Engendering Life: String Objects as a Model of Process, Pattern, and Praxis in Melanesia

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ENGENDERING LIFE: STRING OBJECTS AS A MODEL OF PROCESS, PATTERN, AND PRAXIS IN MELANESIA

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Abstract

In this thesis, I show that string objects materialize and instantiate social organizing principles in Melanesia. In this region, objects like string figures, bilum bags, and fishing nets are vehicles for thought, where mind and material unite to create a multivalent and interactive model of social and temporal relations. Due to the prevalence and universality of string practices in the region, this model is available to everyone. Social and temporal relations become apparent due to the understanding that string objects possess 'processuality,' that the materials of string objects, their (re-)production, and (re-)use are constantly in flux rather than in a state of stasis. Through processuality, string objects convey the relations and circumstances in which desired outcomes should be achieved, prefiguring patterns, processes, and operational sequences which are then instantiated in the social framework. I show that the cognitive and physical processes of string objects in the microcosm make abstract concepts concrete and achievable in social practice by reproducing the same pattern through different levels of social life. I therefore explore how other social activities such as tuber gardening and sexual reproduction produce social cohesion and stability in a similar way to string objects. I argue that string objects are a vehicle through which social actors can conceive of the patterns and processes necessary to sustain life in the macrocosm. Through the coalescence of differentiated and reciprocal labor, string objects make evident the conditions necessary for productivity and efficacy in the social system. In conclusion, I assert that string objects contribute to fundamental understandings of social life in Melanesia.

Keywords: string figures, bilums, fishing nets, Melanesia, material culture, process, materiality, model, temporality.

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[Laete'eboo and his sons playing with lalefui'olanga string figures in front of the men's house on the Solomon Islands, between 1963 &1989]. Roger Keesing Papers. MSS 427. Special Collections & Archives, UC San Diego.
[https://library.ucsd.edu/dc/object/bb2082913b]

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Introduction

I will never forget the awkward fumbling of my fingers the first time my mom introduced me to string crafts. Whether knitting, crocheting, sewing, or macramé, my mom has always had an affinity for string things. These were skills her grandmother taught her, which she then passed on to me. I could not fathom how my mom could take a simple strand of string and transform it into an intricate masterpiece — twirling, winding, dancing, her hands lithe and nimble — it was awe-inspiring. I vacillated between bewilderment and downright chagrin as I tried to replicate her effortless movements, but my final product was often lumpy and misshapen. Nevertheless, I persisted until one day the motions were no longer so foreign and the outcomes far less heinous.

This messy and satisfying process became a distant memory of my childhood until I found myself thrust back into the world of string during my undergraduate studies. In a course on Indo-Pacific anthropology, I learned of themes of control, interdependence, and social organization, all of which are centered around the production, use, and transformation of string. From string figures in the Kula Ring, to nets in China, knots in Japan, and textiles in Sumba, these practices are drenched in complex, layered metaphors of social order and quotidian life, making me, an adult woman, feel as humbled as the day my mother taught me to knit. Due to my mother's influence, I have become engrossed in the magic of string culture, which captures the true beauty of the anthropological discipline: the power to connect people through materials, human relationships, and shared experiences.

On account of string's long history as a binding agent, its associated techniques of manufacture (looping, weaving, knotting),[1] and its status as human universal (Brown 1991), it follows that string has been a source of study for different disciplines as both a functional technology and a cognitive tool. Sabine Hyland (2014) analyzes Andean *khipus*, knotted cords used as a functional technology for record-keeping and communication. Her approach to *khipus* is material and philological, considering the inscriptive capacities of fiber, ply, and knot direction (*ibid*). Meanwhile, David Pankenier looks at weaving metaphors in Early Chinese literature during the Zhou Dynasty (2015). He explores the language surrounding weaving and cordage in conjunction with cultural astronomy and mythology, showing that metaphors of weaving cognitively organize cosmo-political thought (*ibid*). Even science and mathematics have become interested in string studies, as seen in the development of string theory in the 1960s and 1970s. Here, string as "one-dimensional extended objects" (Küchler 2007:128) intertwine, vibrate, and fold to generate the "building blocks of the physical world" (*ibid*:128) by creating matter, energy, and other phenomena (i.e., gravity).

In Melanesia, string objects are understood to function in a similar fashion to that described in the above studies. Objects like string figures, bilum bags, and fishing nets operate as functional technologies, cognitive tools, and a model of generative processes. To show how string objects function in these varying ways, I first analyze processes of producing and using string objects. I then discuss the cultural gnosis encapsulated within these processes and objects, showing how practices that convey a similar value to those of string objects are

1 Not only is string one of the earliest examples of "composite technology" (Hardy 2008), but the advancement of looping and weaving methods enabled people to construct objects entirely of string like mesh bags and fishing nets, "which in turn are likely to have revolutionized hunting, fishing and the collection of small items" (Barber 1994 in Hardy 2008:272). Knotting, as a technique, is supposed to have begun somewhere between 2.5 million and 250,000 years ago (see Hardy 2008).

reproduced in the larger context of social life. Finally, I posit that these objects are not only capable of modeling social and temporal relations individually, but also show how all three string objects model the contingency, or potential futures, of tuber gardens and human sexual reproduction. Ultimately, I aim to show how string objects in Melanesia objectify and instantiate the social organizing principles of the region by prefiguring the patterns and processes necessary to make social life conceivable and feasible.

Following Gell (1998), I conceive of objects as the workings of the mind in an externalized, physical form, known as the "index," a term borrowed from Peircean semiotics. Objects then make visible and concretize invisible, abstract concepts. As mind and material coalesce, social actors produce an iterative and complex social object. To conceive of what these objects can 'do' in the social system, or how they constitute a model of social life, one must consider the concept of 'the image' in Melanesia to show how people produce images or artifacts to "know what they themselves really are" (Strathern 2015:169). Thus in Melanesia, abstraction and knowledge are made concrete via images such as artifacts or other material culture. Objects, as a model of cognitive and social processes, exceed "representations that simply intended to 'look like' or evoke what is being depicted" (Ascher 2002:114). It is the combination of materiality, form, and the processes of construction and contexts of use that make the model capable of transmitting knowledge from the microcosmic scale of string objects to the macrocosmic scale of social life. This model conveys the relationship between the abstract and the concrete through processes of objectification and instantiation, prefigured in the patterns, processes, and operational sequences of string objects. As a model, these string objects "encapsulate and explain the system" (*ibid*: 114) in such a way that expresses causality, temporality, and relationality. These concepts are made apparent in the model because string objects afford specific forms of action; they generate mental models of action and relations;

and they allow for the transposition of such models onto different scales and different media with different aims.

One such way that string objects afford specific forms of action comes from analyzing the capacities of materials. Scholars are no longer exclusively interested in the ways in which people use specific materials and objects, but what these materials enable a person to do with it (Were 2013, Küchler & Carroll 2020). Although the role of human intention is important, the capacities of materials are crucial to string objects as a model, integrating both mind and material. Inspired by this shift in focus to material capacities, I engage string objects as being 'in flux,' which I take from Tim Ingold's (2010a) rebuttal of hylomorphism. However, I conceive of flux as *more* than the flows of materials or as purely about formative processes (*ibid*). I extend the flux of materials to encompass the processes of making and using objects to emphasize that string objects do not exist in stasis. Rather, these objects are fluid, adaptable, and possess 'processuality,' meaning that they undergo constant processes of (re-)production and (re-)use. By presenting string objects as processual, I demonstrate their ability to reproduce not only pattern of form, but also pattern of process. Patterns of form manifest 'interartefactual relations' (Küchler & Carroll 2020) between different objects in the system that look similar or employ similar patterns of production, while the transformations and operational sequences employed in the production of string objects prefigure the same patterns enacted in social activities like sailing or gardening.[2]

2 Interartefactual relations refer to "the elemental relations within the image and between the image and the objects upon which they come to rest" (Küchler & Carroll 2020:3). When using Küchler and Carroll's term, I retain the spelling as it is employed in their work but elsewhere use American spellings to convey the same meaning of 'artifact.'

By conceiving of string objects as existing in flux and embodying processuality, I present a model that encapsulates the ongoing flows of time and social activity from the microcosmic scale of string products to the macrocosm of social life. In sum, these string products objectify a variety of different relations that prefigure similar transformations instantiated in social practice. For example, string figures interiorize transformational and operational sequences, which are also reflected both in the production of outrigger canoes, and employed in sailing itself, while bilums and fishing nets equally reproduce a nexus of social relations. Although these objects can model a variety of different aspects of social life, they also collectively produce a model for contingency and causality in the social system, especially in the context of tuber gardening and sexual reproduction. In addressing the generative life processes of tubers and people, I analyze the conjunctive labor of "cosmological oppositions" (MacKenzie 1991:43), that are engaged in reciprocal labor to achieve desired outcomes and combat entropy in the social system.[3] These reciprocal pairs evoke a distinction similar to the concept of yin-yang, where the synergy of differentiated dyads is complementary and creates balance in the system. These cosmological oppositions are produced in materials, other string objects, and extend to social praxis, reinforcing the orthodox combinations of labor necessary to make these objects and their related praxis efficacious. The model then is generative, objectifying the processes and operational sequences required to sustain the continuity of people and lineages, which are then instantiated through the production of food and people. Making and using these objects reinforce that things must be done in a particular order with intention and purposive action to be efficacious and to achieve desired outcomes in the social system. From materials to everyday use, string objects contribute to fundamental understandings of social life in Melanesia.

3 Scholars of Oceania have employed a variety of different terms to delineate this concept, such as "dualisms" (Gell 2006 [1975]), "polar opposites" (Munn 1986), and "pairs" or "dichotomies" (Strathern 1980).

Literature Review

Already the complexity and multivalence of the model is apparent. To understand the model and what it does in the social framework of Melanesia, one must further consider Marilyn Strathern's discussion of 'the image' (2015). Strathern introduces her definition of 'the image' by addressing the event of initial contact between Europeans and Melanesians. Language barriers made it such that traditional Western meaning-making through linguistic coding and referentiality could not be employed. By contrast, Melanesians remain suspicious of talk, thus images are more concrete and capable of conveying knowledge than the uncertainty of speech (*ibid*). An image is "witnessed or experienced rather than merely described or summed up verbally" (Wagner 1986 in Strathern 2015:169). Contact between the Europeans and Melanesians as an image or artifact reflects an important quality of the image, which is event as either a happening or a performance. Thus, the image is not only relational but temporal, as well.

An event as a happening is one that is conceived of as "incidental... to be explained by being put into its historical (cultural) context" (Strathern 2015:161). Meanwhile, an event as a performance is more concerned with its effect, meaning "it is understood in terms of what it contains, the forms that conceal or reveal, registered in the actions of those who witness it" (*ibid*:161). The concept of image as performance is consistent with my analysis of string objects. I present string objects as performative, where processes and action produce an object that is made meaningful in its effects and causality, inciting those who witness this image to act. In sum, string objects as images are performative when the patterns and processes of string objects are made apparent and give rise to social activities. This reproductive aspect of the

patterns and processes in the object and again in other material culture and social life is what Mark Mosko and Frederick Damon (2005) refer to as self-similarity or a 'fractal.' Thus, the image as performance, I suggest, reveals the agency of social actors through different scales of the social system, from the processuality of string objects to activities such as sailing and cultivation. It is not only the form itself that embodies social organizing principles — informing social actors how to engage in the social system to create stability and order — but also the acts and motivations associated with these objects that make them meaningful and concrete, creating contingency in form and practice.

I show these objects to be efficacious in the social system, as causal and relational. Melanesians understand images and encounters in terms of their effects, where the consequences for the future are revealed and thus the image protends the effect of the artifact in the social system (Gell 1992, 1998). Artifacts, then, are constructed to demonstrate and elicit further effects, as in the case of the Kula Ring, for example, where goods are exchanged for the purpose of producing reputation and fame (Munn 1986). This exchange has greater effects than a legacy of continued exchange; it is a means by which people know of others via fame and can only be accomplished by an initial externalizing process separate from the individual (*ibid*). This externalization concretizes the legacy of exchange in objects which further reverberate the eminence of the initiator. Objects, as images, are causal in the Melanesian system. Transformative action, especially positive value transformations,[4] aims to achieve control, self-construction, and other desired outcomes, where desired outcomes convey the most ideal circumstances and best results or effects of a series of actions.

4 Positive value transformations are specific types of transformative action "through which a community seeks to create the value it regards as essential to its communal viability" (Munn 1986:1).

To understand how objects are causal and relational, I return to Gell's (1998) discussion of the index. The index is a "'natural sign'...from which the observer can make a *causal inference,*" or "an inference about the intentions or capabilities of another person" (*ibid*:9, *emphasis original*). The inspiration for such visible representations is called the "prototype" and "are the things that indices may represent or stand for" (*ibid*:ix). For example, if an artist paints a still life of a vase of flowers, he/she creates an index, in this case, the painting, while the vase of flowers is the prototype. As is the case with string objects, which consist of patterned, geometric abstractions, the prototype is not always readily discernible like the still-life example. The object is cognitively sticky, meaning that the intentions and cognitive processes embodied in the object are not readily apparent (*ibid*). It is through obtaining cultural gnosis and then reproducing the knowledge in social action that the prototype is understood and made apparent to social actors. Thus, in engaging string as a model, I stress the causal relations immanent within the index, conveying how the processes of construction and use — the materials and object in flux — engage and make relevant the prototype of social organizing principles in Melanesia.

Recapitulating upon Gell's (1998) influential work, Küchler & Carroll (2020) reflect on the legacy of the art nexus in the contemporary studies of the anthropology of art, applying current and updated ethnographic examples, some of which I engage in this thesis. Küchler & Carroll's text emphasizes and expands upon Gell's original points, stressing the need to "study relations immanent within the object and the theoretical implications thereof" (2020:xiv). Thus, my definition of the model engages not only the causality implicit within the object, but also the relations immanent within it. One such way that these relations are made immanent is through shifting "the locus of investigation from the role of human intention to that of material capacity" (*ibid*:154). Tim Ingold focuses on material capacities when

problematizing the hylomorphic model of material culture,[5] because it assigns primacy to final products and states of matter rather than material processes and transformations (2010a). Despite Ingold's disdain for the hylomorphic model, my concept of the model *is* deeply hylomorphic. In engaging string objects as a model, I follow Susanne Küchler, who says that "in order to know what string can do and make it your own by tying and untying it, one does need to have a plan in mind whose geometry is then copied by hand and eye movements" (2007:129). String is a material that incites the act of copying something already held in the mind (*ibid.*). Thus, I present the hylomorphic model in such a way that conveys the fluidity of material processes objectified and instantiated throughout the object's "life project" (Gell 1998:11).

Ethnographic Contexts

To convey how string objects operate as models, I begin by investigating the transformative ecologies of the Kula Ring in Melanesia, as "a life form and a form for life" (Damon 2017:247). Ecologies transform into material as trees become string, which then produces knots, string figures, and nets, whose ordering principles are then used to construct boats and other artifacts in the social system. When string is in flux, it connects people, places, and time, while simultaneously conveying how people think about themselves and their world. Interartefactual relations are immanent in the string objects of the system via the transmission of patterns on different scales. Shelley Mallett (2003) also conveys how string figures first encapsulate and then reproduce information on different scales in Nuakata, where string figures are conceived as "doing pregnancy and birth" *(ibid*:196).

