derides the 3^d Chapter of *Genesis*... I wish the ingenious Theorist would seriously reflect upon it, and learn thence to make Sport with the Bible no more.²⁰

All three authors acknowledged that Burnet had not intended to attack revealed religion.²¹ Ultimately, however, his work, and in particular these chapters of the *Archaeologiae*, was being employed by deists and atheists for precisely this purpose. While both chapters were problematic, the one concerning Paradise, and specifically the part that dealt with the Fall, was especially pernicious, for as Edwards and Witty both argued, if the Mosaic history of the Fall in Genesis 3 is not literally true, then

¹⁸ Witty (1705b).

¹⁹ Nicholls (1696), 194-203; Witty (1705b), 111-18.

²⁰ Edwards (1693), 39-40.

²¹ Edwards (1693), 40; Nicholls (1696), preface; Witty (1705b), 2-3.

the Redemption and coming of Christ, that is, the very foundation of the Christian religion, will be undermined.²²

The two “englished” chapters of Burnet’s *Archaeologiae* were certainly not the most heterodox part of Blount’s *Oracles*. As I noted above, the work contained several more dangerous ideas. What set the chapters of the *Archaeologiae* apart from the rest of the work was not so much their content but the status of their author. Other views promoted by Blount were taken chiefly from philosophers. In contrast, Burnet was an Anglican clergyman, and high profile one, possibly even in line to become the next Archbishop of Canterbury. His position in the church thus gave his views on Genesis a level of authority which could be highly damaging in the hands of freethinkers who sought to discredit revealed religion. “This *Theorist*”, wrote Edwards,

is become much more pleasing to them [atheists and deists] than Mr. *Hobbs*. This *new Archaeologist* is far more taking than the *Leviathan*, because he nips the Bible more closely, and also because he is not (as the other) a Layman, but a professed Divine, and that of the Church of *England*. This makes his Enterprize so acceptable to these Men; for now they have a *Clergyman* to vouch them; they have the Warranty of a *Churchman*.²³

4.3. Attacks on the *Theory*

As controversial as the text undoubtedly was, the number of published replies to the *Archaeologiae* was relatively small compared with those directed primarily at the *Theory*. Crucially, the controversy surrounding the *Archaeologiae* drew renewed attention to the *Theory*. The text also alerted readers to the *Theory*’s implications for revealed religion, implications which were not readily apparent in the *Theory* itself. As a result, the number of replies to the *Theory* that appeared from 1692 onwards far eclipsed the number produced during the decade that followed its publication. Additionally, the focus of the debate shifted away from scriptural issues and toward more philosophical concerns. Earlier

²² Edwards (1693), 35-6; Witty (1705b), preface, 5-15.

²³ Edwards (1693), 37.

critics like Croft and Warren were most concerned with the former. In replying to these critics in the *Review*, the responses to Warren, and the *Archaeologiae*, Burnet had made it clear his theory did indeed contradict certain passages of Scripture and argued that these passages should not be understood in their literal sense. Pointing out its incompatibility with Scripture therefore became a far less effective way of attacking it, since it had become clear to all that Burnet was prepared to deny the truth of these passages of Scripture in order to defend it. While the theory's conflict with Scripture was still discussed and was still one of the main reasons for the attacks, it was no longer the main focus of them. Rather, authors turned their attention to its philosophical problems. This approach which typified post-*Archaeologiae* attacks on the theory and the motivation for this approach are summed up nicely by Keill. "THERE are two sort of Arguments", he writes in the conclusion to his devastating attack on Burnet,

that may be brought against the Theory, the one depends only on the principles of Reason and Philosophy, and the other on the Authority of the writings of *Moses*: but these which might be gathered from *Moses* would be of no force against the Theorist; since he denies the truth of his narrations, which he imagines to be invented by that excellent Lawgiver to please and amuse the Jews: I have therefore in this Treatise only made use of Arguments which are drawn from Philosophy, which he cannot refuse to admit since he appeals to them, for the Truth of his own Hypothesis.²⁴

These post-*Archaeologiae* philosophical objections to the theory fell essentially into two categories. The first of these was concerned with *final* causes. These objections pointed to evidence of design in the present earth, the purpose being to undermine Burnet's view that the earth's present features are the result of accidental changes brought about at the Deluge and that the antediluvian earth was of a different form. The second kind of objection concerned *efficient* causes. These took issue with the particular processes that Burnet had proposed for the Creation and Deluge and attempted to show that the causes to which Burnet attributed these events were insufficient to bring

²⁴ Keill (1698), 170.

about their purported effects. An early example of the first kind of objection was the final sermon of philologist and classical scholar Richard Bentley's 1692 Boyle Lectures, delivered in December of that year and published the following year. Though not explicitly framed as an attack on Burnet, it is clear from the content of the sermon that the theory was Bentley's principal target. The overall aim of the sermon was to prove the existence of God from the form and situation of the earth. Bentley's method was to consider various facts about the earth and to imagine the kind of situation that would obtain if things were different than they are. If, given these counterfactual conditions, our situation would be worse, then it could be concluded that God designed the earth *in its present state* for the purpose of supporting life.²⁵

After briefly considering the earth's distance from the sun and its orbit and diurnal rotation, Bentley devoted the larger share of his sermon to those features of the earth that Burnet had claimed manifested no evidence of divine contrivance and had attributed instead to the dissolution of the crust at the Deluge. Against Burnet, Bentley listed numerous advantages of the present earth's oblique situation relative to the ecliptic and various geological phenomena, arguing that, had the earth been in its antediluvian state according to the theory, then human life would be greatly impoverished.²⁶ The implication for Burnet's theory was that the earth was designed by God in its present state, and that the antediluvian earth's form and situation were therefore no different from those of the present earth.

This same implication was stated more explicitly against the theory by Edwards in his 1696 book *A demonstration of the existence and providence of God, from the contemplation of the visible structure of the greater and the lesser world*. Edwards, having as we have seen already attacked the *Archaeologiae* three years earlier, took aim in this work at the *Theory*, arguing that evidence of design in the oblique course of the sun (Edwards, recall, subscribed to a geocentric model of the universe)

²⁵ Bentley (1693), 8-10.

²⁶ Bentley (1693), 20-42. For further discussion of Bentley's attack on Burnet, see Ogden (1947), 148-9; Nicolson (1959), 256-62; Kubrin (1968), 219-33.

and in the earth's mountains and seas clearly refutes Burnet's view that the antediluvian earth lacked these characteristics.²⁷

Other replies to the *Theory* placed greater emphasis on efficient causes. In his 1697 book *The abyssinian philosophy confuted*, the Scottish author Robert St Clair questioned Burnet's account of the Creation. He argued that after the heavier matter and fluid had subsided there would not have been enough matter in the air to form the crust. Even if there *was* sufficient matter, the right angle of the axis would surely prevent the heat of the sun from consolidating the crust at the poles. At the very least, then, the crust would have hardened at the equator long before the polar regions which would have disrupted its continuity, causing the equatorial region to sink and the softer polar regions to rise.²⁸ St Clair also translated into English the Italian physician Bernardino Ramazzini's *Of the wonderful springs of Modena* in which Ramazzini had claimed that Burnet's theory was not original but in fact revived, and was likely derived from, an ancient "abyssinian" myth, an observation from which St Clair derived the title of his book.²⁹

Another author who took issue with Burnet's account of the Creation was the Oxford theologian Samuel Parker. In his essay "The foundations of Dr. Burnet's theory of the earth", a dialogue between "Philaethes" and "Burnetianus" published in 1700, Parker questioned Burnet's assumption that the chaos was a fluid mass, arguing that if instead it was simply a mass of atoms, then the parts of the chaos would attach together in larger masses, creating a mountainous surface rather than Burnet's uniform one. Even if the chaos *was* fluid, he added further, echoing Newton's earlier suggestions about the origin of mountains in his correspondence with Burnet, heat from the central fire would cause chemical reactions in the fluid, resulting in both vacuities and inequalities. Thus,

²⁷ Edwards (1696), 51-116, 137-82.

²⁸ St Clair (1697), preface.

²⁹ St Clair (1697), 87-103. For discussion of St Clair and Ramazzini in relation to Burnet and the controversy, see Ito (1987), 306-7; Rappaport (1997), 145-6.

Burnet's claim that the antediluvian earth was of a different form from the present, the main foundation of his theory, was undermined.³⁰

The two most substantial replies to the *Theory* to be published during the 1690s employed a combination of arguments concerning both final and efficient causes. The most significant and ultimately damaging of these was Keill's 1698 work *An examination of Dr. Burnet's theory of the earth*, which I shall discuss at length in the final chapter. A similar work and the first book-length attack on the *Theory* to appear after the *Archaeologiae* was the Somerset naturalist John Beaumont's *Considerations on a book, entituled the theory of the earth*, published in 1693. In this book, Beaumont examined the first two books of the *Theory* in their entirety, discussing and confuting each chapter in turn. Against Burnet's account of the Creation, he argued following Newton and anticipating Parker that chemical "ferments" in a fluid chaos would produce mountains.³¹ To his explanation of the Deluge, he replied that the sun's heat could not penetrate the abyss, pointing out that the temperature in caves does not vary with the seasons.³² To the purported change in the earth's axis at the Deluge, he noted that the mass of the earth's surface is extremely small relative to the size of the earth and that such a minor change would therefore be insufficient to alter the planet's posture.³³ And against the supposed differences between the antediluvian and present earth he pointed at length to the numerous advantages of the latter's characteristics and the various deleterious effects that would result from their absence.³⁴ He also dedicated considerable space to casting doubt on the evidentiary value of Burnet's frequent appeals to ancient learning, stressing that "every trifling ungrounded Opinion is not to be lookt upon as a Tradition".³⁵

³⁰ Parker (1700), 3-15.

³¹ Beaumont (1693), 23-30.

³² Beaumont (1693), 33-44.

³³ Beaumont (1693), 79-80.

³⁴ Beaumont (1693), 56-60, 68-71, 80-8.

³⁵ Beaumont (1693), 166. For further discussion of Beaumont's *Considerations*, see Collier (1934), 89-91; Kubrin (1968), 213-9; Ito (1987), 306-10.

4.4. New theories and their opponents

Both Keill and Beaumont maintained that the Creation and Deluge were wholly miraculous and as such were not amenable to philosophical explanation.³⁶ Other critics of Burnet proposed alternative philosophical theories of the earth. Some focussed predominantly on the Deluge. John Woodward, professor of physic at Gresham College, published his *Essay toward a natural history of the earth* in 1695. Woodward contended that at the Deluge, after the water had risen from the abyss and covered the earth, God suspended gravity. This caused all inorganic matter to disintegrate and mix with the water, reducing the earth to a great mass of fluid. Following the Deluge, the particles of matter descended in order of their specific gravity, forming the present earth's strata. Originally horizontal, the strata were uplifted and depressed to form mountains and valleys. Plants and animals suspended in the fluid also descended according to their specific gravity and became petrified in the strata. That they did not disintegrate along with the rest of the earth's matter Woodward attributed to their being held together by fibres rather than attraction as is the case with inorganic matter.³⁷

Though Woodward did not give an account of the Creation, he did discuss at length the antediluvian earth and the differences between it and the present earth. Against Burnet, he argued on many of the same grounds detailed above that the earth before the Deluge had seas, mountains, metals, and minerals, and that its axis was oblique and not perpendicular to the ecliptic.³⁸ He also advanced several arguments on the basis of fossils. That the antediluvian earth had seas and that antediluvian seas were of similar proportions to those on the present earth, for example, was evinced in his view by the numerous fossilised remains of marine animals found in the strata which were evidently suspended in it during its dissolution at the Deluge.³⁹

³⁶ Beaumont (1693), 7-8, 26, 44-6, 110-12, 169-86; (1694); Keill (1698), 10-11, 19, 31-3.

³⁷ Woodward (1695), 71-114.

³⁸ Woodward (1695), 242-77.

³⁹ Woodward (1695), 249-55. For discussion of Woodward's *Essay*, see Collier (1934), 125-34; Levine (1977), 18-47; Rappaport (1997), 149-72; Poole (2010), 63-8.

Another attempt at an alternative philosophical explication of the Deluge was published the following year by Archibald Lovell, a pensioner of the Charterhouse where Burnet was Master. Dedicated to the governors of the Charterhouse in the hope of their protection from the “Censure and Mallice” of the Master, Lovell’s essay *A summary of material heads which may be enlarged and improved into a compleat answer to Dr. Burnet’s theory of the earth* was as its title makes clear presented primarily as a response to Burnet rather than an alternative theory.⁴⁰ His principal concern about the theory, echoing to an extent that of Edwards and Witty regarding the *Archaeologiae*, was that in making the earth paradisiacal until the Deluge rather than the Fall, Burnet had undermined the doctrine of Original Sin and with it the Redemption.⁴¹ To confute Burnet, Lovell attempted to show that the Deluge could be accounted for without either the supposition that the antediluvian earth was of a radically different form or recourse to miraculous intervention from God. To this end, he proposed that the Deluge was caused by the earth’s bodies of water and air being broken up into their constituent particles and blended together into a single body of fluid thinner than water and sufficiently vast to submerge the entire surface. That such a mixture of air and water could occur from purely natural processes he argued was evident from his own observations of tropical storms at sea in which the sea and air appeared to coalesce with one another.⁴²

Other theorists focussed not only on the Deluge but emulated Burnet’s attempt to trace the entire history of the earth. The first to do so in the years following the publication of the *Archaeologiae* was the prominent naturalist and theologian John Ray. Ray’s 1693 book *Three physico-theological discourses* was essentially a heavily revised and retitled second edition of his *Miscellaneous discourses concerning the dissolution and changes of the world*, a work published the previous year and which focussed primarily on the Conflagration but also included two relatively brief “digressions” on the

⁴⁰ Lovell (1696), dedication.

⁴¹ Lovell (1696), 24-5.

⁴² Lovell (1696), 8-12.

Creation and Deluge.⁴³ The *Three physico-theological discourses* was Ray's attempt at a more complete account of the history of the earth and allotted roughly equal space to the three events and dealt with them in chronological order.⁴⁴

Ray was largely circumspect about the specific causes of biblical events, preferring to propose and consider various hypotheses rather than set down a single theory. The creation he explained in familiar terms of the chaos containing all the earth's matter and possibly also the seeds of plants and animals. Following its separation, the earth was covered entirely with water. The formation of mountains and seas he attributed to either the direct action of God or subterranean fires and earthquakes, arguing on the grounds of final causes that these and other geological phenomena have existed from the Creation.⁴⁵ For the Deluge, he considered a number of different possibilities. One was the transmutation of other elements into water, a hypothesis which he dismissed on scriptural grounds. Another was a change in the centre of the earth, bringing the continents nearer to the centre and causing them to be overflowed by the sea. This, he noted however, would only produce a partial deluge. What seems have been his preferred hypothesis was the idea that pressure exerted on the surface of the ocean may have forced subterranean waters with which the ocean was connected out onto the earth. He was characteristically noncommittal about whether this occurred via natural or miraculous causes.⁴⁶ His account of the Conflagration was decidedly Burnettian. Like Burnet's account, it was based primarily on St Peter's Third Epistle, chapter three and insisted on a total dissolution followed by a new earth.⁴⁷ As to the physical causes, after considering three other possibilities Ray

⁴³ Ray (1692).

⁴⁴ Ray (1693).

⁴⁵ Ray (1693), 1-46.

⁴⁶ Ray (1693), 70-124.

⁴⁷ Ray (1693), 236-58.

essentially followed Burnet in concluding that it would most likely be brought about by the earth drying out and the simultaneous eruption of volcanoes.⁴⁸

Two further theories appeared in 1696. The first of these was the Cambridge theologian and natural philosopher William Whiston's *New theory of the earth* which I shall discuss in detail in the next chapter.⁴⁹ The second was the natural philosopher and Rector of Ousby Thomas Robinson's *New observations on the natural history of this world of matter, and this world of life in two parts*, a text in which he expanded upon various ideas previously communicated in his short 1694 treatise *The anatomy of the earth*.⁵⁰ Robinson's theory owed much the alchemical theories of the earlier part of the century. He conceived of the chaos as a mass of particles in motion. The separation of the chaos and formation of the earth he conceptualised not in mechanical terms as we find in most other late-seventeenth-century theorists but in alchemical terms of the contrary "qualities" of different particles. The particles' "antipathies" caused them to react with and separate from one another and to unite together with "kindred" particles. The hot, volatile particles coalesced together in the centre. The antipathy between these hot, fiery particles and the cold and watery particles drove the latter to the periphery of the chaos where they formed a watery mist. Between the two formed a body of "intermediate", terrestrial particles, those which were neither hot nor cold but participated equally in both qualities. These particles then receded from one another according to their mutual antipathies and collected together in distinct sections.⁵¹

After the separation of the intermediate particles, the air separated from the water. The water sank down, covered the earth, pressed together the strata, and then drained into its pores. The draining of the water forced sections of strata upwards, making the surface unequal. The strata were

⁴⁸ Ray (1693), 277-330. The best discussion of Ray in connection with Burnet is Kubrin (1968), 183-208. For discussion of Ray's account of the Conflagration, see Poole (2010), 164-6.

⁴⁹ Whiston (1696b).

⁵⁰ Robinson (1694).

⁵¹ Robinson (1696), 22-5.

consolidated by either heat from the central fire or “juices of Salt and Nitre” depending on the kinds of matter of which they were composed. The draining of the water separated it into pure and salt water, the latter being too thick to pass through the pores and draining into channels to form the ocean and the former passing through the pores into subterraneous cavities. These subterraneous waters are continually rarefied by the central fire and emerge at the tops of mountains, forming springs and rivers.⁵²

As the title of his earlier treatise suggests, Robinson saw the earth as strongly analogous to an animal body. The cavities in the earth through which fresh water travels he referred to variously as “veins”, “lymph ducts”, etc. The water cycle was essentially like the circulation of the blood. Fresh water enters the pores and travels through the veins. It is rarefied by the heat of the central fire, emerges at the tops of mountains, flows back into the sea, separates from the salt water, re-enters the pores, and so on.⁵³ Robinson calculated that there are seventy-two oceans of water in the earth’s “veins”, more than enough to supply the Deluge which he attributed to a “Preternatural Fermentation and Dilation of those angry Volatiles” which constitute the central fire. This agitated the subterraneous waters such that they rose and erupted at various points on the surface, causing the sea to rise and cover the earth leaving only the tops of the highest mountains extant. This was what Moses had referred to as the “breaking up of the Fountains of the great Deep”. The forty days rain resulted from the vortex of the moon pushing against the earth’s atmosphere and condensing vapours in the air.⁵⁴

The Conflagration in Robinson’s theory would result, as Joseph Glanvill and George Rust had argued earlier in the century, from the central fire engulfing and consuming the earth. The earth, Robinson contended, is one third volatile, one third combustible, and one third liquid. Hence, it is in equilibrium, the liquid part preventing the combustible part being overcome by the volatile part. The earth’s liquid, however, provides a lifeforce or vital fluid to its various lifeforms. It is therefore being

⁵² Robinson (1696), 25-30.

⁵³ Robinson (1696), 28-30.

⁵⁴ Robinson (1696), 75-82.

continually used up, and this depletion will result in disequilibrium and the volatile matter, no longer checked by the liquid, will overcome the combustible part of the earth.⁵⁵

An important aim of these new theories was to provide an account of the earth's history that cohered better with Scripture than Burnet's theory. The most important biblical text here was the first chapter of Genesis. In this respect Burnet was very different from these later theorists, for where he disregarded entirely the Mosaic history of the Creation, they went to great lengths to reconcile their theories with it. Even those like Woodward who gave no account of the Creation but focussed mainly on the Deluge were at pains to give an account of the latter which did not contradict the Mosaic history of the former. A theory of the Deluge could not, for example, imply, as Burnet's did, that the antediluvian earth had no sea, since Moses mentions the creation of the sea, its bringing forth fish and fowl, and Adam's dominion over the fish in his history of the Creation.⁵⁶ Those like Whiston and Robinson who did give an account of the Creation went further, offering detailed explanations of how their accounts were to be reconciled with that of Moses. Whiston, as I will discuss in detail in the next chapter, prefaced his *New theory* with a lengthy dissertation of how the Mosaic history of the Creation was to be interpreted in order to show that his theory of the formation of the earth from the atmosphere of a comet did not contradict it.⁵⁷ Robinson, too, provided extensive exegesis of Genesis, introducing a threefold cabbala similar to – and likely influenced by – that of More, arguing that Moses wrote in three senses – literal, philosophical, and mystical – and explaining in detail how his account of the Creation cohered with the philosophical sense of Moses.⁵⁸

Notwithstanding their efforts to reconcile their theories with Genesis, these new theorists nevertheless took significant liberties with Scripture. Both Whiston and Robinson, for example, argued that the Days of Creation were not literally twenty-four-hour periods, the former claiming that the

⁵⁵ Robinson (1696), 169-78.

⁵⁶ Woodward (1695), 248-57.

⁵⁷ Whiston (1696a).

⁵⁸ Robinson (1696), Preface, Preliminary Postulata, 1-31.

diurnal rotation of the earth did not commence until the Fall and so days and years were the same, and the latter arguing that the days merely signified six distinct productions, the evening and morning of each day signifying the “Principles of Activity and Passivity” which were the efficient causes of these productions.⁵⁹ Woodward’s theory of the Deluge, too, while perhaps not obviously contradicting Genesis 1, appeared to many inconsistent with the Mosaic history of the Flood, which, among other things, did not seem to imply a total dissolution of all inorganic matter.

Owing in part to their inconsistency with Scripture and partly to more philosophical concerns, these new theories of the earth were scarcely less controversial than the old one, and almost immediately following their publication a number of objections appeared. The nature of these objections was slightly different from those directed at Burnet during this period. Firstly, as I have noted, objections to Burnet based on Scripture had become to a large extent redundant following his open rejection of the Mosaic history of the Creation and Paradise in the *Archaeologiae*. These other theorists, however, claimed to offer hypotheses which did not contradict Scripture in the ways Burnet’s did. Thus, pointing out the ways in which they, too, were inconsistent with Scripture would undermine their claims to have provided superior theories. Secondly, where, as I have argued above, philosophical arguments against Burnet focussed on both final and efficient causes, those advanced against other theorists focussed only on the latter, that is, on the processes the theorists had posited to explain the Deluge and other events. The reason for this was that, unlike Burnet, these theorists did not claim that the antediluvian earth was radically different from the present earth. The antediluvian earth in these theories had an oblique axis, mountains, seas, coastlines, caverns, and so on. There was thus no need for critics to point out evidence of design in these phenomena.

Arguably the most controversial of the new theories was that of Woodward, the first attack appearing the same year from an anonymous author known only as “L.P.”. In his *Two essays sent in a letter from Oxford to a nobleman in London*, L.P. sought, among other things, to cast doubt on the

⁵⁹ Robinson (1696), Preliminary Postulata; Whiston (1696b), 79-91.

organic origin of fossils which had been Woodward's principal source of evidence for a total dissolution of matter at the Deluge, arguing instead that what Woodward and others had claimed were the remains of living organisms were in fact productions of the earth that merely *resembled* such organisms.⁶⁰ L.P. also defended Burnet.⁶¹ This, however, served only to compound the latter's reputation as a heretic, since the author defended materialism and polygenism in the same work.⁶²

A further attack on Woodward appeared two years later from the Scottish physician and satirist John Arbuthnot, who in his *Examination of Dr. Woodward's account of the Deluge* ably and elegantly dismantled Woodward's theory in a manner that anticipated – and likely inspired in part – Keill's attack on Burnet the following year. Marshalling evidence from mechanics, hydrostatics, and empirical observations of strata, and producing mathematical proofs in support of his objections, Arbuthnot, in fewer than thirty pages, amply revealed the numerous weaknesses of Woodward's theory.⁶³ The amount of fluid on the earth at the time of the deluge, he calculated for example, would according to Woodward's hypothesis be merely $1/240^{\text{th}}$ of the particles solid matter, and so the mixture of the two could not have achieved any degree of fluidity.⁶⁴ The bodies of animals would not settle according to their specific gravity, since the descent of bodies in a medium depends not only on their specific gravity but also their size.⁶⁵ He also pointed out various ways in which Woodward's theory contradicted the Mosaic history of the Deluge. Moses, for instance, has the mountains standing throughout the Deluge, whereas Woodward has them being dissolved at the beginning and recreated at the end.⁶⁶ Arbuthnot would also be instrumental in some of the satirical treatments of Woodward

⁶⁰ L.P. (1695), 8-13, 40-7.

⁶¹ L.P. (1695), ii, 7.

⁶² L.P. (1695), ii-iii, 15-28.

⁶³ Arbuthnot (1697), 7-34.

⁶⁴ Arbuthnot (1697), 13-17.

⁶⁵ Arbuthnot (1697), 21-3.

⁶⁶ Arbuthnot (1697), 29-31.

and his theory that would appear during the last years of the seventeenth century and well into the eighteenth.⁶⁷

Whiston's *New theory* also generated its share of controversy. The year following its publication, Edwards, becoming now a serial antagonist to the theorists, published his *Brief remarks upon Mr. Whiston's new theory of the earth*, his principal concern being the reinterpretation of the Mosaic history of the Creation with which Whiston had prefaced his theory.⁶⁸ Whiston was also the main target of Witty's *Essay towards a vindication of the vulgar exposition of the Mosaic history of the creation of the world*, published just prior to his attack on Burnet's *Archaeologiae* in 1705 and adopting a similar approach in discussing and confuting in turn each of Whiston's reasons for departing – though it should be noted, nowhere near as radically as Burnet – from the literal interpretation of Genesis 1.⁶⁹ A rather different approach was taken by Keill who appended a number of more philosophical objections to Whiston's theory to his 1698 attack on Burnet.⁷⁰ I shall discuss this work in detail in the next chapter.

The above attacks provoked several further responses, both from the theorists themselves and from other authors looking to defend them. Burnet and Whiston replied to Keill shortly after the publication of the latter's *Examination*.⁷¹ Keill published another book in response to both authors in 1699, to which Whiston issued a further rejoinder the following year.⁷² (These texts, too, will be discussed in depth in the next two chapters.) In 1697, the recently elected FRS and Rector of Winchelsea John Harris published his *Remarks on some late papers relating to the universal deluge, and to the natural history of the earth*, a lengthy tract in which he defended Woodward against L.P.

⁶⁷ See Levine (1977), 114-29, 238-52.

⁶⁸ Edwards (1697).

⁶⁹ Witty (1705a).

⁷⁰ Keill (1698), 177-224.

⁷¹ Burnet (1699a); Whiston (1698).

⁷² Keill (1699); Whiston (1700).

and also attacked Robinson's *New observations*.⁷³ This provoked an irate response from the latter's namesake, the physician and naturalist Tancred Robinson whom Harris had accused of being L.P., a charge which Robinson denied though he admitted having assisted the author, whose name he did not disclose.⁷⁴ Robinson's letter elicited an equally ill-tempered reply from Harris the same year.⁷⁵

4.5. Peripheral comments

The works discussed above constitute the main body of published works which emerged in England in the wake of Burnet's *Archaeologiae* and which focussed either solely or primarily on either Burnet's work or those other theories of the earth which it inspired. There were numerous other works published during the same period, however, which were not primarily concerned with theories of the earth but in which authors commented on both Burnet and other theorists. Some of these works concerned topics obviously related in various ways to the theories. William Sherlock, Dean of St Paul's Cathedral and Chaplain to the King and Queen, clearly alluded to Burnet in his 1693 book *A discourse concerning the divine providence* when remarking on those "who profess to believe the Story [of the Deluge], [yet] think themselves much concerned to give a Philosophical Account of it, without having recourse to Miracles, and a Supernatural Power, which they say unbecomes Philosophers".⁷⁶ In opposition, he stressed that a Christian must *necessarily* admit miracles, and one who admits miracles should have no problem ascribing the Deluge to them, especially given that no satisfactory philosophical theory of the Deluge, that is, no theory which does not contradict Moses on various points, had been proposed.⁷⁷ William Nicholl, who as we have seen above tackled the *Archaeologiae* in the first volume of his *Conference with a theist*, digressed in the second volume – published in 1697 and primarily concerned with the issue of natural religion – into a discussion of the Deluge in which

⁷³ Harris (1697).

⁷⁴ Robinson (1697).

⁷⁵ Harris (1697).

⁷⁶ Sherlock (1693), 273-4.

⁷⁷ Sherlock (1693), 274-6.

Credentius voices several objections to Burnet's, Woodward's, and Whiston's theories before following Sherlock in defending a miraculous interpretation of the event.⁷⁸

Other works which discussed Burnet and other theories of the earth were devoted primarily to topics ostensibly unrelated to the subject. An especially curious example is the physician and millenarian Thomas Emes' 1698 work *A dialogue between alkali and acid containing divers philosophical and medicinal considerations*, a medical tract in which Emes objects to the view that alkali causes and acid cures disease and discusses Burnet's theory in relation to the question of whether or not there was salt on the antediluvian earth.⁷⁹ Perhaps the most significant work which was generally unrelated to the topic but which discussed it and even had some influence on the debate was John Locke's 1693 book *Some thoughts concerning education*. In a section of the work devoted to educating children in natural philosophy, Locke suggested that the Deluge was brought about by God altering the earth's centre of gravity, claiming that this would "more easily account for *Noah's Flood*, than any *Hypothesis* yet made use of to solve it".⁸⁰ To the anticipated objection that he was appealing to a miraculous power rather than natural causes, he offered the characteristically Newtonian reply that his proposed cause was "a thing as intelligible as gravity it self", having argued on the previous page that gravity is "impossible to be explained by any natural Operation of Matter or any other Law of Motion, but the positive Will of a Superiour Being, so ordering it".⁸¹ Locke also intimated that he had designs to compose a theory of the Deluge himself, stating that he was "reserving to a fitter opportunity, a fuller explication of this *Hypothesis*, and the application of it to all the Parts of the Deluge and any Difficulties can be supposed in the History of the Flood as recorded in the Bible".⁸² Locke's brief conjecture caught the attention of Woodward, who alluded to it – unfavourably – twice in his *Essay* and, according to Alexander Beresford in a letter written to Locke in 1695, wrote but never

⁷⁸ Nicholl (1697), 183-218.

⁷⁹ Emes (1698), 98-9.

⁸⁰ Locke (1693), 229.

⁸¹ Locke (1693), 228-9.

⁸² Locke (1693), 229.

published a tract in which he discussed Locke's view in depth and argued that an alteration of the earth's centre of gravity would cause only a partial deluge.⁸³

4.6. Unpublished remarks

As well as the above published works, there are numerous unpublished writings relating to Burnet's theory and other late-seventeenth-century theories of the earth, and there were almost certainly more – and likely *many* more – written at the time which are no longer extant.⁸⁴ An especially intriguing example which I have transcribed and appended to this thesis and shall now discuss in some depth is a manuscript held at the Royal Society's archives entitled "A remark on a passage in Dr Burnet's *telluris theoria Sacra*", a three-page essay in which the author takes issue with Burnet's discussion of other planets, and in particular Saturn, in the final chapter of book one of his *Theory*.⁸⁵ There is no author name on the essay, but it was evidently sent to Burnet at the request of the Royal Society along with a letter – which is no longer extant – from the Astronomer Royal John Flamsteed, for Burnet replied to the essay in a letter to Flamsteed, thanking him and the Society for both the letter and the essay.⁸⁶ A copy of Burnet's reply to Flamsteed is extant and held in the Royal Greenwich Observatory Archives at Cambridge University Library and reprinted in the second volume of Flamsteed's correspondence.⁸⁷ Burnet's letter to Flamsteed is dated 6th December 1693 and Burnet states that he received Flamsteed's letter on the 5th.⁸⁸ The editors of Flamsteed's correspondence date his letter to Burnet at some time in November or early December (before the 5th), and it is likely that the essay was written around the same time.⁸⁹

⁸³ Woodward (1695), 42-3, 45; Beresford to Locke, 24th March 1695, in de Beer (1978d), 299. For further discussion of Locke's remark in *Some thoughts concerning education* and Woodward's response to it, see Anstey (2011), 99-103; (2018), 41-2.

⁸⁴ For examples, see Kubrin (1968), 150 [note140]; Harrison (2000), 168; Poole (2010), 191.

⁸⁵ Anonymous (c.1693).

⁸⁶ Burnet to Flamsteed, 6th December 1693, in Forbes et al (2001), 498.

⁸⁷ Burnet to Flamsteed, 6th December 1693, 498-501.

⁸⁸ Burnet to Flamsteed, 6th December 1693, 498-9.

⁸⁹ Flamsteed to Burnet, November/December 1693, in Forbes et al (2001), 498.

It is not entirely clear who wrote the essay. Burnet refers in the letter to “[t]he learned Gentleman whose paper you where [sic] pleased to send me”, indicating that Flamsteed presented the essay as having been written by a third party.⁹⁰ The copy letter is heavily annotated with replies to various points Burnet had made in the letter, but as the editors of Flamsteed’s correspondence note, the letter was copied by two different amanuenses, so it is not possible to tell whether these annotations were made by Flamsteed or someone else.⁹¹ What *is* clear is that the annotations were written by the author of the essay, since the content of the essay is repeatedly referred to in the annotations in the first person, for example: “to favor him [Burnet] I suppose it [Saturn] perfectly spherical”.⁹²

Aside from some remarks by the editors of Flamsteed’s correspondence and a brief comment in a footnote from David Kubrin, neither the essay nor Burnet’s letter to Flamsteed has received any scholarly attention.⁹³ The editors of Flamsteed’s correspondence attribute the essay to Beaumont on the grounds that he attacked Burnet in his *Considerations* earlier that year.⁹⁴ Given, however, how widespread the opposition to Burnet was at this time, this seems like an insufficient reason to ascribe the essay specifically to Beaumont. Moreover, the author states in the annotations that he “hopes to make it plaine to him [Burnet] in another paper that our earth never had such a shell on it as he imagins; or if it had that shell could not be broke as he conceaves”, points which Beaumont had *already* argued at length in his *Considerations*.⁹⁵ Additionally, in the *Considerations*, Beaumont showed little interest in Burnet’s observations about other planets, stating after a brief discussion of Venus that he would

⁹⁰ Burnet to Flamsteed, 6th December 1693, 498.

⁹¹ Burnet to Flamsteed, 6th December 1693, 499-501.

⁹² Burnet to Flamsteed, 6th December 1693, 500.

⁹³ Burnet to Flamsteed, 6th December 1693, 500-1; Kubrin (1968), 150, note 140.

⁹⁴ Burnet to Flamsteed, 6th December 1693, 501.

⁹⁵ Burnet to Flamsteed, 6th December 1693, 500; Beaumont (1693), 20-48.

add [no] more... concerning the other Planets, being willing first to see whether we can establish any thing certain concerning this Planet we inhabit; concerning which we have much more hopes to arrive at some solid Knowledge, than of Bodies so remote from us; and I little pleasing my self in opining concerning things undeterminable by Man.⁹⁶

It is also worth noting that throughout the *Considerations* Beaumont refers to the English edition of Burnet's *Theory*, whereas the author of the essay, both in the essay itself and in the annotations on Burnet's letter to Flamsteed, consistently cites the Latin edition.

Kubrin suggests that the essay may have been written by Flamsteed himself.⁹⁷ This seems far more plausible. Indeed, it is highly likely. Although Flamsteed presented it to Burnet as having been written by someone else, it is of course possible that he did so deceptively. And the letter from Burnet being addressed to Flamsteed, it was certainly in his possession, and so was plausibly annotated by him. If this is the case, then given what we have observed above about the views in the essay being referred to in the annotations in the first person, Flamsteed was surely its author. Flamsteed, moreover, is known to have been unsympathetic to Burnet's theory and to have had designs to write against it. Hans Sloane reported in the second volume of his *A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Jamaica* that "Mr. Flamstead... said... that he would prove and make him [Burnet] know, that there went more to the making of the World than a well turn'd Period", the latter clause a reference to Burnet's masterful prose style.⁹⁸ Even more telling here in that it appears to connect Flamsteed more conclusively to this particular essay is an anonymous discussion of Sloane's book in Michel de la Roche's *New memoirs of literature* in which the author, when commenting on Sloane's note on Flamsteed, remarks that "[t]his passage puts me in mind that the same Mr. Flamsteed told me one day, that he was able to overthrow *Dr. Burnet's Theory of the Earth*

⁹⁶ Beaumont (1693), 68.

⁹⁷ Kubrin (1968), 150, note 140.

⁹⁸ Sloane (1725), xiii.

in one sheet of paper”.⁹⁹ The essay consists of three sheets, not one – four if we include the small illustration of Saturn on a separate sheet. Nevertheless, the sentiment that the theory can be decisively refuted in few words is there in Flamsteed’s purported remark, and as we shall see presently, this is something the author of the essay claimed to have done.

Turning at last to the content of the essay, its main focus was on Burnet’s hypothesis about the ring of Saturn. As I have discussed in chapter one, Burnet argued that Saturn’s ring formed during the planet’s deluge as a result of its crust breaking toward the poles and leaving the equatorial part intact and suspended above the surface of the planet.¹⁰⁰ “Tis a Pleasant Conjecture”, wrote the author, “& were it probable would almost force us to believe his Theory, but I fear our ingenious Author has pitcht upon it too hastily & yt when it is seriously considered it will rather wholly overthrow it”.¹⁰¹ One difficulty with the hypothesis was that it was highly unlikely that the crust would break so neatly as to leave intact such a flat, uniform section at the equator. Equally unlikely was its leaving intact a section so thin as to be invisible when the earth is in its plane.¹⁰²

What was most problematic about Burnet’s conjecture regarding Saturn, however, was the volume of the planet’s antediluvian crust which seemed to be entailed by Burnet’s hypothesis relative to the volume of its central sphere. If Saturn’s ring were formed from its crust, then the thickness of the crust at the equator must have been the same as the breadth of the ring. If the rest of the crust broke and fell into the abyss as Burnet had claimed, then the matter of the crust must now be contained within the planet’s central sphere.¹⁰³ The ratio of the diameter of the central sphere to the outer diameter of the ring, the author noted, is 4/9. And the ratio of the diameter of the central sphere to the inner diameter of the ring is 4/6.6. Thus, the ratio of the diameter of the sphere to the breadth

⁹⁹ Anonymous (1726), 98. For discussion of Flamsteed’s opposition to Burnet, see Willmoth (2007), 26-7.

¹⁰⁰ Burnet (1684), 168-70.

¹⁰¹ Anonymous (c.1693), 1.

¹⁰² Anonymous (c.1693), 1.

¹⁰³ Anonymous (c.1693), 1-2.

of the ring is $4/2.4$. The author favoured Burnet by supposing the planet in its antediluvian state to have been spherical rather than a prolate spheroid which his theory implied and which would make its crust thicker at the poles than at the equator and therefore to contain more matter. Since the volume of a sphere is proportional to the cube of its diameter, the original volume of the crust could be calculated from the cube of the outer diameter of the ring minus the cube of the inner diameter of the ring: $729-287.5 = 441.5$. The volume of the central sphere, however, is only 64, and so on Burnet's hypothesis the central sphere must now contain a quantity of matter nearly seven times its volume.¹⁰⁴

In his letter to Flamsteed, Burnet noted first that he had never claimed that all planets in their antediluvian state took the form of a prolate spheroid. As to the uniformity of Saturn's ring, he argued that this in fact favours his hypothesis, since it indicates that the ring was part of an originally uniform crust. The thinness of the ring he claimed was of little consequence, for we cannot know what kind of matter it is composed of or indeed how thin it is at such distance.¹⁰⁵ And regarding the quantity of matter in the crust relative to the volume of the central sphere, he claimed that this cannot be calculated unless we know (a) the figure of the planet in its antediluvian state, (b) the depth of the crust, and (c) whether the crust was of equal depth throughout. "*Till these praeliminaries be determined*", he stressed, "no certain Judgment can be made of the effect, nor his [the author's] calculus be demonstrative".¹⁰⁶ He concluded the letter by emphasising that the author's claim to have refuted the theory was unwarranted:

For whatsoever becomes of this conjecture about Saturne, or howsoever he came into this unusual form, (*which I cannot beleive to have been Original*) it does not from thence follow that our Earth, which we know ris from a Chaos and fluid mas, *came immediately from that Chaos*, into that unequall and broken mountainous from [sic – he means to write "form"], that we now find it.¹⁰⁷

¹⁰⁴ Anonymous (c.1693), 2-4.

¹⁰⁵ Burnet to Flamsteed, 6th December 1693, 498-9.

¹⁰⁶ Burnet to Flamsteed, 6th December 1693, 499.

¹⁰⁷ Burnet to Flamsteed, 6th December 1693, 498-9.

What is most perhaps most remarkable about Burnet's letter to Flamsteed is just how weak his reply to this essay was compared with his earlier responses to Croft and Warren. Croft and Warren had challenged his theory primarily on the basis of theological and scriptural concerns. Burnet's superior ability in theology and biblical exegesis – aided by his remarkable knowledge of antiquity, both pagan and Judeo-Christian – enabled him to defend his theory very effectively – albeit controversially – against these authors. As will become increasingly apparent in the final chapter when we discuss Burnet's response to Keill, when the debate took a more philosophical turn, Burnet was far less well equipped to deal with the objections. Ironically, then, given Burnet's priority of reason and philosophy over Scripture and antiquity, it was the latter two in which he was better skilled. Furthermore, in the period between the publication of Burnet's *Theory* and the controversy of the 1690s, natural philosophy in England had undergone a radical shift away from the Cartesian natural philosophy in which Burnet was schooled and toward a Newtonian experimental *mathematical* natural philosophy. The essay on Saturn was highly illustrative of this shift and prefigured in important respects Keill's later attack on Burnet (as well as his attack on Whiston and also Arbuthnot's attack on Woodward) in advancing a mathematical argument against Burnet's hypothesis concerning Saturn.

Burnet's weakness was instantly recognised by the author of the essay, who in the annotations on the letter compared Burnet's defence of the hypothesis to that of "a Lawyer that pleads an ill cause".¹⁰⁸ Burnet, the author noted, had expressly claimed "that all the planets of our sky proceeded from chaos in approximately the same way, and had the same elementary regions, and the same structure or exterior orb of them built over an abyss".¹⁰⁹ Saturn, then, according to Burnet's theory, must in the beginning have taken the form of a prolate spheroid and therefore its crust must have been thicker at the poles than at the equator. Notwithstanding this, the author had favoured Burnet's

¹⁰⁸ Burnet to Flamsteed, 6th December 1693, 499.

¹⁰⁹ Burnet to Flamsteed, 6th December 1693, 499. The quotations from Burnet are written in Latin in the annotations and translated by the editors of Flamsteed's correspondence in the endnotes. The English translation of this quotation is on 501 [note 6].

hypothesis by supposing the planet to have been spherical and the crust therefore to have been the same depth throughout and also by not taking into account the matter of the central core and abyss which in reality would reduce the capacity of the central sphere to accommodate the matter of the crust. Despite these concessions, the mass of the crust was nevertheless nearly seven times the capacity of the central sphere. Thus, the author asserted, “there is no need of determining his [Burnet’s] new praeliminaries”.¹¹⁰ An additional argument not present in the original paper but advanced in the annotations to Burnet’s letter was the obvious point that if the earth’s crust had broken first at the equator due to the sun’s heat, then the equinoctial part of Saturn’s crust where the sun’s heat was greatest must also have been first to break and surely could not have remained intact. As Burnet had stressed in his *Theory*, “similar judgments should be made about similar things”.¹¹¹

Burnet was of course right in his assertion that the author’s claim to have “wholly overthrow[n]” his theory was unwarranted. As he noted in his letter, his conjecture about Saturn could be wrong and his theory of the earth correct. It was not the decisive refutation the author believed it to be. It was however, as I have noted, precisely the *kind* of mathematical objection that Burnet had difficulty dealing with and the kind of objection that would appear in abundance five years later in Keill’s *Examination*. Keill, however, as we shall see in detail in the final chapter, would focus his attack not merely on a peripheral conjecture as we find in this author, but on the core tenets of the theory. And his objections *would* come widely to be viewed as having successfully refuted it.