5 The hylomorphic model claims that "making entails the imposition of form upon the material world, by an agent with a design in mind" (Ingold 2010a:91).

Moving from island Melanesia to Tonga, I engage Graeme Were's (2010) analysis of string figures and their interartefactual relations to barkcloth and storytelling. Were presents pattern as a materialized process of cognition and simultaneously as a network of social relations (*ibid*). Pattern provokes connections via the transformational properties of string, where the transmission of pattern occurs between media and people as an abstraction of cultural knowledge concretized in the object. While analyzing Tongan string figures and storytelling, Susanne Küchler's (2003) comparative study of knots in Tahiti, Hawaii, and New Ireland provides a comparative lens to discuss the reciprocal relationship between the Hawaiian sacred cord and associated chants to that of string figures and storytelling in Tonga. The parallels between spoken word and string objects show that the transformative and organizational principles supersede tangibility and make relevant the need for reciprocity between social actors.

I further assess interartefactual relations immanent in string objects by including an analysis of sand-drawings in Vanuatu. In doing so, I examine their ephemeral form and processes of construction in relation to string figures to show how prototypical relations are shared between different media. I discuss the various contexts in which sand-drawings are contrived in Vanuatu (Huffman 1996) and show the prototypical relations shared between sand-drawings and string figures (Barron 2021). As I analyze these two forms, I engage Tim Ingold's (2010b) comparative analysis on the transformative nature of the line. Ingold's article is a useful tool for comparing different ethnographic data, making clear that objects from different cultural zones maintain similar organizing principles. Thus, the comparative analysis Ingold provides between Abelam decorative art and Melanesian *maindshe* (bilum string) reflects the same prototypical relations despite using different media and being created in different social contexts. I apply this framework to my analysis of string figures and sand-drawings to show

how different media reproduce similar prototypical relations oriented toward growth and regeneration.

To conclude my discussion of string figures, I investigate A.C. Haddon's string figure research in the Torres Strait (Eastop 2007, McKenzie 2021, 2022). Not only do I address the initial interest and historical context of string figure studies in Melanesia, I also assess contemporary innovations of traditional string practices to show how these practices adapt and change through time (McKenzie 2021). In my analysis, I incorporate Paul Sillitoe's critique of the study of string figures, which he describes as "an oddity, if not something of a joke, to present day anthropologists" compared to "subjects more germane to current interests in anthropology, such as descent or territorial organization" (1976:13). In incorporating his text, I turn his argument back on its own head to show how the legacy of string figures has shaped contemporary string practices and continues to inform a variety of cultural relations that he might consider to be 'more germane', such as those discussed by Robyn McKenzie (2021). In moving through these various ethnographic contexts, I show how string figures manifest relationships of time, space, and interartefactual form and process. Throughout, I incorporate Donna Haraway's posthumanist approach to "living and dying in response-ability on a damaged earth" (2016:2), where string figures are a metaphor and model for ways of relating with the earth and its inhabitants. Haraway's approach to string figures resonates with the Oceanic relationship to string objects as both functional tools and models for relating in the social system.

Having established the relations immanent in string figures, I begin my analysis of bilum bags, which draws heavily from Maureen MacKenzie (1991), who analyzes the development of gender symbolism and the social construction of personhood via the material culture of bilum

bags in intermontane Papua New Guinea (PNG). In looking at bilums, MacKenzie shows how these looped string bags are androgynous, combining the social labor of men and women to produce a "complex social product" (*ibid*:25) of multiple authorship. MacKenzie's work is significant for several reasons. First, it emphasizes "the connections between the particular string bag and the way it is integrated into the lives of those who make and use it" (*ibid*:25). As such, MacKenzie provides readers with a detailed account of the processes by which these looped string bags are made, used, and conceived of in the Telefol social framework. Second, the ethnographic data is unlike most I have found, focusing intently on the production and use of string objects as a key source of anthropological analysis, rather than supplementary to other artifacts. I supplement MacKenzie's findings with bilum practices of the Umeda of PNG (Gell 2006). The Umeda context makes relevant the process of self-externalization and social relations manifest within Umeda bilums as they relate to MacKenzie's bilum data, showing continuity of the relations immanent in bilums throughout PNG.

To evaluate how contemporary bilum practices continue to embody the social identity of its makers in PNG, I reflect on the adaptability and innovation of bilums in the face of social change, urbanization, and technological advancements (Andersen 2015). Looking at the contemporary context alongside MacKenzie's (1991) data, I show the continuity of these practices through time. New developments take the "traditional" craft and restructure it to show how young women in PNG "engage with processes of social change (Andersen 2015:16). Meanwhile, Nicholas Garnier (2009) and Elisabetta Gnecchi-Ruscone (2019) analyze the novelty of 'bilumwear,' which utilizes bilum looping practices to make clothing on international and localized scales. These innovative contexts show how string objects as a model are flexible and adaptable to change, while providing a lens into the contemporary landscape of bilum production in PNG.

I complete my analysis of string objects by addressing fishing nets, as they are produced and used by the coastal dwellers of Muyuw (Damon 1990, 2000, 2017, Mosko & Damon 2005). Nets, like other string objects, are "a vehicle for representing social order" (Damon 2000:57). The cognitive principles of nets engaged in their production and use makes explicit that "what is at issue is the proper combination needed to make things productive" (Mosko & Damon 2005:87). In sum, these objects can be conceptualized as a cognitive map for the operational sequences that make the social framework orderly, facilitating desired outcomes. Like MacKenzie (1991), Frederick Damon describes in detail the processes by which nets are made and used, and the cultural significance of these acts in lived social praxis. I piece together his assorted data on nets, analyzing the cognitive processes and principles inherent within production and use.

To show how string objects are generative of life processes in Melanesia, I analyze the prototypical relations shared by all three string objects. Having established the multifarious relations immanent in string objects, I assess their ability to encapsulate temporality as ongoing flux and discrete units of sequence. In doing so, I provide context for the operational sequences that make these practices meaningful and orderly. I show how string's 'affordances' — or what the material's surface allows one to do with it (Were 2013, Küchler & Carroll 2020) — permit notions of relationality through connection, binding, and tension *and* notions of temporality through form, sequence, and process. To engage string and its objects as temporal, I discuss the affordances of string in conjunction with the Husserlian concept of intentionality (Gell 1992, 1998). Intentions describe how an object persists *in* and *through* time, recapitulating the objects that came before it and manifesting the potential for future production (Gell 1992, 1998).

In discussing how string objects suspend potential futures, I assess how string figures, bilums, and fishing nets model contingency of gardening and human sexual reproduction, where "the microcosmic view of transformation is demonstrably a motivic design within the macrocosmic generativity" (Küchler & Carroll 2020:132). I apply this (re-)generative model to each object, showing how each string object suspends the potential futures of tubers and people, from the flux of materiality to the flux of use. I rely heavily on the Melanesian tuber research of Ludovic Coupaye (2013) to show how tuber reproduction is a sort of vegetative prefiguring for human relationships. I demonstrate this prefiguring as first enacted in string objects, then in tuber gardening, and finally in the reproduction of people. After discussing contingencies embodied in string objects, I discuss how this futurity shifts from potential to instantiation by social actors who engage in these activities, showing the efficacy of the model. I acknowledge that the model is perhaps seemingly 'too clean' as I present it with the ethnographic data in this thesis. However, the literature does not elaborate on inconsistencies between the scales of the model and social praxis. For this reason, among many others, I hope to test my hypothesis with fieldwork in the future. For now, I engage the processes and practices of string and its products outlined in the available literature as they relate to the social organizing principles of Melanesia.

Methodology

Due to the COVID-19 Pandemic, I designed a library-based research project. This thesis identifies gaps in the literature on string-based research in Melanesia with the intention of performing future research in the field. Frederick Damon was my professor and mentor in my undergraduate studies and had already provided me with some resources when he first sparked

my interest in string objects in 2018. From there, I compiled resources, scanned indexes and bibliographies, and searched online databases for texts and museum exhibits. I moved away from museum-based studies to focus on ethnographies, because I felt the best way to establish the flux of string objects is by considering the processes of their construction and use in social practice. Much of the current string research focuses on specific textiles or objects (Ascher 2002, Küchler 2002, Were 2013); modern developments (Küchler 2007, McKenzie 2021), such as polymers in science and innovations in art; as components of other material objects (Mallett 2003, Malinowski 2014 [1922], Damon 2017, McKenzie 2021); or from secondary sources (Eastop 2007, McKenzie 2022). I quickly became aware that most string data has been published by white academics in America and Europe, some of which were published more than twenty years ago (MacKenzie 1991, Gell 2006 [1975]). I have compiled the available information to form a sort of patchwork ethnography, aware of the broad historical range in which these researchers have undergone fieldwork or museum-based studies and the limited (if not, practically nonexistent) primary Indigenous sources.

The work of two indigenous scholars, Epeli Hau'ofa (1994) and Alice Te Punga Somerville (2016), provide an analytical lens for thinking through my ethnographic data. Epeli Hau'ofa invites his readers to understand the geography of Oceania from an indigenous perspective, one that pushes back against a colonial epistemology. Hau'ofa advocates for Oceania to be reconceived as a "sea of islands" as opposed to "islands in a far sea" (1994:152). The latter, overtly colonial view promotes the islands as "dry surfaces in a vast ocean far from the centers of power" (*ibid*:152), yet Hau'ofa explains that prior to colonial imposition Oceania was conceived as an interconnected sea of ocean and lands, entrenched in complex trading and cultural exchange systems (*ibid*). Thus, as he says, "smallness is a state of mind" related more to power relations between the dominant (colonizers) and the subjugated (the colonized) than

truly being representative of the way Oceanic peoples conceive of their world (*ibid*). As a "sea of islands," Oceania — land, sea, fiery underworld, and celestial heavens — is holistic, and "things are seen in the totality of their relationships" (*ibid*:153). Summing up Hau'ofa, Sommerville states that rather than focusing on the geography of Oceania as disparate, barren, and isolated, where "islands (land) are understood as unsustainably microscopic, remote and disconnected specks in a giant nothingness (sea)" (2016:121-122), it is best to consider the landscape, both land and sea, as a web of relationality. Building from Hau'ofa's work Somerville (2016) takes this holistic concept of the Oceanian landscape a step further, arguing that Indigenous Oceanic Islanders and archival information should be understood on similar terms. She says, "When we think about islands (or archives) as "scattered" and tiny we risk not noticing the many forms of connection between them" (*ibid*:122). Thus, an individual letter, photo, artifact, or text can be read individually, but its value is greater when read in the larger context of other related literature, documents, and archival information (*ibid)*.

I frame the eclectic mix of ethnographic data comprising this thesis in a similar manner, focusing on how "traces allow the anthropologist a disjointed and piecemeal reflection on that which normally falls outside the domain of representation" (Navaro 2020:166). Threads of similarity bind the ostensibly disjointed fragments and traces in my corpus, much like the string objects I discuss. Although my greater argument focuses on Melanesian artifacts, I also employ string figure data and comparative analyses from Micronesia and Polynesia. These examples strengthen my argument regarding how these objects encode space and time and manifest interartefactual relations. Given the relationality between this "sea of islands" (Hau'ofa 1994:152), this supplementary data shows that the model could exceed the bounds of Melanesia. This provides the opportunity for future research that could encapsulate the relational capacity of objects throughout the entire region. In analyzing these ethnographic

excerpts altogether, one is presented with a complex view of string as a cognitive and physical building block of social organization in Melanesia.

Thesis Outline

In Chapter 1, I analyze the spatial, temporal, and interartefactual relations of string figures across Oceania. I show how this playful pastime interiorizes social knowledge and trains the body to become a tool for other social activities. Core to my discussion of string figures is their status as "objects, representations, and activity" (Eastop 2007:192), where these fluid objects-as-process reflect transformations and sequences enacted in larger scale social activities, such as sailing and gardening. I address a vast array of ethnographic contexts to show how prototypical relations are shared between different media in different contexts.

Having established the processuality and manifold relations immanent in string figures, Chapter 2 peruses the processes of production and use involved in manufacturing bilums and fishing nets in Melanesia. Part I analyzes bilums as forms, processes, and objects of use, while Part II does the same for fishing nets. I engage these objects as processual in nature throughout their conception, production, and use, modeling lived social praxis. The chapter scrutinizes the nexus of gender and generational relations in the division of labor, showing how processes of making and using these string objects model the proper relations between social actors. Bilums and fishing nets, like string figures, encapsulate ways of relating within the social system.

Chapter 3 engages materiality and temporality in conjunction with the analyses of Chapters 1 and 2, to conceive of the ways string objects are generative of life processes in Melanesia — first objectified in the microcosmic model of string objects, and then instantiated within the macrocosm of the social system. I analyze how the three objects of my study constitute a model of generative processes in relation to tuber gardening and sexual reproduction. In doing so, I show how the operational sequences, differentiation of labor, patterns, and processes enacted in the production and use of string figures, bilums, and fishing nets prefigure the conditions necessary to produce food and to sustain the continuity of the social line.

Chapter 1:

String Figures

> *"In truth, the right way to begin to think about the pattern which connects is to think of it as primarily… a dance of interacting parts and only secondarily pegged down by various sorts of physical limits and by those limits which organisms characteristically impose" (Bateson 1979:13).*

Figure 1. *Two young women on Iama Island, (central islands of the) Torres Strait, making string figures* (MacKenzie 2022:20).

The Beginning: Origins of Interest and Pedagogy

I begin my discussion by introducing Alfred Cort Haddon's anthropological interest in the study of string figures, which "epitomize the professionalization of anthropology and the first phase of anthropological interest in Melanesia" (Eastop 2007:198). A.C. Haddon was one of the first anthropologists to draw significant attention to the prevalence of string figures. His interest was more concerned with tracking cultural diffusion rather than the social implications of their construction. Nevertheless, his interest had profound influence on the ways in which anthropological study is performed today (McKenzie 2022). Funiculomania struck A.C. Haddon on his original expedition to the Torres Strait in 1888.[6] At the time, he was a zoologist, studying coral reefs. However, during his research, he became troubled by the rapidly changing lives of indigenous islanders as a consequence of western civilizations' influence. Worried that missionary and colonial intervention would lead to the loss of traditional culture in the Torres Strait Islands, he began to gather ethnographic data and artifacts (Sillitoe 1976, McKenzie 2022). This collection of artifacts included eight string figures tacked down to cardstock, the final three-dimensional design removed from its maker's hands and secured as a two-dimensional form to the card. They were displayed in the British Museum and are the earliest surviving materialized examples of string figures (Probert 2004 in Eastop 2007:194). Consequently, Haddon had a disciplinary change of heart and focus, investing himself in the anthropological investigation of the cultural transmission of string figures.

6 Funiculomania means 'string-craze' (McKenzie 2022:2).

Ten years later, Haddon returned to the Torres Strait with William Halse Rivers Rivers, a neurologist, and a small team of researchers, all of whom constituted the Cambridge Anthropological Expedition of 1898 (McKenzie 2022). On this expedition, string figures were not documented photographically or physically mounted on cards as 'artifacts.' Instead, Haddon and Rivers developed a written method for recording the processes of making different string figures, determined to use as few words as possible to make the descriptions clear and concise. In addition to a method for documentation, they designed their system as a manual, dictating to future readers how they might construct these figures. What is significant about this process of recording information is that researchers did not simply study the figures as a removed, visual, objective representation, they had to actively participate in learning the processes of making these forms. The 1898 expedition resulted in a published article in 1902, "A Method of Recording String Figures and Tricks," describing the methods for constructing twelve string figures discovered on their expedition. The article employed their descriptive method of documenting string figures and "appealed for the systematic documentation of string figures" throughout the discipline (Eastop 2007:195). Although Haddon and Rivers had established a methodical style of documentation for the processes by which string figures were performed, they made no reference to the indigenous materials used or the techniques by which these materials were prepared (*ibid*).[7]

Haddon's interest in string figures was significant for several reasons.[8] First, he sparked the first wave of anthropological interest in Melanesia. Secondly, he and his fellow researchers had

7 For example, the eight string figures collected in the 1888 exhibition are not made of indigenous fibers (Eastop 2007, McKenzie 2021).

8 Haddon was by no means the only anthropologist to show interest in string figures, "for example Boas and Kroeber collected them from North America, Leakey from Africa, Radcliffe-Brown from the Indian Ocean and, published recently, Firth from the Pacific" (Sillitoe 1976:13); he was, however, one of the first.

a significant pedagogical impact on the field of anthropology. Studying string figures became a ubiquitous part of the 'anthropological tool-kit,' equipping ethnographers for the field (McKenzie 2021:219). Not only did researchers gain cultural insight to the social practices of their region, learning string figures required them to actively participate in ethnographic study. Thus, string figures were "a means and an outcome" for the field (Eastop 2007:199). Robyn McKenzie (2022) argues that Haddon and his daughter, Kathleen,[9] set the stage for participant-observation in anthropological fieldwork. The Torres Strait expeditions were unusual to other contemporary research, in that they "integrated observation with analysis through the first-hand experience of the scientist on the ground" (*ibid*:4). But as Paul Sillitoe points out, "fieldwork was already an integral part of zoological studies" (1976:19) as opposed to the nascent field of anthropology. Thus, Haddon, and most especially the study of string figures, led the way for the 'new school' of participant-observation in anthropological research. In making string figures, relationships of reciprocal understanding develop through shared experience and 'intimate relations' (Jayne 1962 in McKenzie 2022:1), even in places or circumstances where there was no shared language (*ibid*).

In addition to encouraging participation and active engagement between ethnographers and their interlocutors, Haddon wanted to know more about the transmission of string figures by cultural diffusion. Considering his origins in biological sciences, Haddon's attempt to plot points of cultural evolution via string figures seems logical, especially given the way in which he preserved his original string figure 'artifacts' as "'frozen residues' of a manual process" (Gell 1998 in Eastop 2007:197). Despite this static representation of a highly interactional form,

9 Kathleen accompanied her father in 1914 on a two-month journey into the Torres Strait and Papua New Guinea. She continued to study string figures and published many of her own works, popularizing her father's research and expanding upon it with her own original contributions, such as 'String Figures: Their Regional Distribution and Social Significance' in 1930 (McKenzie 2022).

Haddon used this method purposively. Fastening the string figures to cards "has obvious precedents in the methods of collecting animal and plant specimens in the biological sciences: fixing for the purpose of study something that is alive and in process" (McKenzie 2021:222). Even though Haddon's interest was in preservation and documentation, this method shows that he was aware of the inherently processual nature of string figures. It is this process-as-object quality of string figures that informs what these objects can do in the social framework of Oceania.

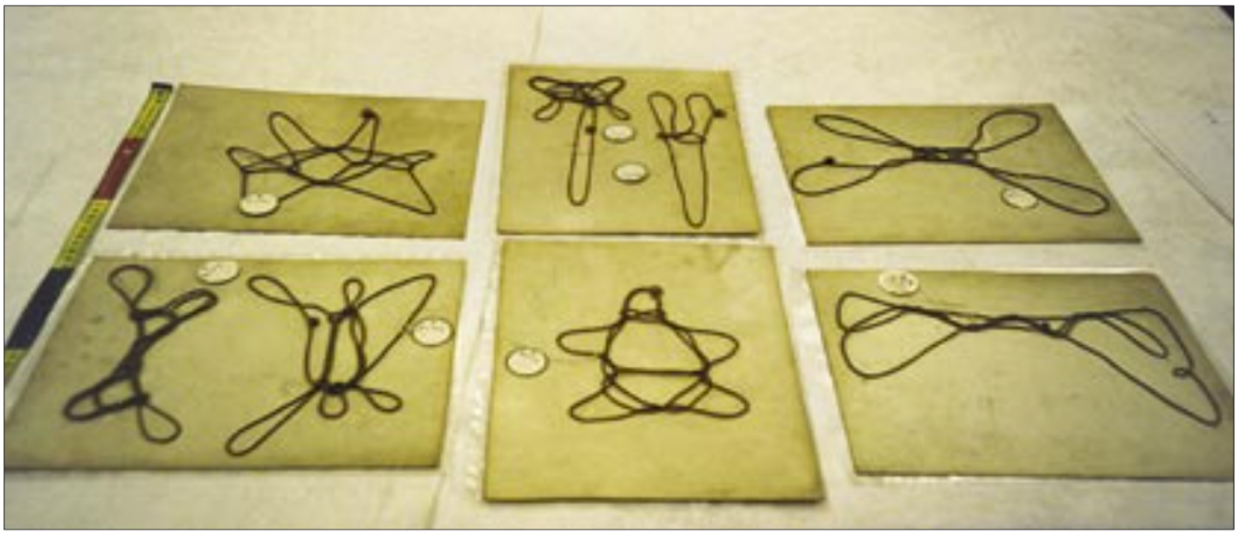


Figure 2. *The eight string figures Haddon collected at the British Museum,* photographed December 10, 1997 (Eastop 2007:193)

Form: Process and Object

String figures are by far the most widely recognized string object across the world, played by inhabitants of East Asia, Australia, Africa, the Arctic, the Americas, and the Pacific Islands. String figures, also known in the Western world as 'cat's cradle,' are composed of a singular, continuous strand of cordage tied or spliced together at both ends to create a loop. The loop

is then draped over the hands to be manipulated by the fingers and wrists of one or two people. However, hands and fingers are not the only means of manipulating the string; some forms require toes, knees, elbows, or even the mouth (Eastop 2007, McKenzie 2022). String figures are unique in that they are simultaneously sequences, actions, and objects, only existing in the act of 'making' them (Eastop 2007). String figures are ephemeral and cyclical. The foundational premise of string figures is that players always begin and end at the same point with a suspended, inert loop of string. Not only are they constructed from a simple loop of string, but their performance is a loop as well. Thus, form and action are closely related to one another. In mathematical typology string figures are understood as 'unknots,' always unraveling and prepared to begin again (McKenzie 2021). String figures are 'finished' when the maker withdraws their fingers and the form dissolves from complex transformations back into the original loop of cordage. Thus, continuity and processuality are key aspects of string figures, which have powerful implications for what string objects can do.

Some string figures represent a particular aspect of society, i.e., flora, fauna, celestial bodies, people, other objects, etc. "Various movements appropriate to the object represented are also made — thus, swinging movements are given to the limbs of the spiny lobster; or, by drawing the hands apart, a sinuous motion is given to the snake" (McKenzie 2022:18). There are other forms like 'lightning,' that is object-as-process, flashing out in a realistic fashion (*ibid*). Therefore, there is a characteristically performative aspect of string figures, embodying action and transition. In Oceania, string figures are often accompanied by myths, folktales, and stories that not only make them an elaborate form of entertainment but convey information about the past, explaining traditions and origins. I assert that string figures are a form of embodied knowledge, which reflects the intellectual order of social organization. By embodied knowledge, I mean that the body becomes a repository for the skills required to

make other cultural forms, and the knowledge as to how and why those forms are structured as such in the context of their cultural framework. "SF [string figures] is a practice and process; it is *becoming-with* each other in surprising relays; it is a figure for ongoingness" (Haraway 2016:3, *my emphasis*). The process of becoming-with is not exclusive to human relations, as makers become-with the objects they construct. In making string figures, the patterns and transformations produced are then reproduced throughout the culture into other artifactual forms, as well as in human relationships with others and the cosmos. When social actors produce string figures, they enact the relations that make these haptic designs and actions consistent in social praxis and logical in thought. As I discuss below, making string figures can be associated with growing yams. These two forms, the entwined strands of a string figure design and the entangled vines of a yam garden, share a visual likeness. Their likeness extends to praxis as well, where the sequenced transformative action of string figure production parallels the transformative sequences enacted in yam horticulture.

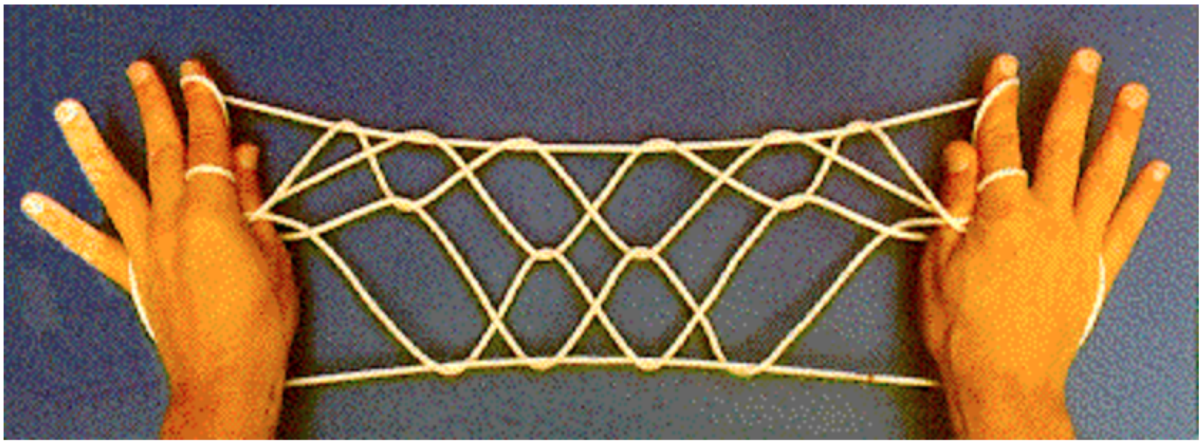


Figure 3. *Flock of Birds*, Tikopia (available at: http://www.isfa.org/isfa1.htm).

String figures are a highly abstract, metaphysical performance. To that point, string figures do not always 'obviously' depict the objects or actions they represent. They are abstract geometric

forms, which require cultural context and creativity to interpret. In Oceania, there are many cases where the 'same' figures are produced in different regions, but they require differences in methods and strategies employed to make the 'same' figure.[10] Key to understanding the social implications of string figures in Oceania is examining their process of construction and analyzing their simultaneous identity as process and object. From this vantage point, string figures are a significant means of understanding how string objects model organization and stability throughout Oceania. String figures inform ways of relating, patterns for other social forms, and the reckoning of time. Here, I explore how string figures function as a basis for other cultural forms, inform ways of relating, and "unite a number of individuals to create something that exceeds the sum of the parts" (Pajaczkowska 2015:145). In my final chapter, I expand upon the temporal implications of these string objects in more detail.

If "pattern is knowledge itself, making visible connections to people and places" (Were 2010:152), then string figures are perhaps the most elaborate forms of 'knowing' in Oceania. Pattern is one of the most varied and significant means by which string figures translate into social organizing principles. String figures are a vehicle through which people organize sequential information. They are a means of relating to ecologies and other social actors, as a form of embodied knowledge that translates action and thought into a conceptual framework through which Oceanic peoples experience the world. String figures convey integration, connection, and motion in form which translate to codependence, individual skill, and the need for action and agility to achieve efficiency in the greater social framework. The plans for string figures, the ideas that constitute their construction, outlive the making of the object

10 Haddon saw differences between these same designs as a lack of evidence for cultural diffusion (McKenzie 2021). However, I suggest that these differences are a consequence of the innovative nature of string, which allows for numerous possibilities of form and design.

itself. Perhaps this is what makes string figures more of a mental game than a physical one. The ordering principles of their composition parallel the formal principles by which major social activities are organized (Adams 1973). Nevertheless, the dexterity of string figures trains the body to become a tool (Damon 2017), making the manual labor needed to produce baskets or boats much easier. Productivity and efficiency are highly valued in the cultural framework, which are manufactured and maintained in this form.

Setting the Scene: Ethnographic Context

There is a diverse breadth of ethnographic data surrounding string figures. This is due to how common they are throughout the region and how well documented they are compared to other string objects. I show how this pervasive form reinforces the idea of string objects as the 'total social object.'[11] The ways string figures connect to lived experience and practice are vast and concatenative. For one, string figures are a cognitive form and basis for other artifactual forms, functioning as a point of reference to which people can mentally configure and enact other social processes (Were 2010, Damon 2017, McKenzie 2021). Throughout Oceania, string figures establish patterns and processes that inform the construction of other culturally significant objects, such as outrigger canoes in Muyuw, barkcloth in Tonga, sand-drawings in Vanuatu, and ghost-net sculptures in the Torres Strait. These interartefactual relations convey the prevalence of string figures as a model for structural organizing principles, cognitively permeating the social framework through different scales of practice and different media.

11 Küchler & Carroll define a 'total social fact' as "a phenomenon that incorporates economic, political, social, cultural, and cosmological aspects in a manner that is difficult to disentangle and yet intuitively recognized in the objects that officiate as key actors in the system" (2020:38). I suggest that string figures are one such object that functions as a key factor in the system, modeling the social framework in which they are made, and thus have coined them as the total social object.

In addition to the numerous interartefactual relations manifest within string figures, notions of renewal and regeneration associated with these transient forms become apparent in the context of yam gardens, pregnancy, and folktales. String figures function as a precedent for these other forms as a sort of "tactile topology that are conceived and practiced in the mind, making the proportional world thinkable and doable" (Damon 2017:283). They become an enacted form of logic embedded in everyday life, producing sequence and order. The shift of string figure knowledge into the production of other innovative forms conveys how traditional and contemporary forms share similar cognitive principles of construction through time. I explore string figures in relation to these varied forms to convey how these objects rehearse transformations instantiated in the social system. In constructing string figures, Oceanic societies produce the quintessential mechanism to conceptualize and realize other aspects of their cultural organization, such as artifactual forms, ecological relations, and social relations, to name a few.

The eclectic ethnographic examples I examine below have been gathered to show the breadth of cultural organizing principles that string figures accumulate within a single form, "manifesting the paradox of the idea of the multiple resting upon the finitude of the one" (Küchler & Carroll 2020:3). I do not have the space to analyze *all* the connections that string figures sustain within their making. Instead, I focus on how their status as a hybrid of process and object makes them adept at modeling other artifactual forms, while informing the activities of their use. The diverse array of ethnographic contexts that I explore helps to express the multifaceted capabilities of string figures. I align threads of similarity between string figures and other string objects across Oceania to demonstrate how string figures are justifiably an example of string objects functioning as a model for organizing principles that structure the region at large.