I have dwelled on the above manuscript for some time largely because it has not received the scholarly attention it deserves and because it is one of only two attacks on the *Theory* to have appeared following the publication of the *Archaeologiae* which are known to have elicited a response from Burnet himself – the other being Keill’s *Examination*. There are of course numerous other unpublished writings concerning Burnet and other theorists, many of which are to be found in various

¹¹⁰ Burnet to Flamsteed, 6th December 1693, 500.

¹¹¹ Burnet to Flamsteed, 6th December 1693, 500. English translation on 501, note 11.

authors' private correspondence. It is of course impossible in the space of this section to discuss all or even many of these writings. What I propose to do instead is focus on the correspondence of one author who had little publicly to do with the debate but who paid close attention to it and corresponded at some length about it with various acquaintances, since this illustrates just how prominent the debate was and the extent to which some of the most important thinkers of the period attended to it, even those who had little public involvement in it. The example I want to discuss is the correspondence of John Locke. As we have seen above, Locke's published output on theories of the earth amounted to less than a single page in his *Thoughts concerning education*. As Peter Anstey has discussed, however, Locke maintained an avid interest in the subject and paid close attention to the debate. He owned books by Burnet, Woodward, Whiston, Robinson, St Clair, Edwards, and Keill, and corresponded on the subject with a variety of acquaintances.¹¹²

We have seen Locke's early comments on Burnet's theory at the beginning of chapter four. Most likely revived by the controversy that was sparked by the publication of the *Archaeologiae*, Locke's and his correspondents' interest in theories of the earth spiked again in the 1690s. It was at this time of course that Locke made his brief comment on the Deluge in his *Thoughts concerning education*.¹¹³ This comment, and in particular Locke's intimation that he may produce a theory himself, appears to have excited a number of his acquaintances. The religious writer Benjamin Furly wrote to Locke the same year, abruptly asking "[w]hen shall we see your explication of the hypothesis by you mentiond concerning the Generall deluge?".¹¹⁴ More subtly, the Irish philosopher William Molyneux, in a letter to Locke written in 1696, noted that his comment appeared "to imply that you have some thoughts of Writing on that subject; it would be a mighty satisfaction to me to know from you the

¹¹² Anstey (2011), 97-103; (2018), 41-5.

¹¹³ Locke (1693), 229.

¹¹⁴ Furly to Locke, 21st/31st December 1693, in de Beer (1978c), 766.

certainty thereof".¹¹⁵ He also enquired as to "what the Opinion of the Ingenious is concerning Mr. Whiston's Book", which had been published earlier that year.¹¹⁶

In his reply early the following year, Locke evaded the first question but answered the second, noting that Whiston's theory had been well-received. His own praise for the book, however, was somewhat guarded and indicated that although he applauded Whiston's creativity and ingenuity he was not entirely convinced of his theory. "I think he is more to be admired", he wrote,

that he has lay'd down an hypothesis, whereby he has explain'd so many wonderful, and, before, unexplicable things in the great changes of this globe, than that some of them should not go easily down with some men, when the whole was entirely new to all. He is one of those sort of writers that I always fancy should be most esteem'd and encourag'd. I am always for the builders who bring some addition to our knowledge, or, at least, some new thing to our thoughts.¹¹⁷

A similar sentiment was communicated to Locke later that year by the Genevan theologian Jean Le Clerc. Le Clerc criticised Whiston for contradicting Moses. He also took issue with both Burnet's and Whiston's use of antiquity, arguing that the mere conjectures and poetic fictions of the ancients are not to be viewed as learned traditions and that the connections these authors had drawn between Sacred and pagan history were ungrounded. He nevertheless praised the theorists for their ingenuity, love of truth, and freedom of thought, qualities which he noted are rarely to be found among theologians.¹¹⁸

4.7. The reception of the second volume

Before concluding this chapter, it is important briefly to discuss the reception of the second volume of Burnet's *Theory*. As William Poole correctly observes, most of Burnet's contemporaries saw him

¹¹⁵ Molyneux to Locke, 26th September 1696, in de Beer (1978d), 702.

¹¹⁶ Molyneux to Locke, 26th September 1696, 702.

¹¹⁷ Locke to Molyneux, 22nd February 1697, in de Beer (1978e), 6.

¹¹⁸ Le Clerc to Locke, 7th/17th November 1697, in de Beer (1978e), 253-4. For more in-depth discussion of Locke's correspondence concerning Burnet and theories of the earth, see Anstey (2011), 97-103; (2018), 41-3.

primarily as a “world maker” and Flood maker”.¹¹⁹ Certainly this is true of the critics discussed above, most of whom paid little or no attention to the second volume. Modern historians have typically followed suit, with discussions of Burnet’s Creation, Deluge, and antediluvian earth far outnumbering those of his Conflagration and Millennium. This is both unsurprising and understandable in that it was the former and not the latter that received the larger share of his contemporaries’ attention and elicited so much controversy. As Poole rightly points out, however, Burnet was also a “world destroyer”. And for a brief period between the publication of the second volume in 1689 and the onset of the controversy over the first in 1692, it was this latter role that was most prominent.¹²⁰

Burnet’s second volume appears generally to have been well received among millenarian writers at the time. One such writer was the Anglican clergyman Drue Cressener, who had received a pre-publication manuscript of the volume in spring 1688 while writing his own millenarian tract *The judgments of God upon the Roman-Catholick Church from its first rigid laws for universal conformity to it unto its last end*. Cressener’s book was published the same year as the second part of the *Theory* and included a note from Burnet dated 25th March 1689 stating that “[t]his Treatise... was perused by me, to the Nineteenth Chapter of it, near a Year ago”.¹²¹ The reason for this note was that Cressener had made a remarkable prediction in the book about the Revolution of 1688-9 and enlisted Burnet and several others to attest to having read his prediction before the event.¹²² Having almost completed the work when he read Burnet’s manuscript, Cressener praised “the late Learned and Ingenious Discoveries about the future State of this Earth” which he had received from his “Honoured Friend, The Author of the New Theory of the Earth” and dedicated the penultimate chapter of his book to “communicat[ing] some of mine own Reflections in confirmation of what he has there advanced”.¹²³ Here he concurs with most of the principal points of Burnet’s theory. He agrees that the Millennium

¹¹⁹ Poole (2010), 159-60.

¹²⁰ Poole (2010), 160.

¹²¹ Cressener (1689), unnumbered page following the dedication.

¹²² Cressener (1689), unnumbered pages following the dedication.

¹²³ Cressener (1689), 288.

will take place on earth; that it will obtain not on this earth but on a new earth which will form after the Conflagration; that the New Jerusalem is to be coeval with the Millennium; that the martyred saints will be literally and physically resurrected on earth; that the Conflagration will commence in Italy; and that the early Church Fathers supported a literal interpretation of the Millennium.¹²⁴

Cressener is not entirely uncritical of Burnet, however, and disagrees with him on one very important point. Although he agrees that Antichrist is to be identified with the Catholic Church and that therefore the Conflagration must begin in Italy and is a single, continuous event culminating in the destruction of the earth and the formation of a new earth on which the Millennium will obtain, he contends that this destruction will be gradual and that there will be an intermediate state of the Church on the present earth in which Christ will reign but which is not to be identified with either the New Jerusalem or the Millennium. His main basis for this is the Book of Daniel which he interprets as implying that, after the destruction of the Papacy, other regions of the earth will remain for a period of time intact but will be free from the rule of Antichrist, a view on which he elaborates in another treatise published the following year.¹²⁵ He also believes this view of the Conflagration to be more consistent with the maxim that God exercises his judgements upon the earth primarily via natural causes, for on this principle, it is more plausible to expect the fire to spread gradually rather than instantaneously throughout the earth. Here, he rejects Burnet's appeal to the ministry of angels, wanting instead to maintain that the destruction of the earth at the Conflagration will result from purely natural causes as appeared to be the case in Burnet's account of the Deluge which in all other respects he had "made the great Parallel of the destruction of the World by Fire".¹²⁶

Another author who had evidently read a manuscript of Burnet's second volume was John Evelyn. Evelyn, who as we saw in the previous chapter had praised the first volume of the *Theory* in his letter to Samuel Pepys, was apparently no less impressed by the second. In 1688, he wrote –

¹²⁴ Cressener (1689), 288-301.

¹²⁵ Cressener (1689), 290-301; (1690), 67-128.

¹²⁶ Cressener (1689), 292.

though never published – an essay “Concerning the Millennium” in which he adopted all the central components of Burnet’s theory. The Millennium, he argued, stressing the non-radical nature of his interpretation, will not take place on this earth but “in that renewed Heaven & Earth” which will form after the present earth and its atmosphere are destroyed at the Conflagration – to which, following Burnet, he did not assign a date. The new earth which is to follow the Conflagration, “as that of the most ingenious author of the *New Theorie*”, will be entirely smooth and home to the thousand-year Kingdom of Christ which will be seated in the New Jerusalem.¹²⁷

The connections between Burnet’s and Cressener’s and Evelyn’s apocalyptic writings have been noted by a number of historians.¹²⁸ The most rigorous application of Burnet’s theory of the Conflagration and Millennium in late-seventeenth-century millenarian writing, however, appears to have gone unnoticed, or at least unacknowledged. I refer here to a work entitled *The Book of the Revelation paraphrased; with annotations on each chapter*, a five-hundred-page treatise abounding with references to Burnet, published in 1693 by Edward Waple, the vicar of St. Sepulchre’s in London.¹²⁹ The most interesting part of this work in connection with Burnet is Waple’s application of Burnet’s theory in interpreting the Seven Vials in chapters 15 and 16 of the Book of Revelation. The pouring of the Vials in chapter 16, Waple observes, appears to represent a series of preparatory and immediate causes of the burning of the world.¹³⁰ “Which Observation”, he notes, “is the more Remarkable, in that there is a very surprising Agreement betwixt the Vials thus interpreted, and the most ingenious *Hypothesis* of Dr. Burnet, concerning the gradual Dispositions to, and progress of the great Conflagration”.¹³¹ For Waple, the pouring of the Vials by angels are symbolic representations of

¹²⁷ Poole (2010), 162-3 – quotations from Evelyn on 163. Evelyn’s essay is also discussed in Jacob (1976), 138-40.

¹²⁸ See, e.g., Jacob and Lockwood (1972), 269-71; Johnston (2011), 207; Poole (2010), 162-3; Iliffe (2017), 301.

¹²⁹ Waple (1693). Waple refers to Burnet on 95, 98-9, 340-2, 344-50, 357-9, 402, 406-7, 435-6, 440, 468-71, 473, 475-6, and 482. Waple’s book has been discussed by Warren Johnston, but Johnston does not discuss Waple’s use of Burnet’s theory – see Johnston (2011a), 227, 235, 242; (2011b), 188, 193, 195.

¹³⁰ Waple (1693), 339-40.

¹³¹ Waple (1693), 340.

natural processes aided, as in Burnet's theory, by the ministry of angels. Also remarkable here is that Waple implements a distinctly Burnettian application of the principle of accommodation. These natural processes, he argues, are communicated in the way that they are in order to suit the capacities of the text's intended audience. "The *Philosophy of Scripture* being generally *Popular*, according to the Common, and Received Opinions of those to whom it was primarily written", he writes citing Burnet in a footnote,

these Vials must also be understood after the same manner. And the Preparations to the *general Fire* must be consequently conceived to be effected by fit and proper Natural Causes (but under the Ministry of the *Angels of each Vial*) hinted at only, and intimated by the *Types in the Old Testament*, to which each Vial alludes; and that after a *popular manner*, according to the common Sentiments of Mankind, but especially of the *Jews*, to whom the Scriptures were primarily written..¹³²

Waple proceeds to interpret each of the Seven Vials in accordance with Burnet's theory. The first Vial which is poured upon the earth in verse 2 represents the droughts which according to Burnet are to desiccate the earth and its plant life prior to the Conflagration.¹³³ The second Vial, poured into the sea and turning it "as the Blood of a Dead Man" in verse 3, refers to the reduction and consequent stagnation of the oceans resulting from the aforementioned drought which will render the water "clotty, thick, and glutinous" – like "[t]he Blood of a Man who has received a *deadly wound*, or of a *Carcase*" – and therefore pervious to fire¹³⁴. The pouring of the third Vial into the rivers represents a similar process, the rivers being dealt with after the sea in accordance with "the *Philosophy of Scripture*" and the common conceptions of the audience for whom it was written, according to which the rivers are supplied by the sea rather than vice-versa.¹³⁵ The fourth Vial, poured on the sun in verse 8, represents the angels in Burnet's theory intervening and increasing the sun's heat.¹³⁶ The fifth Vial

¹³² Waple (1693), 340.

¹³³ Waple (1693), 340-1.

¹³⁴ Waple (1693), 342.

¹³⁵ Waple (1693), 342.

¹³⁶ Waple (1693), 344-5.

being poured onto the seat of the Beast in verse 10 refers to the beginning of the Conflagration in Italy.¹³⁷ The pouring of the sixth Vial into the Euphrates represents the drying out of this river resulting from the drought and the increased heat of the sun and providing passage to the New Jerusalem for the resurrected Saints.¹³⁸ Finally, the seventh Vial is poured into the air in verse 17 and represents the “fiery meteors” in Burnet’s theory which are to result from the same natural/angelic causes.¹³⁹

In addition to his use of Burnet’s theory in interpreting the Seven Vials and his Burnettian application of the principle of accommodation, Waple adopts all the central tenets of Burnet’s theory of the Conflagration and Millennium and explicitly cites Burnet on every point. The earth and its atmosphere are to be totally destroyed, forming a second chaos out of which a new heavens and earth will form.¹⁴⁰ The new earth will be devoid of seas and mountains. This, he argues, is evident in chapter 16, verse 20 of Revelation – “*And every Island fled away, and the Mountains were not found*” – referring the reader to

Dr. Burnet..., whose ingenious *Hypothesis* gives great light to this place; according to which (as is here foretold) the *Mountains* are to be destroyed in the last place; and there are to be no *Islands*, because no *Sea*, in the *New Earth*; which is to be plain and level.¹⁴¹

The martyred saints will be physically resurrected and will reign on the new earth in the New Jerusalem where they will be free of illness, pain, and death.¹⁴² Waple also adopts Burnet’s interpretation of St Peter and his threefold (i.e., antediluvian, postdiluvian, and millennial) state of the earth.¹⁴³ And although he calculates that the Millennium will begin in 1772, he does not assign dates or times to

¹³⁷ Waple (1693), 346-7.

¹³⁸ Waple (1693), 348-50.

¹³⁹ Waple (1693), 357.

¹⁴⁰ Waple (1693), 468-9

¹⁴¹ Waple (1693), 359.

¹⁴² Waple (1693), 468-9, 473, 475-6, 478, 482.

¹⁴³ Waple (1693), 469-70.

either the Conflagration or the pouring of the Vials. Here, too, he explicitly cites “Dr. Burnet”, who, he notes,

very prudently admonishes us *not to be too positive, or presumtuous in our Conjectures about these Things; because if there be an invisible Hand, Divine, or Angelical, that touches the Springs and Wheels of Nature, it will not be easie for us to determine with Certainty, the Order of their Motions.*¹⁴⁴

Waple’s book was intended as a popular treatise, written for the general reader rather than the theologian or divine. Its purpose, Waple made clear in the subtitle, was to make the Book of Revelation “*plain to the meanest capacity*”. That a popular work aimed at the lay-reader could make such extensive and explicit use of the views promulgated by Burnet in the second volume of the *Theory* is testament to just how uncontroversial these views were at the time. A similar point has been made by Poole with regard to Evelyn, who sent his Burnettian essay on the Millennium to Flower Backhouse, the Countess of Clarendon and wife of Henry Hyde, the second Earl. That Evelyn could unabashedly share these apocalyptic speculations with the wife of one of his most influential royal patrons, Poole argues, “shows how open such speculations had become”.¹⁴⁵ Crucially, as I have discussed at length in chapter one, Burnet’s second volume was very much an expression of what was at the time mainstream moderate Anglican millenarianism. He sought to provide a physical theory of the Conflagration and Millennium which would vindicate a historicist interpretation of prophecy and a literal reading of the resurrection of the Saints and Kingdom of Christ on earth, but which at the same time could not be used as a pretext for political instability. This goal of providing a literal, historicist, but non-radical interpretation of the Apocalypse was shared by many late-seventeenth-century thinkers. Thus, while the first volume of the *Theory* was unorthodox, and much more visibly so following the publication of the *Archaeologiae*, the second volume was not, and therefore did not excite any significant controversy.

¹⁴⁴ Waple (1693), 357-8.

¹⁴⁵ Poole (2010), 162-3 – quotation from 163.

4.8. Conclusion

In her discussion of the Burnet controversy, Nicolson notes that a full bibliography of all the primary sources connected with the debate would be a useful resource for scholars.¹⁴⁶ Such a resource would indeed be extremely useful. Given the extent of the debate, however, a full bibliography would take a great deal of work to produce. In the above overview, I have detailed the major works produced in England, some of the more peripheral contributions, and a very small number of unpublished works written in connection with the controversy during the 1690s and early 1700s. There are many more works connected with the debate, however. As I have noted above, there are many more unpublished writings. There was also a substantial reaction to Burnet's and other English theories on the continent and many works produced there which I have not discussed.¹⁴⁷ Additionally, there were various literary works which satirised both Burnet's and other authors' theories which, due to space constraints, I have also been unable to examine.¹⁴⁸ Another issue is the question of when the controversy came to an end. I have treated it as ending in the early years of the eighteenth century when the number of publications debating these theories began to decline. Yet Burnet's theory, as well as Woodward's and Whiston's, continued to be discussed long into the eighteenth century, and so it is difficult to determine a precise cut-off point.¹⁴⁹ These observations show just how significant the controversy was and the extent to which it popularised thinking about the earth and its history. Also significant is that the controversy intersects in interesting ways with other important developments in late-seventeenth-century natural philosophy such as the emergence of Newtonianism, the "ancients and moderns" controversy, and debates about the shape of the earth, Cartesian vortices, occult qualities, final causes, and the possibility of a vacuum. These connections I

¹⁴⁶ Nicolson (1959), 233 [note 20].

¹⁴⁷ For examples, see Rappaport (1997), 139-72.

¹⁴⁸ See Levine (1977), 114-29; Lynall (2012), 50-88.

¹⁴⁹ See, e.g., Cockburn (1750), 49, 53-4, 119-20, 129, 173, 247-9, 256, 259, 308-12, 322-5, 332-4; Catcott (1768), 274-5, 135-6, 234-5; Goldsmith (1774), 21-33, 138-9; Whitehurst (1778), 69-71, 127.

shall explore in the final two chapters when I look in detail at the relationship between Burnet's theory and two prominent Newtonians.

5. Burnet and the Newtonians part one: Whiston's Newtonian-Burnettian synthesis

5.1. Introduction

The publication of the first and second volumes of Burnet's *Theory* bookended rather neatly one of the most momentous events in the history of science. This of course was the publication of Isaac Newton's *Philosophiae naturalis principia mathematica* in 1687. By the time of the publication of Burnet's *Archaeologiae* in 1692 and the ensuing controversy, Newton had gained a considerable number of followers and the Newtonian system of natural philosophy had largely replaced the Cartesian system which had prevailed in England during previous decades and on which Burnet had based much of his theory. Inevitably, then, the new Newtonian philosophy played a number of important roles in the controversy surrounding Burnet and his theory of the earth. The first Newtonian to become involved with Burnet, as I have discussed in previous chapters, was Newton himself in his correspondence with Burnet just prior to the publication of the *Theory*. Newton's correspondence with Burnet, of course, predated the *Principia* by several years and as such contained only a nascent form of Newtonianism. Nevertheless, as will become apparent in this chapter, the views espoused by Newton in this correspondence would become during the 1690s an important part of Newtonian thinking and would play a significant role in the debate over the history of the earth.

The first of Newton's disciples to become involved in the debate during the 1690s was Richard Bentley, whose attack on Burnet in his final Boyle Lecture in 1692 I have discussed in the previous chapter. The next Newtonian involvement came from Edmond Halley, who had played midwife in the publication of Newton's *Principia* the previous decade.¹ In a paper delivered to the Royal Society in December 1694, Halley briefly criticised Burnet's theory "as jarring as much with the Physical

¹ For Halley's role in the publication of the *Principia*, see Westfall (1980), 402-68; Cook (1991); (1998), 147-80.

Principles of Nature, as with the Holy Scriptures, which he has undertaken to reconcile” and proposed an alternative hypothesis for the Deluge, suggesting that it might have resulted from an interaction between the earth and a comet which caused a great agitation in the sea and drowned the earth and altered the landscape.² In another paper delivered the same month, Halley suggested that a similar interaction might have reduced a former world to a chaos, and that the present earth may have formed from this chaos.³ “[B]eing sensible that he might have adventured *ultra crepidam*; and apprehensive least by some unguarded Expression he might incur the Censure of the Sacred Order”, Halley opted not to publish his papers at the time but eventually allowed their publication in the *Philosophical Transactions* some three decades later in 1724.⁴

In these final two chapters, I want to discuss two rather more substantial Newtonian contributions to the Burnet controversy. The first of these is William Whiston’s 1696 work *A new theory of the earth*, the most comprehensive and arguably the most important alternative to Burnet’s theory to be published during the 1690s. The second is John Keill’s 1698 book *An examination of Dr. Burnet’s theory of the earth together with some remarks on Mr. Whiston’s new theory of the earth*, a work in which he attacked both Burnet and Whiston, eliciting responses from and subsequent debate with both theorists. Keill’s attack on and debate with Burnet will be the subject of the next chapter. In this chapter, I shall discuss Whiston’s *New theory*, its connection with Burnet, and Keill’s response to it and the subsequent debate between these two very different Newtonians. I have dedicated entire chapters to Whiston and Keill primarily because their work was more closely connected with Burnet than that of other authors involved in the debate. Keill’s book, as we shall see in detail in the next chapter, was the only attack on Burnet to be published after the *Archaeologiae* which provoked a published response from Burnet himself. It also played an important role in bringing the controversy to a close and was widely viewed as having decisively refuted both Burnet’s and Whiston’s theories.

² Halley (1724a), 120-3 – quotation from 120.

³ Halley (1724b), 123-4.

⁴ Halley (1724b), 125.

Whiston's connection with Burnet is rather less obvious. The two authors did not engage in any public debate. And although Whiston commented extensively on Burnet in his *New theory*, Burnet did not defend his theory against any of Whiston's objections and did not pass comment on Whiston's theory. Furthermore, as far as the historical record shows, there was no private communication between them. The two authors were nevertheless closely connected in important ways, and this is the main thing I intend to show in this chapter.

In his *New theory*, Whiston attempted to produce a comprehensive alternative to Burnet's Cartesian theory of the earth based on Newtonian mechanics and the newly discovered periodicity of comets.⁵ He argued that the earth formed from the atmosphere of a comet and has undergone or will undergo in the future a series of alterations at the Fall, Deluge, Conflagration, and final consummation resulting from various interactions with comets. This of course bears some resemblance to Halley's hypotheses, of which Whiston claims to have arrived at his theory independently.⁶ At the time of writing his *New theory*, Whiston was employed as Chaplain to the Bishop of Norwich John Moore and was a fellow of Clare Hall, Cambridge where he had received his BA and MA degrees in 1689 and 1693 respectively. His interest in earth history arose while studying for the former when he discovered Burnet's *Theory* and wrote about the work as part of his examination. Not long after the publication of his *New theory*, Isaac Newton, having become Warden and then Master of the Royal Mint and apparently being impressed by Whiston's work, made Whiston his substitute in the Lucasian Chair of Mathematics and shortly afterwards secured the professorship for Whiston when he resigned to concentrate on his duties at the Mint. Whiston remained in the Chair until 1710 when he was banished from Cambridge for his anti-trinitarian views.⁷

⁵ Whiston takes the periodicity and elliptical orbits of comets to have been established by Newton – Whiston (1696b), 36.

⁶ See Whiston (1698), preface.

⁷ Snobelen (2009).

Whiston's *New theory* has received a fair amount of scholarly attention, the most in-depth and focussed analysis coming from James Force in his 1985 biography *William Whiston: Honest Newtonian*.⁸ The historical literature on Whiston's *New theory* has tended to emphasise two things: first, the differences between Whiston's and Burnet's theories of the earth; and second, the influence of Newton and Newtonianism on Whiston's theory. I do not wish to deny either of these. Certainly there were numerous important differences between the two theories. And the Newtonian influence in Whiston was undeniably very profound and hugely significant. Nevertheless, the emphasis on these two aspects of Whiston's theory has tended to obscure two equally important aspects of it. These are: (a) the remarkable *similarities* between Whiston and Burnet; and (b) the influence of *Burnet* on Whiston's theory. While these aspects of Whiston's theory have received *some* acknowledgement from historians, they have not been given any sustained attention or discussed in any depth. As a result, the prevailing picture of Whiston's theory is of a Newtonian *attack* on Burnet, or at least a Newtonian theory of the earth which bears little resemblance, and owes little, to Burnet's theory.

In this chapter, I want to propose a slightly different reading of Whiston which takes into account these neglected aspects of his theory. What emerges from such an analysis, I argue, is not so much a Newtonian *attack* on Burnet but rather a *synthesis* of *both* Newton's *and* Burnet's ideas concerning the earth, Scripture, theology, and antiquity. The chapter consists of five main sections. In section one, I give an overview of Whiston's theory of the earth and the principal motivation behind it which, I argue, was ultimately to produce a theory which cohered better with Scripture – and in particular the Mosaic Creation – than Burnet's and Woodward's. In the second section, I discuss the Newtonian influence on Whiston, paying particular attention to the similarities between Whiston's

⁸ Force (1985), 32-62. Force has also discussed Whiston's theory in his (1983); (1990), 144-52; (2004). Force discusses Whiston's theory primarily in relation to Newtonianism. For other important discussions of Whiston's theory and Newtonianism, see Kubrin (1968), 259-313; Harrison (1995); Snobelen (2004). For discussion of Whiston in relation to Burnet and the Burnet controversy, see, e.g., Nicolson (1959), 235-49; Collier (1968), 109-24; Rossi (1984), 66-9; Rappaport (1997), 153-4; Harrison (1998), 144-8; Magruder (2008), 458-66, 470-8; (2009), 58-62; Poole (2010), 68-74; Gaukroger (2010), 37-8. Whiston's theory is also prominent in historical work on early-modern theories of comets – see, e.g., Schechner (1997), 188-215; Heidarzadeh (2008), 129-35.

and Newton's interpretation of Genesis 1. In section three, I turn to the various Burnettian aspects of the *New theory*. I return to Newtonianism in the fourth section where I explicate Whiston's Newtonian conception of miracles and the distinction between the natural and the miraculous, comparing his views on these issues with those of Burnet. Finally, in section five, I examine Keill's attack on Whiston and the subsequent debate between these two authors.

5.2. A more sacred theory of the earth

In Whiston's *New theory*, the biblical chaos was the atmosphere of a comet which had left its eccentric orbit and adopted a circular orbit about the sun. The matter of the comet's atmosphere descended in much the same way as in Burnet's theory to form a solid crust on the surface of a body of fluid.⁹ The formation and characteristics of Whiston's primitive earth differed in important ways from Burnet's, however. First, the varying specific gravity of the solid matter resulted in it being immersed in different degrees in the fluid with unequal amounts of matter extant on the surface. Additionally, the order in which the matter settled on the surface of the fluid depended not only on its specific gravity but also on its place in the Chaos. And since the matter was distributed non-uniformly throughout the chaos, it became distributed likewise on the surface of the abyss. Hence, the surface of Whiston's primitive earth was uneven and mountainous.¹⁰ Second, when the matter of the chaos had subsided, the sun's heat raised vapours from water in the pores of the crust which condensed during the night, fell as rain, and filled the lower parts of the crust. Thus, Whiston's primitive earth was terraqueous.¹¹

Though both mountainous and terraqueous, the primitive state of the earth in Whiston's theory was nevertheless different in certain respects from later states just as it was in Burnet's. Perhaps most importantly, its orbit was *circular* rather than elliptical.¹² Its annual, circular motion about the sun, moreover, was its *only* motion. It had no diurnal rotation in the beginning. And owing

⁹ Whiston (1696b), 69-76, 217-64.

¹⁰ Whiston (1696b), 59-62.

¹¹ Whiston (1696b), 241-8.

¹² Whiston (1696b), 110-18.

to its lack of diurnal motion and the consequent absence of centrifugal force, the primitive earth was spherical rather than an oblate spheroid as Whiston believed the present earth to be.¹³ Finally, although it had lesser seas, the earth in the beginning had no ocean, for the inequality of the surface could not have been significant enough to create such a large channel and the sun's heat could not have raised sufficient vapour from the earth to fill such a channel.¹⁴

The earth's diurnal motion commenced at the Fall, the centrifugal force of the rotation changing the shape of the earth from a sphere to an oblate spheroid.¹⁵ Whiston does not assign a cause for the earth's diurnal motion in the first edition of his *New theory*, attributing it instead to "a miraculous Power".¹⁶ He ascribes it in the second edition to an oblique collision with a comet at some point on the earth's present equator.¹⁷ The Deluge resulted from another comet passing close to the earth in its ascent toward the sun. The involvement of the earth in the comet's atmosphere caused the biblical forty days rain and the gravitational attraction of the comet raised a double tide in the abyss which fractured the crust at various points and released the waters onto the surface – the breaking open of the fountains of the great deep (Fig. 1). The tide raised by the comet's passing altered the shape of the crust, forming the channel of the ocean. The attraction of the comet also accelerated the earth's projectile motion, thereby changing its orbit from circular to elliptical and lengthening the year by just over ten days.¹⁸ The Conflagration would be caused by another comet passing close to the earth. Unlike at the Deluge, this comet will approach the earth in its *descent* from the sun, and, having gathered intense heat at its perihelion, will scorch the earth creating a second chaos from which the new, millennial earth will form via much the same process as the first earth. The final consummation will be brought about by yet another comet colliding directly with the earth and

¹³ Whiston (1696b), 51-7, 79-104, 168-74, 265-82.

¹⁴ Whiston (1696b), 259-62, 298-300.

¹⁵ Whiston (1696b), 51-7, 79-104, 173-4, 274-82.

¹⁶ Whiston (1696b), 282.

¹⁷ Whiston (1708), 111-2. He argues that this comet did not cause a deluge because it had little or no atmosphere.

¹⁸ Whiston (1696b), 123-54, 187-208, 300-68.

diverting it from its current, moderate elliptical path into an eccentric orbit, thereby turning it back into a comet.¹⁹

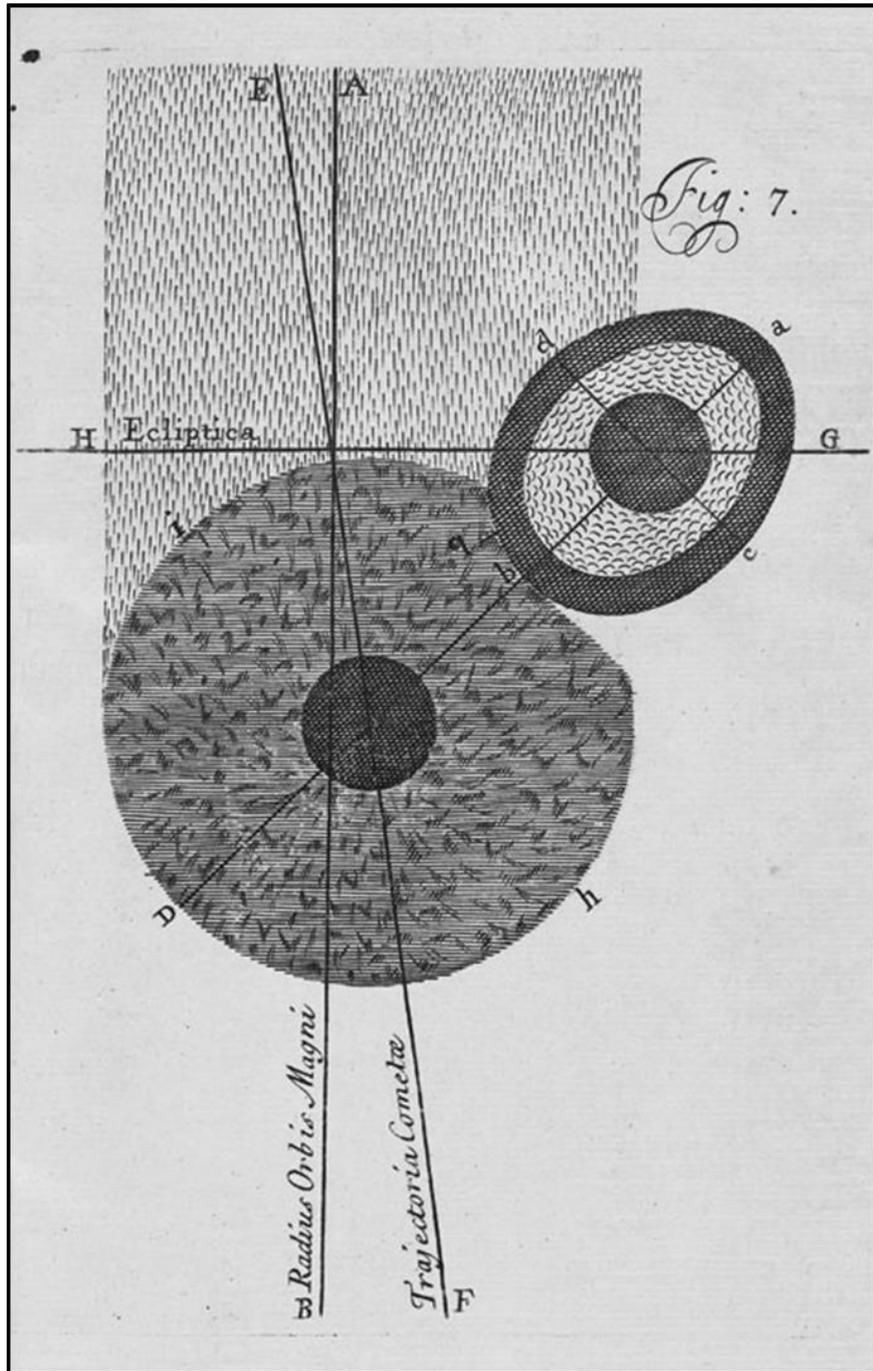


Fig. 1

¹⁹ Whiston (1696b), 209-15, 368-78.

As with other theorists writing in the 1690s, the central aim of Whiston's theory was to provide an account of the earth's history which cohered better with Scripture than that of Burnet. It was to this end that Whiston prefaced the work with a tract nearly one hundred pages long entitled *A discourse concerning the nature, stile, and extent of the Mosaick history of the creation* in which he set out a complex and sophisticated exegesis of the first chapter of Genesis.²⁰ Whiston's interpretation of Genesis 1 consisted essentially of the following two key points. First, the Mosaic Creation of the world in six days pertains only to the earth and its atmosphere. It does not include the celestial heavens which were created before the earth, and importantly, it does not include the creation of the *matter* but only the *form* of the earth, its formation *as a habitable world*, the matter having been created *ex nihilo* prior to the six days.²¹ Second, the Mosaic history is not a *philosophical* account of the formation of the earth. Neither, however, is it false as Burnet had alleged. Rather, it is a *true* account of the various changes that the earth underwent during the six days of creation, *told from the perspective of someone on earth*. In other words, it describes in common-sense terms what a hypothetical observer on the earth would have witnessed during those six days.²²

It was in the *New theory* itself that Whiston introduced the claim that the earth's diurnal motion commenced not at the Creation but at the Fall. This of course meant that the six days of Creation were not twenty-four-hour periods but entire years – though ten days shorter than our years due to the earth's circular orbit.²³ Whiston offered a variety of arguments for this view. He pointed out that the annual and diurnal motion of the earth are entirely independent of one another, and so it was perfectly rational to conceive of the former without the latter. He noted that the central spheres of comets do not appear to have a diurnal motion. Thus, the earth being a former comet, it was likely that it, too, had no such motion in the beginning.²⁴ The identification of days with years was equally

²⁰ Whiston (1696a), 1-94.

²¹ Whiston (1696a), 1-27.

²² Whiston (1696a), 3, 87.

²³ Whiston (1696b), 79-104, 133-54.

²⁴ Whiston (1696b), 79-80.

corroborated by Scripture and religious tradition. Moses and other sacred writers often use the terms “day” and “year” interchangeably. The Jews commemorate the Creation with periods of work and rest measured using both days and years, indicating that the periods of Creation were equally both.²⁵ It was implausible to suggest, moreover, that the work done on each of the six days could be completed in mere twenty-four-hour periods. Adam’s naming of the animals, for example, just one of many things completed on the sixth day, would require sufficient time for him to master language and to acquire knowledge of them.²⁶

The reading of the first chapter of Genesis proposed by Whiston in his *Discourse* together with his reinterpretation of the days of creation as years enabled him to construct a physical theory of the Creation which in his view aligned closely with the Mosaic History, something Burnet had singularly failed to do. The “creation” of light on the first day, he argued, was not literally its *creation* but the clearing of the atmosphere that resulted from the descent of the heavier fluid and solid matter and which enabled light to penetrate the chaos such that day could be distinguished from night.²⁷ The division of the waters on the second day referred to the raising of vapours from the air and earth which rendered the middle region of the earth clear, thereby separating the higher from the lower waters.²⁸ The division of land and sea on the third day was the vapours being condensed and falling as rain during the night (the first part of the third day) and filling the lower parts of the earth.²⁹ As with the creation of light on the first day, the “creation” of the sun, moon, and stars on the fourth day did not refer to the literal *creation* of these bodies but to the atmosphere becoming clear enough to render them visible from the earth.³⁰ Finally, the sun’s heat being intensified by the clearing of the atmosphere enabled the production of fish, fowl, and land animals from seeds in the sea and land on

²⁵ Whiston (1696b), 81-8.

²⁶ Whiston (1696b), 88-91.

²⁷ Whiston (1696b), 235-41.

²⁸ Whiston (1696b), 241-4.

²⁹ Whiston (1696b), 244-8.

³⁰ Whiston (1696b), 248-50.

the fifth and sixth days. The Creation of humans required the direct action of God, which in this instance consisted in Christ appearing in human form and creating Adam and Eve.³¹

Whiston's accounts of the Fall and Deluge were likewise designed to align more closely than Burnet's theory with the Mosaic History. Burnet was not Whiston's *only* target here, however. Woodward, whose *Essay* was published the year before Whiston's *New theory*, had also attempted to account for these events. And Whiston commented extensively on Woodward's theory, adopting his view of the distribution of plant and animal fossils but rejecting the central idea of a complete dissolution of inorganic matter at the Deluge.³² Turning back to Burnet, a major problem with his theory, as we have seen in previous chapters, was the earth's being paradisiacal until the *Deluge* rather than the Fall. In the *Theory*, Burnet ignored the Fall altogether. Worse, however, was his assertion in the *Archaeologiae* that there was no truth in the doctrine whatsoever. Woodward had not done much better. Like Burnet, he held that the earth was paradisiacal until the Deluge when the dissolution and rearrangement of matter rendered it barren and suitable to fallen creatures. Although he addressed the issue of the Fall, he claimed simply that its effects were delayed until the Deluge. Paradise had *in a sense* been "lost" at the Fall in that this was God's punishment for Adam's sin, but God granted mankind a stay of execution until the Deluge.³³ Difficulties with this position Woodward promised, as he did with virtually all of his theory's shortcomings, would be dealt with in that elusive "Larger Work" of which his *Essay* was "only the Module or Platform".³⁴

For Whiston, accounting for the Fall was at least as important as explaining the Deluge, for according to Scripture, the Fall was a more significant event and the difference between the state of innocence and the state of sin more pronounced than that between the antediluvian and

³¹ Whiston (1696b), 251-6.

³² Whiston (1696b), 73-9, 163-8, 181-208, 260-1, 275, 308-9, 343-56.

³³ Woodward (1695), 98-107.

³⁴ Woodward (1695), 107.

postdiluvian.³⁵ His hypothesis concerning the diurnal rotation accounted perfectly in his view for this difference. The longer days prior to the Fall explained the growth of animals from seeds implanted in the soil and sea by God, something which the earth has been unable to do since because eggs and embryos require a continuous temperature as opposed to the extremes of heat and cold that result from the earth's diurnal motion. Paradise, which Whiston argued – contra Burnet – was located in Mesopotamia, was on the ancient ecliptic and so especially warm and therefore peculiarly suited to the growth of animals, something which was impossible elsewhere on the earth. As with Burnet's perpendicular axis, the lack of diurnal rotation and consequent lack of an axis distinct from the ecliptic meant that there was no seasonal variation. And the sphericity of the earth ensured that the heat from the central fire was distributed equally throughout the earth – it also meant that the ecliptic was closer to the central fire than it was after the Fall, which contributed further to the generation of animal life.³⁶ What was perhaps *most* important about Whiston's theory of the Fall in his view was that he was the first theorist to give an account the event *at all*. Others, he observed, had tried to explain the Deluge. But despite its significance, none had yet attempted to account for the Fall. His *New theory*, therefore, was “the *first* attempt at an *Intire Theory*, or such an one as takes in *All* the great Mutations of the Earth”.³⁷

Turning now to causes of the Deluge, the aspects of Burnet's theory that Whiston considered most problematic were those which I discussed in chapter one: the timing and relative significance of the causes mentioned by Moses; the forty days rain being merely preparatory rather than the main cause of the Deluge as appears to be the case in the Mosaic account; and the forty days rain preceding the breaking open of the fountains of the abyss where in Moses it seems to begin at the same time. Once again, Woodward's theory fared little better, for as Whiston noted, he attributed the Deluge

³⁵ Whiston (1696b), 100-4.

³⁶ Whiston (1696b), 168-74, 265-82.

³⁷ Whiston (1696b), 103.

entirely to the waters of the abyss, taking no notice whatsoever of the forty days rain.³⁸ By ascribing the Deluge to the close passing of a comet, Whiston, in contrast, could make the rain that resulted from the involvement of the earth in the comet's atmosphere its primary cause. The onset of the rain and breaking open of the abyss, moreover, *both* occurred when the comet came close enough for the earth to be involved in its atmosphere and for the gravitational attraction to raise a double tide in the abyss and break the crust. Additionally, the rain being derived from the atmosphere of a comet resonated with such expressions as "the Windows, Flood-gates, or Cataracts of Heaven" which seem to imply a celestial rather than terrestrial source.³⁹ The apparent problem of there being no mention in the Mosaic history of a comet passing close to the earth was dealt with by Whiston's precise calculation of the earth's position at the time of the comet's passing, according to which the comet passed in the opposite hemisphere to where Noah and his family boarded the ark, meaning that no survivors of the Deluge could have witnessed it.⁴⁰

5.3. The Newtonian influence

As is well known, Whiston's *New theory* was heavily influenced by Newton in various ways.⁴¹ To begin with, as Peter Anstey has noted, Whiston presented his theory in the style of a mathematical treatise closely resembling Newton's *Principia*, the four books of the work entitled "Lemmata", "Hypotheses", "Phaenomena", and "Solutions".⁴² Whiston's theories of the Creation, Fall, Deluge, Conflagration, and final consummation were all derived principally from Newtonian mechanics and Newton's work on comets, both of which were explained in depth in the Lemmata, making this book of the *New theory* the first popular exposition of Newtonian natural philosophy to be published in English.⁴³ Also

³⁸ Whiston (1696b), 200.

³⁹ Whiston (1696b), 189.

⁴⁰ Whiston (1696b), 314.

⁴¹ See, e.g., Kubrin (1968), 259-313; Force (1985); (1983); (1990), 144-52; (2004); Harrison (1995); Snobelen (2004).

⁴² Anstey (2018), 42.