My string figure investigation takes place primarily in Melanesia, while also crossing into the Polynesian and Micronesian borders. I begin by exploring the Milne Bay Province of Papua New Guinea (PNG), first looking at the material culture of Muyuw (Woodlark Island), and then moving on to the island of Nuakata. On Muyuw, I discuss the interartefactual relations between string figures, gardens, and outrigger canoes, and how making string figures models the activities associated with these related forms. Meanwhile, on Nuakata, I discuss similar notions of renewal as they relate to string figures and gardens, extending the state of nourishment not only to horticulture but people, too. Next, I cross into Polynesia to explore string figures and related material culture in Tonga, investigating the relationship between barkcloth and string figures, as well as stories and myths associated with making string figures. Returning to Melanesia, I turn to the collection of islands known as the nation of Vanuatu, analyzing the structural and prototypical similarities of sand-drawings and string figures. Finally, I conclude my analysis of the Torres Strait Islands of PNG, to discuss the innovation of ghost-net sculptures as they relate to string figures.

Muyuw (Woodlark Island)

On the island of Muyuw, the indigenous terminology for string figures is *kananik* (Damon 2017). Some string figure forms represent specific cultural objects, such as 'basket,' 'old man,' and 'taro' (*ibid*). Some forms are more elaborate and require action and motion to elicit a performance. Some Muyuw examples include 'boat leaving,' 'movement between high and low tide,' and 'snot' (*ibid*). From these few examples, one can see the wide breadth of representations capable of being constructed and performed through a simple loop of string. The preferred string for *kananik* comes from a *vatul* [vine] called *im,* extracted from the aerial roots of the shoreline pandanus tree called *loud* (Damon, *personal communication*). String

figure representations come from a corpus of social knowledge enacted as an elaborate form of play. This playful pastime is one that practices the relations that make the form logical and consistent, by which I mean that they train the mind and body to certain patterns and forms. These forms are then made relevant in other social contexts, such as yam gardens and stars in the night sky.

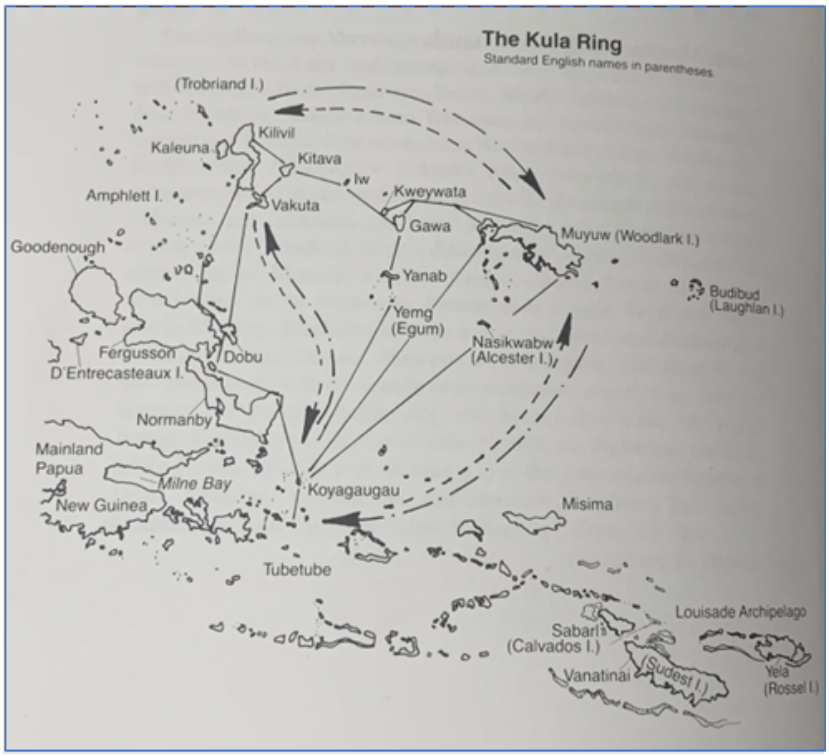


Figure 4. *Map of the Kula Ring* (Damon 1990: facing page 1).

String figures are for everyone: men, women, and children. In Muyuw, there are gendered associations that accompany tying practices. "Although everybody starts more or less at the same level, women's hands and fingers through traditional work — sewing, weaving, sorting, and molding — remain flexible (*manum*), whereas men's become hard (*matuw*)" (Damon 2017:284). I argue that string figures do not have a gendered component the way other string objects do, because they combine the relevant types of tying of both men and women into one

form. Women's tying is supposed to be flexible and absorbing, while men's should be sturdy, holding and releasing as necessary (*ibid*). String figures are a repetitive sequence of hold and release while simultaneously flexible and beautiful performances of knowledge and dexterity. The form combines these two types of tying to become a physical skill and cognitive tool for everyone, as a source of embodied knowledge. String figures, as a skill, "train the mind to fluidity" (*ibid*:286) and mutability, translating patterns from mind to hands and back again. I suggest that introducing string figures to young children acclimates them to the patterns of the social world, sharpens their dexterity, and familiarizes them with different gendered methods of tying.

Muyuw people are clearly aware of the cerebral qualities of string figures, indicated in the language. One such term is *atanak*, which is synonymous with *sinap* [custom]. "More figuratively and actively employed," *atanak* also suggests intelligence, as the term *singayatasinap* [from *sinap*] indicates a successful student or 'very smart person' (Damon 2017:286). String figures are understood to impart intelligence and cultural gnosis to their makers. Therefore, string figures *bitalik non* 'untie the mind (*non*)'; they 'make one smart' (*ibid*:286). It becomes readily apparent that tying and cordage relate to cognition in this region and are a means by which people can connect to and interact within the fabric of their own social framework. Furthermore, it is significant that 'intelligence' and 'custom' are qualities socially realized to be subsumed within the making of string figures. I suggest that these cerebral and cultural associations with *kananik* indicate that they are a means by which people learn and transmit information about their culture. Therefore, as I convey throughout this thesis, not only are string figures (or string objects, at large) a cognitive tool, but they are also a vehicle for transmitting the patterns of society.

My discussion of string figures in Muyuw focuses on the relationship between them and two other cultural activities: gardening and sailing.[12] String figures in this context have powerful associations for time-reckoning and renewal in Muyuw. While I describe string figures at large within the region, I home in on a particularly complex form known as *Gumeau*. *Gumeau* refers to the constellation, the Pleiades, considered to be a single star, whose movement across the sky contextualizes horticultural cycles and navigation (Damon 2017). I show how string figures relate to gardening and sailing as a model informing the temporal processes that constitute these practices and their cultural implications, as they relate to landscape and sky. It is important to note that string figures act as a small-scale model for the patterns of objects, gardens and canoes, but also model the sequences of the activities associated with these objects, cultivation and navigation. Conceptually, this aspect of the model reinforces string figures as both process and object. Furthermore, these interartefactual connections of form and associated action indicate that objects in this region are not stagnant forms but are envisioned as processual entities in continuous flux. String figures make apparent this processual characteristic encapsulated within them and other objects, a powerful notion for the concatenative structure of Oceanian society.

Transmissible Patterns: Enacting Gardening and Navigation in *Kananik*

Yam Gardens

Kananik with their geometric configurations and series of transformations are apt for organizing sequential information, becoming a causal mechanism for coordinating other successive social events. *Kananik* are 'in season' from January to April, after the yam gardens

12 It is also important to note the social implications as well, given that gardening activities are typically reserved for women, while boats and the sea are of the male social domain (see Damon 2017).

have been planted and their vines begin to spread and climb their poles (Damon 2017). The temporal context is specific and purposive. This relationship between yams and *kananik* comes in part from their visual similarity. Climbing vines and the entangled strings of string figures are thought to be beautiful, where beauty here is not merely an appreciation of aesthetics, but a preference for form (Adams 1973).[13] The relationship between yam vines and *kananik* is more than just similarity; making *kananik* foster the production and development of yams. This ideology of transformation engendering social praxis is reinforced by the linguistic terminology, *kapinanig,* meaning that a *kananik* made by one person induces another in the garden (Damon 2017:286). I return to the fuller social significance of *kapinanig* in my final chapter, but for now it is important to recognize that the sequential organization of information enacted in *kananik* performs and orders sequences of yam gardening, too. Sipum, one of Damon's primary interlocutors:[14]

> "…patiently pointed out how important cordage was to boats; next he said they were critical to forests because vines bind trees, giving forests their strength; then he moved on to gardens because intertwined yam vines, "vatul," gave them their strength and beauty; and finally, vatul are fundamental to persons because — he said while flexing his muscles to show his bulging arm veins — these "string/vatul" enabled life. String and things bound by them are everywhere" (ibid:248).

The analogous definition of *vatul* [string/vine] reverberates throughout the cultural framework, from the sea to forests, to gardens, to people. The definition and its social

13 Unfortunately, there are no pictures of the entangled yam vines in any existing ethnographies, so I have tried to be very descriptive of them throughout to compensate.
14 Sipum was Damon's mentor and jungle guide from 1996 through 2006-7 (Damon 2017).

implications are heavily based upon integration and interconnectivity, a potent concept for social relations in this region. Yam vines are conceived as "rope-like structures" that characteristically cannot "stay erect by itself, twines as it grows, searching for a support on which to climb" (Coursey 1967 in Coupaye 2013:30). Thus, the deeply integrated definition of *vatul* reflects the ensnarled qualities of yam vines, implying that to be entwined and interconnected is a form of support. This support helps to achieve the desired outcome of healthy, climbing yams. Humans can then translate the concepts of *vatul* to their own lives, as *vatul* are also essential to people. *Vatul* embody the integration of phenomena witnessed and observed in their environment, reflected in the twining of yam vines and of *kananik*.

Gumeau

In addition to the general context of *kananik*, specific string figure designs are associated with the annual order of the cosmos. *Gumeau* is perhaps one of the most significant of the Muyuw *kananik* forms. The figure models the cosmological and ecological phenomena that it rehearses, such as the position of stars in the night sky and the temporal context for planting yams. *Gumeau* [the Pleiades], as it rises, "organizes the calendar from Iwa to the Trobriand Islands" (Damon 2017:289). The movement of the 'star' contextualizes rain patterns and oncoming winds, from which people then enact gardening tasks accordingly. Due to its cultural significance and the care with which these phenomena are observed, it is also perhaps the most complex string figure form and when executed can be completed with "as few as 8 moves or as many as 27" (*ibid*:289). *Gumeau* is performed by one person with an elongated string. A longer strand is required in contrast to other *kananik* forms so that its maker can control the contortions and intricacies of the complex figure. For this form, it is not only the immense number of reversals, convolutions, and inversions that mark its significance, but the material used in its construction, as well. This minute detail, where different materials — in

this case a longer strand of string — are required for the construction of this *kananik* design, implies that the cultural importance of this cosmological phenomena is exceptional for Muyuw people. It is fitting, then, that the bast fiber *vatul* used to make *kananik* comes from the environment to which string figures representations often refer.

Not all moves in the *Gumeau* sequence are clearly defined, some of which Damon documents as "'a few hours later' because the design simulates the continuous passage of time" (2017:290). This aspect of continuity is directly related to the ongoingness of string figures, making them an ideal model to convey processual operations. The moves of *Gumeau* that are named consist of terminology used to discuss yam cultivation activities as they relate to the heliacal movement of the constellation that the string figure represents. Damon's most distinguished *kananik* performer described the production of Gumeau as if it were part of the cultivation processes it rehearses, saying "you start cutting the small bushes and trees in the forest for a new garden when it is about 45 degrees high in the early evening; plant when it is "*yanay*," zenith at dark; then find "happiness" — *bimasul* — when it rises and it is time to harvest" (*ibid*:290). Thus, the integration of cosmological and ecological relations is realized in the language used to describe the process of its making via horticultural processes and practices. Furthermore, *bimasul* [happiness] although a well-understood and universal emotion, carries a weighted significance in this context, because, here, it implies a positive or desired outcome. In this case, the desired outcome — the cause of such happiness — is a fruitful and plentiful harvest, incited by this *kananik*. As Gell says, "time is salient, in the conduct of human affairs, primarily in connection with the organization and co-ordination of persons and things in the real world, in order to encourage causal forces *to bring about some desired result*" (1992:218, *my emphasis*). Therefore, string figures are a quintessential mechanism by which people structure

Figures 5-8. Final four sequences of *Gumeau* (Pleiades).

Figure 5. Above left: Aligeuna [Damon's foremost expert *kananik* performer] enacting a *katuvin*, double reversal (from one hand to the other).

Figure 6. Above right: Aligeuna enacting the *Ipel kubwan*.

Figure 7. Below left: Aligeuna performing *Tautoul budibud plelidius*, representing black rays — light appearing as black — that shoot into the sky from the east blocking out the stars just before the sun's first light appears.

Figure 8. Below right: Aligeuna finishes the sequence with *Bwiyam* [daybreak]

(Photos and information courtesy of Fred Damon).

sequential information and processes, modeling the time and ways in which these activities should be performed.

Thus, what becomes clear through the performance of *Gumeau*, is that *kananik* are a method of time-reckoning. Their cyclical nature mimics the process of yam growth, the movement of stars, and the passage of time, indicating close surveillance of these phenomena. In a region where "notions of land are expansive and holistic, extending to the bottom of the ocean and lagoon, as far as the ocean currents flow, and as high as the stars and heavens" (Barker 2019:353), string figures are a fitting model for social organization as they express this deeply entrenched value of concatenation integrated within social phenomena. Therefore, the positive value transformations materially enacted in the construction of *Gumeau*, converts the act of observing ecological and cosmological relations into a physical form.[15] Here, *kananik*, with its convolutions and endless possibilities, allows makers to reproduce and reconstruct environmental observations into patterned action, first performed in *kananik*, and then again in the activities of yam gardening.

Outrigger Canoes

The integrative aspects of *Gumeau* do not just inform gardening activities, but sailing and navigation, as well. *Gumeau* contextualizes the temporal patterns of oncoming storms and winds and provides a map for the star's trajectory across the night sky. Stars are significant for navigation and each island in the Kula Ring is associated with one, guiding their course with

15 I borrow the term 'positive value transformation' from Nancy Munn to indicate how these social actors "engage in an effort to construct and control themselves in their own social world" (1986:3) with the intent of harnessing a socially desired outcome. I will continue to discuss positive value transformations throughout this chapter to show how string figures not only model desired outcomes but that their transformations give rise to positive value transformations in other forms — such as gardens and boats.

respect to its position as it rises and sets (Damon 2017). As I have described, for Muyuw this star is *Gumeau*. Given that these stars are most visible in the night sky, people prefer sailing at night. Despite better visibility of the constellations, the process is still difficult, because only once during the night is the star located at the point used for navigation. "So after that moment, what is calculated is not the star's position, which is always changing, but the relative space it defines where it is sighted with respect to where it rises or sets" (*ibid*:291). It is not just the line from the star's position to the navigator that matters, but the space comprising the rising and setting of the star. Navigation, therefore, is the cognitive configuration of movements reflecting that of *kananik*, where it is not just the string and its motion that creates meaning, but the space within and surrounding the figure, as well. String figures "can be both the container and the contained: both matter out of place and non-matter in place" (Eastop 2007:203). As navigation by stars requires points of reference and the space encompassed by their rising and setting, string figures require points of connection as intertwined threads and the space they occupy to create meaningful operations and representations through geometric abstractions.