⁴³ Whiston (1686b), 1-67.

important is that, as Peter Harrison and James Force have discussed, Whiston adopted a distinctly Newtonian conception of miracles and of the relationship between miracles and the ordinary course of nature – I shall discuss this in more detail in the final two sections of the chapter.⁴⁴

As Force has argued at length, the Newtonian influence in Whiston's theory went beyond the above philosophical and theological issues and into exegetical territory.⁴⁵ As Force explains, the origins of Whiston's "Newtonian method of scriptural exegesis" are to be found in Newton's correspondence with Burnet just prior to the publication of the latter's *Theory*. In his letter to Burnet, Newton proposed "in germ", as Force puts it, the same interpretation of Genesis 1 that we find in greatly extended form fifteen years later in Whiston's *Discourse*.⁴⁶ Perhaps most significantly, Newton proposed precisely the same notion of the Mosaic history being an unphilosophical but true of the account of the Creation as it would have appeared to a hypothetical observer on the earth. "As to Moses", he wrote to Burnet, "I do not think his description of ye creation *either Philosophical or feigned*, but that he described *realities* in a language artificially adapted to ye sense of ye vulgar".⁴⁷ And later, "Moses accommodating his words to ye gross conceptions of ye vulgar, describes things much after ye manner as one of ye vulgar would have been inclined to do had he lived & seen ye whole series of wt Moses describes".⁴⁸ He also applied this interpretation to the days of Creation in ways that anticipated Whiston, arguing for example that the "creation" of the sun, moon, and stars refers to their *apparent* rather than actual Creation:

the heavens becoming clear for ye Sun in ye day & Moon & starrs in ye night to shine distinctly through them on the earth & so put on ye form of lights in ye firmament so that had men been now living on ye

⁴⁴ Harrison (1995), 537-52; Force (2004).

⁴⁵ Force (1985), 28-62.

⁴⁶ Force (1985), 50-2.

⁴⁷ Newton to Burnet, January 1680/1, in Turnbull (1960), 331 – emphasis added.

⁴⁸ Newton to Burnet, January 1680/1, 333.

earth to view ye process of ye creation they would have judged those lights created at this time, Moses here sets down their creation as if he had then lived & were now describing what he saw.⁴⁹

The other key point in Whiston's *Discourse*, that is, that the Creation narrative pertains only to the earth and its atmosphere and that other bodies are mentioned only insofar as they are relevant to the earth, is also present in Newton. The sun, moon, and stars, he told Burnet, are considered not "as they were physically bodies in themselves..., but only as they were lights to this earth".⁵⁰ Moses could not omit them, he continued, "without rendering his description of ye creation imperfect in ye judgment of ye vulgar". Yet,

[t]o describe them distinctly as they were in themselves would have made ye narration tedious & confused, amused ye vulgar & become a Philosopher more than a Prophet. He mentions them therefore only so far as ye vulgar had a notion of them, that is as they were phenomena in our firmament & describes their making only so far & at such a time as they were made such phenomena.⁵¹

Also significant here is that Newton proposed to Burnet the idea, later to be taken up by Whiston, that the earth's diurnal motion began after the six days of creation. And like Whiston at the time of writing the first edition of his *New theory*, Newton could not conceive of a sufficient natural cause of the earth's diurnal motion, ascribing instead to direct intervention from God. He also made the very same point about the generation of animals in the earth being better facilitated by a continuous heat rather than short successions of heat and cold in response to Burnet's objection that the long nights entailed by a lack of diurnal rotation would be disadvantageous to life on earth.⁵²

It is not known whether Whiston had seen Newton's correspondence with Burnet. Paolo Rossi suggests that this was probably the case, and the congruence between the two authors' views on the

⁴⁹ Newton to Burnet, January 1680/1, 333.

⁵⁰ Newton to Burnet, January 1680/1, 331.

⁵¹ Newton to Burnet, January 1680/1, 333.

⁵² Burnet to Newton, 13th January 1680/1, in Turnbull (1960), 325; Newton to Burnet, January 1680/1, 333-4.

above points indicates that he is very likely correct.⁵³ What we *do* know from what Whiston wrote in 1698 in the preface to his *Vindication of the new theory of the earth*, his first response to Keill, is that he sent a “a hasty imperfect draught” of his theory first to Bentley and then to Newton in 1695. He subsequently met with Newton twice to discuss the work, and “by the Hints and Directions I received from these Learned Persons, especially from the latter [Newton]..., much corrected, improved, and enlarged my Hypothesis”. Following this, he “brought it to an intire Systeme, and sent it to Cambridge for Mr. Newton's final Review and Correction”. It was only *after* this that he added his *Discourse* to the work.⁵⁴ Thus, whether or not Whiston saw Newton’s correspondence with Burnet, it is highly likely that, either in his comments on those two earlier drafts of the *New theory* or in his conversations and correspondence with Whiston, Newton communicated the above views on Genesis 1 and the length of the days of creation, and that this communication had a significant impact on the finished product.

5.4. The Burnettian influence

I will discuss the Newtonian influence on Whiston further in the next section. For now, it will suffice to refer the reader to the work of Force and others who have examined Whiston’s Newtonianism in greater depth than I am able to here.⁵⁵ What I want to turn my attention to instead is an aspect of Whiston’s theory that has received far less attention in the historical literature, namely, the extent to which it was influenced by *Burnet*. As I have noted above, Whiston’s *New theory* has been characterised by some as an *attack* on Burnet.⁵⁶ This is certainly by no means *false*. Whiston does criticise Burnet quite extensively at various points in the work.⁵⁷ And crucially, he was proposing an alternative theory of the earth because he believed Burnet’s to be inconsistent with both Scripture and philosophy. Nevertheless, this reading of Whiston has tended to obscure his equally extensive use

⁵³ Rossi (1984), 67.

⁵⁴ Whiston (1698), preface.

⁵⁵ Force (1983), 5-6; (1985); (1990), 144-52; (2004); Kubrin (1968), 259-313; Harrison (1995); Snobelen (2004).

⁵⁶ See, e.g., Force (1983), 5-6; (1985), 32-40; Magruder (2008), 475; (2009), 58.

⁵⁷ See, e.g., Whiston (1696a), 76-8; Whiston (1696b), 96-9, 166.

of decidedly Burnettian ideas, and his often-outspoken respect for, and admiration of, the original theorist of the earth.

The Burnettian influence in Whiston's theory is hardly surprising. As Whiston explained in the preface to the *Vindication*, having discovered "the New [Cartesian] Philosophy" upon arrival at Cambridge, he "fell into an exceeding liking of the main part of Dr. Burnet's *Theory of the Earth*; and thought my self never more pleas'd than in a repeated perusal of so ingenious and remarkable a Book".⁵⁸ He notes here that he wrote a defence of the work as part of his BA examination and continued to believe Burnet's theory until reading Newton's *Principia* showed it to be inconsistent with philosophy and further reflection on Scripture revealed it to be incompatible with that, too, though several parts remained plausible.⁵⁹ In his *Discourse*, moreover, Whiston confessed to having previously subscribed to the interpretation of Genesis controversially espoused by Burnet in the *Archaeologiae*.⁶⁰

It is in the *Discourse* that Whiston's admiration for Burnet is most evident. As Force notes, one of Whiston's principle aims in this work was to provide an interpretation of the first chapter of Genesis which occupied a middle ground between two equally unpalatable extremes. These two extremes were, first, the literalism of such divines as Edwards who adhered to a reading of Genesis which was inconsistent both with reason and philosophy and with the wisdom of God, and second, the fictional interpretation of those like Burnet, for whom the aforementioned inconsistencies warranted an outright denial of its truth.⁶¹ In Whiston's view, both extremes were equally pernicious. Yet it was only the latter position which seemed to attract censure, and this was problematic.⁶² Burnet, he stressed, was "a great and good man" who had attempted to give a rational account of the Creation and Deluge

⁵⁸ Whiston (1698), preface – emphasis original.

⁵⁹ Whiston (1698), preface.

⁶⁰ Whiston (1696a), 78.

⁶¹ Force (1985), 41-2, 46, 59-60.

⁶² Whiston (1696a), 61-4, 74-6, 78-9.

in order to remove the apparent unintelligibility of the events which had been conducive to irreligion. His intentions, therefore, were pious and highly laudable. And he had executed his design with considerable skill, employing the best system of natural philosophy known at the time and combining it with rigorous study of Scripture and ancient learning. Yes, he had erred. Yes, he had dishonoured both God and Moses. And his work had been used to attack revealed religion by the very freethinkers from whom he sought to protect it. Nevertheless, Burnet deserved no more censure than those like Edwards who, from equally pious motives, had harmed religion by setting Scripture at odds with reason and philosophy and with a rational conception of God.⁶³

As may already be evident to some extent in the foregoing paragraph, although Whiston disagreed with Burnet's interpretation of Genesis 1, his reasons for rejecting what he referred to as the "vulgar exposition", that is, the view that both the matter and form of the entire universe were literally created in six twenty-four-hour periods, were strikingly similar to the arguments advanced by Burnet in the *Archaeologiae*. Among other similarities, both authors noted that the common interpretation of the text was incompatible with the heliocentric system.⁶⁴ Both pointed out the absurdity of light being created before its source.⁶⁵ Both discussed in depth the disproportionate amount of work done on the different days, emphasising in particular that the earth alone, which is but an insignificant part of the Creation, is allotted four days whereas the sun and stars, which are vaster and nobler bodies, are apportioned merely a day between them.⁶⁶ The two authors also offered very similar arguments as to why Moses gave the account he did, both for instance arguing that Moses's mentioning the creation of the sun, moon, and stars and his subjugation of them to the earth were designed to discourage idolatry.⁶⁷ Also important is that Whiston, like Burnet, placed particular emphasis on the vulgar Creation being contrary not only to reason and philosophy but also to the

⁶³ Whiston (1696a), 76-9.

⁶⁴ Burnet (1736a [1692]), 28-30; Whiston (1696a), 38-41, 58-61.

⁶⁵ Burnet (1736a [1692]), 41-2; Whiston (1696a), 65-6.

⁶⁶ Burnet (1736a [1692]), 44-5; Whiston (1696a), 53-61.

⁶⁷ Burnet (1736a [1692]), 46; Whiston (1696a), 27-30.

wisdom of God, a point he expanded upon at length by introducing various analogies with human works which, if executed in such a disorderly manner, would reflect unfavourably on their authors.⁶⁸ Given the similarity of their arguments and Whiston's extensive study of Burnet's work, it is highly likely that the arguments against the literal interpretation of the Creation in the *Archaeologiae*, which Whiston confesses to having previously convinced him of Burnet's interpretation, were the principal source of his rejection of the "vulgar exposition" of Genesis 1.⁶⁹

Burnet's influence is evident also in various physical details of Whiston's theory. One of these is the earth's central fire, which Whiston explains in terms of the central sphere of the comet from which the earth formed having gathered and retained intense heat each time it passed close to the sun at perihelion.⁷⁰ Two others are mentioned by Whiston in the preface to the *Vindication* as being aspects of Burnet's theory to which he continued to subscribe after becoming convinced that the theory as a whole was untenable. These were (a) the formation of the earth on a body of fluid and (b) the perpetual equinox on the primitive earth, both of which, notwithstanding the theory's more general implausibility, "seem'd very reasonable, and very agreeable to the Accounts Sacred and Profane of those ancient Ages of the World".⁷¹ Perhaps the *most* Burnettian tenet of Whiston's theory was his view of the earth's formation. There were of course important differences between the two theories. Burnet's chaos was a former star, Whiston's the atmosphere of a comet. Burnet's crust was uniform and devoid of seas, whereas Whiston's was unequal and terraqueous. The two authors' conceptions of gravity, moreover, the main force at work in the earth's formation from a chaos, were very different, Burnet subscribing to the Cartesian theory of vortices and Whiston explicitly rejecting vortices and conceptualising gravity in Newtonian terms.⁷² Nevertheless, the formation of the earth in both cases results from matter descending as a result of its gravity to form a solid crust

⁶⁸ Burnet (1736a [1692]), 86-90; Whiston (1696a), 41-50.

⁶⁹ Whiston (1696a), 78.

⁷⁰ Whiston (1696b), 73-4.

⁷¹ Whiston (1698), preface.

⁷² Whiston (1696a), 7-8, 36.

encompassing a body of fluid. Indeed, the two theories were so similar in this respect that, when discussing the earth's formation, Whiston repeatedly refers the reader to the illustrations in *Burnet's* account as accurate representations of his own.⁷³

What is also important here is that the passages of Scripture to which Whiston appealed in support of his account of the formation and constitution of the earth were precisely the same as those invoked by Burnet. He notes, for example, "the Earth's being founded on the Seas, and established on the Floods" and "the stretching out the Earth above the Waters" in Psalms 24.2 and 136.6, "a Compass or Orb being set on the Face of the Deep" in Proverbs 8.27. Perhaps most tellingly, he appeals to St. Peter's Second Epistle, Chap. 3.5 and at one point even follows Burnet in translating the passage as "*consisting*" rather than "*standing*" out of the water.⁷⁴ This latter point is important. Kerry Magruder, as I discussed in chapter four, has argued that Burnet prioritised St. Peter over Moses, and abandoned the literal sense of the latter in order to preserve the literal sense of the former. As I argued there, Magruder's assessment must be amended to account for the fact that Burnet only abandoned the literal sense of Genesis 1-3, and the fact that he abandoned it not only to preserve the literal sense of St Peter but also the literal sense of Genesis 6-9. It is nevertheless true, though, that St Peter took precedence over the Mosaic account of the Creation and Deluge. This priority of St Peter, Magruder argues, was rejected by Burnet's opponents.⁷⁵ Elsewhere, Magruder discusses specifically *Whiston's* rejection of Burnet's priority of St Peter, which he suggests is especially evident in Whiston's use of Burnet's illustrations, for here he assigns Burnet's images of the different stages of the earth's formation to specific days of creation in order to reconcile his account with the Mosaic six-day Creation, something Burnet made no attempt to do.⁷⁶

⁷³ Whiston (1696b), 231, 239, 242, 250. For more in-depth discussion of Whiston's use of Burnet's illustrations, see Magruder (2009), 58-62.

⁷⁴ Whiston (1696a), 84; Whiston (1696b), 163-4.

⁷⁵ Magruder (2008), 478-81.

⁷⁶ Magruder (2009), 58-62.

Magruder's point is important and illustrates a significant difference between Whiston and Burnet. Unlike Burnet, Whiston maintains that the Mosaic history of the Creation, though unphilosophical, is nevertheless *true*. This forces him to reconcile his theory of the earth's formation with his interpretation of this text. It is important to emphasise, however, that Whiston does not reject the Petrine component of Burnet's theory. Indeed, where other critics of Burnet had argued that St Peter's Epistle should not be interpreted literally or is not relevant to the constitution of the earth, Whiston *follows* Burnet in arguing that the earth's "consisting out of the water" literally indicates that it formed on a body of fluid.⁷⁷ He also quotes from St. Peter when arguing that the Mosaic history of the Creation does not pertain to the wider universe. Here he rehearses Burnet's observation that St Peter restricts both the Deluge and Conflagration to the earth and its atmosphere and uses this observation – along with a passage from Hebrews – to argue that the same restriction must apply to the Creation.⁷⁸ He also follows Burnet in making St. Peter the main scriptural basis of his account of the Conflagration.⁷⁹ Thus, although he does not follow Burnet in abandoning the literal sense of the Mosaic Creation in favour of St Peter, he does not reject Burnet's interpretation of the latter. The difference rather is that where Burnet thinks the literal sense of the Mosaic Creation cannot be reconciled with St Peter, Whiston finds a way of making them cohere with one another.

Turning now to Whiston's primitive perpetual equinox, this too differs in certain respects from that of Burnet. What is perhaps most important here is the difference in *timing*. In Burnet, the perpetual equinox ends at the Deluge, whereas in Whiston it ends at the Fall, something he emphasised was more consistent with Scripture than Burnet's hypothesis.⁸⁰ The seasons become *less temperate* at the Deluge, yet this results not from any change in the earth's axis but from the heterogeneity of the air introduced by the comet's atmosphere and the earth's orbit becoming

⁷⁷ Whiston (1696a), 84; Whiston (1696b), 163-4.

⁷⁸ Whiston (1696a), 86-7.

⁷⁹ Whiston (1696b), 209-15.

⁸⁰ Whiston (1696b), 100-4.

elliptical as opposed to circular.⁸¹ The *cause* of the change from a perpetual equinox to seasonal variation in the two authors was also very different. In Burnet it is the disequilibrium introduced by the newly unequal surface of the earth which *shifts* the axis on which the globe was *already* rotating diurnally. In Whiston, it is the *commencement* of the earth's diurnal rotation, caused in the first edition by direct intervention from God and in the second by an oblique collision with a comet at some point on the present equator, which *gives* the earth an axis distinct from its ecliptic.

Notwithstanding the above differences, it is abundantly clear that the *idea* of a perpetual equinox on the primitive earth came from Burnet, for Whiston states this explicitly in the preface to the *Vindication*.⁸² This idea, moreover, appears also to have had a profound impact on *other* aspects of Whiston's theory. As he explains, the plausibility of a perpetual equinox together with the inadequacy of the cause to which Burnet had ascribed the obliquity of the present earth's axis had led him to consider whether the earth's obliquity might instead have been brought about by the gravitational attraction of a comet passing close to the earth. Around "November or December 1694", he calculated whether this hypothesis could account for the present earth's twenty-three-and-a-half-degree angle but determined that the attraction of a comet was not sufficient to effect such a change. The failed hypothesis, however, occasioned further consideration as to the possible effects of a comet passing near the earth. This resulted in a new hypothesis, which he then communicated to Bentley, that the involvement of the earth in a comet's atmosphere may have caused the Deluge. "These", he wrote, "were my first and crude thoughts of this matter; which tho' the particulars were but ill adjusted, and uncertain; yet gave me an eagerness of considering the matter farther, and occasion'd all the subsequent discoveries which are contain'd in the *New Theory*".⁸³

One of the main reasons for Whiston being sympathetic to Burnet's notion of a perpetual equinox on the primitive earth was that the view was, as Burnet had argued at length in the

⁸¹ Whiston (1696b), 287-94.

⁸² Whiston (1698), preface.

⁸³ Whiston (1698), preface.

Archaeologiae, corroborated by numerous ancient writings.⁸⁴ This close attention to antiquity was yet another distinctly Burnettian component of Whiston's theory. Whiston attended to precisely the same canon of ancient writings as Burnet, observed the same maxim of only appealing to the ancients if their views are corroborated by reason and Scripture, and, like Burnet, viewed his theory's ability to make sense of ostensibly obscure notions in ancient learning as one of its major strengths. On this latter point, Burnet's theory was an important point of reference in assessing the success of his own. The ancients' notions of a perpetual equinox and the ecliptic not being distinct from the equator, for example, were accounted for by both theories. Other ancient doctrines, however, were inconsistent with Burnet's theory but accommodated easily by his. Plato and Herodotus, for example, had related various ancient traditions concerning a former state of the earth in which the sun and other planets rose in the west and set in the east, something which could not be accounted for by Burnet's theory but which, Whiston pointed out, was fully explained by his hypothesis that the earth in the beginning had no diurnal motion.⁸⁵

As Magruder has argued, the theorists' and their opponents' shared canon of Scriptural and classical texts played an important role in enabling communication and debate between authors from very different disciplinary backgrounds.⁸⁶ This is certainly correct. In this controversy, we see divines such as Burnet and Robinson, naturalists like Woodward and Beaumont, and mathematicians like Whiston and Keill, authors not just from different disciplinary backgrounds but also using very different philosophical and theological frameworks, all bringing radically different perspectives on the history of the earth. Their main common ground was indeed as Magruder argues a body of sacred, pagan, and also early-Judeo-Christian texts. A significant component of this, I want to suggest, was the ability of this shared canon of ancient writings to provide an important point of comparison between competing theories, a way of measuring their relative success and the likelihood of their being true

⁸⁴ Whiston (1698), preface.

⁸⁵ Whiston (1696b), 91-5, 97-8.

⁸⁶ Magruder (2008), 451-8, 470-8, 484-6.

accounts of the earth's history. As I have noted above, Burnet took the ability of his theory to explain ostensibly obscure notions in Scripture and other ancient writings as important evidence of its truth, as instances of novel empirical success. We find the same kind of use of the same ancient texts in Whiston. He employs the same canon of texts and uses it in precisely the same way in order to show that his theory was better confirmed by antiquity than Burnet's and was therefore more likely to be correct. His theory, he believed, could account for all the same textual phenomena as Burnet's: the ancient chaos; the mundane egg; the perpetual equinox; the excerpts from the Psalms, Proverbs, and St Peter. Yet it could also explain many more besides and was therefore a superior theory.

The above notion of the sun's rising in the west and setting in the east was one example of an ancient doctrine which could be accounted for on Whiston's but not on Burnet's theory. But there were numerous others. An aspect of Whiston's theory that was especially successful in this regard was his hypothesis of the antediluvian earth's circular orbit and the change from a circular to an elliptical orbit at the Deluge. Conducting a brief survey of ancient astronomy, Whiston noted that the true length of the year was unknown for a long time following the Deluge. This indicated that the length of the year changed at this time. The postdiluvians clearly observed that the year was longer, for they lengthened it from 355 to 360 days, the latter number likely influenced by its correspondence with the degrees of a circle and an imagined correspondence with lunar years. This was later corrected with astronomical observations and lengthened to 365 – the Julian year. This lengthening of the year, he emphasised, could only be explained by his hypothesis of the attraction of the comet at the Deluge altering the earth's orbit and lengthening its period.⁸⁷

Another ancient puzzle that could be solved by the earth's circular orbit was the perplexing discrepancy between different translations of Scripture and ancient chronologies as to the length of time Noah was aboard the Ark. In the Hebrew Bible and in Hebrew chronologies, Noah was aboard the Ark for one year and ten days, whereas in the Greek *Septuagint* and in the chronology of Flavius

⁸⁷ Whiston (1696b), 134-8.

Josephus, he was aboard for one year. The clear solution, and the only way to reconcile the two, was to suppose that at the Deluge the year lengthened by ten days, and that the Hebrew bible and chronologies on the one hand and the *Septuagint* and Josephus on the other measured Noah's time on the Ark in antediluvian and postdiluvian years respectively. The lengthening of the year by ten days was of course what Whiston calculated as resulting from the acceleration of the earth caused by the passing of the comet. The ability to reconcile these two apparently conflicting accounts of Noah's time on the Ark, then, provided important confirmation of Whiston's hypothesis concerning the original circular orbit of the earth.⁸⁸

What is also noteworthy here about Whiston's view of the primitive earth's circular orbit is that it mirrors in interesting ways Burnet's notion of a symmetrical, uniform globe. As David Kubrin argues, although Whiston's insistence on symmetry was directed toward the earth's orbit rather than its geological features, it evinces a similar commitment to an orderly first creation that we find in Burnet.⁸⁹ I want to go further than Kubrin and suggest that this commitment was very likely *inherited* from Burnet. To begin with, the language used by Burnet and Whiston on this point is strikingly similar. "[A]ll nature's first motions and her first forms" writes Burnet, "are regular, and whatsoever is not so is but secondary, and the consequence of some degeneracy, or of some decay".⁹⁰ Likewise for Whiston, "[t]is most Philosophical, as well as most Pious, to ascribe only what appears wise, regular, uniform, and harmonious, to the First Cause..., but as to such things as may seem of another nature, to attribute them intirely to subsequent changes".⁹¹ Also very similar here are the two authors' arguments from final causes. For Burnet, as we saw in the second chapter, the earth was designed in such a way as to best serve its purpose of supporting life. The present earth's geological phenomena were ill-suited to this and therefore could not have been part of the first creation. While Whiston

⁸⁸ Whiston (1696b), 141-4.

⁸⁹ Kubrin (1968), 280-2.

⁹⁰ Burnet (1684), 154.

⁹¹ Whiston (1696b), 116.

disagreed with this point in relation to the present earth's geological phenomena, he advanced an almost identical argument concerning its orbit. The earth, he argued following Burnet, was clearly designed for habitation. All life on earth requires a particular quantity of the sun's heat and is therefore not well-adapted to a much greater or lesser quantity and so peculiarly suited to a circular orbit. The earth's orbit, he conceded, is only mildly elliptical and the effects of its varying proximity to the sun are therefore not especially sensible. Nevertheless, it is *suboptimal*, and hence cannot be, as Whiston put it,

the immediate effect of the Divine Power and Wisdom in the first frame of the World, when all things just coming out of the Creator's hands, must be allow'd to have been perfect in their kind, and exceeding good; when the rational Creatures being Pure and Innocent, the natural state of things was to be suited to them; and dispos'd agreeably to reason, proportion, and the convenience of the same unspotted and sinless Creatures.⁹²

The final point I want to emphasise about the influence of Burnet in Whiston's theory is Whiston's commitment to natural as opposed to miraculous causes. This central component of Burnet's theory Whiston adopts and sets down at the end of the *Discourse* as the second postulate of his *New theory*.⁹³ Force has characterised this aspect of Whiston's theory as Newtonian.⁹⁴ Certainly this was a view to which Newton subscribed, having stated in his correspondence with Burnet that "[w]here natural causes are at hand God uses them as instruments in his works".⁹⁵ And, as I shall discuss in more detail shortly, Whiston's distinction between the natural and the miraculous was decidedly Newtonian. However, given Burnet's continued emphasis on the priority of natural over miraculous causes both in his *Theory* and in subsequent work relating to it, it is likely that Whiston's commitment to explaining events in terms of natural processes was influenced at least as much by

⁹² Whiston (1696b), 111-13 – quotation from 113.

⁹³ Whiston (1696a), 95.

⁹⁴ Force (1985), 61-2.

⁹⁵ Newton to Burnet, January 1680/1, 334.

Burnet and almost certainly predates both his reading of the *Principia* and any communication he had with Newton.

Burnet's influence in this area is evident throughout Whiston's often-extensive discussion of this issue. Perhaps most salient here is the similarity between the two authors' emphasis on God's prescience and the synchronicity between the natural and moral world being more in keeping with his wisdom than any extraordinary intervention. Just as Burnet had argued with regard to the dissolution of the crust, Whiston stressed that God's contriving the world such that the comet would pass at precisely the correct proximity to the earth and would yield exactly the requisite quantity of water to drown the earth to the specific depth of fifteen cubits above the highest mountains and would do so at precisely the moment of man's maximal sinfulness was far greater evidence of his wisdom than his simply bringing about the event by divine fiat. "God's Praescience", he emphasised,

enables him to act after a more sublime manner; and by a constant Course of Nature, and Chain of Mechanical Causes, to do every thing so as it shall not be distinguishable from a particular Interposition of his Power, nor be otherwise than on such a particular Interposition wou'd have been brought to pass. He who has created all things, and given them their several Powers and Faculties, foresees the Effects of 'em all: At once looks through the intire Train of future Causes, Actions, and Events, and sees at what Periods, and in what manner twill be necessary and expedient to bring about any changes, bestow any Mercies, or inflict any Punishments on the World: Which being unquestionably true, 'tis evident he can as well provide and praedispose natural Causes for those Mutations, Mercies, or Judgments beforehand; he can as easily put the Machin into such Motions as shall, without a necessity of his mending or correcting it, correspond to all these foreseen Events or Action, as make way for such Alterations afterward by giving a random force to the whole: And when these two ways are equally possible, I need not say which is most agreeable to the Divine Perfections, and most worthy of God.⁹⁶

⁹⁶ Whiston (1696b), 360.

As the foregoing quotation makes clear, this argument in Whiston very closely resembles the parallel argument both in Burnet's *Theory* and in his debate with Warren – with which Whiston, having studied Burnet extensively at exactly the time of this debate, was surely familiar. And just as Burnet had repeatedly done in this debate, Whiston stressed that construing biblical events in terms of natural processes was not a *denial* but an *affirmation* of God's providence. "To assign *Physical* and *Mechanical* causes for the Deluge, or such mighty Judgments of God upon the Wicked", he emphasised echoing Burnet, "is so far from taking away the Divine Providence therein, that it supposes and demonstrates its Interest in a more Noble, Wise, and Divine manner than the bringing in a miraculous Power would do".⁹⁷

In many respects, Whiston takes this commitment to natural causes further than Burnet. Indeed, he even extends it to petitionary prayer. Prayers, he argues, are answered not by God intervening and violating the ordinary course of nature but by natural processes *themselves*. Essentially, God has divine foreknowledge of all our prayers and engineers natural causes so as to answer them in a way that appears indistinguishable from his particular intervention.⁹⁸ This greater commitment to natural causes is evident throughout the *New theory*. As I discussed in the second chapter, Burnet ascribed the protection of the Ark during the Deluge to the ministry of angels. He then gave angels an even more significant role in the Conflagration by having them organise and manipulate natural processes. Whiston, in contrast, is committed in his accounts of the Deluge and Conflagration (and also the Fall in the second edition) *solely* to natural causes. The Conflagration results purely from a comet passing close to the earth in its descent from the sun.⁹⁹ The commencement of the earth's diurnal motion at the Fall, too, which he initially attributes to miraculous intervention, eventually becomes the result of a comet striking the earth at its present equator.¹⁰⁰

⁹⁷ Whiston (1696b), 361.

⁹⁸ Whiston (1696b), 362-4.

⁹⁹ Whiston (1696b), 369-73.

¹⁰⁰ Whiston (1696b), 282; Whiston (1708), 111-2.

As to the protection of the Ark during the Deluge, this is rather more complicated, for here Whiston concocts a quite elaborate scenario – though one which he argues is entailed by his calculation of the time of the comet’s passing and its proximity to the earth – in order to avoid any miraculous intervention. As I have noted above, during the comet’s initial passing, the Ark was protected by being in the opposite hemisphere. To guard it from the storms and tumultuous waters of the Flood, it rested *on land* at the top of Caucasus, which at that time was most elevated point on earth due to the figure of the earth being distorted by the double tide in the abyss, and so the water there was shallow enough for the Ark to come to ground. These details, too, Whiston sees as remarkable examples of God’s prescience, more befitting his wisdom than Burnet’s angels. God, he argues, foresaw that Caucasus would be the most elevated point on the earth during the Deluge and had Noah build and board the ark in that specific location in light of this.¹⁰¹ Whiston, then, takes the commitment to natural causes further than Burnet, but he does so for the distinctly Burnettian reason that they are more in keeping with God’s wisdom than his particular intervention in the world.

5.5. Newtonian miracles and Burnettian motivations

I have argued above that Whiston is more committed to naturalistic explanations than Burnet. I now want to suggest that there is an important sense in which he is more committed to miracles *as well*. This is not as paradoxical as it initially sounds. Here we must remember Whiston’s Newtonian distinction between miracles and the ordinary course of nature. As Harrison has discussed in depth, for Whiston, as for Newton and other Newtonians such as Richard Bentley and Samuel Clarke, gravity requires continual intervention from God. This blurs the distinction somewhat between the natural and the miraculous.¹⁰² “‘Tis not very easy”, emphasises Whiston,

exactly to determine how far, and in what particulars, a supernatural or miraculous Interposition of the Divine Power is concern'd; and how far the Laws of Nature, or Mechanical Powers ought to be

¹⁰¹ Whiston (1696b), 310-26.

¹⁰² Harrison (1995), 537-52.

extended. Nay, indeed, 'tis difficult enough, in several instances, to determine what is the effect of a natural and ordinary, and what of a supernatural and extraordinary Providence. 'Tis now evident, That *Gravity*, the most mechanical Affection of Bodies, and which seems most natural, depends entirely on the constant and efficacious, and, if you will, the supernatural and miraculous Influence of Almighty God.¹⁰³

This construal of gravity as requiring a continual “supernatural and miraculous Influence of Almighty God” allows Whiston to maintain that the Deluge and other biblical events are *both* the result of natural causes *and* “the effect of the peculiar and extraordinary Providence of God”.¹⁰⁴ For, as he puts it,

[a]ll those powers of Attraction or Gravitation, &c. and those Laws of Motion by which these Bodies are capable of producing such Effects, are alike owing to the Divine Operation, Appointment, and Efficacy, *both in their primitive Impression, and continual Energy*; and so still the Effects themselves are to be ascrib'd to a Divine Original.¹⁰⁵

The Deluge, Conflagration, and so on, then, are in an important sense both natural *and* miraculous events, for although they are not contrary to the laws of nature and so are not miraculous in the traditional sense, their causes nevertheless require God’s direct intervention.

As Kubrin notes, Whiston’s Newtonian conception of gravity made his theory more theologically acceptable than Burnet’s.¹⁰⁶ To fully appreciate this point, it is instructive to imagine Whiston’s theory *without* this notion. In Whiston’s theory, interventions from God which seem contrary to or beyond the laws of nature – miracles in the traditional sense – occurred only in the very beginning, prior even to the six days of Creation. In Burnet, on the other hand, angels protect the Ark during the Deluge. They also intervene in nature to bring about the conflagration. And as I have argued

¹⁰³ Whiston (1696b), 218.

¹⁰⁴ Whiston (1696b), 357.

¹⁰⁵ Whiston (1696b), 357 [my italics].

¹⁰⁶ Kubrin (1968), 261-2.

in the second chapter, they seem to be involved in the formation of the earth at the Creation and in its dissolution at the Deluge. Although this is not *direct* intervention from God himself, the angels are carrying out God's commands. It is therefore a form of extraordinary providence which originates with God and occurs long after the Creation. Without his Newtonian conception of gravity, then, Whiston's theory appears decidedly deistic compared with Burnet's, since Burnet in this case would seem to allow more supernatural intervention in the world following the Creation. *With* his Newtonian conception of gravity, however, Whiston can give God a *constant, essential* role in nature, and so can escape the charge of deism more effectively than Burnet. Both authors share the view that God violating the laws of nature is contrary to the divine wisdom. Both want to avoid this state of affairs in their theories. They avoid it, however, in very different ways. Burnet wants to avoid *any* direct intervention from God, and so effectively rules it out by making any miraculous intervention the result of angels carrying out God's commands rather than God himself intervening. Whiston has no problem with God intervening directly in the world. Indeed, he sees it as *necessary* for maintaining the laws of nature. What he does *not* want is God *violating* the laws of nature. And since God is continually intervening in nature anyway, Whiston can maintain *both* God's direct involvement in biblical events *and* the view that God executes his design through natural causes and does not violate his own laws.

As will be apparent at various points in this chapter and as Harrison has correctly noted, Whiston, again in common with Newton and other Newtonians, *appears prima facie* to admit of *some* miracles in the traditional sense of violations of laws of nature or events which cannot be explained in naturalistic terms.¹⁰⁷ Indeed, in the *New theory*, he discusses, among other things, the creation of matter, the formation of animal and vegetable seeds, and the creation of humans as events which appear to be contrary to or to go beyond natural law and which seem to be inexplicable in terms of natural processes.¹⁰⁸ As Harrison argues, however, there is an important sense in which these miracles

¹⁰⁷ Harrison (1995), 545.

¹⁰⁸ Whiston (1696b), 221-30.

in Whiston are only inexplicable *from our limited perspective* and are *in principle* explainable in naturalistic terms. We lack the requisite knowledge of nature to explain them at present, and so we describe them as inexplicable, but the *possibility* or *potentiality* of their being explained is very much open.¹⁰⁹

Harrison illustrates the foregoing point with an example from Whiston's *Vindication*, but it is equally evident in the *New theory* itself.¹¹⁰ At the very end of the work, for example, one of Whiston's "corollaries from the whole" is that events in Scripture which *seem prima facie* to be inexplicable *given our present knowledge of the natural world* may, with progress in the sciences, prove *not* to be inexplicable.¹¹¹ From this, he draws a conclusion against Blount and others who had used the unintelligibility of biblical events to undermine the veracity of Scripture. The apparent inexplicability of biblical events, he argues, is no reason to deny the truth of Scripture, for these events may in fact be consistent with and explicable in terms of natural law and the seeming unintelligibility of the events merely a result of our imperfect knowledge of the natural world. He had shown this to be the case with the Creation, Fall, Deluge, Conflagration, and final consummation, and it would likely be the case with other biblical events, too. "The Measure of our present Knowledge", he emphasised,

ought not to be esteem'd the... Test of Truth; or to be oppos'd to the Accounts receiv'd from Profane Antiquity, much less to the inspir'd Writings. For notwithstanding that several Particulars relating to the Eldest Condition of the World, and its great *Catastrophe's*, examin'd and compar'd with so much Philosophy as was till lately known, were plainly unaccountable, and, naturally speaking, impossible; yet we see, now Nature is more fully, more certainly, and more substantially understood, that the same things approve themselves to be plain, easie, and rational.... 'Tis therefore Folly in the highest degree, to reject the Truth, or Divine Authority of the Holy Scriptures, because we cannot give our Minds particular Satisfaction as to the *manner*, nay or even *possibility* of some things therein asserted. Since

¹⁰⁹ Harrison (1995), 546-52.

¹¹⁰ Harrison (1995), 552.

¹¹¹ Whiston (1696b), 378-82.

we have seen so many of those things which seem'd the most incredible in the whole Bible, and gave the greatest Scruple and Scandal to *Philosophick* Minds, so fully and particularly attested, and next to demonstrated from certain Principles of *Astronomy* and *Natural Knowledge*; 'tis but reasonable to expect, in due time, a like Solution of the other Difficulties.¹¹²

The foregoing quotation strongly evinces what Harrison has stressed concerning the *subjectivity* of Whiston's conception of miracles, something we discussed in the second chapter. For Whiston and other Newtonians, miracles in Scripture are not *objectively* or *ontologically* distinct from the laws of nature. They merely *appear* so due to our limited knowledge of the world. They are *subjective* or *epistemic* miracles, "*miracles for us*", and are, at least *in principle*, explicable in terms of natural processes.¹¹³ This, as I argued in chapter two, is quite different from Burnet's understanding of miracles. For him, miracles are *objectively* and *ontologically* distinct from the ordinary course of nature. Biblical events *are* largely *explicable* in terms of natural processes, but to the extent that they are explicable in such terms, they are *not miracles*. What Burnet and Whiston *do* have in common here is their commitment to explaining them. I have of course discussed this similarity between Burnet and Whiston at length in the previous section, but it is worth stressing further here, since it, too, is very much in evidence in the above passage of the *New theory*. For both authors, regardless of whether biblical events are to be considered miraculous, explaining these events served an important purpose in countering the arguments of deists and atheists who appealed to the apparent unintelligibility of biblical events to undermine Scripture. Herein lies a quite fundamental and important point of agreement between Whiston and Burnet. Both believed that the best way to deal with this threat to revealed religion was to *make* these events intelligible. And both tried to do precisely this in their respective theories. Crucially, then, although they disagreed on many details,

¹¹² Whiston (1696b), 379-80.

¹¹³ Harrison (1995), 545-52.

Whiston and Burnet were ultimately engaged in fundamentally the same pursuit and were so for essentially the same reasons.

5.6. Whiston vs. Keill

One author who disagreed emphatically with Burnet's and Whiston's assessment of the apologetic value of explaining biblical events naturalistically was Whiston's fellow Newtonian John Keill, an Oxford philosopher and mathematician and protégé of David Gregory – one of the first to adopt the Newtonian system following the publication of the *Principia*. Keill's *Examination* was published two years after Whiston's *New theory*. It was an attack primarily on Burnet and only secondarily on Whiston, with a forty-eight-page essay on the latter appended to the 176-page treatise on the former.¹¹⁴ The work prompted replies, first from Whiston and then from an anonymous defender of Burnet, who I will argue in the next chapter was almost certainly Burnet himself.¹¹⁵ In response to these replies, Keill published another book in 1699 entitled *An examination of the reflections on the theory of the earth together with a defence of the remarks on Mr. Whiston's new theory*, a work of roughly the same length and with a similar division of attention between the two theorists.¹¹⁶ This latter book occasioned yet another response from Whiston but no further reply from Burnet.¹¹⁷ Keill issued no response to Whiston's second reply.

As well as being shorter, Keill's attack on Whiston – at least the first one – was less hostile than his attack on Burnet. Unlike Burnet, and Descartes before him, Whiston had applied mathematics, the touchstone of the true philosophy in Keill's estimation, in his theory of the earth. As a result, Keill found much to praise. "I cannot but acknowledge", he writes at the beginning of his attack, "that Mr. *Whiston*... has made greater discoveries, and proceeded on more Philosophical

¹¹⁴ Keill (1698).

¹¹⁵ Whiston (1698); Burnet (1699).

¹¹⁶ Keill (1699).

¹¹⁷ Whiston (1700).

Principles than all the Theorists before him have done".¹¹⁸ He was, moreover, convinced by Whiston's calculations that a comet likely did pass close to the earth on the day the Deluge began, and that the attraction of this comet changed the motion of the earth from a circular to an elliptical orbit.¹¹⁹ What he was not convinced of was that the passing of a comet was sufficient to cause a universal Deluge. Nor was he persuaded that the earth formed from a comet's atmosphere.

As we shall see in the next chapter, Keill's criticisms of Burnet were almost entirely philosophical. This, he noted, was necessary, for scriptural objections could not be effective against an author who denies the truth of Scripture.¹²⁰ In responding to Whiston, however, and in particular on the issue of the Creation, Keill combines his philosophical attack in several places with a scriptural one. Ultimately, Whiston had not *denied* the truth of the Mosaic account of the Creation but had reinterpreted it. Thus, as well as considering the philosophical difficulties with Whiston's theory, it was open to Keill also to assess (a) whether his theory of the earth cohered with his interpretation of Moses, and (b) whether his interpretation of Moses was the correct one.

Keill begins his discussion of Whiston's theory by noting several problems with the supposition that the chaos was the atmosphere of a comet. Comets, for example, are bright, luminous bodies with pellucid atmospheres through which their central solids are clearly visible, whereas the chaos is explicitly stated in Scripture and universally agreed by the ancients to have been *dark*. Whiston's cometary chaos, moreover, conflicted with his own claim that the sun and stars were not created but merely rendered visible on the fourth day, for given the pellucidity of comets' atmospheres, they must *always* on his view have been visible. Though he had claimed that the darkness mentioned in Scripture referred to the atmosphere being clouded with the dense fluid which subsided first and surrounded the central solid, he himself had noted that the heat comets gather at perihelion lasts many thousands of years. The agitation of the matter resulting from this heat, therefore, would only subside as the

¹¹⁸ Keill (1698), 177.

¹¹⁹ Keill (1698), 177-8.

¹²⁰ Keill (1698), 170.

comet cools. So it would be several millennia rather than merely one or two years before an amount of matter sufficient to obscure the light of the sun could subside. It was also clear that the matter of the earth had never been subjected to such heat. The upper strata of the earth are composed mainly of stones, sand, and gravel, substances which, when heated considerably, are liquefied and turned to glass. Had the strata ever been part of a comet's atmosphere, they would have undergone precisely this process at perihelion and would not appear as they do on the present earth.¹²¹

Regarding the primitive earth, although Keill was sympathetic to Whiston's notion of an originally circular orbit, he was not receptive to the idea of the earth having no diurnal motion until the Fall. To this issue he devoted considerable attention.¹²² And as we shall see shortly, his objection against Whiston on this point would have an appreciable impact on Whiston himself, forcing him to modify his theory quite significantly in this area. Interestingly, Keill's argument here closely resembles Burnet's response to Newton's similar suggestion in their correspondence nearly two decades previously. Newton had suggested that the earth's diurnal motion may have been considerably slower in the beginning, making the days longer and allowing more time for the Creation.¹²³ Against this, Burnet had protested that "if ye day was thus long wt a dolefull night would there bee?"¹²⁴ Keill stressed similarly against Whiston that the long periods of extreme heat and cold entailed by the earth having no diurnal motion could not be endured by humans and other animals. Though creatures are adapted to hotter or colder environments, none are fitted to survive successive six-month periods of each.¹²⁵ Such conditions would be even more unfavourable to vegetable life, which requires a determinate heat, too little or too much either preventing its growth or destroying it before it can go

¹²¹ Keill (1698), 179-90.

¹²² Keill (1698), 193-9.

¹²³ The letter in which Newton suggested this is no longer extant. That he suggested it is clear from Burnet's reply: "Your supposition yt ye first revolutions of ye Earth were much slower & ye days much longer then they are now, & consequently a day might then bee a competent time for some great change or transformation of ye Chaos..." – Burnet to Newton, 13th January 1680/1, 325.

¹²⁴ Burnet to Newton, 13th January 1680/1, 325.

¹²⁵ Keill (1698), 193-6

to seed. If the primitive earth's plants *were* adapted to such conditions, they would necessarily have been destroyed at the onset of the earth's diurnal motion, which would introduce conditions for which they were *not* adapted, requiring God to create all plants anew, "which we can hardly imagine to be done". It was hence "far more agreeable to the Laws of Nature and Philosophy, that the Earth received both its annual and diurnal motions at the same time, *viz.* when it was first Created".¹²⁶

Turning now to the Deluge, Keill allows that a comet passing close to the earth would raise a tide in the *seas*. The waters of the abyss, however, were enclosed within a solid orb with no void space. There would therefore be no agitation of these waters and no breaking of the crust, since liquids are no more attracted than solids, and so the fluid would apply no more pressure on the crust than if the entire abyss were filled with a solid substance.¹²⁷ As to the involvement of the earth in the comet's atmosphere, this would indeed cause a prodigious rainfall, but this could not last forty days as Whiston – and Scripture – required, for the resistance of the air would condense *all* the vapours into water almost instantaneously. According to Whiston's own account, the velocity of the vapours descending from the comet's atmosphere was 868 miles per minute. It was well known that the resistance of the air condenses common vapours into rain. The resistance of a medium is proportional to the square of the velocity of the body moving through it. The velocity of the vapours descending from the comet's atmosphere being thousands of times greater than that of common vapour, the resistance they met with from the air would have been *millions* of times greater than that which condenses common vapour. The air, then, would have condensed all the vapours into water, and this would have descended in a single short rainfall.¹²⁸

Whiston's mechanism for releasing water from the abyss onto the surface was also deficient. He had claimed that the weight of the water from the rain would press down the crust and force water from the abyss up onto the surface. To illustrate this, he described a hydrostatics experiment in which

¹²⁶ Keill (1698), 196-9 – quotations from 199.

¹²⁷ Keill (1698), 203-4.

¹²⁸ Keill (1698), 204-7.

a cylinder of stone with holed drilled through it is placed into a cylindrical vessel half filled with water. If we then then pour oil or some other fluid which is lighter than water (the fluid of the abyss being heavier than the water derived from the comet's atmosphere) onto the cylinder, he argued, this will augment its weight, and the pressure of the cylinder on the water will force both oil and water up through the holes and onto the surface.¹²⁹ In response to this, Keill noted an important disanalogy between Whiston's experiment and his account of the Deluge. The pressure of a *stone* cylinder on the surface of the water would force oil and water through the holes onto the surface only because stone is specifically heavier than water. But Whiston had clearly stated that the crust was specifically *lighter* than the waters of the abyss. So, the experiment needed to be rectified and the cylinder of stone replaced with one of wood, which is specifically lighter than the water, and in this case, neither the oil nor the water would rise above the cylinder.¹³⁰

Keill now describes an experiment similar to those which, as we shall see in the next chapter, he had used so effectively against Burnet in order to "demonstratively prove" that the pressure of the water on the crust would not force fluid out of the abyss but on the contrary would make the crust rise *higher* than it did before (Fig. 5). *ABCD* is a vessel half filled with water. *F* is a solid placed in the vessel. *F* will descend into the water until the pressure of the solid on the surface *ik* of the water is equal to the pressure of the incumbent fluid on the surfaces *hi* and *kl*. We now pour oil *eMGn* into the vessel. Now the surfaces *hi* and *kl* are pressed also by the additional columns of oil *mEor* and *qpGn*, and the surface *ik* is pressed by the column *ropq*. Since *mEor* and *qpGn* are greater than *ropq*, the pressure on *hi* and *kl* will be greater than that on *ik*. The water at *hi* and *kl*, therefore, will descend, and force the water at *ik*, and therefore also the solid, further up. Applying this to Whiston's Deluge, the water derived from the comet would descend into the fissures and would exert more pressure on

¹²⁹ Whiston (1696b), 307-8.

¹³⁰ Keill (1698), 208-9.

the abyss than it did on the crust and would therefore force the water under it to descend and that under the crust to ascend, raising the sections of crust higher than they were before.¹³¹

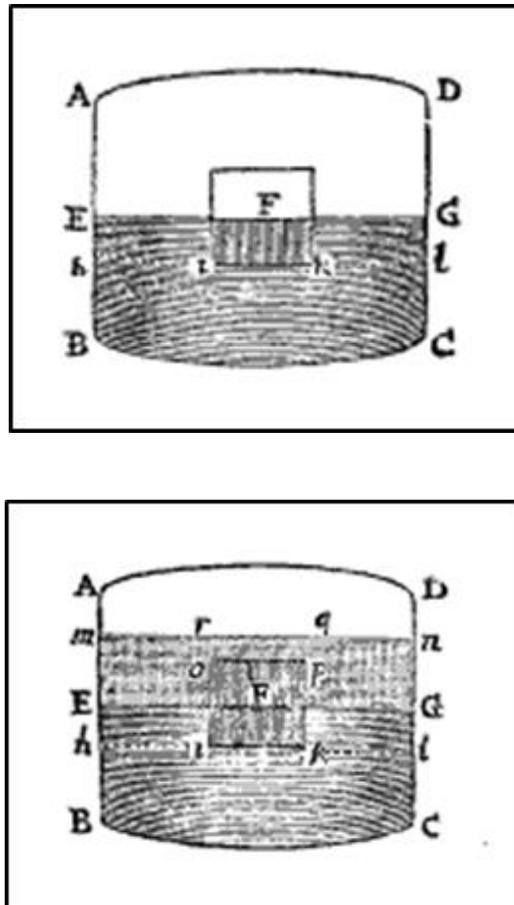


Fig. 5

The final point in Whiston's account of the Deluge with which Keill takes issue is the means by which he supposed the waters were removed from the surface of the earth at the end of the Flood. This Whiston claimed was effected partly by winds and partly by the water descending through fissures in the earth. To assess this claim, Keill conducted a rigorous computation of the amount of water required for a universal Deluge, calculating that twenty-three oceans of water would be required to cover the entire surface of the earth. Since Whiston had conceded that the amount of water drawn off the earth by winds would be insignificant, Keill focusses his attention solely on the

¹³¹ Keill (1698), 209-12 – quotation from 209.

descent of waters through the fissures. He notes first the obvious point that water could not collect on the surface until all the fissures were filled and so there would be no empty fissures through which the water could descend. But even supposing that the fissures *were* empty – “which is indeed an impossible supposition” – they could not contain more water than was derived from them, which Whiston held was only half the waters of the Deluge. Thus, there would remain a further eleven oceans of water on the surface.¹³²

We shall see in the next chapter how Burnet struggled to respond to Keill’s deft attack. More skilled than Burnet in philosophy and mathematics, Whiston fared slightly better, but on the whole his replies were rather unconvincing and easily answered by Keill. Certainly this was the view of subsequent commentators on theories of the earth, who as I will discuss in the next chapter generally viewed Keill’s books as having successfully refuted both Burnet’s and Whiston’s theories. Many of Whiston’s replies merely gifted Keill an opportunity to embellish and strengthen his previous arguments. To Keill’s objection from the luminosity of comets, for example, Whiston replied that comets do not become planets until their ascent toward the sun, at which point they have travelled through cold regions of space and have lost their luminescence.¹³³ This Keill saw as an invitation to produce another mathematical demonstration of the kind he had used to such impressive effect against Burnet. On Whiston’s own admission, he notes, comets at this point have retained enough of their heat for their atmospheres to remain in a chaotic state. It was impossible that they could be hot enough to raise sufficient vapours to sustain such an atmosphere without also being luminous bodies. To “bring this point into numbers, that we may see it more evidently”, he continues, it followed from Whiston’s own supposition that the heat of a comet even in its ascent toward the sun is capable of acting on its atmosphere at a height of 100,000 miles and of raising vapours in its tail for millions of miles. The intensity of its heat at 100,000 miles relative to the intensity at ten miles is $10^2/100,000^2$,

¹³² Keill (1698), 218-23 – quotation from 222.

¹³³ Whiston (1698), 3.

or one to 100 million. If, therefore, the central solid is sufficiently hot to affect its atmosphere at such a distance, it must be prodigiously hot and therefore undoubtedly luminous.¹³⁴ In response, Whiston changed tack completely, arguing that, *notwithstanding* the luminosity of the central solid, *within* the atmosphere it would be dark, that is, the hypothetical observer from whose point of view Moses had written would receive no light from either the central solid or the sun.¹³⁵

Other responses were met simply with ridicule. To Keill's point about the comet's atmosphere taking far longer than a year or two to subside to the point at which it could obscure the light of the sun, for instance, Whiston argued simply that there was no reason to believe that the laws governing the descent of bodies on Earth obtain in the atmospheres of comets.¹³⁶ "This I own to be an Answer", wrote Keill in reply,

not only to this one Argument, but to all that can be said against his Theory. But may not any other Theory be defended at the same rate? Might not Dr. *Burnet* have maintained his Theory this way? And when it was objected against it, that heavy Bodies, such as Earth, Clay and Stones, could not swim upon Oil or Water, would it not have been easy for him to have said, that Bodies had then other Laws, Properties, and Operations, than they have now, and that it was at that time the Law of Nature, that the heaviest Bodies should swim uppermost, and the lightest fall to the bottom?¹³⁷

To this Whiston replied that the atmospheres of comets are evidently very different from that on Earth. Even other planets, which seem *prima facie* to be similar bodies, appear to be governed by different laws, Saturn's ring for example being "hard to account for by the Mechanical Laws upon our Earth". There was thus "no reason to imagine that, because God has been pleas'd to fix several

¹³⁴ Keill (1699), 167-9 – quotation from 169.

¹³⁵ Whiston (1700), 3-4.

¹³⁶ Whiston (1698), 4-5.

¹³⁷ Keill (1699), 173. Here Keill refers to an argument he made in the *Examination*. I shall discuss this in the next chapter.

arbitrary Laws, and Powers of Bodies resulting from them, in our little System; that therefore he has confin'd himself to ordain no others in different ones".¹³⁸

On a number of points, Whiston simply conceded that Keill's objections were insurmountable and adjusted his theory in light of them. Two of these are especially interesting in that they resulted in substantial changes to the theory. The first concerns the primitive earth's lack of diurnal motion. Here Whiston acknowledges that "Mr. Keill's Reasoning... is strong and forcible" and takes the opportunity to "set this matter in a new and clear Light" in order to clear his theory "from this Obvious, Popular, and not inconsiderable Objection".¹³⁹ What is interesting here is that he does not change *this* aspect of his theory but makes an adjustment elsewhere, altering instead his view on the antediluvian earth's circular orbit. He still maintains "that the *Original Orbits* of the Planet, and particularly of the Earth were perfect circles".¹⁴⁰ He changes, however, what is meant by "*Original Orbits*", stating that this now refers not to their orbits in the very beginning but to "those in which they were to revolve immediately after they were intirely form'd, and were to be universally inhabited".¹⁴¹ It is this last clause that is central here, for ultimately, the earth was *not* "universally inhabited" until after the Fall.

Whiston now argues that the change from the eccentric orbit of the comet from which the earth formed to the circular path it followed before the Deluge did not occur all at once. Instead, the greater part of it occurred at the Creation and the rest at the Fall. It is here that Whiston first argues that the diurnal motion of the earth was caused by an oblique collision with a comet. Such a collision would not only impart a diurnal motion to the earth but would also alter its orbit. It was this collision, then, that brought the earth into a circular orbit. Prior to this, its orbit was moderately elliptical. Although Whiston still maintains that a circular orbit is the best possible for supporting life, he adds now the condition that such an orbit is best only for a planet that is inhabited *throughout*. The earth

¹³⁸ Whiston (1700), 6.

¹³⁹ Whiston (1698), 9-10.

¹⁴⁰ Whiston (1698), 10.

¹⁴¹ Whiston (1698), 10-11.

before the Fall, however, was only inhabited in a single place, and so an *elliptical* orbit was optimal. This enabled Whiston to mitigate the effects of the earth having no diurnal rotation, for he could now claim that the earth was at aphelion at noon and at perihelion at midnight in Paradise, making the respective heat and cold at these times less intense than if the earth's orbit were circular.¹⁴²

Keill's response to this is very interesting, for as well as noting that the primitive earth being habitable in only one area "will scarcely be allowed", he also makes an intriguing methodological or epistemological point about the introduction of ad hoc hypotheses. "We know", he writes,

the more Hypotheses any Theory is clogg'd with, the more precarious it looks; such of them especially as do not naturally result from the whole Theory, but are only introduced to remove some urgent difficulty, are generally thought least of all to deserve any credit.¹⁴³

In addition to this, he passes an interesting *aesthetic* judgement on the theory. "One of the great Beauties of the Theory", he observes,

was, That as soon as the Comet was turned into a Planet, it had a Circle for its Orbit, and tho this beauty is not perfectly spoil'd, yet its luster seems to be considerably diminished by the new supposition of his new sort of Figure call'd a moderate Ellipse.¹⁴⁴

Perhaps predictably, Whiston's response to the first point about the habitability of the primitive earth was that the earth at this time only needed to be inhabited in one area, and so its more general uninhabitability is unproblematic. It was

no great matter if all the Earth, excepting the Regions about Paradise, were *uninhabitable* at a time when they *were not to be inhabited*. For to what great Purpose is it that all proper provision be made for the Entertainment of a Company of Guests at a Table, when 'tis certainly known that *not one* Guest will be there? Providence does ever wonderfully provide for the Accommodation of his Creatures

¹⁴² Whiston (1698), 11-13.

¹⁴³ Keill (1699), 181-2.

¹⁴⁴ Keill (1699), 182.

wherever it places them: But that a suitable Provision is made for them where they will *never* be plac'd, I see no reason to imagin.¹⁴⁵

As to Keill's other points, Whiston sees no problem with the introduction of new hypotheses. He views this as simply an inevitable and unproblematic part of the development of scientific theories and sees Keill's assessment as merely symptomatic of his general hostility against theories, declaring unapologetically that

[i]f I ever attempt another Edition of my Book, this Hypothesis, with several other Discoveries since made, will be inserted; and will, I believe, with fair and considering Persons, be thought far from *spoiling the Beauty of the Theory*; whatsoever Mr. *Keill*, who is no friend to Theories in general, may think to the contrary.¹⁴⁶

Whiston of course *did* publish another edition of his book in 1708, and this hypothesis – complete with dinner table analogy – was indeed included in it.¹⁴⁷

The second major alteration of Whiston's theory that resulted from his debate with Keill did not come quite so easily. This change concerned the release of waters from the abyss resulting from the pressure of the water on the crust. In his initial reply to Keill's argument and hydrostatic experiment, Whiston was unconvinced and maintained resolutely that, notwithstanding the crust being specifically lighter than the fluid of the abyss, the addition of the water on the surface will augment its weight, pushing it downward and forcing the waters up through the fissures and onto the surface. This was so "plainly express'd" in his book that he was "a little surpriz'd that one so well vers'd in *Hydrostaticks* as Mr. *Keill*, should be so perplex'd in this matter".¹⁴⁸ "Because Mr. Whiston answers my demonstration, as if he did not rightly understand it", writes Keill in reply, "I will here put it into a

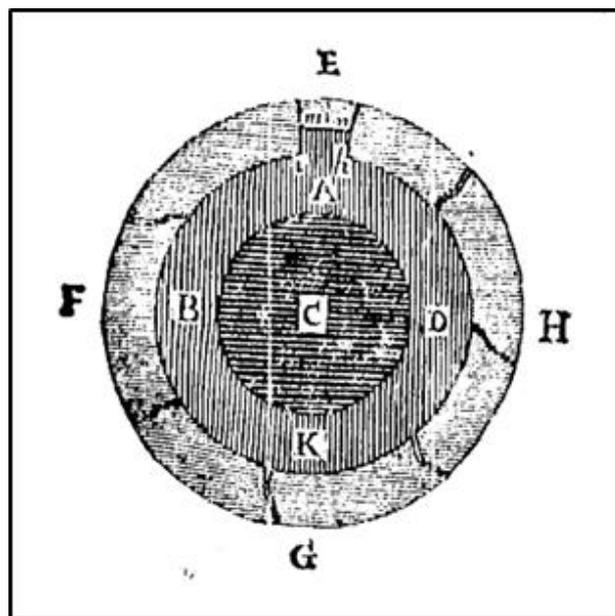
¹⁴⁵ Whiston (1700), 13.

¹⁴⁶ Whiston (1700), 13-14.

¹⁴⁷ Whiston (1708), 114-8.

¹⁴⁸ Whiston (1698), 16-18 – quotation from 17.

clearer light, and apply it more particularly to the present case".¹⁴⁹ He then produces what is essentially a scaled-up version of the same experiment, replacing the vessel, water, solid, and oil with the earth, abyss, crust, and Flood waters (Fig. 6). *ABKD* represents the abyss, *EFGH* the fractured crust floating on it. The crust will sink into the fluid until the pressure of the fragment of crust on the surface *ki* is equal to the pressure of the incumbent fluid on *ih*. Suppose the crust is now covered with water. The water must descend into the fissures and fill all the gaps between them before it can cover the surface. If the pressure of the water on *mn*, the surface of the abyss in the fissure, were equal to the pressure on the crust, the pressure on the surfaces *ki* and *ih* would be the same, and the parts of the fluid and therefore also the fragments of crust would remain in the same position. But in this case, the surface *ih* is pressed by a deeper column of water than the surface *ki*. So the fluid *mnih* must descend and raise the crust higher.¹⁵⁰



¹⁴⁹ Keill (1699), 192.

¹⁵⁰ Keill (1699), 193-5.

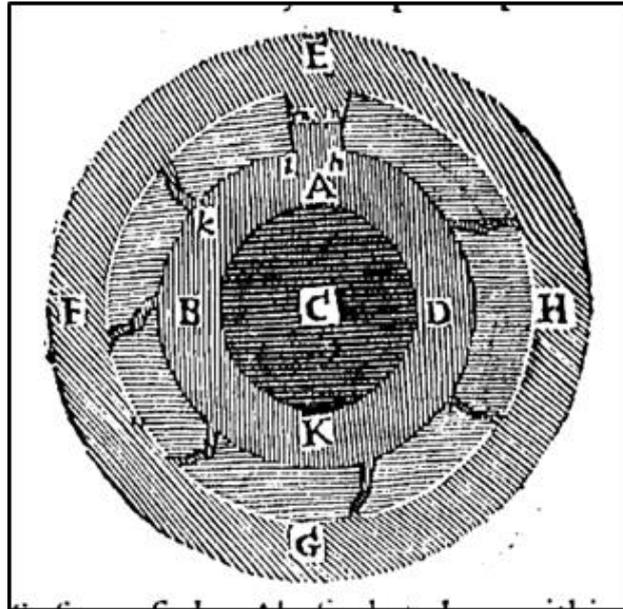


Fig. 6

“I must own”, Whiston acknowledges in his reply, “that I see the force of his Demonstrations *now*, which I did not *before*. And I heartily thank Mr. *Keill* for correcting so considerable a mistake in the New Theory”.¹⁵¹ He now agrees that the pressure of the fluid could not raise waters from the abyss and claims instead that the breaking of the crust was not effected to release waters from the abyss but to provide channels through which the waters could be drained from the earth. This, he argued, cohered perfectly well with Scripture, since there was nothing in the Mosaic narrative explicitly stating that water from the abyss was released onto the earth and contributed to the Flood. Although this was typically inferred, it was not strictly entailed, for

[a]ll that *Moses* says relating to this matter, is, That the Fountains of the Great Deep were *broken up* at the beginning, and *shut up* at the Conclusion of the Deluge, without the least Affirmation that any Waters issued out of them; as has hitherto been universally suppos'd, and as I accordingly believed also.¹⁵²

¹⁵¹ Whiston (1700), 18.

¹⁵² Whiston (1700), 18.

The second edition of the *New theory* sees another shift in Whiston's position. He now argues once again that the weight of the fluid *did* press the parts of the crust downward and force water up through the fissures. Here he acknowledges Keill's point that if the parts of the crust were fully immersed in the fluid in accordance with hydrostatic principles then the pressure of the water on the crust could not sink it any further down. Now, however, he argues that the crust was in fact *not* fully immersed in the fluid since its parts mutually supported one another in an arch. Thus, the weight of the water on the surface *would* press it further into the fluid, and this pressure would force fluid up through the fissures.¹⁵³

An aspect of Whiston's initial reply that Keill found especially unconvincing was his answers concerning the removal of the waters. Here Whiston largely just reiterates his view that the fissures would receive the waters, taking little notice of Keill's arguments to the contrary. He also argues that additional water could be drained through the "pores and interstices" of the earth, noting that "30 or 40 Miles of dry Earth are capable of receiving 3 or 4 Miles of Water into 'em".¹⁵⁴ Replying to this, Keill stresses again that the fissures along with any other vacuities in the earth would already have been full of water. "I am surpriz'd", he writes, "to hear him tell us of *dry Earth*, that was capable of receiving vast quantities of water, for I cannot suppose an Earth that has been watered by eleven Oceans of water gushing thro' its Pores, to be very dry".¹⁵⁵ Even supposing that all the fissures and pores *were* empty, the substances of which the crust is largely composed are dense bodies, and so their vacuities are surely not extensive enough to receive twenty-two oceans of water.¹⁵⁶ And even if we suppose that the fissures and vacuities *were* sufficiently extensive *and* that the water of the Deluge lay on the surface without descending into them, "that is, let us grant to Mr. Whiston so many impossibilities", even this is not sufficient to remove the water in accordance with the Mosaic narrative, according to

¹⁵³ Whiston (1708), 371-6.

¹⁵⁴ Whiston (1698), 20.

¹⁵⁵ Keill (1699), 205.

¹⁵⁶ Keill (1699), 205-6.

which the waters of the Flood were removed in six months. Here Keill calculates the amount of time it would take for the waters to be drained. In his discussion of Burnet's theory in the *Examination*, he had calculated that all the earth's rivers would take 812 years to fill the channel of the ocean if it were empty. Supposing that the fissures were equal to the mouths of all the rivers, then, it would take 17,864 years for the water to drain. And even if we suppose the velocity of the waters to be ten times that of the rivers, it would still take 1786.4 years.¹⁵⁷

Whiston's response to this was rather more extensive than his initial reply to Keill. He notes first that the "Pores and Interstices" of moist earth can receive further water. He also attempts to cast doubt on Keill's assessment that the earth's crust consists principally of dense substances, listing various different materials observed by the German geographer Bernhardus Varenius in a study of strata in Amsterdam.¹⁵⁸ Regarding Keill's computation of the time it would take for the waters to drain, although Whiston disagrees with Keill's calculations, believing that the velocity of the waters was greater due to its immense weight and the fissures wider than Keill had allowed, he nevertheless concedes that the draining of the water would take longer than according to the Mosaic narrative *as commonly interpreted*. These last three words are of course important, for Whiston now reminds Keill that he believes this interpretation to be erroneous and refers him to the Scholium near the end of the *Vindication* where he had argued this, and "which 'tis a little strange he should not discover before, and so perceive that he was, by the last Computation, but confirming one of the Points I had observ'd since the publishing of the New Theory".¹⁵⁹

Whiston closes his debate with Keill firstly by stating once again his intention to produce a second edition of his theory. "The Remarks and Objections Mr. *Keill* and Others have made against some Branches of the New Theory", he writes,

¹⁵⁷ Keill (1699), 206-7 – quotation from 206.

¹⁵⁸ Whiston (1700), 18-19.

¹⁵⁹ Whiston (1700), 20.

have occasion'd me to *correct some Parts, to confirm others, and to improve the whole*. But so little do I esteem the principal Foundations of that Book destroy'd by all that has been hitherto said, (Though Mr. Keill is pleas'd to *presume*, that by those few Objections he before made against a few particulars in it; And this after he had granted me the principal Point of all, *it was in general already confuted*;) That I may venture to say, I am prepar'd, upon a Second Edition, more fully to confirm and establish the main Conclusions in it than ever; as I hope will appear in due time.¹⁶⁰

The “principal Point of all” which Keill had granted of course was that a comet passed close to the earth on the day the Deluge began. That Keill had granted this but had nevertheless rejected his theory was something that Whiston found especially troubling, for in his view, the theory followed necessarily from the passing of the comet. It was, as he put it at the very beginning of his first response to Keill,

the main Point I contend for; and... once establish'd, the rest (as I think I can still demonstrate) must, when fully understood, be granted also; 'Tis a little surprizing that he [Keill] of all Men should in Publick appear against me. And truly I am ready to hope I have but few competent Judges besides Mr. Keill, who, yielding me that main Point of all, do yet reject my Account of the *Phaenomena* of the Deluge; which are, I think, but natural Consequents of such a Concession.¹⁶¹

Whiston revisits this point at the end of the *Vindication*. Here he poses two questions to Keill. First, if a comet passed at the beginning of the Deluge but had no causal relevance to that event, then to what purpose did it pass the earth? And second, how were those effects which he had calculated to be the necessary consequences of a comet passing avoided?¹⁶² At the end of his second reply, Whiston notes that Keill had not addressed these questions in his response to the *Vindication*, and he closes his reply by posing them again.¹⁶³ Keill, perhaps feeling that he had done enough already to confute Whiston's theory, issued no response. If Whiston saw Keill's silence on the above questions as a weakness, few

¹⁶⁰ Whiston (1700), 20.

¹⁶¹ Whiston (1698), 1.

¹⁶² Whiston (1698), 21-3.

¹⁶³ Whiston (1700), 21-2.

others did, and, as I have noted above, his two books would come to be seen as a decisive refutation of both Burnet's and Whiston's theories.

Before concluding this chapter, I want to discuss some more fundamental disagreements between Keill and Whiston which underpinned much of their debate. It should be noted in the first place that at a foundational level there was substantial agreement between these two authors. Most of the fundamental disagreements which, as we will see in the next chapter, characterised Keill's debate with Burnet are not present here. Both believed in an oblate figure of the earth. Neither believed in vortices. Neither had a problem with final causes or attraction. Both held that mathematics and experiment were essential components of natural philosophy. Above all, both were Newtonian, and reasoned from recognisably Newtonian principles throughout the debate. Their disagreement for the most part centred not on fundamentals but on the question of whose application of these principles was the correct one. There were, however, two quite fundamental disagreements between these two authors. The first of these concerned *miracles*. On this issue there were two main points of disagreement. The first was what miracles consist in, and how one should distinguish between the natural and the miraculous, between miracles and the ordinary course of nature. The second was how readily one should appeal to miracles to explain biblical events, or to put it another way, how far one should go in trying to explain biblical events in terms of natural causes.

As I have discussed above, Whiston subscribed to the same Augustinian conception of miracles as Newton and other Newtonians such as Richard Bentley and Samuel Clarke which I outlined in chapter two. Keill, in contrast, subscribed to the modified version of the Thomist conception – also outlined in chapter two. Miracles for him are violations of laws of nature. This important difference between the two authors plays a significant role in their debate. This is most clearly evinced at the very beginning of Whiston's *Vindication* and at the same point in Keill's subsequent reply. Here Whiston accuses Keill of being “deeply engag'd against my design by a peculiar fondness he seems to

have for the Introduction of *unaccountable Miracles*".¹⁶⁴ This phrase, "*unaccountable Miracles*", makes perfect sense to Whiston, who believes that because miracles are not violations of the laws of nature they can, at least in principle and insofar as we know the relevant laws, be *accounted* for. Some, of course, since our knowledge of nature is imperfect, cannot be accounted for, and in these cases Whiston is content to ascribe them to a "miraculous power" (though as I have argued in the previous section, he seems not to want to rule out the *possibility* of their being accounted for in the future as our natural knowledge progresses – they are "unaccountable" only relative to our limited understanding of the world). For Keill, on the other hand, the phrase is simply tautologous, for miracles are *by their very nature* unaccountable, and so its negation "*accountable* miracles" is self-contradictory. "If I had a mind to criticise upon words", he asserts, "I would ask him what he means by *unaccountable Miracles*, and whether there be any that can be accounted for, since it is the common opinion, that what can be accounted for by natural causes, is *no Miracle*".¹⁶⁵

In his book *William Whiston: Honest Newtonian*, Force correctly observes that in adopting "the common opinion" about miracles Keill "isolated himself" from other Newtonians like Whiston and Bentley and indeed from Newton himself who had adopted an Augustinian conception.¹⁶⁶ Force's argument on the other issue concerning miracles that was at stake in the debate between Keill and Whiston – that is, the issue of how far one should go in explaining biblical events in terms of natural causes and how readily one should appeal to miracles – is rather less convincing. On this point, Force claims that "Whiston resorts to miraculous explanations only when there is no adequate mechanical hypothesis, whereas Keill refuses ever to depart from the literal words of Moses".¹⁶⁷ In doing so, Force argues, Keill "departed from Newton's and Whiston's rule... [that] 'that which is clearly accountable in a natural way is not without reason to be ascrib'd to a Miraculous Power'", this being the second

¹⁶⁴ Whiston (1698), 1-2.

¹⁶⁵ Keill (1699), 166.

¹⁶⁶ Force (1685), 125-6.

¹⁶⁷ Force (1985), 61.

“Postulate” of Whiston’s *New theory* and, Force notes, a view to which Newton subscribed, having stated it in his earlier correspondence with Burnet.¹⁶⁸ Force concludes that, to the extent that he departed from this rule, Keill “was a Newtonian dissident”, Whiston of course being the titular “Honest Newtonian”.¹⁶⁹

There are two main problems with Force’s argument here. The first is that it is based on a quite fundamental misrepresentation of Keill’s position, and in particular of why he adopts a miraculous interpretation of the Creation and Deluge. By claiming that Keill “refuses ever to depart from the literal words of Moses” and contrasting this with Whiston’s policy of “resort[ing] to miraculous explanations only when there is no adequate mechanical hypothesis”, Force creates the impression that Keill adopts this interpretation *regardless* of whether there is an “adequate mechanical hypothesis”. But this is not the case. Rather, he adopts it *because* he believes there is *no* “adequate mechanical hypothesis”. Far from *departing* from this rule, then, Keill is essentially *applying* it but reaching a different conclusion from Whiston. And the fundamental disagreement between the two authors is not *whether* the rule ought to be applied but the results one obtains from doing so. Keill is not necessarily against all mechanical explanations of biblical events. Neither does he want to impose miraculous interpretations on events which *can* be explained mechanically. Like others who subscribed to the modified Thomist conception, Keill held that miracles serve important apologetic purposes. And in common with these other authors, he believed that these purposes could be undermined not only by denying *true* miracles but also by affirming *false* ones.¹⁷⁰ As he emphasises in the first chapter of his initial attack on Burnet,

¹⁶⁸ Force (1985), 61.

¹⁶⁹ Force (1985), 61.

¹⁷⁰ For others who held this view, see Harrison (1995), 535-7.

tho' our holy Faith stands so well confirmed by real miracles, that *we are neither to make nor admit of any false ones*, yet certainly we are not to detract from the value of the true ones, by pretending to deduce them from Natural and Mechanical causes, *when they are no ways explicable by them*.¹⁷¹

His central argument in the *Examination* and in his reply to Burnet and Whiston the following year is not that we should accept a miraculous reading of Scripture *uncritically* but that a miraculous interpretation of the Creation and Deluge is necessary because in these cases mechanical explanations are inadequate.

The second problem with Force's argument is his characterisation of Whiston's rule of only appealing to miracles if there are no adequate natural explanations as a specifically *Newtonian* principle. This rule, Force claims, together with "Whiston's view that God's providence is best evidenced by an orderly progression of natural law", a view shared by Newton, are "the criteria by which this facet of Newtonianism must be measured".¹⁷² But it is not at all clear that these views of Whiston's are essentially *Newtonian* principles at all. Certainly they were by no means exclusive to Newton and his circle. As we have seen at length throughout this thesis, both these views were strongly held and extensively argued for by Burnet, a *Cartesian*. And as I have argued above, Whiston's statement of these principles is highly reminiscent of Burnet's, and so these aspects of Whiston's worldview were likely influenced more by him than by Newton, since he studied the *Theory* extensively – and subscribed to the views in it – long before he discovered the *Principia* and even longer before he became personally acquainted with Newton.

The other fundamental disagreement between Keill and Whiston has already been touched upon to some extent in the above discussion of Keill's response to Whiston's account of the Creation of the earth from the atmosphere of a comet. It is worthy of further comment here, however, since it is highly relevant to the foregoing issue of Whiston's and Keill's Newtonianism. This disagreement

¹⁷¹ Keill (1698), 33 [my italics].

¹⁷² Force (1985), 61-2.

concerned how the six-day Creation was to be interpreted. As I have discussed at length above, Whiston departs to some extent from a literal reading of Moses, converting the days of creation into years and making the “creation” of the sun, moon, and stars apparent rather than actual – they were not literally *made* but merely appeared to Moses’s hypothetical observer as the atmosphere cleared. Keill, on the other hand, wanted to maintain a wholly literal reading of Moses, according to which the sun, moon, and stars were actually *created* on the fourth day. He was less explicit about the length of the days but seems to have held that they were literal days, as he believed, contra Whiston, that the earth’s diurnal rotation began at the Creation, making days distinct from years from the beginning.

Some of the reasons for Keill’s literal reading of the Mosaic account were purely scriptural. Whiston’s interpretation, he observed, “seems to be extremely forced, and no way agreeable with the design of the sacred Pen-men”.¹⁷³ The principal problem here was that in the Hebrew Bible Moses, who speaks very clearly and unambiguously throughout his narration, uses precisely the same words – which Keill translates as “*and he made*” – to refer both to the creation of the sun, moon, and stars on the fourth day and to that of the animals on the fifth. And since the animals did not merely become visible but were literally created, then so too were the heavenly bodies.¹⁷⁴ More significant for Keill, however, were the various philosophical problems with such an interpretation. The main issue here was that this interpretation of Moses, which Whiston had clearly contrived expressly to support his view that the earth formed from the atmosphere of a comet, singularly failed to cohere with such a view. We have seen examples of this at the beginning of this section. Another significant one was the supposed appearance rather than actual creation of the moon. This was even more problematic than that of the sun and stars, for comets *do not have satellites*. The creation of the moon on the fourth day, therefore, must pertain to its *actual* and not merely apparent creation. And if the moon was

¹⁷³ Keill (1699), 176.

¹⁷⁴ Keill (1699), 175-7 – quotation from 176.

created on the fourth day, then so too were the sun and stars, for the term “made” is applied to all three and must hence be understood in the same sense for the latter as for the former.¹⁷⁵

Here, Force is certainly right to emphasise the similarities between Whiston’s interpretation of Moses and that expressed by Newton in his correspondence with Burnet. Whether this makes Whiston the truest proponent of Newtonianism and therefore a truer Newtonian than Keill as Force suggests, however, is highly questionable. As both Simon Schaffer and Mordechai Feingold argue in their reviews of Force’s book, it is not at all clear that concordance with Newton’s views is necessarily the measure by which a “true Newtonian” is to be judged.¹⁷⁶ And as Schaffer points out, there were important disagreements between Newton and Whiston on exegetical issues which do not fit with Force’s portrayal of the latter as being more closely aligned with “the master” on such topics than other Newtonians.¹⁷⁷ It seems more reasonable to conclude that Whiston and Keill were simply promoting different, and on certain points conflicting, versions of what may loosely be considered a Newtonian worldview. Part of Whiston’s version was his interpretation of Moses. Another was his conception of miracles. These views of Newton’s were not made public, and so unless Whiston arrived at them independently, which seems unlikely given how similar their views were on these issues, Newton must have related them to Whiston in private – and we know that that they corresponded extensively prior to the publication of the *New theory* and that Newton commented on earlier drafts of the book. There is no evidence, on the other hand, that Keill was personally acquainted with Newton at the time of his debate with Burnet and Whiston. He therefore most likely knew nothing of Newton’s views on these topics. Keill’s version of Newtonianism was derived rather from his close reading of the *Principia* and consisted essentially in the kind of methodology that he believed was exemplified in this text and which he promoted in his Oxford lectures (which I shall discuss in the next chapter) and

¹⁷⁵ Keill (1698), 190-1.

¹⁷⁶ Schaffer (1986), 226; Feingold (1987), 141.

¹⁷⁷ Schaffer (1986), 226.

applied to Burnet's and Whiston's theories in the *Examination* and in his subsequent reply to these authors.

5.7. Conclusion

In his *New theory*, Whiston, who had studied Burnet's theory extensively during his BA, retains certain key details of it such as an orderly, symmetrical first Creation, the earth's central fire, a perpetual equinox on the primitive earth, and the formation of the earth on a body of fluid. He removes these things from Burnet's Cartesian framework and transposes them into a Newtonian system of natural philosophy, explains them in terms of Newtonian laws, and presents them in a Newtonian, mathematical style. His motivation for constructing his theory of the earth is essentially the same as Burnet's, namely, a desire to make biblical events intelligible in order to reconcile revealed religion with philosophy. To this end, he adopts the same commitment to explaining such events in terms of natural processes, the same emphasis on God's prescience, and the same notion of divine synchronicity between the natural and moral world that we find in Burnet, but he combines these things with a distinctly Newtonian conception of miracles and a Newtonian distinction between the natural and the miraculous in order to maintain God's direct involvement in these events. His theory is supported by largely the same passages of Scripture and the same canon of ancient texts as Burnet's, and he appeals to these texts as confirmation of his theory in essentially the same way as Burnet did. The one exception here is that where Burnet discards Genesis 1, Whiston goes to great lengths to reconcile his theory with it. This he achieves by employing a Newtonian style of exegesis but one which was motivated ultimately by a decidedly Burnettian antipathy with the "vulgar" interpretation of the text. What emerges from focussing on both the influence Newton and that of Burnet is not so much a purely Newtonian theory of the earth, but rather an interesting synthesis of Burnet's and Newton's ideas.

As to Whiston's debate with Keill, Force is certainly correct to suggest that, on exegetical issues and on the definition of miracles and the distinction between the natural and the miraculous,

Whiston's views are much closer to Newton than Keill's, though whether this makes Whiston a truer Newtonian than Keill is highly questionable. Force's argument concerning the other facet of Whiston's theory that he characterises as distinctly Newtonian and juxtaposes with Keill's contrary view, that is, his commitment to natural over miraculous causes, is unconvincing. In the first place, as I have argued, it is not clear that the two authors' views on this matter are as contrary as Force suggests. More importantly, however, this commitment in Whiston's theory does not appear to be Newtonian at all. Certainly it was not an exclusively Newtonian commitment. We saw in the second chapter that Joseph Glanvill made the same commitment in 1662. Burnet, I argued there, most likely inherited it from Glanvill. And Whiston more likely inherited it from Burnet than from Newton, for as I have argued here, Whiston was acquainted with – and subscribed to – Burnet's theory long before he discovered Newton, and his statement of this principle, with his emphasis on God's prescience and the divine synchronicity between the natural and moral world, very closely resembles Burnet's. This only becomes clear when we appreciate *Burnet's* influence on the *New theory* as well as Newton's.

6. Burnet and the Newtonians part two: Keill's *Examination* and "T.B."s *Reflections*

6.1. Introduction

Having discussed Whiston's synthesis of Newtonian and Burnettian ideas and his dispute with Keill, I turn now to the latter's attack on and debate with Burnet. At the time of writing his *Examination*, Keill was resident at Balliol College having received a "Scotch Exhibition" and having been incorporated M.A. after following his mentor Gregory from Edinburgh when the latter became Savilian Professor of Astronomy earlier in the decade.¹ While at Balliol, Keill developed experimental demonstrations of Newtonian mechanics and was appointed lecturer in experimental philosophy at Hart Hall, making him the first to teach Newtonian natural philosophy at either of the English universities. These lectures, as I shall discuss below, would become the basis of the first textbook of Newtonian natural philosophy. After his Exhibition expired in 1703, Keill moved – again following Gregory – to Christ Church. Unsuccessful in his attempt to be elected Savilian Professor upon Gregory's death, he nevertheless secured the chair in 1712 following the death of Gregory's successor John Caswell.² It was around this time that he became embroiled in – or according to some accounts, *occasioned* – the dispute between Newton and Gottfried Wilhelm Leibniz over the invention of calculus after publishing a paper in the *Philosophical Transactions* in 1710 accusing Leibniz of plagiarism.³

Keill's penchant for controversy is already evident in the *Examination*, his first book. In it, he attacked not only Burnet and Whiston but several other contemporaries. The main emphasis of the work, however, was of course Burnet's theory, and as I noted in the previous chapter, he devoted

¹ Kubrin (1973); Henry (2010). Scotch Exhibitions were fellowships at Balliol endowed initially by the Bishop of Rochester John Warner – "Warner Exhibitions" – and later by educational benefactor John Snell – "Snell Exhibitions" – specifically for scholars born and educated in Scotland – see Jones (2005), 124-7. Keill was in receipt of a Warner Exhibition – Jones (2005), 149.

² Kubrin (1973); Henry (2010).

³ See Hall (1980), 129-245; Westfall (1980), 698-780.

much more of the work to Burnet than Whiston. Keill's *Examination* and subsequent debate with Burnet have been discussed by several historians in relation to the Burnet controversy but have typically not been dealt with in any considerable depth.⁴ The significance of the work in the context of this debate, nevertheless, has been widely noted, and a number of historians have credited Keill's books with providing a decisive refutation of Burnet – and also Whiston – and as such bringing the controversy to a close.⁵ What precisely it was about Keill's work that enabled it above all other responses to the theorists to achieve such closure, however, remains somewhat obscure. It is widely acknowledged that Keill's attack was especially *able*, that Keill was more adept than others at recognising and demonstrating the weaknesses of these theories.⁶ This is certainly correct. But it raises further questions. *Why* was Keill more adept than other critics of the theorists? What did *his* criticisms of the theorists bring to the debate that others did not? What impact did Keill's work have on debates about the history of the earth beyond the Burnet controversy? Another important question which has been given little consideration by historians is why he became involved in the controversy *at all*; what motivated his attack on Burnet and Whiston?⁷ It is generally agreed that Keill was not merely attacking the theorists themselves but also, and more fundamentally, the Cartesian philosophy. This again is correct, and again it raises further questions. Which tenets of the Cartesian philosophy did Keill consider most pernicious? What were the main issues at stake in his debate with Burnet? Why did he direct his attention to theories of the earth rather than another manifestation of Cartesian thinking?

The purpose of this chapter is to consider the above questions about Keill's *Examination* and subsequent debate Burnet and the role this work and this debate played in the controversy and in later developments in earth science. The chapter consists of four main sections. In the first, I discuss

⁴ The most extensive discussions of Keill's *Examination* appear in two PhD theses: Kubrin (1968), 318-37; Magruder (2000), 143-58. The most in-depth published discussions are: Allen (1949), 110-12; Force (1983), 7-8; (1985), 60-2; Rossi (1984), 70-4; Friesen (2008), 42-8; Coppola (2010), 132-4; Lynall (2012), 57-64, 79-82.

⁵ See, e.g., Taylor (1950), 196; Macklem (1958), 35; Kubrin (1968), 319, 330-1, 335.

⁶ Allen (1949), 110-112; Tuveson (1950), 63; Nicolson (1959), 237; Kubrin (1968), 319, 330; Rappaport (1997), 143; Harrison (2000), 177; Poole (2008), 73 (2010), 46, 59, 71-2; Coppola (2010), 132.

⁷ Notable exceptions here are Kubrin (1968), 318-30; Magruder (2000), 153-8; Friesen (2008), 42-8.

Keill's attack on Burnet, considering in particular what distinguished it from other responses to the *Theory* and why it constituted such a devastating attack. In section two, I turn my attention to Keill's motivations, discussing first his dislike for the Cartesian philosophy before focussing on patronage as a further possible motivating factor. In the third section, I examine Burnet's response and Keill's subsequent reply to Burnet. I first explain why I believe this anonymous response did indeed come from Burnet. I then turn to the content of Burnet's defence and Keill's reply, discussing first two important foundational issues that underpinned much of the discussion before examining the role the debate played in strengthening Keill's case against Burnet's theory. Finally, in section four, I consider Keill's role in bringing the controversy to a close and the impact his work had on thinking about earth history during the next century.