This geometric abstraction of the night sky can also be understood in the context of the spatial mapping of the sea and nearby islands, reaffirming the comprehensive nature of string objects as a model. The way in which string figures calculate the movement of the stars to guide navigation, boats also follow these same spatial patterns in their journeys across the sea. The islands between which they travel are fixed points, with canoes traversing the flows of the sea between them. String figures are thus a means of geometrically conceptualizing different levels of space and action, in the sky and the sea. In the Marshall Islands a similar and potentially

Figure 9. From 1973, a Nasikwabw *anageg* being loaded off the shores of Wabunun (Photo courtesy of Fred Damon).

more complex process is embodied within navigational stick charts (*mettang*),[16] which "calibrate multiple levels of action and geometrically complex ideas of relation" (Küchler & Carroll 2020:195). These charts, consisting of sticks, string, and shells, functioned as maps before electronic navigation was accessible. *Mettang* "visualize the relation between underwater elevations, currents, surface-wave crests, winds, and islands" (*ibid*:195), by using three charts in the process of mapping. The first is "an abstract chart for instruction showing relations between above- and below-surface articulations and their consequences" (*ibid*:195). The other two charts denote actual locations, one indicating the proximity of water around the island, and the other the landing destination itself. Together these three coordinate charts

16 This spelling of stick charts comes from Marcia Ascher (2002) who Küchler and Carroll are citing in their own text. Different authors have spelled the term in different ways, but I use Ascher's spelling as this is her area of expertise.

help navigators realize the "topological relation between reference points that are only ever partially visible" (*ibid*:195). The geometric configurations of these charts are structurally similar to the relationship of string figures to navigation in Muyuw. Thus, string figures are not only capable of encapsulating time, but also modeling spatial relations, as well.

For Muyuw males, boating is the ultimate form of geometry and coordination. Producing string figures also helps to inform different methods involved in constructing an outrigger canoe. "If string figures are a kind of magical geometry interiorizing a system of concepts, *anageg* [outrigger canoe] put into practice a geometry of motion" (Damon 2017:296). I suggest, then, that geometries of motion can be understood as a metaphor for productive social action, where people work together to accomplish an intended goal. Outriggers consist of a collection of different parts that work together to achieve synthesis, first inspired in string figures. Although Damon describes the tying related to boats as being different than string figure construction, he concedes that there are "as many twists, turns, and inversions in tying the sail, mast mount, or hull" (*ibid*:284). Therefore, the knowledge of string figures informs the dexterity required to make outrigger forms. The way string figures are constantly on the edge of dissolution, boats also teeter along this same edge of chaos (Damon 2021:26). Outrigger canoe maintenance and navigation along the open seas require synchronized movements and cohesive action represented in string figures. Although string figure methods of construction are not identical, they impart cognitive frameworks that become realized in social action.

String figures employ 'additive technology.' Not exactly by "bonding materials layer by layer to form objects" as Susanne Küchler describes (2014:387). Rather, "the layering of existing material" (Damon 2021:27) in string figures occurs in the cognitive context, as an accumulation of intellectual patterns. Amassing these patterns develops a repository of motifs

Term	String Figure	Sailing
katuvin	turn upside down or inside out.	Describes what is done with a sail when inverted 180 degrees so that the boat changes direction to take advantage of the wind from a different angle.
Katilev	to change hands, right takes left, left takes right.	Refers to something that is left behind and may also be heard exercising this transformation with the line called *asan* (cunningham controller).
Kilov	release or unfasten, as in "it is finished."	The *alit'* lines on the sail are released; it is also heard when a voyage's sequences are described, referencing a place just left behind.

Figure 10. Relationship between string figure moves and outrigger sailing configurations. (Damon 2017:287-288)

that apprise other objects as they are made, and the social action employed as the objects are used. Further evidence for the concretization of string figure principles into the construction of boats is the parallel between the language of the 'moves' of string figures and that of sailing boats, as language is but another cognitive lens through which one can understand how people in this region conceptualize lived social action. As seen with the example of *Gumeau*, string figure logic is embedded in the language used to discuss other cultural phenomena, such as

gardening. In this case there are several overlaps between the language surrounding the moves of string figures and those of transitions that outriggers undergo as they are in motion. Damon (2017) provides examples such as, *katuvin*, *katalov/katilev*, and *kilov*, all of which are terms related to outriggers, referring to their navigation and use.

Each term in the chart is a causative verb, meaning that their action gives rise to other phenomena. The linguistic structure of these terms has powerful implications for the capabilities of making string figures, implying their sequenced processes give rise to other actions in the social system. Not only are string figures a means for establishing the skills needed to make and conceive outriggers, but they also inform their navigation and use. As these examples show, descriptions of string figure movements are embedded in daily logic and practice, connecting one form as a precedent for the other. Therefore, string figures can be seen as both a cognitive and a physical building block for other artifacts. They are a mechanism for conveying action and concepts simultaneously. Each term refers to a kind of transition in the structure, whether it be outrigger or string figure form. These transitions elicit a positive value transformation, where the labor of mind and body through the haptic construction of string figures becomes a causal mechanism to achieve desired outcomes in the production of boats and their navigation.

As I have now shown, *kananik* manifest a variety of interconnected phenomena as they are made. By investigating the structure and organization of *kananik* in Muyuw, one can understand how the patterned actions that structure and produce these designs are a schema transmitted to the larger social framework. I use the term schema here to describe the praxis enacted in and by these forms. As such, thinking through *kananik* makes clear the relationship between its sequences and transformations to lived social action and other artifactual forms,

making it possible to transmit actions of a similar value to the forms and practices of gardens or canoes. As evinced in the conflation of language, the transformative action of boats and gardens is parallel to string figure moves, implying that the processes of producing and using these forms require structured, sequential action in order to produce desired outcomes like a healthy yam garden or successful seafaring. Through the performance of *Gumeau*, one can see the interrelated phenomena of celestial bodies that structure activities on land and sea, which are first rehearsed in string figures and then instantiated in the production and use of canoes or the cultivation of a garden. The patterns and processes of string figures then are interchangeable, capable of manifesting interartefactual relations and organizing the sequences of action amongst related objects.

Nuakata

Key to my discussion of string figures is how they manifest ways of relating and connecting ideas, which then inform how people relate to each other, their cosmologies, and their environments. As previously discussed in the context of Muyuw, string figures organize observed ecological phenomena and help to pattern cycles of gardening to produce healthy growth in yams. A powerful association of regeneration is immanent in string figures, a notion reinforced by the cyclical and ongoing nature of their construction as "an endless game that can be started and finished at will" (Pajaczkowska 2015:145). These complex, geometric abstractions provide a mnemonic for sociotemporal organizing principles, where renewal becomes more than just potential suspended in a loop of twine, it becomes lived social action. This theme of renewal extends from yams to also encompass pregnancy, relating ideas of growth to people and lineages (Mallett 2003). Thus, string figures can be said to be generative of ideas and things. Similar associations of regeneration and growth occur in the string figure

context in Nuakata, Papua New Guinea. Nuakata is "a small island that lies in the Goschen Strait of the Solomon Sea, between East Cape [the southeastern tip of PNG] and Normanby Island.[17] It is roughly thirty miles from Alotau and fifteen kilometers east of East Cape" (Mallett 2003:41). Shelley Mallett (2003) briefly reflects on making string figures (*'ai'abi*), as they relate to making healthy yam gardens and healthy people. In her research on pregnancy, recognizable cycles of reproduction in plants and humans are performed in *'ai'abi* and then reproduced in social life. String figures mark stages of change in development and keep time for these particular cycles.

Here *'ai'abi* means 'building or making in process' (Mallett 2003:196-197), the linguistic analogy making clear that the importance of string figures is the flow of sequences they enact, as opposed to the abstractions they represent. The cognitive processes of *'ai'abi* mentally reproduce sets of culturally recognized pattern sequences, as the hands physically enact them. As Marie Jeanne Adams says, they become "permutable codes by which structural relations are transposed from one plane of reality to another" (1973:265). The conceptual framework of *'ai'abi* translates into principles of cultivation and care for yam gardens or tending to others. Mallett shows this caring relationship in Nuakata by describing the development of the *'ai'abi* called 'pregnant woman.' This design depicts the development of a fetus from the first month of pregnancy through birth, where once more, the string figure becomes the simple loop from whence it began. Here, the reproductive powers of the womb harness procreative powers immanent in the string figure design, represented in the developmental stages of the fetus and the generative sequences that constitute growth. Combining this prolific potency with the temporal context for *'ai'abi*, constructed between June and August, before the yam harvest

17 At the time of the census, 385 people — 180 females and 205 males — were living on Nuakata (Mallett 2003:56).

Figure 11. *Eunice Tau'owa performing the 'first month of pregnancy'* (Mallett 2003:199)

Figure 12. *Eunice Tau'owa performing the 'ninth month of pregnancy'* (Mallett 2003:203).

(Mallett 2003), these reproductive cycles become associated with and enacted in the horticultural practices of yam gardening. This same practice of combining fecund entities is reflected in the way Muyuw people plant their yams, where "a female (*parawog*) yam and male (*kuv*) yam are planted proximate to one another so that their vines climb up the same pole" (Damon 2017:285). The combination of cosmological oppositions (male/female) to accomplish a task with a common goal reflects the need for differentiation of men and women to achieve desired outcomes, especially in regard to sexual reproduction.

Through sexual reproduction, men and women take their differences and combine them via action into a productive measure (sexual intercourse) that contributes to the continuity of the social line. Therefore, not only can string figures replicate processes of fetal growth and development, but they also model the complementary acts between cosmological oppositions needed to instantiate the process. The process is envisioned as strands of string intertwine and transform much like the act of copulation which requires male/female social actors to be interconnected to achieve the positive value transformation of their labor into a fetus. The string figure itself contains permutations reflecting those of the lived world. But in addition to its readily changing form, there is tension and the intertwining of threads, strain and integration. String figures model the tensions and contradictions of cosmological oppositions, while still reflecting their complementary features in such a way that creates stability via an unstable topology. A single slip causes the entire routine to collapse, a routine on the edge of dissolution (Damon 2017:285). It seems that the complementary efforts of cosmological oppositions are designed to combat the entropic nature of social organizing principles. String figures are models for positive, successful, and productive relations, extending into the future generations of new plants and people. Hence, it seems logical that there would be such care

and purposive intention associated with string figures, for by constructing them, makers are constructing themselves and their futures, a point to which I return in my final chapter.

Tonga

Crossing the Melanesia/Polynesia cultural boundary, string figure forms in Tonga reveal further how these string objects transmit patterns between other cultural forms. These patterns are physically reproduced in the manufacture of other textiles and verbally reproduced in the telling of stories, while cognitively these patterns structure larger social principles of time and place. Barkcloth (*ngatu*), a highly valued textile, and folktales, which often accompany string figure production in this region, convey the spatiotemporal and reciprocal patterns encapsulated in the production of string figures and made manifest in tangible (barkcloth) and intangible (storytelling) artifactual forms. In engaging these tangible and intangible forms, I show how string figures manifest temporal relations with the past and future, which are drawn into the present moment of construction.

Barkcloth (ngatu)

Barkcloth is a non-woven textile form in Tonga referred to as *koloa*, denoting objects of considerable value and social prestige (Were 2010:162). Barkcloth is associated with the ritual complex as a ceremonial wrap and in some contexts as an item of exchange. Women make barkcloth from thin strips of paper mulberry that are pasted together to make a flat surface, which is then decorated with designs rubbed onto the surface.[18] The decorative patterns of the

18 Küchler says that Tongan barkcloth patterns are applied by "rubbing tapa over knotted fishnets" to make designs (2003:206), which is the physical relationship of pattern transmission between cordage and barkcloth, while string figures are the cognitive transmission.

barkcloth consist of a regular arrangement of geometric shapes and intersecting lines, which must be applied for barkcloth to be permitted in ritual contexts. Patterns stenciled onto the surface of the barkcloth "act as mnemonic devices that encode knowledge relating to genealogy and place" (Kaeppler 2002 in Were 2010:157), mapping spatiotemporal relations. String figures are more commonplace and quotidian than barkcloth, but as I showed in the Melanesian context of Muyuw and Nuakata, string figures can elicit spatial and temporal relations, too. I argue that string figures are an in-between medium for the development of barkcloth. String figures are transient and impermanent but a segue to establishing higher value, more permanent fibrous forms. Although barkcloth does not employ the binding principles enacted in making string figures, these textiles do consist of the same structural patterns as their string counterparts. I make this claim on the basis that string figures are a means by which barkcloth patterns are transmitted and practiced. In making string figure representations of barkcloth designs, these spatiotemporal relations are produced first in string and then onto barkcloth.

The cognitive skills and pattern recognition developed in making string figures work to train young minds towards culturally significant themes which manifest in higher forms of material culture. Therefore, string figures are a precedent form for other artifacts, as "channels for transmitting higher forms of knowledge" (Azadeh 2015:47) from one medium to the next. Not only do string figure forms reflect patterns of barkcloth, but the construction of string figures also helps to enable the processes by which barkcloth is made. Once again, the duality of pattern between representation and action is produced by making string figures. String figures inform the skills needed for the construction of other material forms, as well as their designs. The dexterity and manipulation of string figures make a woman's hands lithe and nimble, qualities needed to construct valuable textiles, such as barkcloth and mats (*ta'ovala*).

Figure 13. Tapa Cloth (*Ngatu*), 1930, Tongan culture; Nuku'alofa, Tongatapu Island, Tonga, Polynesia. Pounded mulberry tree bark and pigment; 74 x 108 1/2 in. Bowers Museum (2000.32.1)

The ability to practice string figures that represent the motifs of barkcloth allows for innovation in design, as well. It seems then that making string figures is a means of refining manual skills and sharpening mental acuity.

Contrary to the argument I have put forth, Tim Ingold claims that Melanesian string culture is "radically different" than Polynesian cloth cultures (2010b:23). He makes this distinction based on the "aesthetic focus" of the material, claiming Melanesian open-work, mesh designs focus on the line as opposed to the homogenous surface of barkcloth and other woven or plaited textiles, which "wrap things up so they can alternately be concealed and revealed" (*ibid*:23). However, the Tongan relationship between string figures and barkcloth invalidates

this distinction, where the open, meshwork of string figure patterns represents the patterned surfaces of barkcloth. Graeme Were provides one such example, describing the transformations that compose the figure as follows: "the string loop is placed over the foot, then the right string is twisted once around it. Both hands are then inserted into the loop from below, followed by each hand turning outwards. In the end, the string reveals two diamond figures between each open hand" (2010:159). Such string figure forms are named in accordance with the barkcloth pattern they represent, making this 'radical difference' Ingold describes seemingly unradical and quite similar. Granted this example of string figures and barkcloth patterns consists within Polynesia, yet neither form is exclusive to Melanesia or Polynesia. Both forms, string figures and barkcloth, seep across the Melanesian/Polynesian cultural boundary.

Folktales and Narratives

The linear mnemonic qualities of barkcloth that transmit knowledge of genealogy and place, are not specific to the medium. The same process of contextualization is seen in the relationship between folktales and string figures. In Tonga, string figures are sometimes performed with accompanying folktales or stories. There does not appear to be a specific temporal context for the production of string figures in Tonga as there is in Muyuw and Nuakata, which took place proximate to yam planting and harvesting. Nevertheless, they are a temporal form, specifically in their relationship to the past and future. Constructing string figures alongside the stories that accompany them provides a means of introducing the social past or the potential future into the present. "They entice and prolong into the fleshly present what would disappear without the active reciprocity of partners" (Haraway 2016:25). The threads of stories are pulled into the immediate present as each line of narrative and performance is executed. In Tonga, string figures are a mechanism for discussing and

presenting origins, as well as narratives of cosmological predecessors. Some articulate stories of the formation of the islands, landscapes, and people, while other narratives focus on recalling tales of mythic ancestors and deities (Were 2010).

One such example comes from Honor Maude, that of *Kato 'a Hina* [Hina's basket] and *marare 'a Hina mo Sinilau* [the parting of Hina and Sinilau] (Maude 1986 in Were 2010:160). The latter design is an elaboration and extension of the former. The story of these string figure performances tells of Hina, a moon goddess, who, after becoming separated from her husband, Sinilau, transforms into a reef. Sinilau (who may have leapt from his wife's basket) is able to transform himself into a shark, eagerly awaiting his prey with a gaping jaw (Were 2010). The string figure is performed by two people as such:

> "The first loops the string around her wrists and, after manipulating her index fingers and thumbs so that the string makes a series of parallel lines running between each hand and between opposing fingers, the second person inserts a finger, from below, through the first person's left wrist loop then hooks down through four crossed strings in the centre of the configuration. The first person manipulates the string again, by grasping various strands so that the figure resembles a basket. The string is further manipulated to tell the story of Hina and Sinilau's parting; the second person removes her finger and the first person moves her own hands slowly apart" (*ibid:*160).

This example is significant in that it requires more than one person for its construction. It is more like cat's cradle, which Robyn McKenzie describes as when "two players take the strings off each other's hands, turn and turn about, to produce a set sequence of designs that is endlessly repeatable" (2021:216). Up until this point, the examples and discussion surrounding

Oceanic string figures have been focused on individualized contexts. However, this form of string object sometimes relies on the cooperation and cohesion of process and action between social actors. The figure requires turn-taking, shared knowledge, and collaborative action, a method by which people learn to liaise and participate in their culture. Like social actors who construct these forms, narrative and string figures engage reciprocally. Both duplicate sequential information in a patterned and organized structural form, one a verbal articulation of cultural gnosis, the other a socially and materially enacted form. The conjoined performance of these two forms reflects the conjunction of the two social actors required to make the *Kato ʻa Hina* and *marare ʻa Hina mo Sinilau* figures. The simultaneous performance of string figure and narrative synchronize these cognitive, sequential forms into an individual, tangible form of structured and patterned action. The mutual transformations of narrative and string figure encourage its performers to engage in the reciprocity of its construction. Thus, making string figures fabricates narratives in the present habitable moment. As Donna Haraway says, "string figures are like stories; they propose and enact patterns for participants to inhabit" (2016:10). Social actors can participate *within* these forms, mentally and physically, engaging in the reciprocity of form and action.

The integrated relationship of string and narrative are not unfamiliar to Oceanian object forms. In "Imaging the Body Politic," Küchler (2003) discusses the coterminous relationship of chants and the object known as the Hawaiian sacred cord. The concomitance comes from the Hawaiian linguistic term *haku,* which means 'ruler,' as well as 'to weave,' 'to put in order,' 'to compose a chant' (*ibid*:215). Therefore, it would seem the sequences of the string object are parallel to the order of narratives and songs. The weaving of chants, like the tying of cords, enact intellectual lines of social connection, realized in the tandem nature of their transformations. Küchler describes the Hawaiian sacred cord as having a 'processual value,'

which links the visible and invisible. This means that the constant series of transformations, which objects incur in conjunction with the lines of narratives or chants, create a parallel between these two forms. Though one is more concrete than the other, the spoken words of song or story (intangible) become realized in the transitions that the object (tangible form) itself undergoes. The Hawaiian sacred cord and associated chants are cognitively and similarly patterned systems of organization structured and related much like the relationship of *Kato ʻa Hina* and *marare ʻa Hina mo Sinilau* and their associated myths.

When the string figure sequences of Hina and Sinilau are enacted in conjunction with the myth, the present act of constructing the string figure draws on the knowledge of the past in the context of the myth's storyline. String figures, as I described in the context of Muyuw and Nuakata, are apt time-reckoning mechanisms due to their ongoing, processual form at the moment in which their transformations exist and then dissolve. In Tonga, once again the temporal capacities of string figures become apparent, as the narrative of Hina and Sinilau's mythical existence in the past permeates the current context of string figures in the present. In the Oceanic context, "ancestral power appears in continuous motion — being conceived as a flow that is activated through its periodic arrest and release" (Küchler 2003:214). Therefore, storytelling and string figures are socially appropriate forms for encapsulating time, marking periods of transformation and change supplemented with the information that makes these transformations relevant. The continuity of the narrative intertwined with the transformations of the figure, in Ingold's words, respond "to one another in counterpoint, alternately as melody and refrain" (2010a:96). I posit that the complementary nature of narrative and string are due in part to the characters themselves, Hina and Sinilau, undergoing metamorphosis, one into a reef, the other a shark. In essence, the string figure quite literally performs the

transformations enacted in the myth, showing how these two forms follow the same cultural thread of organizational sequences.

Having explored the interartefactual relations of string figures to barkcloth and folktales, one can see how patterns extend to different media and maintain similar prototypical relations immanent in these relational objects. In the case of barkcloth, its relationship to string figures shows how makers develop manual skills for the production of highly valued textiles and train the mind to patterns of genealogical and social significance. Although these media do not employ similar processes of production, they engage similar cognitive processes and transmit patterns between seemingly disparate forms. I have also shown how these forms are more closely related across the Melanesian/Polynesian cultural boundary than Tim Ingold might suggest. Thus, string figures as a vehicle for transmitting skill and pattern recognition is seen throughout Oceania. As for folktales and their relationship to string figures, one can see how string figures train their makers towards reciprocal action and engagement, while encapsulating the temporal flux of past, present and future into these objects. Although folktales are intangible, they show the cognitive abilities imparted through the production of string figures, which function to structure and organize the flux of time, while engaging time as a continuum through which social actors must navigate. Thus, Tongan string figures show the relationship to other culturally significant artifacts and manifest concepts of time which require sequence to order the continuity of past, present, and future.

Vanuatu

In Vanuatu, string figures do not seem to have been studied as intently as some of the other regions I explore in this thesis. However, sand-drawings are a culturally significant form in

this region, which are mentally and visually like string figures. Sand-drawings also manifest relations between intersecting lines and intertwined yam vines and are therefore another string-like object through which one can understand the interartefactual relations modeled in design and form.

Although there is limited evidence of string figures in Vanuatu on record, some examples do exist. Like other regions previously discussed, representations can be static, while others reflect an action, animation, or transition. Some examples include 'fish net,' 'rat eating cane,' 'canoe,' 'yam,' 'dancing sunbeams' [a continuation of the 'yam' form], 'bow and arrow,' and 'two birds flying' (Dickey 1928). In Vanuatu, material culture research has been predominantly directed toward sand-drawings instead.[19] Despite the imbalance in anthropological focus, there is much to be said about the relationship between these two forms. In the context of this thesis, the significance of sand-drawings comes from the isomorphic nature of their construction and that of string figure configurations, as well as the prototypical relations immanent between them.

To aid in my discussion and analysis, I explore the relationship between sand-drawings and yam gardens in Jacob Barron's recent article on sand-drawings in Ambrym, in which he calls sand-drawings a mnemonic device for the preservation of knowledge (2021:4). Already, one is reminded of Were's description of barkcloth designs, performing a similar cultural purpose of recalling and embodying knowledge. However, here, I argue that string figures are more like sand-drawings than barkcloth designs. I make this claim on the basis that barkcloth is a more permanent medium than sand-drawings. Like string figures, sand-drawings are temporary and

19 There is no real indication in the literature as to why sand-drawings are of such significant focus in Vanuatu, but they have been of interest for various disciplines for over a century.

transient forms, etched into volcanic ash only to be erased once they have been completed. Both forms are dissoluble, consisting of a single intricately convoluted line, comprised of transformations, inversions, and nonlinear intersections that return to the state in which they began their transformational journey. They both impart patterns reflected in other material culture in an almost identical fashion.

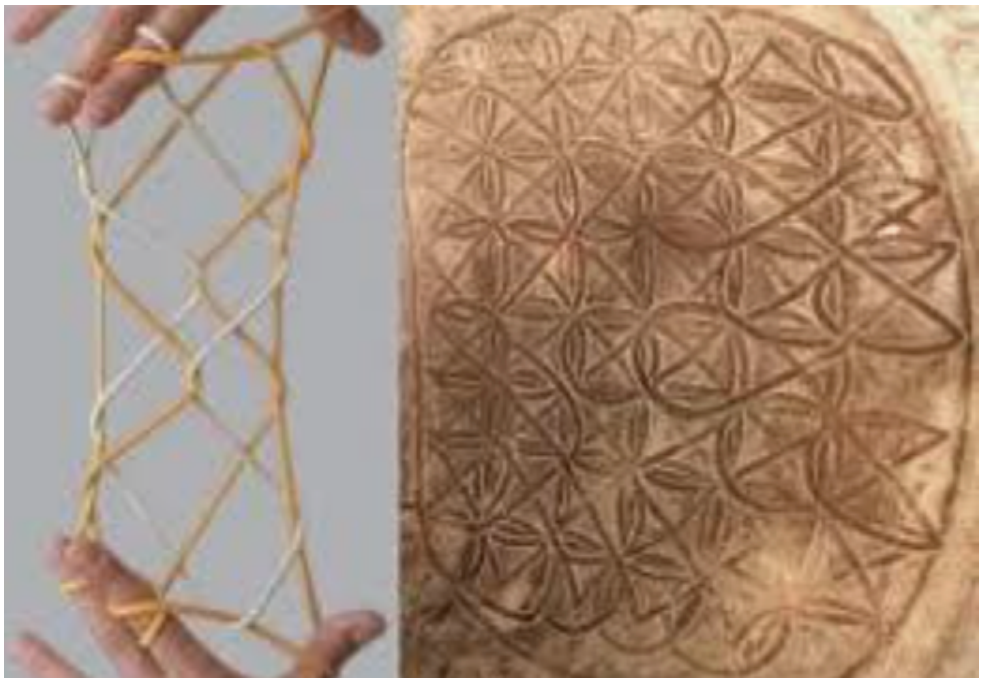


Figure 14. *Left: String figure* wayu *(hairy yam). Right: Sand-drawing of* rem *(yam). Northern Ambrym, Vanuatu (E. Vandendriessche, 2006).*

However, these two forms are not the only examples of linear, string (or string-like) objects in the region that maintain strong similarities between form and process (see Küchler 2003, Ingold 2010b, Fortis & Küchler 2021). Ingold discusses how qualities between the decorative art of the Abelam [a people of East Sepik Province in PNG] and bilum bags of Melanesia share a common structural principle in their construction called, *maindshe* (2010b:23-24). The decorative art of the Abelam consists of painting linear designs on sago palm spathes. The

spathes are covered in dark mud as the background of the image, overlaid with continuous and discontinuous, patterned lines in the foreground. The painting progresses from an initial white line, which is the most important, as it establishes the pattern for the rest of the image. The painter works from the top of the sago palm canvas and moves across, painting in rows. Lines from the previous row trail to the top of the next, providing a point of continuity from whence the painter continues the design of the consecutive row. As the painting progresses, these white lines connect from row to row, creating a continuous strand, called *maindshe*. Other colored lines are intermittently drawn around the continuous white *maindshe,* with the purpose of emphasizing the continuous line. Meanwhile, in the same region, bilum bags are also constructed of a continuous white line, in this case of thread. The bast fiber string of bilum bags is understood to be 'white' and must be twined into a continuous strand.[20] Rolling and plying bast fibers into thread creates approximately a 5-meter strand at a time (MacKenzie 1991). Therefore, women must attach additional lengths to the loose end of the strand, by twining the fibers and rolling them on the thigh. Once the string is its desired length, this continual linear strand from which the bilum is produced becomes known as *maindshe*.

The relationship between Abelam paintings and bilum bags in PNG is similar to that of string figures and sand-drawings in Vanuatu. However, the comparison I make here is more like that of Küchler (2003), where she analyzes the relationship between the Hawaiian sacred cord, the Tahitian *to'o*, and the New Irish *malanggan*. This comparative study is significant because its implications supersede the Melanesian/Polynesian cultural boundary. Although I do not permeate the Melanesian cultural boundary in my analysis, it exceeds the bounds of Vanuatu, specifically. Despite initially introducing Vanuatuan string figures in this section, my analysis

20 The bast fiber string used to construct a bilum bag is a beige color but is culturally accepted as 'white' (Ingold 2010b:23).

between string figures and sand-drawings looks at string figures more generally in Melanesia. This decision is informed by the relationship between yam gardens and sand-drawings in Vanuatu, and yam gardens and string figures in greater Melanesia.

Figure 15. Abelam decorative art. Men painting *maindshe* (Ingold 2010b:24).

Ingold (2010b) discusses the *maindshe* in the comparative context of traces and threads, which he identifies as varieties and distinctions of the line. Bilum bags are composed of threads, which are "a filament of some kind," and such a filament can be either "entangled with other

threads or suspended between points in a three-dimensional space" (*ibid*:13). Abelam paintings consist of traces which he defines as "any enduring mark left in or on a surface by a continuous movement" (*ibid*:15). Ingold further breaks down traces into two types, additive and reductive. Additive traces are formed when lines are "superimposed upon the substrate," while reductive traces involve "removing material from the surface itself" to form the line (*ibid*:15). The additive traces to the surface of the sago palm spathes in Abelam art resemble the reductive traces of sand-drawings in Vanuatu, both constructed on a flat, planar surface and consisting of continuous lines. Meanwhile, bilums and string figures are both objects, as I show in this chapter and the next, whose construction consists of an ongoing and cyclical nature. Like Ingold, I explore the relationship between threads and traces, looking at the reductive traces of sand-drawings, the threads of string figures, and their ability to inhere the same organizing principles between different media. As with Abelam art and bilum bags, the prototypical relations that inform the construction of string figures and sand-drawings are the same. In the case of sand-drawings and string figures, I explore their construction as it relates to yam gardening.