6.2. Keill's Examination

Keill's *Examination* was in many respects similar to those other responses to Burnet's *Theory* which I discussed in chapter five. As with the other attacks on the *Theory* that appeared in the wake of Burnet's *Archaeologiae*, the arguments in the *Examination* were chiefly *philosophical* rather than scriptural as had been the case with earlier attacks, Keill noting firstly that the *Theory's* incongruence with Scripture had already been dealt with at length by authors better qualified than him to comment on such issues and secondly that attacks based on Scripture had effectively been rendered impotent by Burnet's reinterpretation in the *Archaeologiae* – which as we have seen amounted essentially to a denial – of those passages of Scripture with which his *Theory* seemed to be inconsistent.⁸ Keill's objections against Burnet consisted of essentially the same combination of arguments from efficient and final causes that we find in other authors, the former designed to show that the physical processes to which Burnet attributed the Creation and Deluge were insufficient to produce such effects, and the latter pointing to evidence of design in the present earth in order to undermine Burnet's claim that the antediluvian earth was of a different form and underwent a radical change at the Deluge. Keill also

⁸ Keill (1698), 26-7, 170.

emphasised many of the same individual points that we find in other responses to Burnet. Like Whiston and Parker, he took issue with Burnet's assumption that the chaos was fluid, arguing that the quantity of solid matter on the earth made this unlikely to have been the case.⁹ Following Beaumont, he noted the inability of the heat of the sun to penetrate through the crust and into any supposed abyss of water.¹⁰ And echoing Bentley, he stressed at length that the obliquity of the present earth is preferable to the supposed perpendicular situation of Burnet's antediluvian axis.¹¹

So what was it about Keill's *Examination* that set it apart from other responses to Burnet and made it above all others such a decisive refutation of the *Theory*? My answer to this question is that there were essentially three factors that distinguished the *Examination* from other replies to the *Theory*. These factors will already be evident to some extent from our discussion of Keill's attack on Whiston in the previous chapter, but they are much more pronounced in his more thorough and sustained attack on Burnet. To illuminate these factors, it is instructive to compare the work with the attack on Burnet with which it was most similar, namely, Beaumont's *Considerations on a book, entitled the theory of the earth*, published half a decade earlier in 1693. Both Beaumont's *Considerations* and Keill's *Examination* were book-length responses to Burnet and were roughly the same length as one another. Both, like the vast majority of replies to Burnet, dealt solely with the first volume of the *Theory*, ignoring the second volume entirely. Both, in common with other post-*Archaeologiae* responses to Burnet, focussed primarily on philosophical issues with the *Theory*, both authors noting that scriptural issues had been dealt with by persons better qualified to do so. Both advanced essentially the same kinds of arguments from efficient and final causes, emphasising many of the same specific points about the same phenomena. Finally, and importantly, both authors maintained that the Creation and Deluge were *miracles*, and as such were not explicable in terms of

⁹ Keill (1698), 48-50.

¹⁰ Keill (1698), 148-51.

¹¹ Keill (1698), 63-76.

natural processes. Both, moreover, conceptualised miracles in precisely the same terms, that is, as violations of the laws of nature resulting from God's direct intervention.

The first thing I want to emphasise about Keill's *Examination* that distinguished it from other attacks on Burnet is that it was more *focussed*, and as a result constituted a more in-depth and thorough set of criticisms than any that had previously been attempted. In his *Considerations*, Beaumont had essentially followed Warren in trying to confute every detail of the first volume of the *Theory*, dealing with each of the book's twenty-one chapters in turn and dedicating an entire chapter of his own work to all but a few of them.¹² In contrast, aside from a brief introduction and conclusion, Keill's *Examination* consisted of only seven chapters, each criticising in depth a key constituent of Burnet's *Theory*. The content of the *Examination* was dictated largely by Burnet himself, Keill respecting the Theorist's request that critics "keep themselves close to the substance of the Theory, and wound that as much as they can" rather than "make excursions upon things accidental or collateral, that do not destroy the *Hypothesis*".¹³

As to what the "the substance of the Theory" consisted in, Keill closely follows the summary given by Burnet immediately after the foregoing request. "[T]he substance of the Theory", Burnet writes here,

is this, THAT there was a *Primitive Earth* of another form from the present, and inhabited by Mankind till the Deluge; That it had those properties and conditions that we have ascrib'd to it, namely, a perpetual Equinox or Spring, by reason of its *right* situation to the Sun; Was of an Oval Figure, and the exterior face of it smooth and uniform, without Mountains or a Sea. That in this Earth stood *Paradise*; the doctrine whereof cannot be understood but upon supposition of this Primitive Earth, and its properties. Then that the disruption and fall of this Earth into the Abyss, which lay under it, was that which made the Universal Deluge, and the destruction of the Old World; And that neither *Noah's Flood*,

¹² Beaumont (1693).

¹³ Burnet (1684), 287.

nor the present form of the Earth can be explain'd in any other method that is rational, nor by any other Causes that are intelligible: at least that have been hitherto propos'd to the World.¹⁴

This summary, Keill uses as a model for his attack, offering in-depth criticisms of what were, by Burnet's own admission, the core components of his theory. The only ostensible exception here is Keill's extensive discussion of Burnet's view of the antediluvian earth's hydrography, something Burnet does not mention explicitly in the above summary but to which Keill dedicates more than an entire chapter of his *Examination*.¹⁵ It is important to stress, however, that this exception is *only apparent*, for as Burnet himself had explicitly stated, the watering of the primitive earth was an essential part of its being "inhabited by Mankind till the Deluge" and the seat of Paradise.

Keill's more focussed approach enabled him to cut much more deeply than other critics into Burnet's most central claims, exposing their weaknesses in a way that made other attacks on the *Theory* look decidedly superficial. An illustrative example of this is the aforementioned discussion of the antediluvian hydrography. Here, Keill produces a compelling, multi-layered confutation which exemplifies the depth of argument employed throughout the *Examination*.¹⁶ Burnet, recall, held that on the antediluvian earth the sun penetrated through fissures in the crust at the equator, raising vapours from the abyss which travelled toward the poles and upon coming into contact with the cooler air condensed and formed reservoirs in the northern and southern hemispheres from which rivers formed and flowed back toward the equator due to the earth's prolate figure.

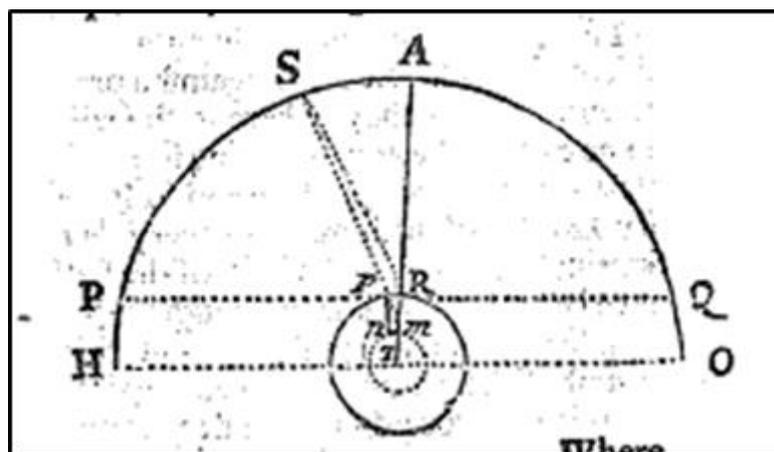
This proposed antediluvian water-cycle Keill sets about confuting at several junctures. He first argues that the heat of the sun could not raise sufficient vapours to furnish the antediluvian earth with rivers. The amount of vapour raised from a body of water by a determinate heat, he notes, is directly proportional to the surface area of the water. Suppose, then, that the total surface area of the fissures

¹⁴ Burnet (1684), 287-8.

¹⁵ Keill (1698), 84-109.

¹⁶ Keill (1698), 84-109.

at the antediluvian equator amounts to $1/10,000^{\text{th}}$ of the surface area of the earth, which “is as much as the Theorist can reasonably allow” since it is nearly equal to a single, continuous, mile-wide fissure encompassing the entire equator. Following Burnet’s assumption that one half of the present earth is land and the other half sea, the amount of vapour raised from the sea to supply the present earth’s rivers is 5,000 times what can be raised from Burnet’s abyss. Thus, if the amount of land were the same on the antediluvian earth as it is now, there would be merely $1/5,000^{\text{th}}$ of the water on it. But, Burnet’s antediluvian earth had no seas, and therefore double the amount of dry land. So, on Burnet’s view, $1/5,000^{\text{th}}$ of the water had to furnish double the land with rivers. Any given portion of land on Burnet’s antediluvian earth, then, would have merely $1/10,000^{\text{th}}$ of the water which it has now. This, however, is supposing that the sun raises as much vapour from the abyss as it does from the same area of sea. In the former case, however, the sun can only raise vapours from the abyss when it is more or less directly above the fissures, for at all other times, the sun’s rays are intercepted and obscured by the crust. This latter point, Keill illustrates with the following diagram (Fig. 1) in which *S* represents the sun in the equator, *PQ* the sensible horizon, and *mn* the surface of the abyss opened by the fissure *PnmR*. The sun must be at the height *HS* above the Horizon before it can begin to raise any vapour from the surface of the abyss.¹⁷



¹⁷ Keill (1698), 89-93.

Fig. 1

The next step in Keill's argument is to show that even if the sun *were* able to raise sufficient vapours from the abyss, these vapours would not travel toward the poles as Burnet had supposed but would remain at the equator. Here Keill makes use of a notion that had been the subject of much attention among English natural philosophers since around mid-century when experiments using Torricellian vacuums and air-pumps revealed the capacity of air particles to expand and fill a given space.¹⁸ This elasticity or "spring" of the air, Keill uses to show that the equatorial region on Burnet's antediluvian earth would be subject to a continual wind blowing from east to west. "It is well known to all the Philosophers", he notes, "that the air is a very elastick fluid body". If every part of the air is equally dense, the particles would resist each other's pressure and there would be no movement. If, however, any part of the air is thinner than the rest, the surrounding atmosphere, which is grosser and therefore has a greater capacity to expand, will rush in upon the thinner air and maintain equilibrium.

Keill now introduces another diagram (Fig. 2). *EZWN* represents the air surrounding the earth *T* at the equator. If the sun is shining directly on the air at *Z*, the air here will be considerably rarer than the air at *E*, but due to the heat, it is more expanded and so remains in equilibrium with it. When the sun shifts to the west, however, and comes to shine on the air at *W*, the air at *Z* will be rarer than the air at *E*, but its heat being gone, its capacity to expand is not as strong as the air at *E*, and so the air at *E* will rush into *Z* to maintain equilibrium. So too, when the sun shines directly on the air at *W*, the air here is rarer than the air at *Z*, but it is expanded by its heat and so is in equilibrium. When the sun moves to shine on the air at *N*, the air at *W* is cooled and rarer than the air at *Z*, which will rush into *W*. For the same reason, when the sun shines on *E* and *Z*, the air will move from *W* to *N* and from *N* to *E* respectively, and so on. That is to say, there will be a continual wind from east to west at the equator, as there indeed is on the present earth. Any vapours raised from the abyss at the equator,

¹⁸ See Henry (1986), 348-50, 360-1.

then, being the same specific weight as the air, will be carried by this wind and will move from east to west, thus remaining at this latitude rather than moving toward the poles.¹⁹

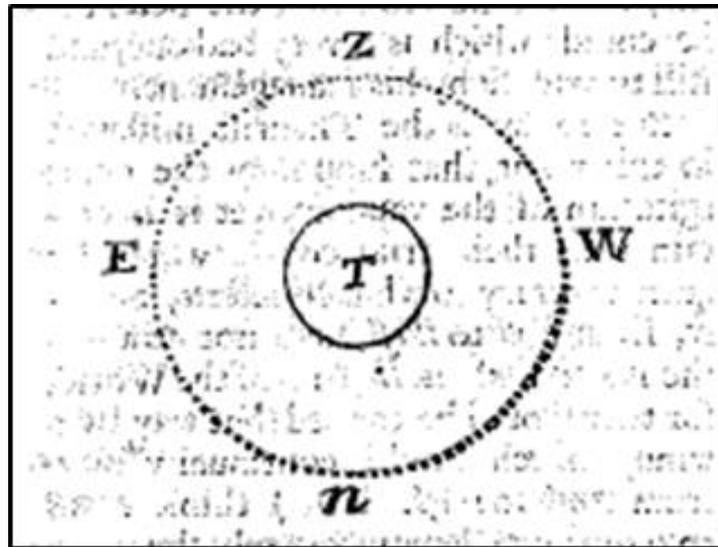


Fig. 2

The final step in Keill's argument is to demonstrate that even if the sun was able to raise sufficient vapour from the abyss *and* this vapour were able to travel toward the poles, the prolate figure of Burnet's antediluvian earth would not enable rivers to flow toward the equator. Here, Keill rather cleverly uses part of Burnet's own theory against him. Burnet had claimed that the earth's prolate figure resulted from the centrifugal force of its diurnal motion which caused the fluid of the chaos to recede from the axis, meet with resistance from the atmosphere, and move toward the poles where the atmosphere exerted less pressure on the chaos. This, of course, Keill rejects, arguing that the earth's atmosphere does not exert pressure on the earth but moves *with it*, that if the atmosphere *did* exert pressure on the chaos there is no reason why it would exert less pressure at the poles than at the equator, and that, owing to the centrifugal force created by the earth's diurnal motion, the figure of the earth is an *oblate* rather than a prolate spheroid. Notwithstanding this, Keill uses Burnet's argument for the earth's prolate figure to show that, *according to his own principles*, this figure would

¹⁹ Keill (1698), 93-100

not facilitate the flow of rivers from the polar regions to the equator. Since the earth is still rotating diurnally, he argues, the same pressure of the atmosphere which in Burnet's view caused the fluid of the chaos to move toward the poles will continue to exert the same force on any fluid on the surface and will therefore prevent the water descending from the poles to the equator. The fluid will ascend toward the poles or descend in the direction of the equator only until the two forces are in equilibrium, at which point it will remain, neither ascending nor descending. It was evident, then "*from the Theorists own principles, and his Oval figure of the Earth, that there could be no course of Rivers in the Antediluvian world, if his Theory were true*".²⁰

The second distinctive element of the *Examination* was Keill's frequent use of experiments, both physical and conceptual, in confuting Burnet's claims. Where other authors appealed to empirical evidence in their arguments against Burnet, these appeals were typically *observations* of the natural world which appeared to conflict with his theory. Such observations, of course, are present throughout the *Examination*, but it is the *experimental* evidence which gives his attack a level of rigour not present in other responses. As in his attack on Whiston, the majority of Keill's *physical* experimental evidence against Burnet came from hydrostatics. In some cases, this evidence was employed directly and straightforwardly to show that the processes described by Burnet simply would not occur in the manner he had envisaged. Against the formation of the crust on a body of oily fluid, for example, Keill first notes Burnet's claim that this oil was lighter than the watery abyss on which it was situated and that the terrestrial particles which would come to form the crust would sink in water. From this, it followed that the terrestrial particles were heavier than water. And if they were heavier than water, and water heavier than oil, then *a fortiori* they were heavier than oil and must therefore sink also, and more easily, in that fluid. It was well established, moreover, that many substances which float in water sink in oil but not vice versa for this very reason.²¹

²⁰ Keill (1698), 101-7.

²¹ Keill (1698), 37-8.

What “seem[ed] to have deceived the Theorist” on this matter in Keill’s view was that he had observed small dust particles floating on the surface of oil. From this, he had concluded that if a vast quantity of such particles were to accumulate over a period of time, they would not sink but would form a contiguous, solid body on the surface. If, however, we consider the hydrostatic principles behind the buoyancy of these particles, Keill argued, Burnet’s conclusion will not hold up. No liquids in nature, he notes first, are perfectly fluid. All liquids have some degree of resistance to the separation of their parts, and this resistance will retard to some extent the descent of bodies through them. All other things being equal, this resistance is always directly proportional to the surface area of the descending body. Thus, a small body whose surface area is large relative to its weight will float on the surface of a liquid, since its weight cannot overcome the resistance of the fluid. The surface area of a body, however, typically increases disproportionately to its weight, and so the resistance of a fluid to the descent of a small body will be greater than its resistance to a larger body of the same specific gravity. If, for example, we place a sphere of one-inch diameter into a fluid whose resistance is equal to the gravity of the sphere, then the two being in equilibrium, the sphere will float on the fluid. But if a sphere of two-inch diameter and of the same intensive gravity is placed into the same fluid, it will sink, since its weight is eight times, but its surface area only four times, that of the former sphere, and so the resistance of the fluid will not impede its descent. So while small particles of dust may float on a body of oily fluid, as they accumulate, their weight will increase disproportionately with their surface area, and the fluid having the same degree of resistance as before, it will no longer impede their descent, and they will sink through it.²²

Elsewhere in the *Examination*, Keill’s use of hydrostatics is rather less direct and more analogical. An interesting example of this is his argument against Burnet’s assumption that the uniform distribution of the primitive earth’s mass would result in its axis being perpendicular to the plane of the ecliptic, “[f]or a Body sayes he freely left to its self in a fluid medium will settle it self in

²² Keill (1698), 38-40.

such a posture as will best answer to its gravity, and the Earth being uniformly ballanced, there is no reason why it should incline at one end more than at the other towards the Sun".²³ There was, however, no reason at all why specially the *axis* of the earth should be perpendicular to the ecliptic,

for it is demonstrated by the writers of *Hydrostaticks*, that a sphere whose centre of Gravity is the same with its centre of Magnitude if put in a fluid of the same specifick gravity with it self, will retain *any given position*, and therefore there can be no reason drawn from the earths gravity or equilibration why the position of its *axis* should be perpendicular to the plane of the *Ecliptick* rather than any other of its diameters.²⁴

Keill, then, uses this hydrostatic experiment essentially as an analogy or model of the earth in space in order to demonstrate that the mass of Burnet's primitive earth being uniformly distributed entails nothing whatsoever about its position relative to the ecliptic.

As I have noted above, many of the experiments used by Keill against Burnet were *conceptual* or *thought* experiments – often aided by diagrams – rather than physical experiments. In this respect, they were similar to the experimental demonstrations used in his Hart Hall lectures which were developed around the same time and published as a textbook four years after the *Examination*, most of which, as John Henry notes, were also conceptual rather than physical.²⁵ We have seen examples of these above in Keill's arguments against Burnet's antediluvian hydrography. One further example from Keill's discussion of the Deluge is worth taking notice of, however, for it is highly illustrative of how Keill used these thought experiments to embellish arguments that other critics had advanced in order to provide a more convincing critique of Burnet than had previously been achieved. Burnet had claimed that the heat of the sun on the earth rarefied the waters of the abyss, likening the crust to an aeolipile or hollow sphere full of water which, when heated by the sun, turned the subterraneous water into vapour, exerting pressure on the crust. Against this, several authors had argued that the

²³ Keill (1698), 82.

²⁴ Keill (1698), 83.

²⁵ Henry (2010). See Keill (1720 [1702]).

sun does not penetrate deep enough into the crust to rarefy the waters of any supposed abyss. Beaumont, for example, noted that a thermometer placed in a cave gives the same reading in summer as in winter.²⁶ Keill repeats this point, adding also the testimony of miners who report that the temperature in mines does not vary sensibly with the seasons.²⁷ He does not rest here, however. Wanting to “bring this point to a Calculation as near as I can”, he introduces the following thought experiment. Suppose the earth’s crust was composed of one hundred concentric spheres. And suppose that the amount of the sun’s heat that is transmitted diminishes by half with each sphere, which “may be... easily allowed; for it is plain, that the Surface of the Earth does not transmit the half, nay not the hundredth part of the Suns beams which fall upon it”. In this case, half the heat which falls on the first surface will fall on the second, one quarter on the third, one eighth on the fourth, and so on until the one-hundredth sphere which will receive just one part of the sun’s heat to 2⁹⁹ parts on the outer sphere, “a number which if written at length would consist of a hundred Figures”.²⁸

The third and final aspect that distinguished Keill’s work from other responses to Burnet was his use of mathematical demonstrations. This of course is already evident in many of the above arguments. One further example is worth briefly taking notice of, however, for it illustrates how Keill’s use of mathematical demonstrations extended not only to the kinds of arguments concerning efficient causes discussed above but also to arguments about *final* causes. It also illuminates how Keill’s use of mathematics set his work apart from other responses to the *Theory*, for in this example he is essentially advancing an argument that many other critics of Burnet had made but using mathematics to make it more compelling. The example comes from Keill’s discussion of Burnet’s perpendicular axis. As we have seen in previous chapters, this part of Burnet’s theory had been subject to frequent objections from final causes, Bentley, Beaumont, and several others noting the advantages accrued from the present earth’s oblique position on the one hand and the disadvantages that would obtain if

²⁶ Beaumont (1693), 25-6.

²⁷ Keill (1698), 148-9.

²⁸ Keill (1698), 149-50.

the earth's axis were perpendicular to the plane of the ecliptic on the other.²⁹ Keill repeats many of these arguments, adding also a detailed discussion of Johannes Kepler's observations on the same subject.³⁰ In addition to this, however, he points to a further "considerable advantage which we reap by the present position of the earth" which had not yet been noted. With the present inclination of the earth's axis, he explains, in the northern and southern hemispheres above forty-five degrees latitude the sum of the sun's heat throughout the year is greater, and at fewer than forty-five degrees latitude the sum of the sun's heat throughout the year is less, than if the axis was perpendicular to the ecliptic. This he demonstrates with rigorous calculations of the aggregate heat of the sun throughout the year at different latitudes to show that

we who live in this part of the World, and have greatest need of the Sun's heat, have more of it take the whole year about, than if the Sun moved continually in the *equator*, whereas they that live in the *Torrid Zone* and in places near them, and who are rather too much exposed to the heat of the Sun, than too little, have by this means less of his heat than they would have had the earth observed a right position.³¹

6.3. Attacking Cartesianism and courting patronage

I turn now to Keill's motivations for attacking the theorists. Here it is important to emphasise that as well as Burnet and Whiston, Keill's examination has a much broader target. That is, it was a response to what Keill believed were fundamentally flawed methods of philosophical inquiry which, firstly, had led to erroneous views about the natural world, and secondly, were conducive to irreligion. Theories of the earth, and Burnet's in particular, were simply an especially pernicious, and at the time especially prominent, manifestation of this more general problem. This broader target is immediately evident in the book's introduction. "WHAT *Plutarch* particularly proves of the *Stoicks*", writes Keill at the very beginning of the work,

²⁹ Bentley (1693), 20-7; Beaumont (1693), 81-8.

³⁰ Keill (1698), 62-9.

³¹ Keill (1698), 69-76 – quotations from 69 and 70-1.

that they spoke more improbabilities than the Poets, may be extended to a great part of Philosophers, who have maintained opinions more absurd than can be found in any of the most Fabulous Poets, or Romantick Writers. The one as well as the other fancied that their character did oblige them to say things, which were not common or obvious to vulgar capacities, and therefore scorning the Instructions of sense and reason, they only cultivated their own wild imaginations, which seldom produce any thing but what is extravagant and unaccountable. This will soon appear to any who will be at the pains to examin either the Ancient or Modern Philosophers.³²

He then conducts a survey of various “extravagant” notions which had been promulgated by philosophers, both ancient and modern. Of the former, his main target is Epicurus, the first philosopher to whom Keill gives the title of “world-maker”.³³ This philosopher, he notes, had argued that the earth is cylindrical, notwithstanding the fact that before his time mathematicians had demonstrated its sphericity and developed methods of calculating its proportions. He had conjectured that the sun, moon, and stars may be no larger than they appear; that the stars might be kindled in the east and extinguished in the west; that the sun and stars might be created anew every day. “I am sure a Blind man”, writes Keill, “who had never seen either Sun or Stars, could not have given a worse account of them, than this Philosopher has done; and yet with an unpardonable boldness he pretended to tell us, how the World was made, when it is plain he knew not what it was”.³⁴

As several historians have noted, Keill’s principle target among the moderns is Descartes.³⁵ After attacking several other contemporary philosophers whose notions were in his view no less absurd than those of the ancients, he asserts that

³² Keill (1698), 1-2.

³³ Keill (1698), 4.

³⁴ Keill (1698), 4-5.

³⁵ The most extensive discussion of Keill’s attack on Cartesianism is in Kubrin (1968), 319-25. See also Roger (1982), 109; Rossi (1984), 71-4; Harrison (2000), 177-8; Magruder (2000), 151-3; Coppola (2010), 132-3; Poole (2010), 71; Lynall (2012), 60-1; Anstey (2018), 44.

M. *Des Cartes* the great Master and deliverer of the Philosophers from the tyranny of *Aristotle*, is to be blamed for all this, for he has encouraged so very much this presumptuous pride in the Philosophers, that they think they understand all the works of Nature, & are able to give a good account of them, whereas neither he, nor any of his followers, have given us a right explication of any one thing.³⁶

He then voices objections to various tenets of the Cartesian philosophy.³⁷ It is important to stress here that Keill's description of Descartes as "the great Master and deliverer of the Philosophers from the tyranny of *Aristotle*" is to be read with a heavy dose of sarcasm. Crucially, in Keill's view, it was *only* because of the "outcry against Aristotle" that the "absurd notions" set down by Descartes in his *Principles of Philosophy* had become so widely accepted among philosophers.³⁸ Yet the system that had come to replace the Aristotelian philosophy was in fact

much more absurd than *Aristotle's* ἐντελέχεια or the Schoolmens substantial formes, which must give way to Mons. *Des Cartes's* ingenious hypothesis, who, as his followers pretended, could solve all the phaenomena in nature, by his principles of matter, and motion, without the help of attraction and occult qualities.³⁹

It was this claim to be able to "solve all the phaenomena in nature" that Keill viewed as especially pernicious. Particularly problematic was that Descartes, by supposing that in the beginning God created merely a certain fixed quantity of matter and motion, had claimed to deduce "how, by the necessary laws of *Mechanisme*, without any extraordinary concurrence of the Divine Power, the world and all that therein is might have been produced".⁴⁰ This made Descartes essentially a modern-day Epicurus, "the first world-maker this Century produced",

³⁶ Keill (1698), 11-12.

³⁷ Keill (1698), 12-19.

³⁸ Keill (1698), 13.

³⁹ Keill (1698), 13-14. It is noteworthy also that, in his subsequent rejoinder, Keill censures Burnet for his "rude treatment of Aristotle" – Keill (1699), 158 – and, as we shall see below, praises Aristotelian natural philosophy in a later work. For an illuminating discussion of Keill's Aristotelian sympathies, see Wilson (2009), 44-53.

⁴⁰ Keill (1698), 14.

the first who introduced the fancy of making a World, and deducing the origination of the Universe from Mechanical principles. Which notion has been so stily maintained by his admirers, that by it they have given the ignorant Atheists (for so are most of that perswasion) some plausible pretences for their incredulity without any real grounds.⁴¹

Following his discussion of Descartes, Keill turns at last to the theorists. They were engaged in essentially the same enterprise of “world-making” as Epicurus and Descartes but were ultimately far more dangerous, for they had

not only asserted, that the world was made by the laws of Mechanism, without the extraordinary concurrence of the Divine power, but also that all the great changes which have happened to it, such as the Deluge, and other great effects dilivered to us as miracles by the sacred writers, were the necessary consequences of natural causes, which they pretend to account for.⁴²

Like Descartes, “these flood-makers”, though not atheists themselves, had “given the Atheists an argument to uphold their cause”.⁴³ Crucially, although the theorists themselves had maintained a role for God in the Creation and Deluge, by explaining the events in terms of natural causes, they had minimised that role to such an extent that it was now only a short step to denying it altogether, and from there only a short step to denying his *existence*. In making these steps, the atheist was now armed with what appeared *prima facie* to be plausible mechanical explanations of the Creation and Deluge, events which, like other miracles in Scripture, had traditionally been seen as requiring God’s particular intervention and as such had served important apologetic purposes. These events, that is, *as instances of God’s interposition in the world*, had served as important evidence of the truth of Christianity. By explaining them in terms of natural processes, the theorists had undermined this purpose, and with it the entire Christian religion.

⁴¹ Keill (1698), 14, 19.

⁴² Keill (1698), 19.

⁴³ Keill (1698), 21.

For Keill, the only way to counter this threat to religion was to show that the causes the theorists had assigned for the Creation and Deluge were insufficient to bring about these events. By demonstrating that the best physical theories of the earth were inadequate, he could show that these events could not have been brought about via natural causes but required miraculous intervention. Here it is interesting to contrast Keill's attitude with that of Burnet and Whiston. His ultimate goal is essentially the same as theirs. He wants to vindicate Scripture and to show that it is consistent with philosophy. But where Burnet and Whiston believe that the best way to do this is to show that biblical events *can* be explained in terms of natural processes, Keill thinks that the way to go about it is rather to show that these events *cannot* be explained in such terms. This, he tries to do by showing that Burnet's and Whiston's theories are, as he puts it,

neither consonant to the established laws of motion, nor to the acknowledged principles of natural Philosophy, of that Philosophy I mean, which is founded upon observations and calculations, both which are undoubtedly the most certain principles, that a Philosopher can build upon.⁴⁴

This latter point was very important, for it was primarily a lack of empirical observation and an ignorance of or inattention to mathematics that had in Keil's view led the philosophers, both ancient and modern, and the theorists – though Burnet much more than Whiston – astray. These two things, Keill stressed, are essential components of any inquiry into the natural world, for without empirical observation we cannot become acquainted with the forces of nature, and without mathematics we cannot know whether the causes we assign to explain a given phenomenon are proportional to their effects.⁴⁵ No one, Keill noted, had yet tested Burnet's and Whiston's theories empirically and mathematically. Whiston's theory was of course only recently published. And although Burnet's had "been published many years, and has been animadverted upon by several, yet it has not been so fully refuted as it might have been, nor has any one shew'd the greatest mistakes in it".⁴⁶ It is

⁴⁴ Keill (1698), 21-2.

⁴⁵ Keill (1698), 22.

⁴⁶ Keill (1698), 22.

interesting to note here that Keill does *not* attack Woodward's *Essay*, the other prominent late-seventeenth-century theory of the earth. This is most likely because John Arbuthnot had already subjected Woodward's theory to precisely the kind of mathematical and empirical examination that Keill was advocating.⁴⁷ Indeed, Keill's and Arbuthnot's attacks on the theorists are so similar in their approach that it is highly likely that the former was influenced to some extent by the latter.

Keill's discussion in the *Examination* of what true natural philosophy should consist in, and also his above assessment of ancient and modern philosophy, were closely mirrored in the preface and first lecture of his *Introductio ad veram physicam*, the published version of his 1700 Oxford lecture series published initially in Latin in 1702 and then in English under the title *An introduction to natural philosophy* in 1720.⁴⁸ In the preface to this book, Keill launches another scathing attack on the Cartesian philosophy, noting in particular the inadequacy of vortices in accounting for gravitation.⁴⁹ In lecture one, entitled "Of the Method of Philosophizing", he discusses four "Sects of Philosophers that have wrote on Physical Subjects".⁵⁰ The first are the ancient mathematical philosophers such as the Pythagoreans and Platonists. Although these thinkers had often obscured their philosophy with "Images and Hieroglyphicks", they had nevertheless correctly recognised the necessity of "Geometry and Arithmetick" in philosophical inquiry.⁵¹ The second are the Peripatetics, who "explained their Philosophy by Matter and Forms, Privations, Elementary Virtues, occult Qualities, Sympathies and Antipathies, Faculties, Attractions, and the like", and who, while not uncovering the true *causes* of natural phenomena, had nevertheless formulated an appropriate nomenclature with which these phenomena may be described.⁵² Third are the experimentalists. These philosophers had "too often distorted their Experiments and Observations, in order to favour some darling Theories they had

⁴⁷ Arbuthnot (1697), 7-33.

⁴⁸ Keill (1720 [1702]), iii-xii, 1-11.

⁴⁹ Keill (1720 [1702]), iii-viii.

⁵⁰ Keill (1720 [1702]), 1.

⁵¹ Keill (1720 [1702]), 1-2.

⁵² Keill (1720 [1702]), 2.

espoused”, but had nonetheless enriched philosophy by emphasising the importance of empirical investigation.⁵³ The final sect are the ancient atomists and mechanical philosophers, who “imagine they can explain all the Phenomena of Nature by Matter and Motion, by the Figure and Texture of the Parts, by subtle Particles, and the Actions of Effluvia”.⁵⁴

“AMONGST these various ways of Philosophizing”, writes Keill, “as there is no particular one, wherein we do intirely acquiesce; so in each, there are some things which we can approve of. Wherefore we shall chuse out of all of them what may be thought useful, and thence compose the Method we shall here follow”.⁵⁵ With the Pythagoreans and Platonists, we must recognise the necessity of geometry and arithmetic.⁵⁶ With the Peripatetics, we may appeal to occult qualities such as attraction, for though we may not know the physical causes of these phenomena, we can understand the mathematical laws that govern their effects.⁵⁷ Once we have formulated these laws, we must, with the experimentalists, test our theories empirically.⁵⁸ And following the ancient atomists and mechanical philosophers, we may consider the extent to which phenomena can be explained in terms of matter and motion and the laws of mechanics. In doing so, however, we must follow three important rules, which had typically not been observed by mechanical philosophers. First, we must premise appropriate definitions for the phenomenon under investigation. Second, we must use abstraction in order to focus our attention on the particular phenomenon in question. And third, we must begin with simple cases and uncover the laws governing *them* before investigating more complex phenomena.⁵⁹ Keill concludes the lecture with a brief note on “the Theorists” who “offend against this [third] Rule...; [and] neglecting, or not thoroughly understanding the first and more simple Principles

⁵³ Keill (1720 [1702]), 2-3.

⁵⁴ Keill (1720 [1702]), 3.

⁵⁵ Keill (1720 [1702]), 3.

⁵⁶ Keill (1720 [1702]), 3.

⁵⁷ Keill (1720 [1702]), 4-7.

⁵⁸ Keill (1720 [1702]), 7.

⁵⁹ Keill (1720 [1702]), 7-11.

of the mechanical Philosophy, at the very first stroke attempt the most difficult Problems, and rashly enough endeavour to shew how a World, a Planet, or an Animal might be formed".⁶⁰

For Keill, the above synthesis, the method of philosophical inquiry that he was promoting in his lectures, was exemplified by Newton in the *Principia*.⁶¹ And it is this synthesis that he employs against Burnet in the *Examination*. We have seen above examples of Keill's use of mathematical, experimental, and mechanical philosophy, and his note on the necessity of occult qualities. There is, however, one further aspect of natural philosophy which Keill considers indispensable that he does not discuss in the *Introduction* but attends to at length in the *Examination*. This is the consideration of final causes. Here again, he is explicitly pitting himself against the Cartesians who had tried to exclude all consideration of final causes from natural philosophy in favour of formal and efficient causes. Against this, Keill stresses in the first place the *theological* value of final causes. They lead us to the admiration of God. They show us that the world could not have been created through mere chance. As to their philosophical value, he points out that there are many things in nature for which we do not – and in some cases *cannot* – know the efficient causes. In such cases, final causes are our only way of knowing about the natural world. We do not, for example, know the efficient causes of mountains, yet we can attain intimate knowledge of them by considering their final causes, since we learn, among numerous other things, that they condense vapours and facilitate the flow of rivers.⁶² Proper consideration of final causes was also an essential part of reasoning about *efficient* causes. Here Burnet had made several grave errors. When considering the earth's oblique position relative to the ecliptic, for example, by not attending adequately to final causes, Burnet had concluded that this position was brought about by an accidental unbalancing of the earth. Had he appreciated the extent to which the earth's oblique posture is essential to its being a habitable world, he would have

⁶⁰ Keill (1720 [1702]), 10.

⁶¹ Cf. Wilson (2009), 44-5.

⁶² Keill (1698), 54-8.

understood that it was not brought about in the manner he had imagined but was placed in that position by God at the Creation. This example in particular, Keill emphasises,

shews us... how much we ought to regard final causes in *Natural Philosophy*, which in things of this nature are by far more certain and convincing than any of the *Physical* and *Mechanical* ones which the Theorist brings to prove the truth of his assertion which have brought him into many strange and dangerous errors, it being just that God Almighty should deliver these men up to follow strange delusions, who neglecting to proceed upon final causes the true principles of *Natural Philosophy*... have followed the wild and extravagant Fancies of their own imaginations.⁶³

Before we move on to look at Burnet's reply to Keill and Keill's response to this reply, it is worth briefly considering some further plausible motivations for Keill's attack on Burnet and Whiston, namely, patronage. John Friesen has very plausibly argued that Keill's attack was motivated in large part by a desire to curry favour with the Christ Church wits, a circle of literary scholars at Christ Church, Oxford, the college to which Keill was soon to follow Gregory. The Christ Church wits, all High Church Tories, were at the time involved in the so-called ancients-moderns controversy, asserting the superiority of ancient wisdom against such authors as Richard Bentley and William Wotton, Low Church Whigs who argued for the superiority of modern learning. Keill, and also Arbuthnot, were closely associated with the wits, and so their attacks on Burnet, Whiston, and Woodward were likely designed to court their patronage by aligning themselves on the side of the ancients in this dispute. This, Friesen argues, is plausibly why Keill singles out both Bentley and Wotton in the *Examination*, attacking Bentley in his discussion of the primitive earth's axis for having claimed in his Boyle Lectures that the aggregate heat of the sun on different parts of the earth would be the same regardless of whether the axis was perpendicular or oblique to the plane of the ecliptic and for his assertion that the moon always shows the same face to the earth because it does not turn on its axis rather than because it does turn once on its axis during the time of its orbit, and Wotton for praising Descartes for

⁶³ Keill (1698), 76.

“Marrying Geometry and Physicks together”, which, Keill argues, “is a clearer demonstration than any in *Des Cartes’s* principles of Philosophy, that Mr. *Wotton* either understands no Geometry, or else that he never read *Des Cartes’s* principles”.⁶⁴

It is also possible that Keill was looking after his current source of patronage at Balliol, too. As well as his Warner Exhibition, Keill was evidently receiving patronage from Roger Mander, who was Master of Balliol College from 1687 to 1704 and also Vice Chancellor of Oxford University from 1700 to 1702. Keill dedicated the work to Mander, praising him for his “prudence in so Industriously promoting the Mathematical Sciences” and “prudent Zeal for the Authority of Scriptures”. “We who live under the Advantages of these Excellent Qualifications in a Governour”, he continued,

cannot but be sensible of the Obligations we have to be thankful for them; and indeed the desire of Expressing my Gratitude, for these Common and many other Particular Favours You have been pleased to bestow on me, was the great motive of my presuming to Inscribe this Discourse to your Name.⁶⁵

Like the Christ Church wits, Mander was a High Church Tory, who undoubtedly would have been pleased by Keill’s attack on the theorists and may even have suggested the topic to him – Keill mentions in the dedication Mander’s “Direction and Encouragement”.⁶⁶ Like the wits, Mander would have been impressed that Keill was arguing – and doing so very effectively – for what was essentially

⁶⁴ Friesen (2008), 42-8; Bentley (1693), 17, 23; Keill (1698), 14-16, 22-6, 70-1 – quotation from 15. See also Magruder (2000), 147-57. It should be noted here, as Magruder points out, that on the former point Bentley seems rather to be arguing – correctly – that the aggregate of the sun’s heat on the *entire* earth would be the same regardless of the position of its axis relative to the ecliptic and that Keill, perhaps deliberately, misinterprets him. The passage Keill cites states that “[t]ho the Axis had been perpendicular; yet take the whole Year about we should have had the same measure of Heat, that we have now”, Keill interpreting “we” as referring to people in England. Bentley clearly states in the preceding sentence, however, that “the *whole* Globe would continue in the same Distance from the Sun, and receive the same Quantity of Heat from him in a Year or any assignable time, in either Hypothesis [i.e., whether the axis is perpendicular or oblique to the ecliptic]”, which suggests that “we” in the following sentence to refers not merely to the English but to life on earth more generally – Magruder (2000), 153-4. Keill’s interpretation of Bentley on the moon, on the other hand, is correct.

⁶⁵ Keill (1698), dedication.

⁶⁶ Keill (1698), dedication.

an orthodox reading of Scripture and also by his attack on Whiston, Bentley, and Wotton, who were Low Church Whigs.⁶⁷

The orthodox interpretation of Scripture that Keill was promulgating of course was that the Creation and Deluge were *miraculous* and not natural events. Interestingly, though, Keill's main source of evidence for this interpretation was not Scripture itself but *nature*. Here it is important to remember that Keill's conception of miracles and of the distinction between the natural and the miraculous was very different from Burnet's and Whiston's conception. As I explained in the previous chapter, unlike the theorists, Keill followed Robert Boyle and others in adopting the modified version of the Thomist definition discussed in chapter two according to which miracles are violations of laws of nature resulting from God's direct intervention in the world. As Peter Harrison notes, philosophers who adopted this definition saw themselves as peculiarly well qualified to distinguish between miracles and the ordinary course of nature and thus to differentiate between true and false miracles. Ultimately, they understood the laws of nature better than others and so were best placed to judge whether a given event constituted a violation of those laws.⁶⁸ Keill exemplified this attitude. His knowledge of the laws of nature, he believed, enabled him to state with absolute certainty that the Creation and Deluge could not have been brought about by natural causes but required miraculous intervention from God. A miraculous interpretation of these events was the interpretation that was best supported by the *physical* evidence.⁶⁹

6.4. Some Reflections and a second Examination

A year after the publication of Keill's *Examination*, a response defending Burnet's theory appeared entitled *Reflections upon the Theory of the Earth occasion'd by a Late Examination of it*. The tract was anonymous, the author not giving a full name but merely signing the work "T.B." and referring to

⁶⁷ For Mander's political and religious affiliation, see Hone (2017), 60.

⁶⁸ Harrison (1995), 535-7; (2006), 504-9.

⁶⁹ Keill (1698), 30-3, 43-5.

Burnet in the third person as “the Theorist” throughout. The work was originally attributed to Burnet himself and appended to the fifth and subsequent editions of the *Theory* alongside his responses to Warren which were first appended to the fourth edition. Following the title page, an “Advertisement from the Bookseller” read:

*THE following Tract hath been much inquired after by some curious Persons, but was so scarce that a Copy could not be procured at the time of the former Edition of the Theory. Since that, an intimate Friend of Doctor Burnet’s hath favoured me with a Copy; so that the Reader may be assured it is genuine, and was wrote by Doctor Burnet; and it is apprehended, it may very well deserve a place in his Works.*⁷⁰

In the seventh edition, a biography of Burnet written by the Anglican Clergyman Ralph Heathcote was added to the preface, and in his discussion of Keill’s attack on Burnet and Whiston, Heathcote also attributes the *Reflections* to Burnet.⁷¹ During the nineteenth century, for reasons that are unclear, the work came also to be attributed to the millenarian writer Thomas Beverley. The earliest example I have seen of this is in an 1813 British Museum catalogue in which it is listed in *both* Beverley’s and Burnet’s works.⁷² It was later attributed to Beverley (and *not* Burnet) by Samuel Halkett and John Laing in their 1885 *Dictionary of the anonymous and pseudonymous literature of Great Britain*.⁷³

In modern discussions of the *Reflections*, historians have typically followed the above bookseller and Heathcote in attributing the work to Burnet.⁷⁴ Some, however, have cited it as an anonymous text.⁷⁵ And a few have ascribed it to Beverley.⁷⁶ The first to do the latter was Don Cameron Allen in his 1949 work *The legend of Noah*. Allen discusses the work only very briefly in a footnote and

⁷⁰ Burnet (1722); (1726); (1759).

⁷¹ Heathcote (1759), xxxi.

⁷² Ellis and Maty (1813).

⁷³ Halkett and Laing (1885), 2115.