Sand-drawings

Sand-drawings are made in a variety of contexts at many different points in time. Differences in time and context can have implications for the meaning of the drawing and its design. Often, sand-drawings are a form of play for children or may simply consist of a message left for a friend. Others, however, have cosmological implications, such as the transition of the spirit from life to death (Huffman 1996:252). The depictions of these forms, like string figures, are varied; they can depict animals, human affairs, historical events, or material objects.

Rather than sustained between the hands, sand-drawings are constructed on a flat surface of the ground. If they are constructed on the beach, they are etched in compact sand, or if constructed in the bush, in the tephra (volcanic ash) that covers the dark soil surface. Tephra is preferred as it is finer than sand and allows for more detail with less accumulation of soil displaced in producing a line (Barron 2021:3-4). The first step in constructing a sand-drawing is to establish the lined grid over which the intersecting lines of the design are rendered. This grid functions as the foundation for the drawing, "starting with the vertical lines (from left to right) and followed by the horizontal (from top to bottom)" (Huffman 1996:249). The grid, with its perpendicular lines, is referred to as *lee, iye* (west Ambrym) or *ree, etu* (north Ambrym) which translate to "stakes," specifically like those used to support the growth of yams (Barron 2021:5). The continuous line of the sand-drawing design is overlaid atop the perpendicular grid in the sand or tephra. These lines intersect, reverse, and coil, all while maintaining contact between the drawer's right index finger and the ground (Huffman 1996:249). As I described, on the islands of Muyuw and Nuakata the cyclical nature of string figures made them apt for modeling horticultural patterns in yam gardens and visualizing the relationship of the ensnarled vines of yams and the strings of sting figures. Just as yam vines entwine around the stakes in a garden, the line of the sand-drawing does the same around its 'stakes' [*lee, iye* or *ree, etu*]. Therefore, the prudence and detail attributed to composing sand-drawings is metaphorically and linguistically tied to caring for yams (Barron 2021). Visualizing a sand-drawing is a cognitive process with an intentional design, one which can be translated to other artifactual systems.

Figure 16. Sand-drawing, Vanuatu (Barron 2021:2).

As a cyclical process of making, sand-drawings return to their 'root' as Barron (2021:8) calls it, defining it as the point at which the drawing is completed and the artist closes the form at the point from which the design began. Given that tubers, like yams, are root vegetables, the reference to root implies that the development of intertwining lines during the process of making sand-drawings concludes by returning to the point at which it began, paralleling the processes by which yams are harvested. When yams are removed from the ground and cultivated for consumption, their cycle of horticultural growth has finished until the next year's planting. The convoluted lines of the sand-drawing like the ensnarled yam vines help the object itself to grow and flourish, following the same trajectories of enmeshed form and cyclical process. It is important to note that this cyclical completion does not occur by

retracing a previous line, the motion remains continuous. With this knowledge, the analogy between sand-drawings and yam gardens becomes more explicit. Once yams have been harvested, their vines are cut back and the remains of the plants dry out, just as the sand-drawing is erased from the tephra. Not only is the root indicative of the yam, but it also implies a transitional point between beginning and end. Although sand-drawings are not string objects, the cognitive and compositional patterns are strikingly similar to those explored in string figures, fostering intentional acts of care towards design and yam horticulture.[21]

Torres Strait

The Torres Strait Islands consist of 274 islands situated between the northernmost top of the Australian mainland and the southern coast of PNG. However, only 17 of the islands are inhabited with a population of approximately 8,000 people (West 2009:822). In the Torres Strait, many of the string figure representations, like those I have explored throughout Oceania, reflect the objects of their cultural purview. There are many different representations on record on account of Haddon and his successors. Some examples include human action such as a laugh or a cough, plants like *oorup* [coco-palm] and *guat gual* [liana, a vine-like plant], and animals such as *umai* [dog], *ger* [sea-snake], *kairi* [crayfish] (Eastop 2007:193-194). Other examples incorporate action into their representation such as 'two men fighting' (*ibid*). This form is enacted as two loops approach each other and become entwined. One loop represents a Murray Island man and the other a Dauar Island man, and when the two become entangled, the men are said to be 'fighting.' In the end, only one loop remains, which can be drawn to one hand along the two strings, representing the Murray man carrying off the Dauar man's

21 Sand-drawings show evidence of pattern transmission with string objects and could convey that the model is about lines rather than exclusively string (see Ingold 2010b).

head (*ibid*:197). As in Tonga, string figures can also be used to convey myth and the conventions of tradition. Haddon cites a particular figure which begins with boys playing and is transformed into two rings, which geometrically constitute two of the sacred grounds on Mer (Murray) Island (*ibid*). These grounds were used for initiation rituals that boys underwent in their transition to manhood. These examples convey the diverse representations achievable through the geometric abstractions of string figures and their ability to encompass the mundane and the extraordinary.

Ghost-Net Sculptures

The string figure designs I am most interested in, however, are the numerous representations of sea life. Seafaring is significant to the subsistence of Torres Strait Islanders. As a result, many of the string figures represent sea creatures, such as lobsters, turtles, crabs, and a variety of different kinds of fish (kingfish, triggerfish, cuttlefish, and dugong) (McKenzie 2021:222). Ocean dwellers such as turtles and sharks are of great spiritual and cultural significance to Torres Strait Islanders, and their representation in string figures "can be understood as a commentary on social life" (Eastop 2007:201). The geometric representations of string figures indicate the powerful spiritual relationship between the ecological and social landscapes. Indigenous artists continue to draw on this social commentary, transforming string figures and their associated knowledge into a new artifactual form. Looking at the innovative nature of string figures and the possibilities this material and its form allow its makers, I engage this new artifactual form to refute Sillitoe's misguided claim that "it is pointless to suppose that certain [string] figures or ways of tying them are evidence of diffusion, invention or anything else" (1976:20). The innovation known as 'ghost-net sculptures' are currently being made on Erub, which is "the centre of this new art-making activity" (McKenzie 2021:222). Artists make tied, netted sculptures from the debris of industrial fishing nets, known as ghost nets (*ibid*).

People repurpose the synthetic fibers of the net into a sculpture, usually representing one of the sea creatures that are threatened by the ghost net debris lurking in ocean waters.

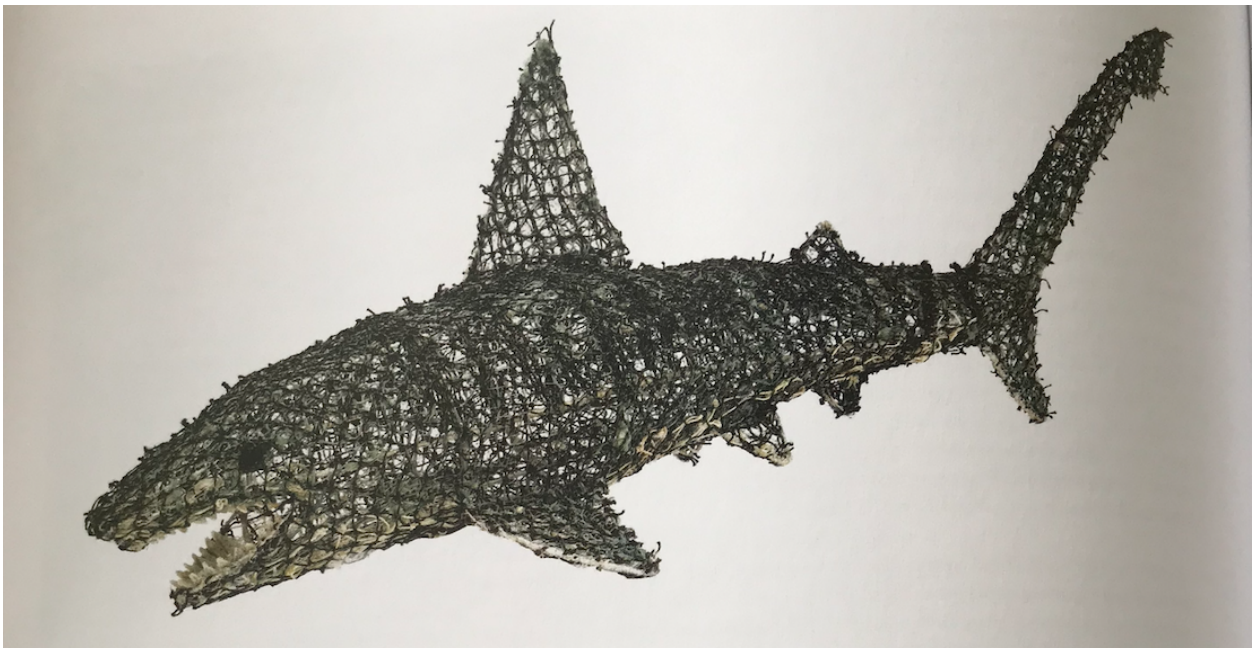


Figure 17. *Ghost-net sculpture*, Torres Strait (McKenzie 2021:222).

By recycling the debris into art form, Torres Strait Islanders make art that not only reflects influential aspects of their culture but conserves their ecologies. These sculptures convey care and reverence for the ecologies of the Torres Strait, especially for the organisms represented in the designs. Ghost-net sculptures transform the prototypical representations of string figures into new artistic medium in such a way that "we can begin to see the 'stickiness' of string and the various configurations we create through hands-on manipulation to give expression to new ideas and relations" (Were 2010:154). Torres Strait Islanders employ the familiar haptics of binding and tying to produce a new, innovative interartefactual form from old materials.[22] String figures, as in the case of Tongan folktales, combine the old/past and the

22 For more on regional innovation and transformation among materials, see Were 2018.

new/present. Ghost-net sculptures, as an innovative totem, using traditional knowledge and skill, ensure the safety of venerated ocean life. "Attributing value to this sea-borne debris through the production of art creates incentives for the removal and recycling of the ghost nets and provides a welcome source of income for people living on the islands, whose economy and livelihoods are threatened by rising sea levels" (McKenzie 2021:222). Recycling and re-using materials are by no means innovative concepts in this region. As I discuss further in the next chapter, the same repurposing of old and new materials is seen in the process of making fishing nets. In fact, it seems that the cultural method of making traditional fishing nets informs the ways in which ghost nets are recycled and reused, prefigured in string figure production. Ghost-net sculptures highlight the ways in which isomorphic cultural forms change over time, while maintaining traditional principles of organization and structure, firmly disproving Sillitoe's dismissal (1976) of the inventive nature of string figures. Ghost-net sculptures portray the innovation and creativity that string figures allow their makers, giving rise to entirely new cultural forms which rely on the precursory knowledge and methods of string figures.

Conclusion

String figures encompass many different patterns and processes. They maintain and manifest temporal cycles; they function as a cultural mnemonic for other artifactual forms and interartefactual relations; and they transform the body into a tool. Despite their transient nature, they are powerful cognitive and physical tools for the production of social organization and order. They contribute to renewal and growth, aligning processes of making with productivity and efficiency.

As I have shown, string figures relate to a variety of other social forms. This is significant because it shows the vast array of concepts and objects that string figures can represent and reproduce. These mental and physical forms become ultimate standards of reference underpinning the social framework and thought processes in this region. First and foremost, the notion of connectivity is powerful in social life, a concept made apparent in the production of string figures. Notions of the future and the past are conflated with the present as these objects are made. The ability to recall the past and the future within the current moment of the object allows the maker to contextualize time and space in the present. This is a powerful tool for understanding tradition and cultural norms as they relate to the present. I flesh out these temporal implications in my final chapter, combining the analysis of string figures with the remaining two string objects of my investigation.

It is the breadth of cultural contexts and the powerful implications of cognitive processes that informed my decision to place string figures as my first ethnographic object of investigation. Given the constant transformations and cyclical nature of string figures that leads them to only exist as they are made, I have used them as a preemptory discussion to introduce the processual nature of string objects in Melanesia. I reiterate that these forms are both objects and processes simultaneously, to set the framework in which I look at bilum bags and fishing nets, which recall the principles of making and use in string figures and manifest their own social significance in these different forms. However, I return to Melanesian string figures as a point of comparison for bilums and fishing nets in the final chapter, analyzing their shared temporal relations.

Chapter 2:

Bilum Bags and Fishing Nets

> *"...if our relationship to others is built on the process of externalization, in which the self is experienced indirectly as another, it follows that the reflection by which we know our own self involves self-externalization rather than self-introspection. In order to become self-conscious, individuals must become objects to themselves" (Josephides 2008:xxi).*

I have addressed string figures as a pivotal and widespread representation of Oceanian artifact forms, cognitively and physically imbuing social organizing principles through an exceedingly processual object. I now turn to two other artifactual forms of Melanesia, the bilum bag and the fishing net, which reflect many of the qualities previously discussed in the context of string figures. I take what are two seemingly more static forms and show how they too embody process through making and in use. As the objects are made, I discuss the processes of composition that reflect aspects of social organization. Once the object is 'complete,' I move on to discuss the usage of these objects as cycles of re-making, in the context of the object and the social principles they convey. By this, I mean that qualities inherent within the processes of making are re-realized in its use. Fishing nets, although considered to be a feminine object, are in the realm of male production and use. Bilums, on the other hand, are used by everyone, men, women, and children, but spinning and looping bilums are tasks exclusively performed by women of the Telefolmin. According to social norms of Melanesian society, women are responsible for domestic labor and chores and men are responsible for tasks that take them outside of the village, such as hunting, fishing, and seafaring, especially in the context of Kula

exchange (see Strathern 1980, MacKenzie 1991 Damon 2017). Thus, these objects may have stricter social conditions dictating who retains the knowledge of these forms and who makes or even uses them, but I show how despite these distinctions, they are processual and how this quality makes string objects a highly successful model for social organizing principles in Melanesia.

This chapter focuses on string culture within Melanesia, specifically within regions of Papua New Guinea (PNG). I explore bilum production and use in the interior montane region of the largest island, looking more intently at the social context of the Telefolmin. My analysis of the fishing net as a processual object in its making and use takes place in the social context of Muyuw, in the Milne Bay Province of PNG, from which I drew some of my string figure analysis in the previous chapter. This chapter is divided into two parts, the first discusses bilums, and the second examines fishing nets. Each part is divided into four sections: the introduction, providing the social context in which these objects exist; an explanation of the form of the string objects, describing their physical appearance and structural composition; a look at how these two objects are made, exploring the social implications for the material in flux and the processes by which these objects are constructed; and my discussion of the object in flux, describing the processes of re-making that accompany using the objects for their intended physical and social purposes. I convey how these seemingly separate stages are processually linked through the ways in which they repeatedly manifest social organizing principles, to make explicit the combinations of labor and circumstances required to create stability and order in the social system.

Part I: *Bilums*

Figure 18. Left: *Traditional Bilum from Bena Village*, PNG (Díaz & Vuong 2018a).

Figure 19. Right: *Synthetic Fiber Bilum from Sepik Region*, PNG (Díaz & Vuong 2018b).