⁷⁴ Taylor (1950), 197; Porter (1977), 228, 245; Rappaport (1997), 149; Mandelbrote (2008); Eddy (2008), 181; Anstey (2018), 45-6; Lynall (2012), 60-8, 162-3, 183.

⁷⁵ Henry (2010); Ogden (1947), 148 [note 21].

⁷⁶ Allen (1949), 111 [note 100], 194; Macklem (1958), 37, 99, 113; Magruder (2000), 100-2, 128, 144-5, 157, 504 [note 155], 559, 599-600, 748; (2006), 252, 255; (2009), 58-9; Johnston (2009).

does not question Beverley's authorship.⁷⁷ Michael Macklem attributes the piece to Beverley in his 1958 book *The anatomy of the world*. Macklem notes that the work had also been attributed to Burnet and that it was appended to later editions of the *Theory* but does not tell us why he disagrees with this attribution and ascribes it instead to Beverley.⁷⁸ It is highly likely that both Allen and Macklem were following Halkett and Laing, whose *Dictionary* was reprinted several times during the twentieth century. The only recent work on theories of the earth in which the text is attributed to Beverley is that of Kerry Magruder.⁷⁹ Magruder appears to have followed Macklem, whose list of works connected with Burnet's *Theory* forms the basis of much of his PhD research.⁸⁰ He mentions nothing of the work being attributed to Burnet. One other attribution to Beverley appears in Warren Johnston's *Oxford dictionary of national biography* entry on him. In his brief discussion of the *Reflections*, Johnston appears to have confused it with Keill's *Examination*, since he claims that the work "preserved the mysteriousness of Christianity by maintaining the miraculous nature of the creation of the earth, and of the flood", which of course is what Keill did in the *Examination* and precisely *not* what was done in the *Reflections* in which it was maintained *against* Keill that the Creation and Deluge resulted from *natural* causes.⁸¹

The attribution of the *Reflections* to Beverley is somewhat puzzling as well as decidedly unconvincing. It is not *entirely* without grounds. Beverley had praised Burnet's *Theory* in a number of his works and had cited it in support of some of his arguments about the Conflagration and Millennium, noting in particular Burnet's interpretation of St Peter, with which he was especially sympathetic.⁸² Burnet was also named in the dedication in Beverley's 1690 pamphlet *The pattern of*

⁷⁷ Allen (1949), 111 [note 100].

⁷⁸ Macklem (1958), 113.

⁷⁹ Magruder (2000), 100-2, 128, 144-5, 157, 504 [note 155], 559, 599-600, 748; (2006), 252, 255; (2009), 58-9.

⁸⁰ See Magruder (2000), 143-5.

⁸¹ Johnston (2009). It is interesting to note that the *DNB* contains three different attributions for the *Reflections*, the other two being Scott Mandelbrote's entry on Burnet in which he attributes the work to him and John Henry's entry on Keill in which he cites it as an anonymous text – see Mandelbrote (2008); Henry (2009).

⁸² Beverley (1689), 41; (1691), 9; (1693), 130, 143; (1694), 11.

the divine temple, sanstuary [sic], and city of the New Jerusalem measured according to Ezekiels last and greatest vision. Beverley's discussions of the *Theory*, however, are all very brief, and as an obsessive millenarian, he was far more interested in its implications for the Conflagration and Millennium than anything to do with the Creation and the Deluge, which were of course the sole focus of the *Reflections*. It is important also not to read too much into the above dedication, for here Burnet was listed alongside the Archbishop of Canterbury (Beverley's primary dedicatee), five other Bishops, and thirteen other prominent divines, and so was most likely named due to his position in the church rather than anything to do with the *Theory*, which is not mentioned at all in the pamphlet.⁸³

Beyond his initials, then, there is little reason to think that Beverley was the author. There are, however, several very good reasons to attribute the work to Burnet. To begin with, it was written in Burnet's distinctive and much remarked upon prose style. It was also published by Burnet's publisher, Walter Kettilby, who, apart from the third Latin edition, published all the editions of the *Theory* that appeared during Burnet's lifetime as well as both of Burnet's responses to Warren and the *Archaeologiae* – that is, almost his entire bibliography – but published none of Beverley's work.⁸⁴ Additionally, as will become increasingly apparent shortly when I discuss the work in more depth, the content of the *Reflections* is highly indicative of Burnet's authorship. In this regard, two things in particular stand out. First is the author's resolute adherence to, and extensive knowledge of, Cartesian natural philosophy, something which is present throughout Burnet's work but wholly absent from Beverley's. The second is a fervent belief in the existence of extra-terrestrial life, a belief which is not expressed in *any* of Beverley's other published work but *was* expressed by Burnet.⁸⁵ Allen, who as we

⁸³ Beverley (1690), dedication. Burnet was at this time Chaplain-in-Ordinary to the King.

⁸⁴ Aside from the third Latin edition of the *Theory*, the only works by him which were published during his lifetime by anyone other than Kettilby were his three pamphlets on John Locke's *Essay concerning human understanding* – Burnet (1697a); (1697a); (1699b); (1702).

⁸⁵ I have conducted a thorough search of all Beverley's published works. None of them were published by Kettilby. There is no mention of extra-terrestrial life. There is only one brief mention of Descartes in relation to the priority of rational over empirical knowledge and no discussion of Cartesian natural philosophy or any use of Cartesian terminology (e.g. vortices). Beverley's single reference to Descartes appears in his (1694), 91. For Burnet's discussion of extra-terrestrial life, see Burnet (1684), 321-2.

have seen attributes the work to Beverley, correctly notes that much of the discussion in the *Reflections* was guided by this belief.⁸⁶ Yet the presence of this belief in Burnet's work and the absence of it in Beverley's surely point us *away* from Beverley and toward Burnet as the author.

Keill may very well have suspected that the *Reflections* was written by Burnet. For the most part, he does not let on, referring to the author throughout his reply as "the Defender" and often distinguishing between "the Defender" and "the Theorist". At the end of his reply, however, he requests that Burnet "spend some time in the study of Numbers and Magnitude, Astronomy and Statics, that he may be the better able to understand the force of my Arguments against his Theory, after which I doubt not but that he will easily perceive its errors, and have the ingenuity to acknowledge them".⁸⁷ Until he does, Keill continues, "all further disputation between him and me, must needs be vain and frivolous".⁸⁸ Keill's intimation here is that it was *Burnet* who had not understood the force of his arguments. And his reference to *further* disputation indicates that he believed himself currently to be engaged in disputation *with him*. This suggests that Keill likely suspected "the Theorist" and "the Defender" to have been one and the same author.

Turning now to the content of the *Reflections* and Keill's reply, what is perhaps most interesting about the way this debate progresses is the extent to which it becomes, as Keill had indeed intended, about much more than just Burnet's theory of the earth. That is, it extends to precisely the kinds of foundational issues about the nature of philosophical inquiry with which Keill, both in his *Examination* and in his Oxford lectures, was most concerned. Essentially, with Burnet's reply, the debate becomes a battle between Burnet's Cartesian and Keill's brand of Newtonian principles, for in responding to Keill, Burnet advances several decidedly Cartesian arguments against various of the distinctly Newtonian foundations on which Keill's attack on the theory was based. The conflict between Cartesianism and Newtonianism in Burnet's debate with Keill centred primarily on two

⁸⁶ Allen (1949), 111 [note 100].

⁸⁷ Keill (1699), 160-1.

⁸⁸ Keill (1699), 161.

closely-related methodological issues concerning the kinds of scientific explanations that should be sought and the sorts of concepts that could be employed in explaining natural phenomena.

The first issue I want to discuss is the that of final causes. As we have seen, in his *Examination*, Keill argued at length for the necessity of considering final causes when conducting philosophical inquiry. In his view, inadequate consideration of final causes had led Burnet to err. In response to this, Burnet makes a number of distinctly Cartesian observations on the dangers of theorising about final causes and the priority of efficient causes.⁸⁹ It is important to note here that Burnet does not want to *banish* final causes from natural philosophy as we find in Descartes.⁹⁰ He agrees with Keill that there is *some* value in understanding final causes.⁹¹ Nevertheless, he wants to emphasise the importance and ultimate priority of *efficient* causes. This he illustrates as he did several points in the *Theory* with the example of a watch or clock. He argues that if someone understands the final cause of such a machine – that is, to tell the time – yet knows nothing of its internal construction and of how its various parts conspire to move the hands on the dial, then that person could not be said to understand this machine, or at the very least we should say that this person has a greatly inferior understanding compared with someone who understands its efficient causes. And since everything in nature *has* an efficient cause, we must (a) endeavour to understand it, and (b) acknowledge that, in so far as we do *not* understand it, our philosophical understanding of the phenomenon in question is imperfect.⁹²

Although Burnet does not want to *exclude* final causes, then, he does assert the priority of efficient causes. He also wants to impose strict limits on theorising about final causes. And it is here that his view is most like that of Descartes. Descartes's main reason for rejecting final causes is that he believes theorising about them to be inherently hubristic, for as limited, imperfect beings, we cannot presume to understand God's purposes. As he writes in the *Meditations*,

⁸⁹ Burnet (1699a), 12-13, 16-18, 61.

⁹⁰ Descartes (1996 [1641]), 38-9; Descartes (1982 [1644]), 14-15.

⁹¹ Burnet (1699a), 17, 61.

⁹² Burnet (1699a), 12-13.

For since I now know that my own nature is very weak and limited, whereas the nature of God is immense, incomprehensible and infinite, I also know... that he is capable of countless things whose causes are beyond my knowledge. And for this reason alone I consider the customary search for final causes to be totally useless in physics; there is considerable rashness in thinking myself capable of investigating the <impenetrable> purposes of God.⁹³

And in the *Principles*,

concerning natural things, we shall not undertake any reasonings from the end which God or nature set Himself in creating these things, {and we shall entirely reject from our Philosophy the search for final causes}: because we ought not to presume so much of ourselves as to think that we are the confidants of His intentions.⁹⁴

Burnet does not go as far as Descartes. He believes there are *some* natural phenomena for which the final causes are clear enough that we can acquire reliable knowledge of them. He also maintains that such knowledge can lead us to a greater understanding of God's wisdom. But he wants to restrict final cause theorising in natural philosophy *only* to these clear and obvious cases. And his reason for this is precisely the same as Descartes's reason for rejecting it outright. For Burnet, any theorising about final causes beyond such clear cases is presumptuous. It is beyond our capabilities as limited beings to understand God's purposes, and we must therefore acquiesce instead in knowing *efficient or physical* causes, that is, "to know what God hath done, and conclude it to be the best, and that we should judge it so, if we had the same extent of thought and prospect its Maker had".⁹⁵ As far as Burnet was concerned, Keill, in his arguments from final causes, and in particular in arguing for the necessity of mountains and an oblique situation of the earth's axis for providing a habitable world, had overstepped this boundary. "[T]is a great vanity", he writes at the end of his discussion of

⁹³ Descartes (1996 [1641]), 39.

⁹⁴ Descartes (1982 [1644]), 14.

⁹⁵ Burnet (1699a), 17.

mountains, “for short-sighted Creatures and of narrow understandings to prescribe to Providence what is necessary and indispensable to the frame and order of an habitable World”.⁹⁶

It is in his discussion of final causes that Burnet’s belief in extra-terrestrial life comes to the fore. It is highly likely, he argues, that there are other planets without mountains and that there is life on these planets. It is *known* that Jupiter’s axis is perpendicular to the plane of the ecliptic. And it is likely that, notwithstanding this, there is animal and vegetable life there, both of which Keill had claimed were impossible given such a situation. Moreover, the other planets in our solar system – and therefore almost certainly in the universe more generally – have their axes at a great variety of angles relative to the plane of the ecliptic. They also have vastly different orbits and diurnal motions and therefore greatly varying lengths of days and years. By claiming that the present situation of the earth makes it peculiarly capable of sustaining life, Keill was effectively precluding the possibility of life on countless other planets. This implied that the creation of these innumerable worlds was to no purpose, which was contrary to the wisdom of God, who does nothing in vain.⁹⁷

What is noteworthy here is that embedded in this argument is yet another recognisably Cartesian consideration which is closely related to the issue of final causes and is articulated by Descartes immediately following the above-quoted passage of the *Meditations*. When reasoning about the perfection of God’s works, Descartes argues here, we must consider the universe as a whole rather than merely an individual part of the creation in isolation from the rest, for what may appear imperfect when viewed from this narrow perspective may in fact be perfect when considered in relation to the whole.⁹⁸ In Burnet’s view, it was from just such a narrow perspective that Keill had considered final causes. Because he did not, and *could* not, have the entire universe in view, the conclusions he had drawn from these considerations were unwarranted. Only God can comprehend the entire universe. Thus, when reasoning about the natural world from our limited perspective, we

⁹⁶ Burnet (1699a), 16.

⁹⁷ Burnet (1699a), 13, 19, 28-30.

⁹⁸ Descartes (1996 [1641]), 39.

must not “tell God Almighty what is best to be done, in this or that World”. Burnet sums up his position on final causes at the end of the *Reflections*. “As to Final Causes”, he writes,

the Contemplation of them is very useful to moral purposes, and of great satisfaction to the Mind where we can attain to them. But we must not pretend to prove a thing to be so or so in Nature, because we fancy it would be better so. Nor deny it to be in such a manner, because to our mind it would be better otherwise. Almighty Power and Wisdom that have the whole complex and composition of the Universe in View, take other measures than we can comprehend or account for.⁹⁹

In his reply, Keill recognised immediately the fallacy of relevance in Burnet’s argument. His arguments from final causes, he emphasises, pertained only to life *on earth*. Other planets are irrelevant. If there is life on other planets, it will be differently constituted and adapted to different environments, as is indeed the case with life in different areas of the earth. His argument did not prescribe to or place limits on God. God can create animal and vegetable life which is suited to different environments. Life *on earth* is better adapted to the present state than to Burnet’s antediluvian state and is therefore advantaged by the former and would be disadvantaged by the latter. But this implies nothing whatsoever about life – or the possibility of life – on other planets.¹⁰⁰ Crucially, Keill rejects Burnet’s Cartesian-inspired principle that the entire universe must be considered when reasoning about final causes. As we have seen above, this principle had led Burnet to place strict limits on final cause theorising, since only God can comprehend the entire universe. Keill does not disagree that we have only a limited view of things compared with God. But he does not feel the need to limit final cause theorising to the same extent, because he sees such theorising as necessarily *localised*, as relative to the needs of life on this planet. The rest of the universe is irrelevant. It need not be considered, and therefore our inability to comprehend it in its entirety presents no impediment

⁹⁹ It is interesting to note here that Burnet also follows Descartes in allowing that final causes are useful in *moral* philosophy.

¹⁰⁰ Keill (1699), 26-38.

to our understanding of final causes in relation to the earth. As he emphasises with regard to the position of the earth's axis,

Conveniencies and inconveniencies are *relative* terms, and therefore to prove a position incommodious, we must not only consider the consequences of the position its self, but the Nature and Constitution of those Animals to which it is to be adapted; and I hope I may affirm (without any reflection on Divine Providence) that the present position in which God hath put the Earth, is more suitable and agreeable to the Nature and Frame of *our* Animals and Plants, than any other, and especially than that which the Theorist assigns to the Primitive Earth.¹⁰¹

Regarding the issue of final versus *efficient* causes, Keill does not explicitly give either one *priority* over the other. He does, however, want to impose strict limits on explanations about efficient causes, and these limits are essentially very similar to those which Burnet places on explanations concerning *final* causes. That is, he believes we should only give explanations of efficient causes when those causes are "plain and obvious".¹⁰² By "plain and obvious", he means those which are in accordance with empirically derived laws of nature and which can be articulated in mathematical terms. Burnet had accused Keill of censuring him simply for considering efficient causes. This, Keill emphatically denies. What he censured Burnet for was, firstly, claiming to have uncovered the efficient causes of things for which such causes cannot be known, and secondly, positing efficient causes for these things which are contrary to the established, mathematical laws of nature.¹⁰³ In Keill's view, it was ultimately a lack of understanding of these laws that had led Burnet and the various other philosophers he attacked in the *Examination* to believe they could discover such causes, whereas those who *do* understand them also understand their limitations and acknowledge that there are many phenomena for which we cannot ascertain the efficient causes and must be content instead to consider their *final* causes, of which we *can* obtain reliable knowledge. "I never knew any", he stresses,

¹⁰¹ Keill (1699), 31-2 [my italics].

¹⁰² Keill (1699), 33.

¹⁰³ Keill (1699), 32-4.

that cry'd down... Physical causes, *when they were plain and obvious*. But it is no wonder if there are some that are displeas'd with the... causes that are assign'd, by a set of Philosophers who think they can give a Mechanical account, how an Animal, a Mountain, a Planet, or a World may be made; and yet they know not so much of the principles of Staticks and Geometry, as to explain the most common and ordinary appearances of nature, which *are really* explicable by Mechanical principles... And tho' one would think that it were but reasonable, that a man who pretends to give the Physical causes of all those things, should be very well skill'd in Arithmetick, Geometry, Mechanicks, and the Laws of motion; yet it generally happens, that those that are *least* acquainted with those Sciences, pretend most to the solution of such intricate problems, whereas they, who know them best, can best discover how far they may proceed upon Physical causes, how far their principles will lead them in the discovery of truth, and where it is that they must be content to be ignorant; they know that they have not sufficient Data to determine such problems, nor a great many others that have not the hundredth part of the difficulty of those I have mentioned; and they are well pleas'd if they know their final causes, the uses for which they were design'd by their wise Contriver, and never trouble themselves with that which it is impossible to discover.¹⁰⁴

The other foundational issue at stake in this debate was the status of “occult qualities”. This of course was closely related to the issue of final causes in that it, too, was an essentially Aristotelian notion that Descartes had sought to banish from natural philosophy and which Newton and his followers appeared to many to be bringing back. This, as is well known, was a significant bone of contention between Cartesians and Newtonians at this time, and it is present in the debate between Keill and Burnet, albeit not explicitly discussed to the same extent as the above issue of final causes. Like his assessment of final causes, Burnet’s views on occult qualities are resolutely negative and decidedly Cartesian. When in the *Examination* Keill sarcastically slights Burnet’s somewhat clumsy avoidance of the term “attraction” in the *Theory* – “because that word was not Philosophical, (being exploded and ridiculed by those who call themselves new Philosophers)” – he is unapologetic, insisting

¹⁰⁴ Keill (1699), 33-4 [my italics].

that Keill “tell us how this Attraction differs from an Occult Quality: Whether it is a Mechanical Principle or no: And if not, from what Principle it arises. When he hath told us this, we shall be better able to judge of it”.¹⁰⁵ Keill is equally unapologetic about his use of occult qualities. “We shall not be ashamed to use, with the Peripareticks, the Terms *Quality, Faculty, Attraction*, and the like”, he writes in his *Introduction*, “[a]nd if the true Causes are hid from us, why may we not call them occult Qualities?”.¹⁰⁶ And in his reply to Burnet, he questions, as he did in the *Examination*, whether the theoretical entities posited by the “new Philosophers” are in any way superior to those of the Schoolmen,

[f]or loose and general Harangues about Effluvioms, Particles, subtle Matter, Modes and Motions, signify very little more to explain Nature, than the Qualities and Attractions of the old Philosophers, (whom the *Theorist* upon this account so often derides) 'tis indeed but another sort of Cant, and affords as little satisfaction to the mind.¹⁰⁷

Beyond this, there is little *explicit* discussion of the question of occult qualities versus mechanistic causes. But the issue underlies one of the subjects that Keill and Burnet *do* discuss and debate at great length, namely, the shape of the earth, which, as is well known, was being widely debated at this time. We have seen above Keill’s argument that Burnet’s prolate figure of the earth would not facilitate the flow of rivers because the cause Burnet assigns for the earth taking this form, that is, the pressure exerted by the atmosphere on the equator causing the *fluid* of the chaos to move toward the poles, would continue to act and prevent rivers flowing toward the equator. Here, of course, he was *supposing* that Burnet’s prolate figure of the earth and the cause he assigned for it were *true*, and showing that, *given this cause*, rivers could not flow from the poles to the equator. After advancing this argument, he turns to the issue of the shape of the earth itself. Here, he argues that the earth *is spheroidal*, but is an *oblate* rather than a prolate spheroid. The centrifugal force of

¹⁰⁵ Keill (1698), 94; Burnet (1699a), 30.

¹⁰⁶ Keill (1720), 4.

¹⁰⁷ Keill (1699), 60.

the earth's diurnal motion does indeed cause the earth's matter to recede from its axis, but the atmosphere *moves with* the earth and therefore does not present any impediment. Even if the atmosphere *did* exert such pressure, it would surely exert the *same* pressure at the poles as at the equator, and so the fluid would not move toward the poles and create a prolate figure. He then proceeds to give rigorous mathematical demonstrations of the earth's oblate figure and discusses experiments conducted using pendulums which show the force of gravity to be less at the equator as well as various other kinds of empirical evidence for this view.¹⁰⁸

In his reply, Burnet emphasises that he did not make any claims about the shape of the *present* earth, only the antediluvian, and since we do not know precisely what effects the Deluge had on the shape of the earth, the shape of the present earth does not necessarily imply anything about that of the antediluvian earth. He nevertheless acknowledges that the shape of the earth had been the subject of much controversy, and it was a controversy to which he had clearly given a great deal of consideration and on which he knew much of the current literature, for he goes on to discuss the issue at some length, citing various contemporary authors and suggesting several new ways of measuring the circumference at the equator and poles. His aim here, unsurprisingly, is to cast doubt on Keill's arguments for an oblate figure and to argue for the contrary position.¹⁰⁹

What is interesting about Burnet's discussion for our purposes is that at the heart of his belief in the prolate figure of the earth is his adherence to the Cartesian theory of vortices. And underpinning this belief in vortices is his Cartesian rejection of occult qualities. In the third English edition of the *Theory*, which was published the year before Keill's *Examination*, Burnet adds to the above argument about the pressure of the atmosphere with the observation that the antediluvian earth must have adopted the same shape as the vortex that contained it and so was of a prolate figure.¹¹⁰ In the *Reflections*, he expands on this observation and brings it to bear on his earlier argument, suggesting

¹⁰⁸ Keill (1698), 107-43.

¹⁰⁹ Burnet (1699a), 39-60.

¹¹⁰ Burnet (1697c), 44.

that, since the vortex of the earth is “streighter, or of a shorter diameter” at the equator than at the poles, the fluid of the chaos which recedes from its axis due to the centrifugal force would have less room to dilate and would therefore be pushed toward the poles.¹¹¹ Anticipating the reply from those who believe in an oblate figure of the earth that there is no such thing as vortices, Burnet insists, as other vortex theorists did when arguing against Newtonians, that those who deny vortices must provide some *other* physical cause of planetary motion.¹¹²

In responding to this point, Keill rebukes Burnet for not keeping abreast of recent developments in natural philosophy:

I thought that this *Defender* had been better acquainted with the history of Philosophy for these twelve years past, than it seems he is. One would think that he had done nothing but por'd upon the Theory all this time, since he is not acquainted with what is known to every body that pretends to Philosophy now a days.¹¹³

There are, Keill insists, “other causes” than vortices which explain planetary motion. With these causes we are able to explain why the planets move in elliptical orbits, why they are fastest at perihelion and slowest at aphelion, the precession of the equinoxes, the apogee and nodes of the moon, and numerous other phenomena, “none of which could ever be made out by the *Vortices*”.¹¹⁴ By “other causes”, of course, Keill means Newton’s laws of motion and universal gravitation, and so he was ultimately talking past Burnet, who, had he responded, would have insisted that these laws rely on the notion of attraction which is an occult quality and therefore do not give us an account of what actually *causes* celestial bodies to move, for as he emphasises at the end of the *Reflections*, physical

¹¹¹ Burnet (1699a), 53.

¹¹² Burnet (1699a), 53.

¹¹³ Keill (1699), 127. It is important to note here that it was exactly twelve years since the publication of Newton’s *Principia*, which Keill held to have refuted the theory of vortices – Keill (1698), 16-17.

¹¹⁴ Keill (1699), 127-8.

causes “*must be Mechanical*: There being no other Modes, or Powers of Matter... but what are *Mechanical*. And to explain Effects by such Causes is properly Natural Science”.¹¹⁵

I want now to turn my attention back to the question of why Keill’s attack constituted such a decisive refutation of Burnet’s theory, for Burnet’s response to Keill and Keill’s subsequent reply to Burnet played an important role here. Crucially, Burnet’s attempt to answer Keill’s objections only served to expose further (a) the weaknesses of his theory, (b) his inferior knowledge of and ability in natural philosophy, and (c) the extent to which the essentially Cartesian principles on which both his theory and defence against Keill were based had become superseded by a new system of philosophy with which he lacked the requisite background and training to engage effectively. The above debate concerning the shape of the earth is an interesting case in point. Although Burnet knew the current literature on the topic, Keill knew it better and a far better grasp of it, enabling him to defeat Burnet’s arguments for a prolate figure with ease and to dismiss his suggestions of new ways to determine the shape of the earth in a manner that made Burnet’s philosophy appear decidedly amateurish.¹¹⁶

Elsewhere, too, Burnet’s attempts to answer Keill’s objections were quite weak and rather than vindicating his *Theory* served merely to further expose both its flaws and its author’s want of philosophical learning. They also furnished Keill with ample opportunity to compose several more of the same kinds of mathematical and experimental demonstrations that he had used to such devastating effect in the *Examination*. To Keill’s argument that a sphere whose centre of gravity is the same as its centre of magnitude will retain any given position when placed in a fluid of the same specific gravity, for example, Burnet countered with the somewhat precarious assumption that this will only be the case if the sphere and the fluid are at rest. If, however, the sphere and the fluid

¹¹⁵ Burnet (1699a), 61.

¹¹⁶ Keill (1699), 97-135.

medium in which it is moving are turning on their axes as is the case with the earth in the sun's vortex, then the sphere being equally balanced, its axis will be parallel to the axis of the fluid.¹¹⁷

To test Burnet's assumption, Keill offers the following thought experiment and diagram (Fig. 3). *ABC*, he explains, represents an arch of the ecliptic. *DEF* represents any circle in the earth which is in the same plane as the arch *ABC*. *H* is the point where the fluid falls perpendicularly on the circle *DEF*. Take any two arches *GE* and *ID* which are parallel to and at equal distances from the arch *ABC*. The particles which move from *G* to *E* and *I* to *D* fall obliquely on *E* and *D*. Part of the force on *E* will be spent moving the circle forward and part of it turning the circle around an axis perpendicular to the plane *ABC* from *H* to *E* to *F*. The total force of the particles relative to the force used in turning the circle around the axis is as the square of the radius to the rectangle contained between the sine of the arch *HE* and its cosine. Likewise, part of the force on *D* will be spent moving the circle forward and part of it turning the circle around an axis perpendicular to the plane *ABC* from *H* to *D* to *L*. Here too the total force of the particles relative to the force used in turning the circle is as the square of the radius to the rectangle contained between the sine of the arch *HD* and its cosine. Because *HE* and *HD* are equal, the force of the particles which turn the circle around its axis are equal, and because they are contrary forces, they cancel one another out. The same is true of any two points which are equal distances from the arch of the ecliptic in any circle which is parallel to the ecliptic. Thus, the sphere will not turn on any one diameter more than any other due to the motion of the fluid but will be free to turn on *any* of its diameters.¹¹⁸

¹¹⁷ Burnet (1699a), 25-6.

¹¹⁸ Keill (1699), 54-6.

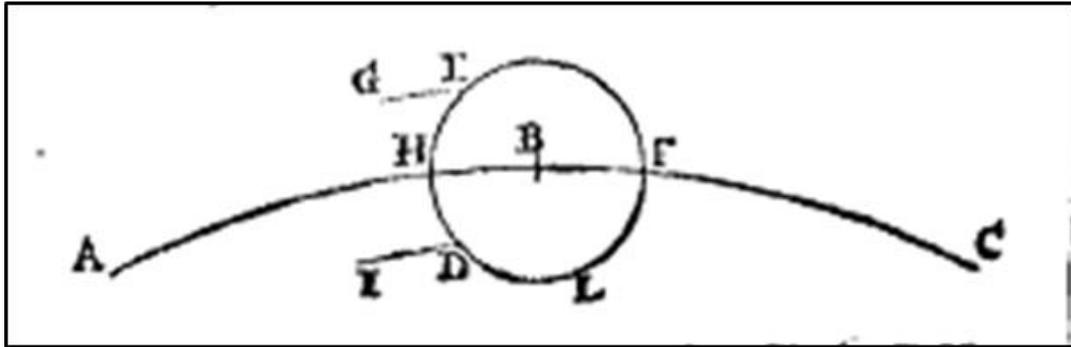


Fig. 3

In many cases, Keill does not merely *nullify* Burnet's responses as in the foregoing example but actually uses them to *strengthen* his case against the theory. An interesting example here is his response to Burnet's reply to his point about the inability of the sun to raise vapours through fissures in the crust and supply the earth with rivers and volatise the waters of the abyss such that they exerted pressure on the crust. In response to this, Burnet appealed to the earth's "Pores" as another possible conduit for the sun's heat.¹¹⁹ In his reply, Keill constructs a geometrical demonstration which was exactly analogous to the one above concerning the fissures but which in his view was far more damaging to the theory (Fig. 4). Consider, he proposes, that one of these pores is one inch in diameter and the crust is one mile thick. *AB* represents the opening of this pore, *AC* the depth of the crust, *CND* the face of the abyss, *EGHF* the diameter of the sun, and *GH* the diameter of the section of the sun which can shine on the point *N* halfway between *C* and *D*. The ratio of *AC* to *CN* is 120,000/1, and hence the angle *CAN* is less than two seconds and the angles *ANB* and *GNH* less than four seconds. The diameter of the sun *EF* subtends thirty minutes, so *EF* relative to *GH* is thirty minutes to four seconds, or 450/1. The circumference of a circle is directly proportional to the square of its diameter, so the amount of the sun's disc that shines on the sea to that which shines on the abyss is 450²/1 or 202,500/1. But the sun would shine on the abyss less than one ten-thousandth of the time it shines

¹¹⁹ Burnet (1699a), 31-3.

on the sea. Hence, the heat of the sun on the abyss would be less than one ten-millionth of its heat on the sea, and the vapours raised from it would be proportionably less.¹²⁰

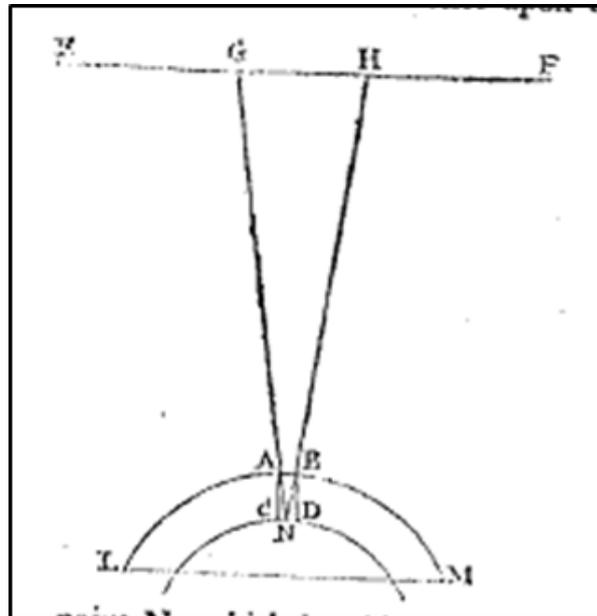


Fig. 4

Burnet's answers to Keill, then, merely revealed his inferior philosophical knowledge and ability and ultimately weakened his theory further. "Has not the *Theorist* now mended his cause mightily", asked Keill rhetorically in conclusion to the foregoing calculation, "by this answer of his *Defenders*, which has made the argument against him much stronger than it was before?".¹²¹ At various points in the *Reflections*, Burnet seems to be sensible of this weakness and tries to play to his strengths by invoking the testimony of the ancients, of which he *did* possess both considerable knowledge and remarkable skill in interpreting. Unfortunately, rather than having its intended effect, this merely gifted Keill an opportunity, firstly, to showcase his own considerable knowledge and skill in this area, and secondly, to discredit a source of evidence on which Burnet had drawn extensively

¹²⁰ Keill (1699), 69-72.

¹²¹ Keill (1699), 71-2.

not only in the *Theory* itself but also in his replies to Warren and even *more* extensively in the *Archaeologiae* but which Keill had not addressed in his *Examination*.

Burnet's most extensive appeal to the ancients appears in his discussion of the primitive earth's axis. Just prior to his above argument about the motion of the earth and the vortex of the sun, Burnet stressed that, *notwithstanding* its physical causes, this former position of the earth is a matter of *historical fact*. If Keill "would look a little into Antiquity..., [i]t may be that would awaken him into new thoughts, and a more favourable opinion of the Theory as to this particular".¹²² He then refers Keill to the relevant passages of the *Theory* and *Archaeologiae* and also the third English edition of the *Theory* to which he had added further examples of ancient authors whose writings he believed supported his view.¹²³

In his reply, Keill follows Warren and others in noting that these ancient philosophers lived too long after the Deluge to be considered authoritative and that they had said many false and absurd things. In addition to this, he conducts a rigorous examination of Burnet's sources which in his view showed conclusively that, even if we *were* to take these philosophers seriously, what they *actually said* does not in fact support Burnet's theory. Diogenes, Anaxagoras, Empedocles, and Leucippus had spoken of a depression of the earth to the south, by which they presumably meant that the northern hemisphere became more inclined toward the sun than the southern. But this clearly does not describe the present earth, on which *both* poles are *equally* inclined to the sun. Elsewhere, these philosophers' writings seemed to imply the very *opposite* of Burnet's theory. Leucippus, for example, had claimed that the sun had previously risen higher toward the north pole, which would indicate that the axis was formerly *more* rather than less inclined to the ecliptic. Plato's notion of a regular and uniform motion of the heavens during the reign of Saturn, on which Burnet had drawn extensively in the *Archaeologiae*, did not support his view either, for if the axis was perpendicular to the plane of

¹²² Burnet (1699a), 23.

¹²³ Burnet (1699a), 23-5.

the ecliptic, we would observe the same apparent irregularities in the motion of the planets. And as to the poets, they had indeed spoken of a “perpetual spring” in their various accounts of the Golden Age, but they had used this phrase in various *other* contexts when bestowing praise on a given place. Virgil, for instance, from whom Burnet had quoted extensively, had used precisely the same terms when praising Italy and expressing his preference for that country above all others. So it signified nothing whatsoever about the primitive earth’s axis.¹²⁴

If it was Burnet’s extensive appeal to the ancients on the issue of the primitive earth’s axis that gave Keill the opportunity to showcase his knowledge of Greek and Roman antiquity, it was his rather brief appeal to them on the subject of the chaos that allowed him to demonstrate his equally impressive command of the Judeo-Christian tradition. Keill had argued that, given the composition of the earth, the chaos could not have been a perfectly fluid mass as Burnet had supposed but likely contained large bodies of solid matter.¹²⁵ In response, Burnet appealed, as he did on this subject in the *Theory and Archaeologiae*, to the ancients, both pagan and Judeo-Christian, urging that the chaos “hath been always describ'd and suppos'd a mass of fluid matter all over”.¹²⁶ In reply to this, Keill introduced translations of several ancient Jewish sources as well as a number of Church Fathers, all of whom understood the chaos described in Genesis as the earth simply being “Void and Uncultivated, without Ornaments and Inhabitants”. Certainly there was nothing in these writings to suggest that it was a *fluid* mass.¹²⁷ As to pagan writers, they could be discounted, since they evidently took their doctrine of the chaos from Scripture but “corrupted [it] with their own fancies”.¹²⁸

Another thing that Keill had not done in the *Examination* but took the opportunity to do in his reply to Burnet was attack the *Archaeologiae*. Keill’s sole focus here was on Burnet’s account of

¹²⁴ Keill (1699), 41-53.

¹²⁵ Keill (1698), 47-9.

¹²⁶ Burnet (1699a), 8.

¹²⁷ Keill (1699), 15-18.

¹²⁸ Keill (1699), 15.

the Mosaic history of the Creation. His main purpose was to undermine Burnet's claim that it was necessary for Moses to give a false account of the Creation because they lacked the capacity to understand a *philosophical* account. Burnet's idea of a philosophical account was hardly difficult to understand. Indeed, it was so contrary to the true laws of nature, that the less one knew of philosophy, the easier it was to grasp, and, ultimately, to believe. Certainly Moses could have taught the Jews that the chaos was a fluid mass which separated into an inner orb and a fluid abyss, that the fluid separated into water and oil, and that solid matter descended and mixed with the oil to form a solid crust.

What deep reach of thought is requir'd for the understanding of this? How many, and what are the Laws of nature and motion that the *Jews* must know before they can comprehend it? in my mind the less they knew of those things, the fitter they would be to understand the Theory; at least, I am sure they would be more easily perswaded to believe it. We see now that this way of reasoning as the *Theorist* has apply'd it, is of no force against the *Mosaick History*, for his refin'd Theory if it had been true, might have been as easily comprehended by the *Jews*, as the plain and simple *Cosmogonia* of *Moses*.¹²⁹

Burnet's exegesis also failed to stand up to scrutiny. On this topic, Keill is often characterised by historians as a literalist.¹³⁰ This is misleading. Keill actually had no problem at all with adopting a non-literal interpretation of Scripture where necessary. And his principles for doing so were essentially very similar to Burnet's. That is, he agreed that we should depart from the literal sense of Scripture (a) where the Sacred Writers use parables to teach moral lessons, (b) where they refer to sensory appearances such as the motion of the sun, and (c) where their writings imply something contradictory or absurd. His issue was not with the principles themselves, but with Burnet's application of them. Crucially, the mosaic narrative fulfilled none of the above criteria. It was clearly not a parable, for when they write parables, the Sacred Writers make very clear (a) the parabolic nature of their teachings and (b) the moral lessons for which a given parable is contrived. Moses, on the other hand, makes very

¹²⁹ Keill (1699), 153-7 – quotation from 157.

¹³⁰ See, e.g., Force (1985), 61; Rappaport (1997), 143.

clear that his narrative is intended as a *history* of the Creation. Neither does the narrative pertain to sensory appearances, since no one witnessed the Creation. Indeed, we would know nothing of it were it not for Moses's narration, and so unlike the motion of the sun it cannot have been contrived to cohere with our sensory experiences. And most importantly, the Mosaic account implied nothing contradictory or absurd, for Moses ascribes the entire Creation to the action of God, who can form the earth or any part thereof in any way he chooses.¹³¹

One final important issue in the debate between Keill and Burnet that needs to be addressed before we move on to discuss the effect Keill had on the controversy and on eighteenth-century thinking about the earth is the subject of miracles. As we have seen above, Keill maintained that the Creation and Deluge were miraculous. Burnet, who as we have seen had argued repeatedly against such an interpretation, unsurprisingly objected to this. For him, there were two main issues with Keill's appeal to miracles. Firstly, Keill had not given any explanation as to the nature of these miracles: "he does not tell us wherein this Miracle consisted".¹³² Such an explanation, he saw as important. In his *Theory*, where he had appealed to miracles in explaining the protection of the Ark during the Deluge and the causes of the Conflagration, he had given an account of "wherein these miracles consisted", that is, in the ministry of angels. Appeals to miracles without such an explanation were in his view simply attempts to evade the difficulty of uncovering the true causes of an event. "Some Men", he writes toward the end of the *Reflections*, "when they are at a loss in the progress of their work, call in a Miracle to relieve them in their distress".¹³³ Keill was guilty of doing just this. Secondly, when defending a miraculous interpretation of the Deluge, Keill had not answered the philosophical arguments he had advanced against this interpretation in the *Theory*. This he must do, especially if he

¹³¹ Keill (1699), 146-53.

¹³² Burnet (1699a), 3.

¹³³ Burnet (1699a), 60.

supposes that God created or transmuted other elements into water, both of which were problematic from a philosophical point of view.¹³⁴

In his response, Keill dismisses Burnet's first point out of hand. "The truth is", he declares, "I never thought it my business to explain miracles".¹³⁵ He nevertheless offers some possible descriptions of what the miracle that produced the Deluge may have consisted in. God may have raised subterraneous waters and sustained them on the surface of the earth. He may have created new water, transmuted other elements into water, or brought water from elsewhere in the universe.¹³⁶ Ultimately, though, it was not incumbent upon him to determine which of these or any other processes God used to bring about the Deluge. It was enough to show that it could not be brought about via natural causes and so was necessarily miraculous. As to the second point, Keill informs us that he did not consider Burnet arguments against a miraculous interpretation of the Deluge because "when I wrote the Examination, I thought them so weak and precarious that it would not be worth while to take notice of them".¹³⁷ Here again, Burnet's Cartesianism – and Keill's disdain for it – comes to the surface. Burnet's argument against the creation of new matter, Keill observes, was based on "a notoriously false notion of the Cartesian Philosophy, *viz.* That matter and space are the same".¹³⁸ Since this principle had been discredited, it was no impediment to the creation of new water. As to the transmutation of other elements into water, this was unproblematic even on Cartesian principles, for if physical bodies differ only "in their modifications, motions and figures", then there is no reason why any substance cannot be transformed into any other. And if, according to the Cartesian principle of a plenum, there are no vacuities, then not only the air but the subtle matter

¹³⁴ Burnet (1699a), 3-4.

¹³⁵ Keill (1699), 4.

¹³⁶ Keill (1699), 4-5.

¹³⁷ Keill (1699), 5.

¹³⁸ Keill (1699), 5.

which supposedly fills all space may be transformed into water and will produce as much of it as if the same amount of completely *solid* matter were so transformed.¹³⁹

Keill closes his debate with Burnet in much the same way as he opened it, that is, with yet another attack on Cartesianism. When praising Burnet, Whiston noted that “he employ'd his utmost skill in the best System of Philosophy then known in the World”.¹⁴⁰ Keill offers a rather more negative take on things. In his view, “the best System of Philosophy then known in the World” was actually rather poor, and Burnet *lacked* the requisite skill to apprehend this. The blame for Burnet’s misdeeds, however, is placed firmly on the Cartesian system rather than on Burnet himself. Burnet simply lacked the training necessary to make an informed judgement about this system and was therefore taken in by it and led to believe that he, like Descartes, could give an account of the origin of the world. “I acknowledge him to be an ingenious Writer”, writes Keill of Burnet in his closing statement,

and if he had taken a right method and had made a considerable progress in those Sciences, that are Introductory to the study of nature, I doubt not but that he would have made a very acute Philosopher.

It was his unhappiness to begin at first with the *Cartesian* Philosophy, and not having a sufficient stock of Geometrical and Mechanical principles to examine it rightly, he too rashly believed it, and thought that there was but little skill required in those Sciences to become a Philosopher, and therefore in imitation of Mons. *Des Cartes*, he would undertake to shew how the World was made, a task too great even for a Mathematician.¹⁴¹

6.5. Burnet, Whiston, Keill, and theories of the earth in eighteenth-century England

Thirteen years before the publication of Keill’s *Examination*, in what was the first attack on Burnet to appear in print in England, Herbert Croft wrote:

¹³⁹ Keill (1699), 5-6.

¹⁴⁰ Whiston (1696a), 76.

¹⁴¹ Keill (1699), 160.

I shall now address my self unto the learned Men of the Universities; and desire to know what Lethargy hath possessed them all, that not one of them appears in Writing to confute the Fables of this Man: For I have diligently enquired and cannot hear of any one yet come forth in Print. If they answer me that they are so vain and extravagant in themselves, that they need no other Confutation; I consent unto them that it is true. But if they prevail so far in the World, as to get Reception and Applause, the next step may be, for ought I know, to be approved and believed. This hath engaged, me, tho now in the Eighty Second Year of my Age, to put some stop to this Current, and to awaken some younger, abler and fitter Person to undertake this Man.¹⁴²

Croft died in 1691. Had he lived to see Keill's attack, he undoubtedly would have been pleased by it. A young, fit, able "man of the university" had finally produced a thorough confutation of the Theorist's "Fables". Certainly this was how many viewed the *Examination* at the time. As George Smalridge, a tutor at Christ Church where Keill was soon to follow Gregory, wrote in 1698:

Mr. Keil, whom I am well acquainted with, is a plain, rough, honest, thorough Scholar, and his book answers that character. I am not master enough of Mathematics to understand him always; but, where I do, I am convinced he is in the right; and those who are better skilled are satisfied he has demonstratively confuted all the material things in Dr. Burnet's Theory.¹⁴³

The view that Keill successfully refuted both Burnet and Whiston appears to have been widespread. It is found throughout the eighteenth century and well into the nineteenth and appears in some of the most famous works in the history of earth science. Georges-Louis Leclerc, Comte de Buffon, for example, in his voluminous *Natural history* refers to "Mr. Keill, who has geometrically demonstrated the errors of Mr. Burnet, in a treatise called 'Examination of the Theory of the Earth'". "This Mr. Keill", he continues, "has also refuted Whiston's system".¹⁴⁴ And as late 1830, when discussing Whiston in his *Principles of geology*, Charles Lyell states that "[h]is book, as well as Burnet's,

¹⁴² Croft (1685), preface.

¹⁴³ Quoted in Friesen (2008), 45.

¹⁴⁴ Buffon (1776), 398.

was attacked and refuted by Keill".¹⁴⁵ So widespread was the view that Keill had defeated the theorists that even in Heathcote's biography of Burnet, which appeared in the 1759 edition of the *Theory* itself, Keill is said "to have confuted solidly the Theory, on true mathematical Principles" and "to have shewn the Insufficiency of both these Theories [i.e. Burnet's and Whiston's]".¹⁴⁶

Why, then, did these theories, despite such widespread belief that they had been discredited scientifically, continue to be so popular during the eighteenth century? By the 1750s, Burnet's *Theory* was in its eighth edition and Whiston's *New theory* in its sixth. Heathcote poses precisely this question in the aforementioned biography. "The reader may be ready to wonder", he writes of Burnet's work, "that a Book fundamentally wrong should run through so many Editions, and be so much read; and he may express the same Surprise... in regard to Mr. Whiston's *New Theory of the Earth*, which is a Work of the same Nature, and has been equally well received". His answer to this query is that both works are to be read not for instruction but for entertainment; not as true accounts of Scripture and earth history, but as works of fiction, philosophical romances. "[N]o Man", he observes,

reads *Homer's Iliad* for History, any more than he reads *Milton's Paradise Lost* for Divinity.... Such Works are read purely to entertain and amuse the Fancy; and it is not the Story, but the Imagery, that is principally sought after. Why may not *Burnet's* and *Whiston's Theories* be read with the same View? They are not, it may be said, strictly true in the philosophic Part, and so in that Light are not to be depended on: yet they present to the Imagination new and amazing Scenes; and therefore will always furnish out the highest Entertainment to a Reader, who is capable of being pleased as well as instructed.¹⁴⁷

Al Coppola traces the romantic reading of Burnet to the essayist Joseph Addison whom Burnet taught at the Charterhouse and who as well as writing a Latin ode to Burnet which appeared in all eighteenth-century editions of the *Theory* promoted the work in the *Spectator*, a daily paper published

¹⁴⁵ Lyell (1830), 39.

¹⁴⁶ Heathcote (1759), xxxi-xxxii.

¹⁴⁷ Heathcote (1759), xxxii-xxxiii.

by Addison and Richard Steele, another former pupil of Burnet, from 1711 to 1712. “[L]ong after Burnet’s book was discredited scientifically”, observes Coppola, Addison praises the work purely for its aesthetic value, its utility in cultivating the imagination. “[I]n Addison’s hands”, he argues,

we have moved a great deal beyond the question of whether Burnet’s is literally true or not; rather, the book becomes the occasion for enjoying ‘the highest pleasure’, ‘sublime thoughts’... Addison and his readers have learned to dislodge Burnet’s cosmology from the minute particulars of its natural philosophy or its theological commitments, and instead prize it as a means for producing edifying thoughts about nature.¹⁴⁸

But this ability to distinguish between the philosophical and theological implications of Burnet’s *Theory* and its aesthetic value is already present in many earlier criticisms of the work. “I conceive he [Burnet] had done far better”, wrote Croft in 1685, “if he had published it under the Title of a Romance only: for several Persons would then have read it as a pretty invention to pass away their idle time, and perchance have taken much delight in it”.¹⁴⁹ And at the end of the *Examination*, Keill, having exposed Burnet’s philosophical shortcomings, conjectured that

[p]erhaps many of his Readers will be sorry to be undeceived, for as I believe, never any Book was fuller of Errors and Mistakes in Philosophy, so none ever abounded with more beautiful Scenes and surprising Images of Nature; but I write only to those who might perhaps expect to find a true Philosophy in it. They who read it as an Ingenious Romance will still be pleased with their Entertainment.

Ultimately, then, once its philosophical value was no longer in question, Burnet’s *Theory* came to be read, as many critics believed it should, for its aesthetic value. And being, as Heathcote noted, “a Work of the same Nature”, Whiston’s *New theory*, notwithstanding both its far greater complexity and its authors vastly inferior prose style, became seen in the same light.

¹⁴⁸ Coppola (2010), 134-5.

¹⁴⁹ Croft (1685), preface.

There is also evidence that Burnet's, Whiston's, and other late-seventeenth-century theories of the earth along with the various responses to them were read during the eighteenth century for their pedagogical value. William Poole notes that "[i]n the English universities, the whole Burnet-Woodward-Whiston canon 'with the answers to them &c.' was being recommended to students for impartial comparison in the early decades of the eighteenth century".¹⁵⁰ Here Poole cites an early-eighteenth-century guide for students at Oxford drawn up by Thomas Haywood, a fellow of St. John's College.¹⁵¹ A further example which shows that this practice extended to Cambridge and continued into the latter part of the century is the Master of Magdalene College Daniel Waterland's *Advice to a young student. With a method of study for the first four years*. First published in 1730 and revised and reprinted until 1761, all editions and reprints of this text set "*Burnet's Theory, with Keill's Remarks*" and "*Whiston's Theory, with Keill's Remarks*" as required reading for the third of four years study, the rationale being, as Waterland put it, that "[t]he two Theorists, with Keill upon them, may now be useful: There is a great deal of curious Learning and Philosophy in them, which a Student may very much improve himself by".¹⁵²

Although true of Burnet's and Whiston's theories, the extent to which the "theory of the earth" genre *as a whole* became discredited scientifically and appreciated purely for its aesthetic value rather than its philosophical and theological content, and Keill's role in bringing this situation about, has been greatly overstated. Coppola, for example, claims that the new romantic reading of Burnet popularised by Addison "suggests the endpoint of the trajectory of late seventeenth-century cosmology [i.e. theories of the earth], where physicotheology gives way to the cultivation of exquisite states of affective pleasure".¹⁵³ With regard to Keill's influence, David Kubrin claims that after Keill's attack on Burnet and Whiston "it was generally concluded in England that world-making was

¹⁵⁰ Poole (2010), 73.

¹⁵¹ Poole (2010), 192 [note 22].

¹⁵² Waterland (1730), 25-6; (1730), 25-6; (1740), 25-6; (1755), 28; (1761), 28-9.

¹⁵³ Coppola (2010), 135.

unphilosophical as well as impious”.¹⁵⁴ By attacking Burnet and Whiston, Kubrin argues, Keill showed theorising about the earth to be (a) an essentially Cartesian enterprise and (b) incompatible with Newtonianism. “Represented in this way as inconsistent with Newtonian principles”, Kubrin observes, “world-making had little chance of retaining any following or exercising any persuasion. The prestige of Newtonianism was too great, and the shortcomings of Cartesianism too much on peoples’ [sic] minds in the eighteenth century for this form of theorizing to be convincing”.¹⁵⁵

The foregoing arguments, however, conflict very strongly with the historical record. As Roy Porter has amply shown, theories of the earth very much in the mould of Burnet’s and Whiston’s continued to be published – and widely read – throughout the eighteenth century.¹⁵⁶ By mid-century, authors on the continent and in Scotland had begun to disconnect earth science from both sacred history and human history more generally. In the latter part of the century, *some* in England did the same. Oliver Goldsmith, for example, derided the theories of the previous century as inherently hubristic and overambitious and rejected attempts to connect earth and human history.¹⁵⁷ Most English writers in the eighteenth century, however – William Stukeley, Alexander Catcott, William Worthington, and John Whitehurst for example – despite paying greater attention to field evidence than earlier theorists, persisted in producing theories of the Creation and Deluge very much in the vein of the late-seventeenth-century cosmogonies.¹⁵⁸ Even local natural histories like William Borlase’s studies of Cornwall and the Scilly Isles continued to attribute geological phenomena to the biblical Flood.¹⁵⁹ Neither is it the case that Newtonians eschewed such theorising as Kubrin suggests. Stukeley, as is well known, was a close associate and biographer of Newton.¹⁶⁰ As Porter notes, Whitehurst’s theory was based explicitly on the Newtonian principle of an oblate earth, drew heavily

¹⁵⁴ Kubrin (1968), 331.

¹⁵⁵ Kubrin (1968), 336.

¹⁵⁶ Porter (1977), 104-27.

¹⁵⁷ Porter (1977), 106, 110-11.

¹⁵⁸ Porter (1977), 107-27.

¹⁵⁹ Porter (1977), 113.

¹⁶⁰ See Haycock (2002).

on Newtonian physics and chemistry in explaining the formation of the earth from a fluid chaos, and used Newton's theory of the tides to explain the formation of primitive land masses.¹⁶¹ Another interesting theory from the late eighteenth century is a manuscript written around 1773 by the Newtonian astronomer Thomas Wright entitled *A new theory of the earth founded upon, and more fully explaining the universal phenomenon, of earthquakes; effects of ye magnet; and doctrine of tides* in which the Creation and Deluge are explained in similarly Newtonian terms.¹⁶²

Keill's attack on Burnet and Whiston, then, was successful insofar as it refuted *their theories* in the eyes of both contemporaries and later thinkers. But it did not deter people from theorising about the earth along essentially the same lines during the following century. Nor did it show such theorising to be incompatible with Newtonian principles. Ultimately, although eighteenth-century English theorists accepted that Keill had shown the mechanisms posited by Burnet and Whiston to explain the Creation and Deluge to be inadequate, they typically rejected his further inference that these events could not be explained in terms of natural causes at all. Some did so explicitly. Patrick Cockburn, for example, in his 1750 work *An inquiry into the truth and certainty of the Mosaic Deluge*, appealed to Keill in arguing against Burnet's and Whiston's theories but lamented the fact that he had concluded from the falsity of these theories that the Deluge must be explained wholly miraculously and had not inquired into the natural causes of the event himself, something which, given his remarkable philosophical ability, he was well qualified to do. As he emphasised in his discussion of the draining of the waters of the Deluge after recounting Keill's confutation of Whiston on this point:

His [Keill's] design in the Examination and Remarks on the two noted Theories was to shew that their principles were wrong, and that they reasoned wrong from their own principles. But had he set himself to account for the increase and decrease of the waters of the Deluge by the true principles of Natural Philosophy, without assuming any fanciful Hypotheses, (the way that others have taken) I make no

¹⁶¹ Porter (1977), 124-7.

¹⁶² Wright (c.1873). On Wright's Newtonianism, see, e.g., Schaffer (1978), 180-9; Kaiser (1997), 335-7; Fara (2004), 148.

doubt but that he might have shewn the natural causes of the reduction of the waters far better than I can pretend to do.¹⁶³

Those who appealed to miracles as well as natural causes in their accounts of the Creation and Deluge, moreover, did not accept Keill's maxim that, insofar as these events were miraculous, they were unexplainable. As Catcott stressed in the second edition of his *Treatise on the Deluge*, published in 1768:

When an *extraordinary effect* is performed, to tell a person – *that GOD did it* – and there rest, without explaining the *end*, the *means*, and the *manner* of doing it, is losing great part of the evidence of the miracle, and the intent for which it was performed; and is generally spoken as a cover for our ignorance, or rather our pride, which is piqued at a difficulty we cannot solve.¹⁶⁴

This of course strongly echoes Burnet. Eighteenth-century theorists, like their seventeenth-century counterparts, wanted to know “wherein the miracles consisted”.

6.6. Conclusion

What set Keill's attack on Burnet apart from the numerous other attacks that appeared during the 1690s, then, was his sharper focus and experimental and mathematical approach, an approach that he had adopted ultimately from his close study of Newton's *Principia*, promoted in his Oxford lectures, and employed to devastating effect against the theorists. This is essentially why his two books became seen as having decisively refuted both Burnet's and Whiston's theories. What they did not do, however, is deter philosophers – including Newtonians – from theorising about the earth along essentially the same lines during the eighteenth century. Keill's motivation, as well as a desire to court favour among his patrons at Oxford, was a strongly held antipathy with the Cartesian philosophy, of which he viewed the practice of theorising about the earth as an especially pernicious manifestation,

¹⁶³ Cockburn (1750), 298.

¹⁶⁴ Catcott (1768), 6.

even Whiston's Newtonian version of it. What is perhaps most interesting about Keill's debate with Burnet is that it embodies several of the disagreements between Newtonians and Cartesians that were prevalent in the late seventeenth century: the shape of the earth, the existence of vortices, the rejection of final causes, the use of occult qualities. Keill's two books and Burnet's pamphlet provide a fascinating epitome of these important debates in late-seventeenth-century natural philosophy. In England of course the advent of Newtonianism that coincided with the debate over Burnet's theory meant that, on these issues, the dice were very much loaded in Keill's favour, and this surely contributed to the judgement among the reading public that Keill's refutation of Burnet had been a success. Nevertheless, the *Theory* continued to be immensely popular. No longer did anyone "expect to find a true Philosophy in it", and yet they were nonetheless "pleased with their Entertainment".

Conclusion

Following his debate with Keill, Burnet wrote nothing more on his theory. We can only conjecture as to why not. It is possible that he had come to see, as virtually everyone else had, that his theory had been refuted, though this is doubtful given his resolute confidence that he had discovered the true history of the earth. It was this confidence as well as his theory's heterodox implications that likely rendered him out of favour with the Latitudinarians – aside from Tillotson – and ultimately damaged his chances of further advancement in the Church, for as well as the various Latitudinarian principles to which Burnet subscribed, the Latitudinarians also stressed diffidence and humility in matters of Scripture, philosophy, and theology. This anti-dogmatic probabilism the Latitudinarians termed “moral certainty”, and Burnet had stated explicitly that “we must in equity give *more* than a moral certitude to this Theory”.¹

It was this confidence in his theory that ultimately led him to be equally confident about his controversial interpretation of the first chapters of Genesis. Crucially, he believed that he had discovered important truths about the earth and its history, and these truths were incompatible with the literal sense of these chapters. Additionally, these truths he had discovered had uncovered the true, literal and philosophical sense of other passages of Scripture such as St Peter's Second Epistle, chapter 3 and Psalms 24.2 and 136.6, and he was equally confident about his *literal* interpretation of these passages. These, too, were incompatible with a literal interpretation of Genesis 1-3. Both the theory itself and its implications for Scripture, then, had “more than moral certitude”, and the literal interpretation of these passages had to be abandoned, just as it had with those passages that refer to the motion of the sun.

¹ Burnet (1684), 150 [my italics]. On the Latitudinarians' principle of moral certainty, see Griffin (1992), 60-4.

It is interesting to compare this picture of Burnet with that portrayed in the nineteenth and early twentieth century by Charles Lyell, Archibald Geikie, and Andrew Dickson White. As I discussed in the introduction, they portrayed Burnet as someone whose theory of the earth was designed to support orthodox Christianity. Burnet and others like him are juxtaposed against those like Galileo and Giordano Bruno who suffered for their science at the hands of the religious establishment. Yet what emerges from the above analysis is that Burnet is actually much closer to these latter thinkers. Certainly this was how he saw himself. Indeed, given his frequent comparison of his theory with the heliocentric system, it is no exaggeration to say he considered himself very much to be the next Galileo. He thought he had discovered the true, philosophical history of the earth, of its formation, and of its past and future development. This, like the heliocentric system, contradicted the literal sense of certain passages of Scripture. The overwhelming evidence for the heliocentric system had led the literal sense of those passages of Scripture which it contradicted to be abandoned by all but a few. So, too, the evidence for his theory implied that the literal sense of the early chapters of Genesis should be abandoned likewise. That this had not been appreciated by his contemporaries and that it had cost him his ecclesiastical career made Burnet, in his eyes, a martyr for the “new science” just like Galileo and Bruno.

This is not to say of course that the story of Burnet and his theory embodies a straightforward conflict between science and religion of the kind White portrays. As countless subsequent historians of science and religion have amply shown, the historical relationship between these two worldviews is highly complex, and this is very much the case with Burnet’s theory. Although he wished to discard a literal interpretation of certain passages of Scripture which conflicted with his theory, his motivations for doing so were ultimately religious. He believed that opposition between reason and philosophy on the one hand and faith on the other was ultimately far more damaging to the latter than to the former. Truths about the world which contradict the literal sense of Scripture will in time be exposed, and so dogmatically pitting Scripture against reason and philosophy will ultimately discredit religion. Yet he is not trying to rescue orthodox seventeenth-century Christianity here, but

rather a rational, progressive form of it which is grounded in the fundamental tenets of the Christian faith and flexible as to inessential doctrines such as particular interpretations of specific passages of Scripture. It is these fundamental tenets, and in particular his rational conception of God's wisdom and goodness, as much as a desire to cohere with philosophy, that motivate his denial of the literal sense of Genesis 1-3. These passages, if understood in their literal sense, conflict with this conception of God as much as with true philosophy, and so their literal sense must be abandoned.

The above considerations on the earth, philosophy, theology, and Scripture ultimately led Burnet to publish one of the most controversial texts of the late seventeenth century. This, as we have seen, gave rise to significant interest in and debate about the history of the earth. Eighteenth-century English theorists, undeterred by Keill's refutation of Burnet and Whiston, continued to theorise about the earth along essentially the same lines as Burnet. Even those on the continent like Buffon and in Scotland like James Hutton – whose work borrowed Burnet's title – who discarded the biblical timeframe and disregarded the Deluge paid attention to Burnet.² Their evaluation of his theory was of course negative. They were moving away from biblical time and toward our modern notion of geological time, whereas Burnet believed the earth was merely six thousand years old. He did not, however, believe that it was created in six days, and he believed that it had formed and developed primarily as a result of natural processes. And this was an important first step away from a literal reading of the Hexameron and toward something resembling a nascent form of modern earth science.

² Buffon (1776), 398; Hutton (1795), 271.

Appendix: A Remark on a Passage in Dr. Burnets Telluris Theoria Sacra pag. 108 Edit. Lat.

Classified Papers of the Royal Society, Cl.P/8i/51

The Learned Author of this Treatise in ye aforementioned Page argues from ye zones observed in ye Planet Jupiter & ye spots in Mars & Venus, compared wth those in ye Moon, yt all ye Planets were formed like his primitive Earth wth a solid nucleus in ye center, an Abyss of waters over that, & a shell again covering yt Abyss of waters, ye breaking of wch on our Earth was ye cause of ye universal Deluge and ye intermixture of Land & seas, whereas his primitive earths have no seas in their surfaces.

The spots seen in ye Moon Venus and Mars with ye zones of Jupiter he will have proceed from a like breaking of their shells & mixture of ye Earth with ye waters.

But ye shell of Saturne he will have broak only towards ye Poles & so to have fall'n in as to leave a solid Arch standing over his equator wch formes ye present wonderfull appearance of his Ring.

Tis a Pleasant Conjecture & were it probable would almost force us to believe his Theory, but I fear out ingenious Author has pitcht upon it too hastily & yt when it is seriously considered it will rather wholly overthrow it.

For this Ring of Saturn (tho it be above half as broad as ye body of ye Planet) is yet so flat and thin yt tis not visible when ye Earth falls into its extended Plane, now tis highly probable and extreamly difficult to concieve that so thick a shell should breake off equally every where from this Rimm or Ring & leave it so very thin as we find it and perfectly flat without any inequalitys or eminencys to be discovered or seen by reflection of ye suns light, as his body is and ye Ring it selfe when the Earth is either above or beneath its Plane.

But admit ye Ring of Saturne to have been formed as he would have it by ye falling in of ye shell, ye question then is what became of the shell and ye Abyesse yt sustained it. I see not how he will dispose of it except he supposes yt ye present globe of that Plane was formed out of its ruines & that I shall shew is improbable by reason the shell considered alone contained matter enough to make a Globe seven times & ye whole globe eleven times as bigg.

Mons Huygens in his Systema Saturnia page 47 gives us the true figure of this Planet wch I have here copyed from him wherein he makes IH ye Diameter of his central Ball 4 such parts as the greatest Diameter of his Ring AB is 9 & it least or inward Diameter CD $6\frac{6}{10}$ wch proportions as often as I have viewed this Planet with long and good Telescopes I have ever found as exact as they could be determined by observation or judgment.

The breadth of ye Ring AC = DB is therefore $2\frac{4}{10}$ such parts as the Diameter of ye ball IH is 4. & this must be ye least thickness of ye shell before it fell in, for if we allow what our Author imagines (contrary to ye inviolable demonstration of two eminent mathematicians) yt all ye Planets were ovals or spheroids having their longest Diameters from Pole to Pole as he gives them in his oval figures or at least their Hemispheres were bigger than they would be should we concieve their Bodys perfect spheres described on ye Diameters of their Æquator.

I favour our Author therefore in supposeing ye body of Saturn perfectly spherical & yet more in not demanding any central ball on wch ye ruines of ye shell falling might increase ye bulk of ye planet.

Now Globes or Spheres are in proportion to each other as ye Cubes of ye Diameters by 18.e.12.

If therefore from ye Cube of ye longest Diameter of ye Ring ye Cube of its less be subtracted, ye remainder is ye solid content of ye shell before it fell in.

The Cube of HI = 4. The Diameter of ye Planet is 64.

of AB = 9 The greatest Diam. of ye Ring is 729.

of CD = $6\frac{6}{10}$ ye Lesser Diam. of ye Ring is $287\frac{1}{2}$

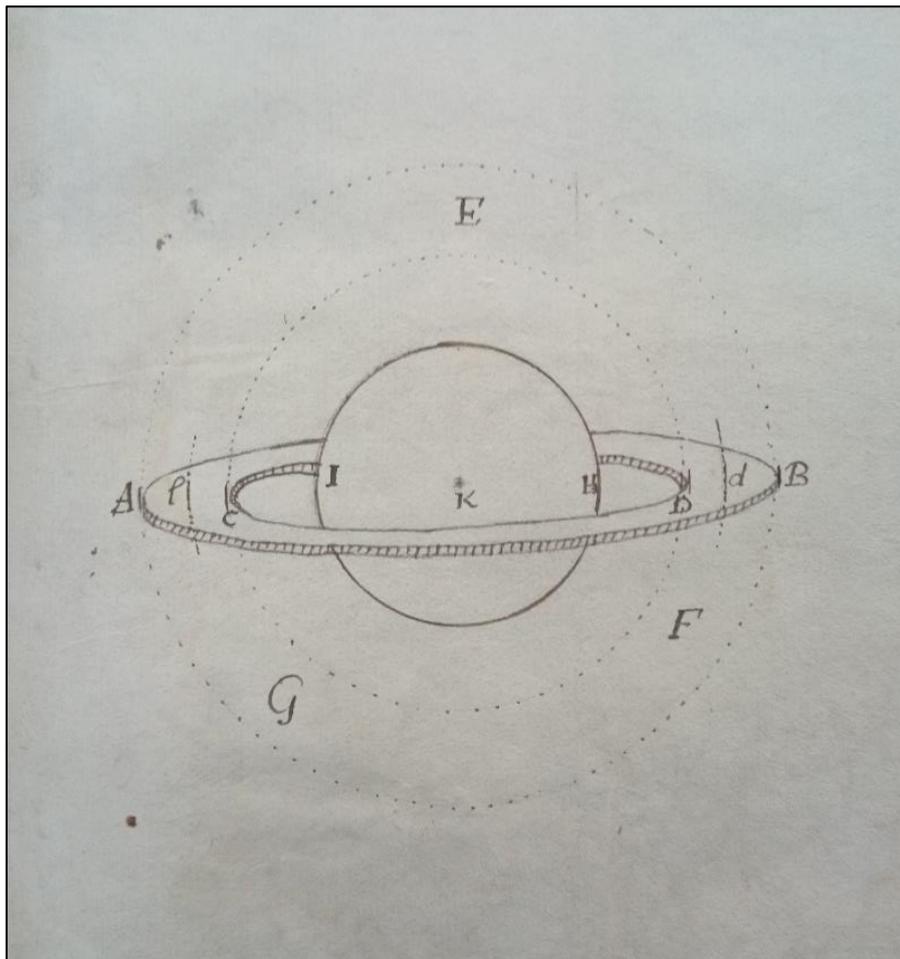
Which Cubes since they are proportional to ye spheres of ye same Diameters may be taken for ye contents of ye spheres themselves, and then ye Differences of ye Cubes of ye greatest & least Diameters of ye ring gives ye content of ye perfectly spherical shell $GEF = 441\frac{1}{2}$ which contains 64 ye Cube of ye Diameter of ye present ball of Saturne almost almost 7 times so yt it is impossible ye body of ye Planet should be made up of ye Ruines of ye shell if they employed as much space after as they did before their fall since they would made one almost 7 times as big as ye present is.

The Cube root of $441\frac{1}{2}$ is $7\frac{615}{1000}$ equall to ye Diameter Pd in the figure whereby it is pretended that ye ball made up of the Ruins of ye shell is so far from being contained within ye ring that it extends nearly halfe its breadth.

The outward space included betwixt ye Diameter of ye sphere Pd & sphere described on AB ye greatest diameter of ye Ring is equall to ye inward content of ye shell; if this space was filled wth a liquid such as he concieves filld ye Abyesse of our Earth & ye other Planets before their Shells broke; a 2d question will be askt what is become of it? why did it not mix with ye broken pieces of ye shell (as he imagines it did in our Earth & ye other Planets) & compose one nearly entire globe as it does in them of ye same bigness wth their first balls? how comes its bulk to be sunk into a globe that is but ye eleventh part of ye content of ye first. the water of our Earth cannot be so comprest how shall we concieve the liquid that sustained ye shell of Saturn could? Solid Arches of our Earth when they fall employ as much space as they did standing how can we imagine yt ye shell of Saturne breaking should sink into a ball of but a seventh part of its entire content.

It seems therefore much more probable yt ye Planet Saturne was formed at first in that shape wee see him with his Ring distinct from his body rather than in yt of ye Author or any other and no

less ye other Planets wth their land intermixt with seas much after the manner we now find them. tho since ye Creation there have happened changes in some few places by subterranean Eruptions, Earthquakes & Inundations, & till he can solve ye aforementioned Difficultys that his Theory is highly improbable.



References

Primary sources

Anonymous. (c.1693). A remark on a passage in Dr Burnet's *telluris theoria sacra*. Unpublished manuscript. *Classified Papers of the Royal Society*, Cl.P/8i/51.

Anonymous. (1726). Article XIV. *A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Jamaica, with the natural history of the herbs and trees, four-footed beasts, fishes, birds, insects, reptiles, &c. of the last of those islands; to which is prefix'd an introduction, wherein is an account of the inhabitants, air, waters, diseases, trade, &c. of that place, with some relations concerning the neighbouring continent, and islands of America. Illustrated with the figures of the things describ'd, which have not been heretofore engraved. In large copper-plates as big as the life. By Sir Hans Sloane, Baronet. In two volumes. Vol. II. London: Printed for the author. 1725. in folio. pagg. 499. reckoning the index, besides the figures and the introduction. In M. de la Roche (Ed.), *New memoirs of literature, containing an account of new books printed both at home and abroad, with dissertations upon several subjects, miscellaneous observations, &c.* (pp. 93-100). London: Printed for William and John Innys.*

Arbuthnot, J. (1697). *An examination of Dr. Woodward's account of the deluge, &c. with a comparison between Steno's philosophy and the doctor's, in the case of marine bodies dug out of the earth.* London: Printed for C. Bateman.

Beaumont, J. (1693). *Considerations on a book, entituled the theory of the earth, publisht some years since by the Dr. Burnet.* London: Printed for the author, and are to be sold by Randal Taylor.

Bentley, R. (1693). *A confutation of atheism from the origin and frame of the world. a sermon preached at St Mary-le-Bow, December the 5th, 1692: Being the eighth of the lecture founded by the Honourable Robert Boyle.* London: Printed for H. Mortlock.

Beverley, T. (1689). *The propheticall history of the reformation, or, the reformation to be reform'd in that great re-reformation that is to be 1697 according to the divine table or vision of it, Revel. 10 compared with other visions especially of the churches...: to which is adjoyn'd the apocalyptical vision of the witnesses.* London: S. N.

Beverley, T. (1690). *The pattern of the divine temple, sanstuary [sic], and city of the New Jerusalem measured according to Ezekiels last and greatest vision, chap. 40 to the end...: designed as a preface to two late treatises, viz. The prophetic history of the Reformation, and the grand apocalyptick vision of the witnesses, rising and ascending.* London: Printed, and are to be sold by John Salusbury.

Beverley, T. (1691). *The universal Christian doctrine of the Day of Judgment applied to the doctrine of the thousand years kingdom of Christ (herein guided by Mr. Baxter's Reply) to vindicate it from all objections.* London: S. N.

Beverley, T. (1693). *Evangelical repentance unto salvation not to be repented of upon 2 Cor. 7, 10; and as most seasonable, Short considerations on that great context Hebr. 12, 26, "Yet once more I shake not only Earth, &c.": upon the solemn occasion of the late dreadful earthquake in Jamaica and the later monitory motion of the earth in London, and other parts of the nation and beyond the sea; whereunto is adjoined a discourse on death-bed repentance, on Luc. 22, 39.* London: Printed by R. Smith for W. Miller.

Beverley, T. (1694). *A discourse upon the powers of the world to come, or, the miraculous powers of the Gospel, and kingdom of our Lord Jesus Christ and their certain return at the kingdom of Christ in its succession.* London: Printed for William Marshall.

Birch, T. (1757). *The History of the Royal Society of London for improving of natural knowledge, from its first rise. In which the most considerable of those papers communicated to the Society, which have hitherto not been published, are inserted in their proper order, as a supplement to the Philosophical Transactions, Vol. 4.* London: A. Millar.

Blount, C. (1683). *Miracles, no violations of the laws of nature.* London: Printed for Robert Sollers.

Blount, C. (1693). *Oracles of reason: in several letters to Mr. Hobbs and other persons of eminent quality and learning.* London: S. N.

Blount, T. P. (1693). *A natural history containing many not common observations extracted out of the best modern writers.* London: Printed for R. Bentley.

Buffon, G. L. L., comte de. (1776). *The natural history of animals, vegetables, and minerals; with the theory of the earth in general, Vol. 5. Translated from the French of Count de Buffon.* London: Printed for, and sold by, T. Bell.

Burnet, G. (1676). *A modest survey of the most considerable things in a discourse lately published, entituled Naked truth, written in a letter to a friend.* London: Printed for Moses Pitt.

Burnet, T. (1681) *Telluris theoria sacra: orbis nostri originem & mutationes generales, quas aut jam subiit, aut olim subiturus est, complectens: libri duo priores de Diluvio & Paradiso.* Londini: Typis R.N. impensis Gualt. Kettilby.

Burnet, T. (1684). *The theory of the earth: Containing an account of the original of the earth, and of all the general changes which it hath already undergone, or is to undergo till the consummation of all things. The two first books concerning the Deluge, and concerning Paradise.* London: Printed by R. Norton, for Walter Kettilby.

Burnet, T. (1689a). *A relation of the proceedings at Charter-house, upon occasion of King James the II. his presenting a papist to be admitted into that hospital. In vertue of his letters dispensatory.* London: printed by Walter Kettilby.

Burnet, T. (1689b). *Telluris theoria sacra: orbis nostri originem & mutationes generales, quas aut jam subiit, aut olim subiturus est, complectens: libri duo priores de Diluvio & Paradiso. Editio secunda.* Londini: typis R.N. Impensis Gualt. Kettilby.

Burnet, T. (1689c). *Telluris theoria sacra: orbis nostri originem & mutationes generales, quas aut jam subiit, aut olim subiturus est, complectens: libri duo posteriores de conflagratione mundi et de futuro rerum statu*. Londini: Typis R.N. Impensis Gualt. Kettilby.

Burnet, T. (1690a). *An answer to the late exceptions made by Mr Erasmus Warren against the theory of the earth*. London: printed by R. Norton, for Walter Kettilby.

Burnet, T. (1690b). *A review of the theory of the earth and of its proofs, especially in reference to scripture*. London: Printed by R. Norton for Walter Kettilby.

Burnet, T. (1690c). *The theory of the earth: Containing an account of the original of the earth, and of all the general changes which it hath already undergone, or is to undergo, till the consummation of all things. The two Last books, concerning the burning of the world, and the new heavens and new earth*. London: Printed by R. Norton, for Walter Kettilby.

Burnet, T. (1691a). *A short consideration of Mr. Erasmus Warren's defence of his exceptions against the theory of the earth*. London: Printed by R. Norton for Walter Kettilby.

Burnet, T. (1691b). *The theory of the earth: Containing an account of the original of the earth, and of all the general changes which it hath already undergone, or is to undergo till the consummation of all things. The two first books concerning the Deluge, and Paradise. The second edition*. London: Printed by R. Norton, for Walter Kettilby.

Burnet, T. (1692). *Archaeologiae philosophicae, or, doctrina antiqua de rerum originibus*. Londini: Impensis Gualt. Kettilby.

Burnet, T. (1697a). *Remarks upon an essay concerning humane understanding: in a letter address'd to the author*. London: Printed for M. Wotton.

Burnet, T. (1697b). *Second remarks upon an essay concerning humane understanding: in a letter address'd to the author, being a vindication of the first remarks against the answer of Mr. Lock, at the end of his reply to the Lord Bishop of Worcester*. London: Printed for M. Wotton.

Burnet, T. (1697c). *The theory of the earth containing an account of the original of the earth, and of all the general changes which it hath already undergone, or is to undergo till the consummation of all things*, 3rd ed. London: Printed by R.N. for Walter Kettilby

[Burnet, T.] T. B. (1699a). *Reflections upon the theory of the earth, occasion'd by a late examination of it. In a letter to a friend*. London: Printed for Walter Kettilby.

Burnet, T. (1699b). *Third remarks upon an essay concerning humane understanding: in a letter address'd to the author*. London: Printed for M. Wotton.

Burnet, T. (1702). *Telluris theoria sacra: orbis nostri originem & mutationes generales, quas aut jam subiit, aut olim subiturus est, complectens. Libri duo priores de Diluvio & Paradiso. Editio tertia, recognita & contracta*. Londini: impensis Benj. Took.

Burnet, T. (1719). *The sacred theory of the earth: containing an account of the original of the earth, and of all the general changes which it hath already, or is to undergo, till the consummation of all things*, 4th ed. London: printed for J. Hooke.

Burnet, T. (1722). *The sacred theory of the earth: containing an account of the original of the earth, and of all the general changes which it hath already, or is to undergo, till the consummation of all things*, 5th ed. London: printed for J. Hooke.

Burnet, T. (1726). *The sacred theory of the earth: containing an account of the original of the earth, and of all the general changes which it hath already, or is to undergo, till the consummation of all things*, 6th ed. London: printed for J. Hooke.

Burnet, T. (1728). *Of the state of the dead, and of those that are to rise*, vol. 1. London: Printed for E. Curll.

Burnet, T. (1736a [first published in Latin 1692]). *Archaeologiae philosophicae, or, the ancient doctrine concerning the originals of things*. London: Printed and sold by J. Fisher.

Burnet, T. (1736b [first published in Latin 1692]). *Doctrina antiqua de rerum originibus: or an inquiry into the doctrine of all the philosophers of all nations, concerning the original of the world*. London: Printed for E. Curll.

Burnet, T. (1736c [first published in Latin 1692]). *Dr. Burnet's theory of the visible world; by way of commentary on his own theory of the earth. Being the second part of his Archaeologiae philosophicae*. London: Printed for E. Curll.

Burnet, T. (1739). *Hell torments not eternal. Argumentatively proved, from the attribute of divine mercy*. London: printed for E. Curll... and sold by T. Cooper.

Burnet, T. (1759). *The sacred theory of the earth: containing an account of the original of the earth, and of all the general changes which it hath already, or is to undergo, till the consummation of all things*, 7th ed. London: printed for T. Osborn, C. Hitch and L. Hawes, J. Whiston and B. White, J. Rivington, J. Rivington and J. Fletcher, W. Johnston, D. Wilson and T. Durham, S. Crowder, H Woodgate and S. Brooks, P. Davey and B. Law, T. Field, Z. Stuart, T Caslon.

Catcott, A. (1768). *A treatise on the deluge. Containing I. Remarks on the Lord Bishop of Clogher's account of that event. II. A full explanation of the scripture history of it. III. A collection of all the principal heathen accounts. IV. Natural proofs of the Deluge, deduced from a great variety of circumstances, on and in the terraqueous globe... the second edition, considerably enlarged*. London: Printed for the author by E. Allen

Cockburn, P. (1750). *An inquiry into the truth and certainty of the Mosaic Deluge. Wherein the arguments of the learned Isaac Vossius, and others, for a topical Deluge are examined; and some vulgar errors, relating to that grand catastrophe, are discover'd*. London: Printed for C. Hitch.

Cressener, D. (1689). *The judgments of God upon the Roman-Catholick Church from its first rigid laws for universal conformity to it unto its last end: with a prospect of these near approaching revolutions*,

viz. the revival of the Protestant profession in an eminent kingdom where it was totally suppressed, the last end of all Turkish hostilities, the general mortification of the power of the Roman Church in all parts of its dominions: in explication of the trumpets and vials of the Apocalypse upon principles generally acknowledged by Protestant interpreters. London: Printed for Richard Chiswell.

Cressener, D. (1690). *A demonstration of the first principles of the Protestant applications of the apocalypse together with the consent of the ancients concerning the fourth beast in the 7th of Daniel and the beast in the Revelations.* London: Printed for Thomas Cockerill.

Croft, H. (1675). *The naked truth, or, The true state of the primitive church, by an humble moderator.* London: s. n.

Croft, H. (1685). *Some animadversions upon a book intituled, the theory of the earth.* London: Printed for Charles Harper.

de Beer, E. S. (Ed.) (1978a). *The correspondence of John Locke*, vol. 2. Oxford: Oxford University Press.

de Beer, E. S. (Ed.) (1978b). *The correspondence of John Locke*, vol. 3. Oxford: Oxford University Press.

de Beer, E. S. (Ed.) (1978c). *The correspondence of John Locke*, vol. 4. Oxford: Oxford University Press.

de Beer, E. S. (Ed.) (1978d). *The correspondence of John Locke*, vol. 5. Oxford: Oxford University Press.

de Beer, E. S. (Ed.) (1978e). *The correspondence of John Locke*, vol. 6. Oxford: Oxford University Press.

de la Bédoyère, G. (Ed.) (1997). *Particular friends: The correspondence of Samuel Pepys and John Evelyn.* Woodbridge: The Boydell Press.

Derham, W. (1714 [1713]). *Physico-theology: Or, a demonstration of the being and attributes of God, from His works of creation*, 3rd ed. London: printed for W. Innys.

Descartes, R. (1982 [1644]). *Principles of philosophy.* Dordrecht: Kluwer.

Descartes, R. (1996 [1641]). *Meditations on first philosophy, with selections from the objections and replies.* Cambridge: Cambridge University Press.

Descartes, R. (1998 [1664/1667]). *The world and other writings.* Cambridge: Cambridge University Press.

Descartes, R. (2006 [1637]). *A discourse on the method of correctly conducting one's reason and seeking truth in the sciences.* Oxford: Oxford University Press.

Edwards, J. (1693). *A discourse concerning the authority, stile, and perfection of the books of the Old and New-Testament with a continued illustration of several difficult texts of scripture throughout the whole work*, vol. 2. London: Printed by I. D. for Jonathan Robinson... and John Wyat.

Edwards, J. (1696). *A demonstration of the existence and providence of God, from the contemplation of the visible structure of the greater and the lesser world in two parts, the first shewing the excellent*

contrivance of the heavens, earth, sea, &c., the second the wonderful formation of the body of man. London: Printed by J.D. for Jonathan Robinson ... and John Wyat.

Edwards, J. (1697). *Brief remarks upon Mr. Whiston's New theory of the earth and upon an other gentleman's objections against some passages in a discourse of the existence and providence of God, relating to the Copernican hypothesis.* London: Printed for J. Robinson... and J. Wyat.

Ellis, H., and Maty, P. H. (1813). *Librorum impressorum qui in Museo Britannico adservantur catalogus*, Vol. 1. Londini: s. n.

Emes, T. (1698). *A dialogue between alkali and acid containing divers philosophical and medicinal considerations: wherein a late pretended new hypothesis asserting alkali the cause and acid the cure of all diseases, is proved groundless and dangerous: being a specimen of the immodest self-applause, shameful contempt, and abuse of all physicians, gross mistakes and great ignorance of the pretender John Colbatch.* London: Printed for R. Cumberland... and Tho. Speed.

Forbes, E. G., Murdin, L., and Willmoth, F. (Eds.) (2001). *The correspondence of John Flamsteed, the first Astronomer Royal*, vol. 2. Bristol: Institute of Physics Publishing.

Glanvill, J. (1662). *Lux orientalis, or, an enquiry into the opinion of the Eastern sages concerning the praeexistence of souls being a key to unlock the grand mysteries of providence, in relation to mans sin and misery.* London: s. n.

Goldsmith, O. (1774). *An history of the earth and animated nature*, vol. 1. London: printed for J. Nourse.

Hakewill, G. (1627). *An apologie of the power and providence of God in the government of the world. Or an examination and censvre of the common errovr tovching natvres perpetvall and vniversal decay, divided into fovre books.* Oxford: Printed by Iohn Lichfield and William Tvrner, Printers to the famous Vniversity.

Hale, M. (1678). *The primitive origination of mankind, considered and examined according to the light of nature.* London: Printed by William Godbid, for William Shrowsbery.

Halley, E. (1686). "An account of the circulation of the watry vapours of the sea, and of the cause of springs, presented to the Royal Society". *Philosophical Transactions of the Royal Society of London*, 17, 468-73.

Halley, E. (1724a). "Some considerations about the cause of the universal Deluge, laid before the Royal Society, on the 12th of December 1694". *Philosophical Transactions of the Royal Society of London*, 33, 118-23.

Halley, E. (1724b) "Some farther thoughts upon the same subject, delivered on the 19th of the same month". *Philosophical Transactions of the Royal Society of London*, 33, 123-5.

Halkett, S., and Laing, J. (1885). *A dictionary of the anonymous and pseudonymous literature of Great Britain. Including the works of foreigners written in, or translated into the English language.* Edinburgh: William Paterson.

Harris, J. (1697). *Remarks on some late papers, relating to the universal deluge: and to the natural history of the earth*. London: Printed for R. Wilkin.

Harris, J. (1697). *A letter to Dr. Tancred Robinson, in answer to some passages in his to Mr. Wotton, relating to Mr. Harris's remarks on some late papers, &c.* London: S. N.

Heathcote, R. (1759). An account of the life and writings of the Rev. Thomas Burnet, LL.D. In T. Burnet, *the sacred theory of the earth: containing an account of the original of the earth, And of all the General changes which it hath already, or is to undergo, till the consummation of all things*, 7th ed. (pp. xvii-xxxv). London: printed for T. Osborn, C. Hitch and L. Hawes, J. Whiston and B. White, J. Rivington, J. Rivington and J. Fletcher, W. Johnston, D. Wilson and T. Durham, S. Crowder, H Woodgate and S. Brooks, P. Davey and B. Law, T. Field, Z. Stuart, T Caslon.

Hooker, R. (1622 [first published 1594]). *Of the lawes of ecclesiastical politie*. London: Printed by William Stansby.

Hutton, J. (1795). *Theory of the earth, with proofs and illustrations, in four parts*. Edinburgh: Cadell and Davies, London, & William Creech, Edinburgh.

Keill, J. (1699). *An examination of the reflections on the theory of the earth. Together with a defence of the remarks on Mr. Whiston's new theory*. Oxford: Printed at the theater for Henry Clemens.

Keill, J. (1720 [first published in Latin 1702]). *An introduction to natural philosophy: Or, philosophical lectures read in the University of Oxford, Anno Dom. 1700. To which are added, the demonstrations of Monsieur Huygens's theorems, concerning the centrifugal force and circular motion*. London: Printed by H.W. for William and John Innys.

Kircher, A. (1675). *Arca Noë, in tres libros digesta, quorum I. De rebus quae ante Diluvium, II. De iis, quae ipso Diluvio ejusque duration, III. De iis, quae post Diluvium à noëmo gesta sunt, quae omnia novâ method, nec non summa argumentorum varietate, explicantur, & demonstrantur*. Amstelodami: Apud Joannem Janssonium à Waesberge.

Locke, J. (1693). *Some thoughts concerning education*. London: Printed for A. and J. Churchill.

Lovell, A. (1696). *A summary of material heads which may be enlarged and improved into a compleat answer to Dr. Burnet's theory of the earth*. London: Printed by T.B.

L. P. (1695). *Two essays sent in a letter from Oxford to a nobleman in London: The first concerning some errors about the creation, general flood, and the peopling of the world: in two parts: The second concerning the rise, progress, and destruction of fables and romances, with the state of learning*. London: Printed, and are to be sold by R. Baldwin.

Lyell, C. (1830). *Principles of geology, being an attempt to explain the former changes of the earth's surface, by reference to causes now in operation*, Vol. 1. London: John Murray.

More, H. (1653). *Conjectura cabbalistica or, a conjectural essay of interpreting the minde of Moses, according to a threefold cabbala: viz. literal, philosophical, mystical, or, divinely moral*. London: Printed by James Flesher, and are to be sold by William Morden.

More, H. (1660). *An explanation of the grand mystery of godliness, or, A true and faithfull representation of the everlasting Gospel of our Lord and Saviour Jesus Christ, the onely begotten Son of God and sovereign over men and angels*. London: Printed by J. Flesher for W. Morden.

Nicholls, W. (1696). *A conference with a theist*. London: Printed by T.W. for Francis Saunders... and Tho. Bennet.

Nicholls, W. (1697). *A conference with a theist. Part II*. London: Printed by T.W. for Francis Saunders and Thomas Bennet.

Parker, S. (1700). *Six philosophical essays upon several subjects*. London: Printed by J.H. for Tho. Newborough.

Ray, J. (1692). *Miscellaneous discourses concerning the dissolution and changes of the world wherein the primitive chaos and creation, the general deluge, fountains, formed stones, sea-shells found in the earth, subterraneous trees, mountains, earthquakes, vulcanoes, the universal conflagration and future state, are largely discussed and examined*. London: Printed for Samuel Smith.

Ray, J. (1693). *Three physico-theological discourses, concerning i. the primitive Chaos, and creation of the world, ii. the general Deluge, its causes and effects, iii. the dissolution of the world, and future conflagration*. London: Printed for Sam. Smith.

Robinson, T. (1697). *A letter sent to Mr. William Wotton, B. D. Chaplain to the Right Honourable the Earl of Nottingham. Concerning some late remarks, &c. written by John Harris, A.M.* London: s. n.

Robinson, T. D. (1696). *New observations on the natural history of this world of matter, and this world of life in two parts: being a philosophical discourse, grounded upon the Mosaick system of the creation and the flood: to which are added some thoughts concerning paradise, the conflagration of the world, and a treatise of meteorology: with occasional remarks upon some late theories, conferences, and essays*. London: Printed for John Newton.

Rust, G. (1661). *A letter of resolution concerning Origen and the chief of his opinions*. London: C. L.

Sherlock, W. (1694). *A discourse concerning the divine providence*. London: Printed for William Rogers.

Sloane, H. (1725). *A voyage to the islands Madera, Barbados, Nieves, S. Christophers and Jamaica, with the natural history of the herbs and trees, four-footed beasts, fishes, birds, insects, reptiles, &c. of the last of those islands; to which is prefix'd an introduction, wherein is an account of the inhabitants, air, waters, diseases, trade, &c. of that place, with some relations concerning the neighbouring continent, and islands of America. Illustrated with the figures of the things describ'd, which have not been heretofore engraved. In large copper-plates as big as the life*. Vol. 2. London: Printed for the author.

St. Clair, R. (1697). *The abyssinian philosophy confuted, or, telluris theoria neither sacred not agreeable to reason, being for the most part a translation of Petrus Ramazzini, Of the wonderful springs of Modena: illustrated with many curious remarks and experiments by the author and translator: to which is added a new hypothesis deduced from Scripture and the observation of nature: with an addition of some miscellany experiments*. London: Printed for the author and sold by W. Newton.

Stillingfleet, E. (1662). *Origines sacrae, or, a rational account of the grounds of Christian faith, as to the truth and divine authority of the Scriptures and the matters therein contained*. London: Printed by R. W. for Henry Mortlock.

Stillingfleet, E. (1680). *Origines sacrae, or, a rational account of the grounds of Christian faith, as to the truth and divine authority of the Scriptures and the matters therein contained, the fifth edition corrected and amended*. London: Printed by J. H. for Henry Mortlock.

Tillotson, (1699). *Several discourses upon the attributes of God viz. Concerning the perfection of God. Concerning our imitation of the divine perfections. The happiness of God. The unchangeableness of God. The knowledge of God. The wisdom, glory, and sovereignty of God. The wisdom of God, in the creation of the world. The wisdom of God, in his providence. The wisdom of God, in the redemption of mankind. The justice of God, in the distribution of rewards and punishments. The truth of God. The holiness of God. To which is annexed a spital sermon, of doing good*. London: Printed for Ri. Chiswell.

Tillotson, J. (1700). *The remaining discourses, on the attributes of God viz. his goodness. His mercy. His patience. His long-suffering. His power. His spirituality. His immensity. His eternity. His incomprehensibility. God the first cause, and last end*. London: Printed for Ri. Chiswell.

Turnbull, H. W. (Ed.) (1960). *The correspondence of Isaac Newton*, vol 2. Cambridge: Cambridge University Press.

Wagner, C. (1683). *Animadversiones in T. Burnetii telluris theoriam sacram*. Leipzig: S. N.

Waple, E. (1693). *The book of the Revelation paraphrased; with annotations on each chapter. Whereby it is made plain to the meanest capacity*. London: S. N.

Ward, J. (1740). *The lives of the professors of Gresham College*. London: Printed by John Moore for the author.

Warren, E. (1690). *Geologia, or, a discourse concerning the earth before the Deluge*. London: Printed for R. Chiswell.

Warren, E. (1691). *A defence of the discourse concerning the earth before the Flood*. London: Printed for John Southby.

Warren, E. (1692). *Some reflections upon the short considerations of the defence of the exceptions against the theory of the earth*. London: Printed for John Southby.

Waterland, D. (1730). *Advice to a young student. With a method of study for the four first years*. London: Printed for John Crownfield... and sold by Cornelius Crownfield, printer to the University of Cambridge.

Waterland, D. (1730). *Advice to a young student. With a method of study for the four first years. The second edition*. London: Printed for John Crownfield... and sold by Cornelius Crownfield, printer to the University of Cambridge.

Waterland, D. (1740). *Advice to a young student. With a method of study for the four first years. The third edition.* Cambridge: printed for C. and J. Crownfield.

Waterland, D. (1755). *Advice to a young student. With a method of study for the four first years. The second edition, corrected.* Oxford: printed... and sold by Richard Clements.

Waterland, D. (1761). *Advice to a young student. With a method of study for the four first years. The third edition.* S. N.

Whiston, W. (1696a). A discourse concerning the nature, stile, and extent of the Mosaick history of the creation. In W. Whiston, *A new theory of the earth, from its original to the consummation of all things wherein the creation of the world in six days, the universal deluge, and the general conflagration, as laid down in the Holy Scriptures, are shewn to be perfectly agreeable to reason and philosophy: with a large introductory discourse concerning the genuine nature, stile, and extent of the Mosaick history of the creation.* London: Printed by R. Roberts for Benj. Tooke.

Whiston, W. (1696b). *A new theory of the earth, from its original to the consummation of all things wherein the creation of the world in six days, the universal deluge, and the general conflagration, as laid down in the Holy Scriptures, are shewn to be perfectly agreeable to reason and philosophy: with a large introductory discourse concerning the genuine nature, stile, and extent of the Mosaick history of the creation.* London: Printed by R. Roberts for Benj. Tooke.

Whiston, W. (1698). *A vindication of the new theory of the earth from the exceptions of Mr. Keill and others with an historical preface of the occasions of the discoveries therein contain'd, and some corrections and additions.* London: Printed for Benj. Tooke.

Whiston, W. (1700). *A second defence of the New theory of the earth from the exceptions of Mr. John Keill.* London: Printed for Benj. Tooke.

Whiston, W. (1708). *A new theory of the earth, from its original to the consummation of all things wherein the creation of the world in six days, the universal deluge, and the general conflagration, as laid down in the Holy Scriptures, are shewn to be perfectly agreeable to reason and philosophy: with a large introductory discourse concerning the genuine nature, stile, and extent of the Mosaick history of the creation, 2nd edition.* London: Printed at the University-Press; for Benj. Tooke.

Whitehurst, John (1778). *An inquiry into the original state and formation of the earth: Deduced from facts and the laws of nature.* London: Printed for the author, and W. Bent, by J. Cooper.

Witty, J. (1705a). *An essay towards a vindication of the vulgar exposition of the Mosaic history of the creation of the world. In several letters.* London : printed for John Wyat, and sold by Tho. Baxter.

Witty, J. (1705b). *An essay towards a vindication of the vulgar exposition of the Mosaic history of the fall of Adam. In several letters.* London: printed for John Wyat, and sold by Tho. Baxter.

Woodward, J. (1695). *An essay toward a natural history of the earth and terrestrial bodies, especially minerals: as also of the sea, rivers, and springs: with an account of the universal deluge: and of the effects that it had upon the earth.* London: Printed for Ric. Wilkin.

Woodward, J. (1777). *Of the wisdom of the antient Egyptians, &c. A discourse concerning their arts, their sciences, and their learning; their laws, their government, and their religion. With occasional reflections upon the state of learning among the Jews, and some other nations.* London: Printed by W. Bowyer and J. Nichols.

Wright, T. (c.1773). A new theory of the earth founded upon, and more fully explaining the universal phenomenon, of earthquakes; effects of ye magnet; and doctrine of tides. *Durham University Library Special Collections*, Thomas Wright MS 18/1.

Secondary sources

Allen, D. C. (1949). *The legend of Noah: Renaissance rationalism in art, science, and letters.* Urbana: University of Illinois Press.

Almond, P. C. (1999). *Adam and Eve in seventeenth-century thought.* Cambridge: Cambridge University Press.

Anstey, P. R. (2000). Descartes' cardiology and its reception in English physiology. In S. Gaukroger, J. Schuster, and J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 420-44). New York: Routledge.

Anstey, P. R. (2011). *John Locke and natural philosophy.* Oxford: Oxford University Press.

Anstey, P. R. (2018). Locke and Cartesian cosmology. In P. Hamou, and M. Pécharman (Eds.), *Locke and Cartesian philosophy* (pp. 33-48). Oxford: Oxford University Press.

Ashcraft, R. (1992). Latitudinarianism and toleration: historical myth versus political history. In R. Kroll, R. Ashcraft, and P. Zagorin (Eds.), *Philosophy, science, and religion in England 1640–1700* (pp. 151-77). Cambridge: Cambridge University Press.

Austin, W. H. (1970). Isaac Newton on science and religion. *Journal of the History of Ideas*, 31, pp. 521-42.

Barnett, L. (2015). The theology of climate change: Sin as agency in the Enlightenment's Anthropocene. *Environmental History*, 20, 217-37.

Barton, W. M. (2017). *Mountain aesthetics in early modern Latin literature.* New York: Routledge.

Bitbol-Hespériès, A. (2000). Cartesian physiology. In S. Gaukroger, J. Schuster, and J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 349-82). New York: Routledge.

Bowen, M. (1981). *Empiricism and geographical thought: From Francis Bacon to Alexander von Humboldt.* Cambridge: Cambridge University Press.

Bowler, P. J. (1992). *The earth encompassed: A history of the environmental sciences.* New York: Norton.

- Bowler, P. J. (2003). *Evolution: The history of an idea*. Berkeley: University of California Press.
- Breidbach, O., and Ghiselin, M. T. (2006). Athanasius Kircher (1602-1680) on Noah's Ark: Baroque "intelligent design" theory. *Proceedings of the California Academy of Sciences*, 57, 991-1002.
- Brooke, J. H. (1991). *Science and religion: Some historical perspectives*. Cambridge: Cambridge University Press.
- Buchwald, J. Z., and Feingold, M. (2013). *Newton and the origin of civilization*. Princeton: Princeton University Press.
- Buonanno, R. (2014). *The stars of Galileo Galilei and the universal knowledge of Athanasius Kircher*. Cham: Springer.
- Claydon, T. (2007). *Europe and the making of England, 1660-1760*. Cambridge: Cambridge University Press.
- Cohn, N. (1996). *Noah's flood: The Genesis story in western thought*. New Haven: Yale University Press.
- Collier, K. B. (1968). *The cosmogonies of our fathers: Some theories of the seventeenth and the eighteenth centuries*. New York: Octagon.
- Cook, A. H. (1991). Edmond Halley and Newton's *Principia*. *Notes and Record of the Royal Society*, 45, 129-38.
- Cook, A. H. (1998). *Edmond Halley: Charting the heavens and the seas*. Oxford: Oxford University Press.
- Coppola, A (2010). Imagination and pleasure in the cosmography of Thomas Burnet's sacred theory of the earth. In A. B. Kavey (Ed.), *World-building and the early modern imagination* (pp. 119-39). New York: Palgrave Macmillan.
- Cope, J. I. (1954). Joseph Glanvill, Anglican apologist: Old ideas and new style in the Restoration. *PMLA*, 69, 223-50.
- Cope, J. I. (1954). "The Cupri-Cosmits": Glanvill on latitudinarian anti-enthusiasm. *Huntington Library Quarterly*, 17, 269-86.
- Crocker, R. (1990). Henry More: A biographical essay. In S. Hutton (Ed.), *Henry More (1614-1687): Tercentenary studies* (pp. 1-17). Dordrecht: Kluwer.
- Crocker, R. (2003). *Henry More 1614-1687: A biography of the Cambridge Platonist*. Dordrecht: Springer.
- Davids, K. In the shadow of Jesuits: Isaac Vossius and geography. In E. Jorink and D. van Miert (Eds.), *Isaac Vossius (1618–1689): Between science and scholarship* (pp. 189-206). Leiden: Brill.
- Dean, D. R. (2009) Benjamin Franklin and geology. In G. D. Rosenberg (Ed.), *The revolution in geology from the Renaissance to the Enlightenment: Geological Society of America Memoir 203*, 209-23.

- Debus, A. G. (1965). *The English Paracelsians*. London: Oldbourne.
- Dixon, P. (2003). *Nice and hot disputes: The doctrine of the Trinity in the seventeenth century*. London: T & T Clark.
- Draper, J. W. (1875 [first published 1874]). *History of the conflict between religion and science*. New York: D. Appleton and Company.
- Duncan, J. E. (1969). Paradise as the whole earth. *Journal of the History of Ideas*, 30, 171-86.
- Duncan, J. E. (1972). *Milton's earthly Paradise: A historical study of Eden*. Minneapolis: University of Minnesota Press.
- Emerton, M. E. (1994). Creation in the thought of J. B. van Helmont and Robert Fludd. In P. Rattansi and A. Clericuzio (Eds.), *Alchemy and chemistry in the 16th and 17th Centuries* (pp. 85-102). Dordrecht: Springer.
- Eddy, M. D. (2008). *The language of mineralogy: John Walker, chemistry and the Edinburgh Medical School, 1750-1800*. Farnham: Ashgate.
- Fara, P. (2002). Heavenly bodies: Newtonianism, natural theology and the plurality of worlds debate in the eighteenth century. *Journal for the History of Astronomy*, 35, 143-60.
- Feingold, M. (1987). *William Whiston: Honest Newtonian* by James E. Force. *Eighteenth-Century Studies*, 21, 141-2.
- Force, J. E. (1983). Some eminent Newtonians and providential geophysics at the turn of the seventeenth century. *Earth Sciences History*, 2, 4-10.
- Force, J. E. (1985). *William Whiston: Honest Newtonian*. Cambridge: Cambridge University Press.
- Force, J. E. (1990a). The Newtonians and deism. In J. E. Force, and R. H. Popkin (Eds.), *Essays on the context, nature, and influence of Isaac Newton's theology* (pp. 43-74). Dordrecht: Kluwer.
- Force, J. E. (1990b). The breakdown of the Newtonian synthesis of science and religion: Hume, Newton, and the Royal Society. In J. E. Force and R. H. Popkin (Eds.), *Essays on the context, nature, and influence of Isaac Newton's theology* (pp. 143-63). Dordrecht: Kluwer.
- Force, J. E. (2001a) The virgin, the dynamo, and Newton's prophetic history. In J. E. Force, and R. H. Popkin (Eds.), *The millenarian turn: Millenarian contexts of science, politics, and everyday Anglo-American life in the seventeenth and eighteenth centuries* (pp. 67-94). Dordrecht: Springer.
- Force, J. E. (2001b). Newton's theocentric cosmogony and Hume's cometary "seeds". In R. Crocker (Ed.), *Religion, reason and nature in early modern Europe* (pp. 159-80). Dordrecht: Springer.
- Force, J. E. (2004). Providence and Newton's *Pantokrator*: Natural law, miracles, and Newtonian science. In J. E. Force and S. Hutton (Eds.), *Newton and Newtonianism: New studies* (pp.65-92). Dordrecht: Kluwer.

- Friesen, J. (2008). Christ Church Oxford, the Ancients-Moderns controversy, and the promotion of Newton in post-revolutionary England. In Feingold, M. (Ed.), *History of Universities, Volume XXIII/1* (pp. 33-66). Oxford: Oxford University Press.
- Gabbey, A. (1982). "Philosophia Cartesiana triumphata: Henry More (1646–1671)". In T. M. Lennon, J. M. Nicholas, and J. W. Davis (Eds.), *Problems of Cartesianism* (pp. 171–250). Kingston and Montreal: McGill Queen's University Press.
- Gascoigne, J. (1984). Politics, patronage and Newtonianism: The Cambridge example. *The Historical Journal*, 27, 1-24.
- Gascoigne, J. (1989). *Cambridge in the age of Enlightenment: Science, religion and politics from the Restoration to the French Revolution*. Cambridge: Cambridge University Press.
- Gascoigne, J. (1991). The wisdom of the Egyptians' and the secularisation of history in the age of Newton. In S. Gaukroger (Ed.), *The uses of antiquity: The Scientific Revolution and the classical tradition* (pp. 171-212). Dordrecht: Springer.
- Gaukroger, S. (1995). *Descartes: An intellectual biography*. New York: Oxford University Press.
- Gaukroger, S. (1998). Introduction. In R. Descartes, *The world and other writings*. Cambridge: Cambridge University Press.
- Gaukroger, S. (2001). *Francis Bacon and the transformation of early-modern philosophy*. Cambridge: Cambridge University Press.
- Gaukroger, S. (2002). *Descartes' system of natural philosophy*. Cambridge: Cambridge University Press.
- Gaukroger, S. (2006). *The emergence of a scientific culture: Science and the shaping of modernity, 1210-1685*. Oxford: Oxford University Press.
- Gaukroger, S. (2010). *The collapse of mechanism and the rise of sensibility: Science and the shaping of modernity, 1680–1760*. Oxford: Oxford University Press.
- Gaukroger, S. (2016). The challenges of empirical understanding in early modern theology. In U. L. Lehner, R. A. Muller, and A. G. Roeber (Eds.), *The Oxford handbook of early modern theology, 1600-1800* (pp. 564-76). New York: Oxford University Press.
- Geikie, A. (1897). *The founders of geology*. London: Macmillan.
- Geikie, A. (1905). *The founders of geology*, 2nd ed. London: Macmillan.
- Godwin, J. (1979). *Athanasius Kircher: A Renaissance man and the quest for lost knowledge*. London: Thames and Hudson.
- Gohau, G. (1990). *A history of geology*. New Brunswick: Rutgers University Press.

- Goldgar, B. A. (1982). Fielding, the flood makers, and natural philosophy: "Covent-Garden Journal" No. 70. *Modern Philology*, 80, 136-44.
- Griffin, M. I. J. (1992). *Latitudinarianism in the seventeenth-century Church of England*. Leiden: Brill.
- Gruman, G. J. (2003 [1966]). *A history of ideas about the prolongation of life*. New York: Springer.
- Hall, A. R. (1980). *Philosophers at war: The quarrel between Newton and Leibniz*. Cambridge: Cambridge University Press.
- Hall, A. R. (1992). *Isaac Newton: Adventurer in thought*. Cambridge: Cambridge University Press.
- Harrison, P. (1990). "Religion" and the religions in the English Enlightenment. Cambridge: Cambridge University Press.
- Harrison, P. (1995). Newtonian science, miracles, and the laws of nature. *Journal of the History of Ideas*, 56, 531-53.
- Harrison, P. (1998). *The Bible, Protestantism, and the rise of natural science*. Cambridge: Cambridge University Press.
- Harrison, P. (2000). The influence of Cartesian cosmology in England. In S. Gaukroger, J. Schuster, and J. Sutton (Eds.), *Descartes' natural philosophy* (pp. 168-92). New York: Routledge.
- Harrison, P. (2001). Scaling the ladder of being: Theology and early theories of evolution. In R. Crocker (Ed.), *Religion, reason and nature in early modern Europe* (pp. 199-224). Dordrecht: Springer.
- Harrison (2004). "Priests of the most high God, with respect to the book of nature": The vocational identity of the early modern naturalist. In A. J. L. Menuge (Ed.), *Reading God's world: The scientific vocation* (pp. 59-84). St. Louis: Concordia.
- Harrison, P. (2006). Miracles, early modern science, and rational religion. *Church History*, 75, 493-510.
- Harrison, P. (2007). *The fall of man and the foundations of science*. Cambridge: Cambridge University Press.
- Harrison, P. (2011). Natural history. In P. Harrison, R. L. Numbers, and M. H. Shank (Eds.), *Wrestling with nature: From omens to science* (pp.117-48). Chicago: University of Chicago Press.
- Harrison, P. (2013). Laws of nature in seventeenth-century England: From Cambridge Platonism to Newtonianism. In E. Watkins (Ed.), *The divine order, the human order, and the order of nature: Historical perspectives* (pp. 127-48). New York: Oxford University Press.
- Haycock, D. B. (2002). *William Stukeley: science, religion, and archaeology in eighteenth-century England*. Woodbridge: The Boydell Press.

Haycock, D. B. (2008). Living forever in early modern Europe: Sir Francis Bacon and the project for immortality. In M. E. Novak (Ed.), *The age of projects* (pp. 166-84). Toronto: University of Toronto Press.

Heidarzadeh, T. (2008). *A history of physical theories of comets, from Aristotle to Whipple*. Dordrecht: Springer.

Henry, J. (1986). Occult qualities and the experimental philosophy: Active principles in pre-Newtonian matter theory. *History of Science*, 24, 335-81.

Henry, J. (2010). Keill, John (1671–1721), mathematician and natural philosopher. *Oxford Dictionary of National Biography*. Retrieved 4 Nov. 2018, from <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-15256>.

Henry, J. (2013). The reception of Cartesianism. In P. R. Anstey (Ed.), *The Oxford handbook of British philosophy in the seventeenth century* (pp. 116-43). Oxford: Oxford University Press.

Heringman, N. (2004). *Romantic rocks, aesthetic geology*. Ithaca: Cornell University Press.

Hone, J. (2017). *Literature and party politics at the accession of Queen Anne*. New York: Oxford University Press.

Hudson, W. (2009). *The English deists*. London. Pickering & Chatto.

Hunter, M. (1981). *Science and society in Restoration England*. Cambridge: Cambridge University Press.

Hutton, S. (2001). Ralph Cudworth, God, mind and nature. In R. Crocker (Ed.), *Religion, reason and nature in early modern Europe* (pp. 61-76). Dordrecht: Springer.

Hutton, S. (2001). The Appropriation of Joseph Mede: Millenarianism in the 1640s. In J. E. Force and R. H. Popkin (Eds.), *Millenarianism and messianism in early modern European culture, volume III. The millenarian turn: Millenarian contexts of science, politics, and everyday Anglo-American life in the seventeenth and eighteenth centuries* (pp. 1-13). Dordrecht: Springer.

Hutton, S. (2002). The Cambridge Platonists. In S. Nadler (Ed.), *A companion to early modern philosophy* (pp. 303-19). Malden: Blackwell.

Hutton, S. (2015). *British philosophy in the seventeenth century*. Oxford: Oxford University Press.

Iliffe, R. (2017). *Priest of nature: The religious worlds of Isaac Newton*. New York: Oxford University Press.

Ito, Y. (1988). Hooke's cyclic theory of the earth in the context of seventeenth century England. *British Journal of the History of Science*, 21, 295-314.

Jacob, M. C. (1976). Millenarianism and science in the late seventeenth century. *Journal of the History of Ideas*, 37, 335-41.

Jacob, M. C., and Lockwood, W. A. (1972). Political millenarianism and Burnet's *Sacred theory*. *Science Studies*, 2, 265-79.

Janiak, A. (2012). Newton and Descartes: Theology and natural philosophy. *Southern Journal of Philosophy*, 50, 414-35.

Johnston, W. (2006). Thomas Beverley and the "late great revolution": English apocalyptic expectation in the late seventeenth century. In A. Hessayon and N. Keene (Eds.), *Scripture and Scholarship in Early Modern England* (pp. 158-75). Aldershot: Ashgate.

Johnston, W. (2009). Beverley, Thomas (d. 1702), Independent minister and author. *Oxford Dictionary of National Biography*. Retrieved 4 Nov. 2018, from <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-66364>.

Johnston, W. (2011a). *Revelation restored: The apocalypse in later seventeenth-century England*. Woodbridge: The Boydell Press.

Johnston, W. (2011b). Radical Revelation? Apocalyptic ideas in late seventeenth-century England. In A. Hessayon and D. Finnegan (Eds.), *Varieties of seventeenth- and early eighteenth-century radicalism in context* (pp. 183-204). Farnham: Ashgate.

Jorink, E. (2008). "Horrible and blasphemous": Isaac la Peyrère, Isaac Vossius and the emergence of radical biblical criticism in the Dutch Republic. In J. M. van der Meer and S. Mandelbrote (Eds.), *Nature and scripture in the Abrahamic religions: Up to 1700, volume 2* (pp. 429-50). Leiden: Brill.

Jorink, E., and van Miert, D. (2012). Introduction. The challenger: Isaac Vossius and the European world of learning. In E. Jorink and D. van Miert (Eds.), *Isaac Vossius (1618–1689): Between science and scholarship* (pp. 1-13). Leiden: Brill.

Jones, J. (2005). *Balliol College: A history, second edition, revised*. Oxford: Oxford University Press.

Kaiser, C. B. (1997). *Creational theology and the history of physical science: The creationist tradition from Basil to Bohr*. Leiden: Brill.

Kaplan, A. (2018). Analysis and demonstration: Wallis and Newton on mathematical presentation. *Notes and Records of the Royal Society*, 72, 447-68.

Kelly, S. (1970). Burnet, Thomas. In C. C. Gillispie (Ed.), *Dictionary of scientific biography*, vol. 2 (pp. 612-14). New York: Charles Scribner's Sons.

Kempe, M. (2003). Noah's Flood: The Genesis story and natural disasters in early modern times. *Environment and History*, 9, 151-71.

Key, N. E. (1990). Comprehension and the breakdown of consensus in Restoration Herefordshire. In T. Harris and P. Seaward (Eds.), *The politics of religion in Restoration England* (pp.191-215). Oxford: Wiley-Blackwell.

Killeen, K. (2007) "A nice and philosophical account of the origin of all things": Accommodation in Burnet's Sacred Theory (1681) and Paradise Lost. *Milton Studies*, 46, 106-22.

Kirby, E. W. (1938). "The Naked Truth": A Plea for Church Unity. *Church History*, 7, 45-61.

Knight, D. M. (2014). *Voyaging in strange seas: The great revolution in science*. New Haven: Yale University Press.

Kraye, J. (2002). British philosophy before Locke. In S. Nadler (Ed.), *A companion to early modern philosophy* (pp. 283-97). Malden: Blackwell.

Kroll, R. (1992). Introduction. In R. Kroll, R. Ashcraft, and P. Zagorin (Eds.), *Philosophy, science, and religion in England 1640–1700* (pp. 1-28). Cambridge: Cambridge University Press.

Kubrin, D. (1968). *Providence and the mechanical philosophy: The creation and dissolution of the world in Newtonian thought. A study of the relations between science and religion in seventeenth-century England*. PhD Thesis, Cornell University.

Kubrin, D. (1973). Keill, John. In C. C. Gillispie (Ed.), *Dictionary of scientific biography*, vol. 7 (pp. 275-7). New York: Charles Scribner's Sons.

Levine, J. M. (1977). *Dr. Woodward's shield: History, science, and satire in Augustan England*. Berkeley: University of California Press.

Levine, J. M. (1992). Latitudinarians, Neoplatonists, and the ancient wisdom. In R. Kroll, R. Ashcraft, and P. Zagorin (Eds.), *Philosophy, science, and religion in England 1640–1700* (pp. 85-108). Cambridge: Cambridge University Press.

Levitin, D. (2013). Halley and the eternity of the world revisited. *Notes and Record of the Royal Society*, 67, 315-29.

Levitin, D. (2015). *Ancient wisdom in the age of the new science: Histories of philosophy in England, c. 1640-1700*. Cambridge: Cambridge University Press.

Lewis, C. L. E. (2009). "Our favourite science": Lord Bute and James Parkinson searching for a theory of the earth. In M. Kölbl-Ebert (Ed.), *Geology and religion: A history of harmony and hostility* (pp. 111-26). London: The Geological Society.

Lindberg, D. C., and Numbers, R. L. (1986). Introduction. In D. C. Lindberg, and R. L. Numbers (Eds.), *God and nature: Historical essays on the encounter between Christianity and science* (pp. 1-18). Berkeley: University of California Press.

Lynall, G. (2012). *Swift and science: The satire, politics and theology of natural knowledge, 1690-1730*. Basingstoke: Palgrave MacMillan.

Macklem, M. (1958). *The anatomy of the world: Relations between natural and moral law from Donne to Pope*. Minneapolis: University of Minnesota Press.

- Magruder, K. V. (2000). *Theories of the earth from Descartes to Cuvier: Natural order and historical contingency in a contested textual tradition*. PhD Thesis, University of Oklahoma.
- Magruder, K. V. (2006). Global visions and the establishment of theories of the earth. *Centaurus*, 48, 234-57.
- Magruder, K. V. (2008). Thomas Burnet, biblical idiom, and seventeenth-century theories of the earth. In S. Mandelbrote and J. M. van der Meer (Eds.), *Nature and Scripture in the Abrahamic religions: Up to 1700*, vol. 1 (pp.461-500). Leiden: Brill.
- Magruder, K. V. (2009). The idiom of a six day creation and global depictions in theories of the earth. In M. Kölbl-Ebert (Ed.), *Geology and religion: A history of harmony and hostility* (pp. 49-66). London: The Geological Society.
- Malusa, L. (1993 [first published in Italian 1981]). Part I: The first general histories of philosophy in England and the Low Countries. In F. Bottin, L. Malusa, G. Micheli, G. Santinello, and I. Tolomio (Eds.), *Models of the history of philosophy: From its origins in the renaissance to the "historia philosophica"* (pp. 161-370). Dordrecht: Kluwer.
- Mandelbrote, S. (1994). Isaac Newton and Thomas Burnet: Biblical criticism and the crisis of late seventeenth-century England". In R. H. Popkin and J. E. Force (Eds.), *The books of nature and Scripture: Recent essays on natural philosophy, theology, and biblical criticism in the Netherlands of Spinoza's time and the British Isles of Newton's time* (pp. 149-78). Dordrecht: Springer.
- Mandelbrote, S. (2008). Burnet, Thomas (c. 1635–1715), natural philosopher and headmaster. *Oxford Dictionary of National Biography*. Retrieved 4 Nov. 2018, from <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-4067>.
- Marshall, W. (2008). Croft, Herbert (1603–1691), Bishop of Hereford. *Oxford Dictionary of National Biography*. Ed. Retrieved 30 Jan. 2018, from <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-6717>.
- Mayhew, R. J. (2004). *Landscape, literature and English religious culture, 1660–1800: Samuel Johnson and languages of natural description*. Basingstoke: Palgrave Macmillan.
- Montgomery, D. R. (2012). *The rocks don't lie: A geologist investigates Noah's Flood*. New York: Norton.
- Montgomery, D. R. (2013). Faith in floods: Field and theory in landscape evolution before geomorphology. *Geomorphology*, 200, 9-19.
- Mulligan, L. (1973). Anglicanism, latitudinarianism and science in seventeenth century England. *Annals of Science*, 30, 213-19.
- Newcomb, S. (2009). *The world in a crucible: Laboratory practice and geological theory at the beginning of geology*. Boulder: The Geological Society of America.

- Newman, W. R. (2009). Geochemical concepts in Isaac Newton's early alchemy. In G. D. Rosenberg (Ed.) *The revolution in geology from the Renaissance to the Enlightenment: Geological Society of America Memoir 203*, 41-9.
- Nicolson, M. H. (1929). The early stage of Cartesianism in England. *Studies in Philology*, 26, 356-74.
- Nicolson, M. H. (1959). *Mountain gloom and mountain glory: The development of the aesthetics of the infinite*. Ithaca: Cornell University Press.
- Numbers, R. L. (2002). Cosmogonies. In G. B. Ferngren (Ed.), *Science and religion: A historical introduction* (pp. 234-44). Baltimore: Johns Hopkins University Press.
- Ogden, H. V. S. (1947). Thomas Burnet's *telluris theoria sacra* and mountain scenery. *ELH*, 14, 139-50.
- Oldroyd, D. R. (1980). Sir Archibald Geikie (1835-1924), geologist, romantic, aesthete, and historian of geology: The problem of Whig historiography of science. *Annals of Science*, 37, 441-462.
- Oldroyd, D. R. (1974). Mechanical mineralogy. *Ambix*, 21, 157-78.
- Olsen, R. G. (2004). *Science and religion, 1450-1900: From Copernicus to Darwin*. Baltimore: Johns Hopkins University Press.
- Pasini, M (1981). *Thomas Burnet: Una storia del mondo tra regione, mito e rivelazione*. Florence: Pubblicazioni del Centro di Studi del Pensiero Filosofico del Cinquecento e del Seicento in Relazione ai Problemi della Scienza.
- Pleins, D. J. (2003). *When the great abyss opened: Classic and contemporary readings of Noah's Flood*. Oxford: Oxford University Press.
- Poole, W. (2006). The Genesis narrative in the circle of Robert Hooke and Francis Lodwick. In A. Hessayon, and N. Keene (Eds.), *Science and scholarship in early modern England* (pp. 41-57). Aldershot: Ashgate.
- Poole, W. (2008). Sir Robert Southwell's dialogue on Thomas Burnet's theory of the earth: "C & S discourse of Mr Burnetts Theory of the Earth" (1684): Contexts and an edition", *The Seventeenth Century*, 23, 72-104.
- Poole, W. (2010). *The world makers: Scientists of the restoration and the search for the origins of the earth*. Witney: Peter Lang.
- Popkin, R. H. (1977). Spinoza and La Peyrère. *Southwestern Journal of Philosophy*, 8, 177-95.
- Popkin, R. H. (1987). *Isaac La Peyrère (1596-1676): His life, work and influence*. Leiden: Brill.
- Porter, R. (1977). *The making of geology: Earth science in Britain, 1660-1815*. Cambridge: Cambridge University Press.
- Porter, S. (2009). *The London Charterhouse: A history of Thomas Sutton's charity*. Chalford: Amberley.

- Psillos, S. (1999) *Scientific realism: How science tracks truth*. London: Routledge.
- Rappaport, R. (1997). *When geologists were historians, 1665-1750*. Ithaca: Cornell University Press.
- Roger, J. (1982). The Cartesian model and its role in eighteenth-century “theory of the earth”. In T. M. Lennon, J. M. Nicholas and J. W. Davis (Eds.) *Problems of Cartesianism* (pp. 95-112). Kingston and Montreal: McGill-Queens University Press.
- Rogers, G. A. J. (1985). Descartes and the English. In J. D. North and J. J. Roche (Eds.), *The light of nature: Essays in the history and philosophy of science* (pp. 281-302). Dordrecht: Martinus Nijhoff Publishers.
- Rogers, G. A. J. (1992). Locke and the latitude-men: ignorance as a ground of toleration. In R. Kroll, R. Ashcraft, and P. Zagorin (Eds.), *Philosophy, science, and religion in England 1640–1700* (pp. 230-52). Cambridge: Cambridge University Press.
- Rossetter, T. (2018). Realism on the rocks: Novel success and James Hutton's theory of the earth. *Studies in History and Philosophy of Science Part A*, 67, 1-13.
- Rossi, P. (1984). *The dark abyss of time: The history of the earth and the history of nations from Hooke to Vico*. Chicago: University of Chicago Press.
- Rudwick, M. J. S. (1976). *The meaning of fossils: Episodes in the history of palaeontology*, 2nd edition. Chicago: University of Chicago Press.
- Rudwick, M. J. S. (2005). *Bursting the limits of time: The reconstruction of geohistory in the age of revolution*. Chicago: University of Chicago Press.
- Rudwick, M. J. S. (2014). *Earth's deep history: How it was discovered and why it matters*. Chicago: University of Chicago Press.
- Rudwick, M. J. S. (1986). The shape and meaning of earth history. In D. C. Lindberg, and R. L. Numbers (Eds.), *God and nature: Historical essays on the encounter between Christianity and science* (pp. 296-321). Berkeley: University of California Press.
- Russell, C. A. (2000). The conflict of science and religion. In G. B. Ferngren (Ed.), *The history of science and religion in the western tradition: An encyclopedia* (pp. 12-17). New York: Garland.
- Schaffer, S. (1977). Halley's atheism and the end of the world. *Notes and Records of the Royal Society*, 32, 17-40.
- Schaffer, S. (1978). The phoenix of nature: Fir and evolutionary cosmology in Wright and Kant. *Journal for the History of Astronomy*, 9, 180-200.
- Schaffer, S. (1986). *William Whiston: Honest Newtonian by James E. Force*. *British Journal for the History of Science*, 19, 226-8.

- Schechner, S. J. (1997). *Comets, popular culture, and the birth of modern cosmology*. Princeton: Princeton University Press.
- Schweizer, C. (2009). Scheuchzer, von Haller and de Luc: geological world-views and religious backgrounds in opposition or collaboration? In M. Kölbl-Ebert (Ed.), *Geology and religion: A history of harmony and hostility* (pp. 95-101). London: The Geological Society.
- Shapin, S. (2000). Descartes the doctor: Rationalism and its therapies. *British Journal for the History of Science*, 33, 131-54.
- Shapiro, B. J. (1968). Latitudinarianism and Science in Seventeenth-Century England. *Past & Present*, 40, 16-41.
- Shapiro, B. J. (1985). *Probability and certainty in seventeenth-century England*. Princeton: Princeton University Press.
- Smolinski, R. (1999). The logic of millennial thought: Sir Isaac Newton among his contemporaries. In J. E. Force, and R. H. Popkin (Eds.), *Newton and religion: Context, nature, and influence* (pp. 259-90). Dordrecht: Springer.
- Snobelen, S. D. (2004). William Whiston, Isaac Newton and the crisis of publicity, *Studies in History and Philosophy of Science Part A*, 35, 573-603.
- Snobelen, S. (2009). Whiston, William (1667–1752), natural philosopher and theologian, *Oxford Dictionary of National Biography*. Retrieved 12 Oct. 2018, from: <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-29217>.
- Spellman, W. M. (1993). *The Latitudinarians and the Church of England, 1660-1700*. Athens: University of Georgia Press.
- Spurr, J. (1988). "Latitudinarianism" and the Restoration church. *The Historical Journal*, 31, 61-82.
- Sytsma, D. S. (2017). *Richard Baxter and the mechanical philosophers*. New York: Oxford University Press.
- Taylor, E. G. R. (1948). The English worldmakers of the seventeenth century and their influence on the earth sciences. *Geographical Review*, 38, 104-112.
- Taylor, E. G. R. (1950). The origin of continents and oceans: A seventeenth century controversy. *The Geographical Journal*, 116, 193-98.
- Thompson, K. (2005). *Before Darwin: Reconciling God and nature*. New Haven: Yale University Press.
- Till, B. (2008). Stillingfleet, Edward (1635–1699), bishop of Worcester and theologian. *Oxford Dictionary of National Biography*. Retrieved 16 Dec. 2018, from <http://www.oxforddnb.com.ezphost.dur.ac.uk/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-26526>.

van den Berg, J. (1999). *Religious currents and cross-currents: Essays on early modern Protestantism and the Protestant Enlightenment*. Leiden: Brill.

Tuveson, E. (1950). Swift and the world-makers. *Journal of the History of Ideas*, 11, 54-74.

van der Meer, J. M., and Oosterhoff, R. J. (2008). God, Scripture, and the rise of modern science (1200-1700: Notes in the margin of Harrison's hypothesis. In J. M. van der Meer and S. Mandelbrote (Eds.), *Nature and scripture in the Abrahamic religions: Up to 1700, volume 2* (pp. 363-96). Leiden: Brill.

Vermij, R. (1998). The Flood and the scientific revolution: Thomas Burnet's system of natural providence. In F. García Martínez, and G. P. Luttikhuisen (Eds.) *Interpretations of the Flood* (pp. 150-66). Leiden: Brill.

Walsham, A. (2012). *The reformation of the landscape: Religion, identity, and memory in early modern Britain and Ireland*. Oxford: Oxford University Press.

Walton, M. T. (2011). *Genesis and the chemical philosophy: True Christian science in the sixteenth and seventeenth centuries*. New York: AMS Press.

Weldon, S. P. (2017). Science and religion. In G. B. Ferngren (Ed.), *Science and religion: A historical introduction*, 2nd ed. (pp. 3-22). Baltimore: Johns Hopkins University Press.

Westfall, R. S. (1980). *Never at Rest: A Biography of Isaac Newton*. Cambridge: Cambridge University Press.

Westfall, R. S. (1987). Newton's scientific personality. *Journal of the History of Ideas*, 48, 551-70.

White, D. A. (1897 [first published 1896]). *A history of the warfare of science with theology in Christendom*. New York: D. Appleton and Company.

Williamson, A. H. (2008). *Apocalypse then: Prophecy and the making of the modern world*. Westport: Praeger.

Willmoth, F. (2007). Rumbly in the air: understanding earthquakes in the 1690s. *Endeavour*, 31, 24-9.

Wilson, C. (2008). *Epicureanism at the origins of modernity*. New York: Oxford University Press.

Wilson, D. B. (2000). The historiography of science and religion. In G. B. Ferngren (Ed.), *The history of science and religion in the western tradition: An encyclopedia* (pp. 2-11). New York: Garland.

Wilson, D. B. (2009). *Seeking nature's logic: Natural philosophy in the Scottish Enlightenment*. University Park: Pennsylvania State University Press.

Wootton, D. (2015). *The invention of science: A new history of the scientific revolution*. New York: Harper.

Wragge-Morley, A. (2009). *A strange and surprising debate: Mountains, original sin and "science" in seventeenth-century England*. *Endeavour*, 33, 76-80.

Young, D. A., and Stearley, R. F. (2008). *The Bible, rocks and time: Geological evidence for the age of the earth*. Downers Grove: InterVarsity Press.