I. The Ethnographic Context

The Mountain Ok people, with a population of approximately 30,000, reside in the sparsely populated central cordillera of northwest New Guinea, from the Western and West Sepik provinces in the south and north through the Star Mountains of Irian Jaya in the west (MacKenzie 1991). Individual groups of the Mountain Ok region are identified by the suffix *min* [peoples] which refer to the numerous political communities, who share the same technology, economy and subsistence based on hunting and gathering, shifting taro horticulture, and domestic pig-raising (*ibid*:32). Despite these similarities, they do not share a

common language, perhaps due to the difficulty of traversing the rugged terrain of the New Guinea Highlands. Instead, *min* groups are more closely related due to specific shared cultural norms, including belief in Afek, the creator ancestress, and engagement in the male cult. All the Min groups are believed to be children of Afek, who not only gave birth to them, but also provided them with their social, cultural, and ritual customs. The affinity of Min groups is further evinced in the uniformity of their material culture (*ibid*).

One such material form is the 'bilum' as they are called in Melanesian pidgin. Bilums are carrier bags made of bast fiber used to carry a variety of cultural items such as food, babies, piglets, personal belongings, and spirits, to name a few (MacKenzie 1991). Its primary purpose is a container, especially a domestic and personal one. Bilum bags are widespread throughout PNG, but not all groups make or use them. According to Maureen MacKenzie (1991), they are particularly relevant in the mountain and hill groups of the hinterland. In the Mountain Ok region, bilums are said to be of "one kind" (*ibid*:33), and there is indeed a coherent style that makes bilums from the region recognizable (see MacKenzie 1991). However, form and technique are not universal; each group produces an artifact that is distinct from its neighbors (*ibid*).

MacKenzie focuses her ethnographic study most closely on the Telefolmin. The Telefol are believed to be Afek's lastborn, and thus the principal guardians of her legacy. Afek is said to have left all her primary mythical relics in the cult house which she herself built at Telefolip (a contraction of Telefol and *abiip* [village]) (*ibid*:33).

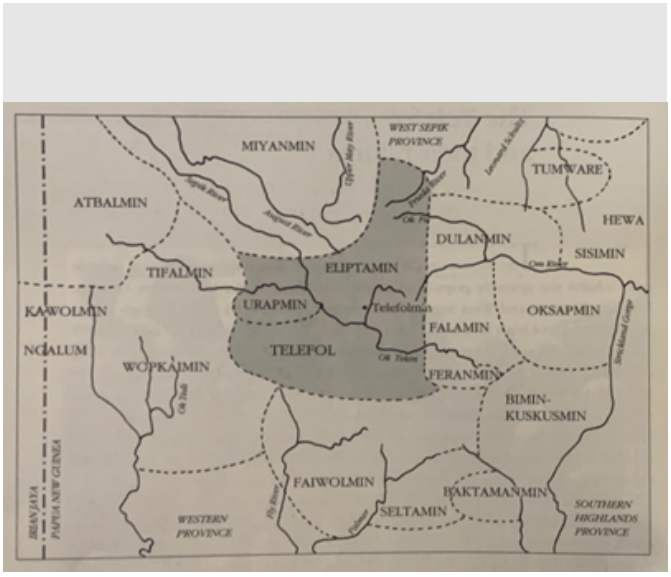


Figure 20. Left: *Map of the Mountain Ok Region*, PNG (MacKenzie 1991:32).

Figure 21. Right: *The domestic bilum of various Mountain Ok Groups. 1. Telefolmin, 2. Tifalmin, 3. Frieda, 4. Oksapmin, 5. Atbalmin, 6. Wopkaiman* (MacKenzie 1991:137).

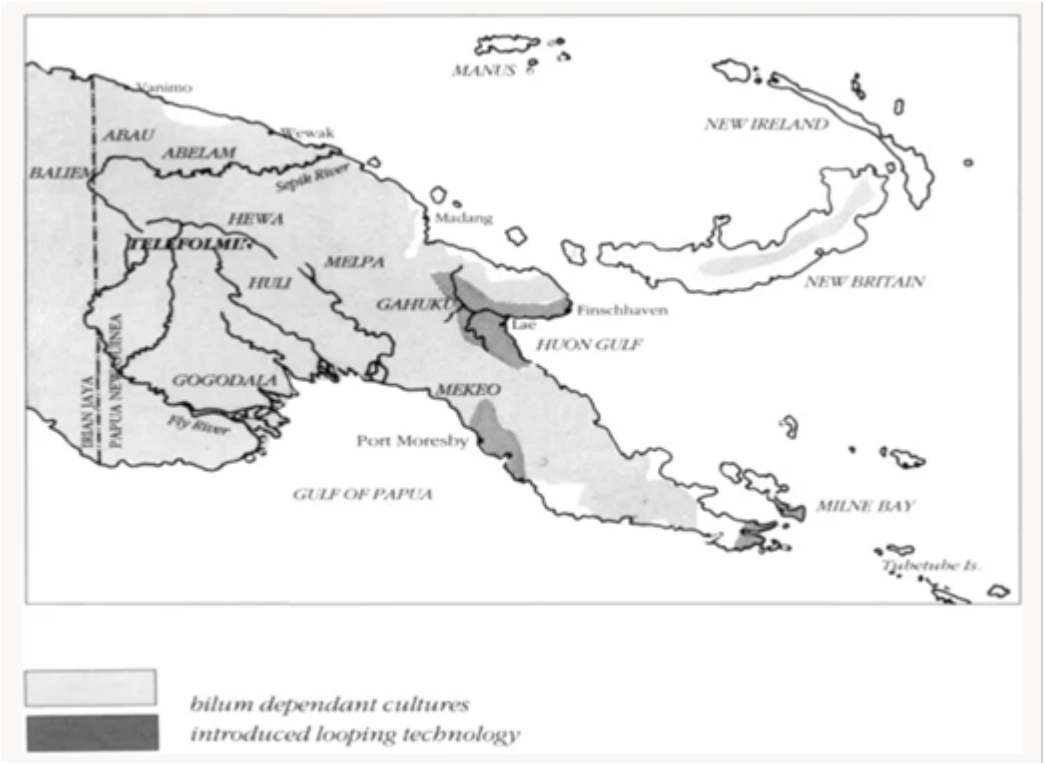


Figure 22. *Map of Bilum Making and Using Cultures in PNG* (MacKenzie 1991:3).

Telefol Bilums: Materializing the Self and the Division of Labor

Bilum, in pidgin, refers to more than exclusively the bag itself. The term encompasses indigenous looping techniques and resulting products, western-introduced equivalents like pockets, and bodily features such as the marsupial pouch, human placenta, and afterbirth (MacKenzie 1991:18-19). In appearance and function, they are like "the fecund maternal belly," imbued with "nurturance, encompassment, and protection" (*ibid*:19). Given the exhaustive linguistic associations of the bilum, especially its visual and functional affiliation with reproductive vessels, it is not surprising that making bilums is a skill reserved exclusively for Telefol women. Bilums index femininity across PNG because women are the primary makers of the form,[23] and they are a means through which Telefol women define themselves. There is nothing taboo or inherently wrong with men participating, they simply do not (*ibid*).[24]

Bilums are but one manifestation of the highly differentiated sexual division of labor. First, it is important to understand the socially valued qualities of the sexes and their social responsibilities. Women's activities involve care; they are responsible for the domestic sphere, rearing plants, pigs, and people. Gardening, pig-rearing, and childbirth are all associated with renewal, growth, and "domestic well-being" (MacKenzie 1991:39), which are deeply integrated into a Telefol woman's social identity. On the other hand, men's tasks are

23 Female production of bilums is not exclusive throughout Papua New Guinea (see MacKenzie 1985). Tim Ingold also says from a very early age that all Telefol children — boys and girls — are introduced to bilum techniques, learning to rove, roll, and shred fibers for spinning string as early as two years old. Boys, however, do not master looping techniques as they are soon plunged into the sphere of men's activities and initiation (2000:354).

24 However, men's participation could be viewed as social subversion (Andersen 2015), which I discuss later in this chapter. MacKenzie says that a man wearing a large open-looped bilum worn from the head "serves as a very cogent marker of femininity and indicates transvestism" (1991:18) but does not indicate whether making bilums would do the same.

concerned with "the public affairs of political interaction and community well-being" (*ibid*:39), hunting, and warfare. Their activities often take them farther outside the village than women's domestic tasks. This division is important to the stability of social organization for the Telefolmin, contributing to the complementary nature of their productive roles, especially in regard to subsistence activities. "In general, men fell the trees, partially clearing the land, fence the gardens (against wild pigs), hunt large game animals and build the houses, while women prepare the ground, harvest the crops, tend the pigs, gather forest foods and keep house" (*ibid*:38). Next, I look specifically at how bilum production and use reinforces this division of labor and the social implications for such distinctions, especially as they relate to the production of other interartefactual relations (i.e., taro gardens) and the stability of social order.

The differentiation between stages of production and object form is directly related to the social obligations of each sex. The domestic bilum is associated with women, who spin bast fibers into string and then loop that string into a bilum. Looping knowledge is reserved exclusively for women and it is they who distinguish the bilum forms and techniques. As MacKenzie says of the Telefolmin, "those practices associated with the manufacture of the principal form of the bilum, the collection of fibres, the spinning of string and looping itself, are continuous activities which are completely integrated with women's daily lives" (MacKenzie 1991:61). Their portable and pause-able nature makes looping on-the-go an easy task such that "no matter where a Telefolmin woman might be, whether sitting or walking, her hands are rarely idle" (*ibid:*61). There seem to be no regulations on when and where women may loop bilums, but their context is generally communal. Their work fits into "the repetitive cycle of work in a daily routine undifferentiated by harvest or food storage"

(*ibid*:62).[25] This idea of continuity in string production echoes the structural qualities of string figures.

The cosmological link between Afek, the creator ancestress, and bilums concretizes and contextualizes these cultural norms of sexual differentiation. "First Afek came from the east from the region of the Ok Om. She came alone carrying a net bag and everything important to Telefol life came into being as it 'fell out of or dropped out of' her bilum" (MacKenzie 1991:45). This origin myth of bilums is significant for several reasons. First, this myth links womanhood with bilums, as Afek carries the womb of Telefol humanity. The bilum, as a procreative object, is associated with the caretaking qualities of womanhood, and in the case of Telefol women, motherhood is the highest valued social role that a woman can obtain (*ibid*). Through myth, cosmologies reaffirm "the positive value placed on qualities such as caring for, nurturing and providing for all the needs of those one has given birth to, to ensure their constant and continued well-being" (*ibid*:146). Afek is referred to as 'Primal Mother,' (*ibid*:171) implying she is the mother of all Telefolmin and their material culture, as well as the other Min groups who identify themselves as her children. Therefore, in addition to the linguistic associations that the term bilum has for reproductive roles, Afek and her bilum further index this same quality. The language, cosmology, and the physical qualities of the bag are deeply integrated with the desired social traits of a Telefol woman.

Men construct and use bilums in distinctly different ways for different purposes, where construction is a process of 're-making' the bilum for use in the ritual complex as well as

25 Similar to Telefol looping practices, Yūko Tanaka says of embroidery practices in Laos that "Hmong women are never without their needle and thread. Even when they go to sow rice in the burned-off fields, they take their needlework along" (2013:19).

everyday use (MacKenzie 1991). According to MacKenzie, the men's cults were abandoned in the late 1970s and early 1980s due to the Christian Rebaibal [Revival] Movement, meaning few of its previous rituals are still performed. Prior to its dissolution, however, the cult system was responsible for organizing the regional political alliances. On one level, individual familial households venerated the remains of their cognatic ancestors, while on the larger scale, cults served to bring villages together in a wider unified community during wartime (*ibid*). A man's bilum was deeply tied to his relationship to the cult system. However, recent literature indicates that initiation bilums are still produced (Andersen 2015), but their social context in contemporary PNG remains unclear. Thus, I describe men's bilums as MacKenzie discusses them among the Telefolmin. For men, bilums serve to mark initiation phase through the male cult, where different bird feathers index different stages of manhood. Bilums were further used in rituals exclusive to the male cult to facilitate taro growth and to venerate ancestors, harnessing their ancestral power and benevolence for aid in cultivating and caring for the social whole. Thus, for men bilums are a means of distinguishing their identity in the cult hierarchy and in contrast to women.

Thus, bilums can index different social roles depending upon who carries and uses them: first, by which bilum one carries and the way they are carried; second, by who is responsible for the production and dissemination of the different forms; and finally, by who retains the knowledge of these distinct forms. Bilums are carried by men, women, and children, and they tend to have more than one bilum of differing sizes, styles, and functions. Women may carry several bags at a time draped across their heads, as a consistent accompaniment in their domestic chores. Smaller bilums are typically carried by men over their shoulders, containing personal items and contents for quotidian tasks. As a man's bilum is considered a personal item, it and its contents are private to others. Children carry schoolbooks or objects discovered

while foraging in their bilums. These string bags are intimately bound to social identity and mark transitional life phases for their wearers. For men, bilums mark the hierarchical stages of achievement of manhood. For women, the looping and subsequent adornment of a large domestic bilum indicates to the community at large that a young girl is actively accepting the responsibilities of adulthood (*ibid*).

I briefly turn to another indigenous group of PNG, the Umeda, to further contextualize the sexual division of labor. In *Metamorphosis of the Cassowaries* (2006 [1975]), Alfred Gell briefly discusses bilum bags amongst the Umeda, who like most PNG cultures, carry bilums with them as everyday practical objects. Gell contextualizes this object as an extension of the self through his analysis of kinship terms and associated linguistic forms, specifically *ude* [younger sister, dog] *(ibid:*141). Younger sisters and dogs are expected to take on similar social roles, an ancillary "satellite" to a man as either an older brother or dog owner (*ibid*:142). Another term, *uda,* refers to a bilum bag, which Gell hypothesizes is directly related to the linguistic and social implications of *ude* [younger sister] (*ibid*:142-143). The expectations of an older brother to a younger sister are as intimate to his identity as the bilum he carries. His dog is also a supplement to his identity, a "parallel subsidiary" (*ibid*:142). In the way a man is vigilant with his bilum, keeping it close to him and safeguarding its contents, an older brother should do similar for his younger sister. Therefore, the bilum is not only an externalization of the self but also contextualizes and informs ways of relating. As with the Telefolmin, Umeda women are responsible for spinning and looping the bilums carried by both sexes. They are also carried by men and women in the same fashion across sex distinctions, with women suspending them from their heads and men carrying them over the shoulder (*ibid*).

Figure 23. *Women carrying bilums across the head in the Arara village of Collingwood Bay*, Oro Province (A. Hermkens 2001).

II. Form

Open-worked or tightly coiled, bilums are made via looping processes to create a mesh-like, netted fabric bag from a single strand of hand-spun, two-ply string, and they come in many different styles and forms. The Telefol distinguish 27 types. MacKenzie (1991) differentiates bilum forms as a 'principal form,' or an 'elaborated form.' 'Principal forms' "are defined by a focus on the technical attributes" (*ibid*:46) (i.e., large open looped, small tightly looped, small open looped, etc.) and their association with women, who use them for daily subsistence activities (*ibid*). By contrast, the 'elaborated form,' is exclusively decorated and carried by men for use in the ritual context, and takes a principal form bilum as material for decorating or filling with permanent contents.

Here, I discuss and analyze three specific bilum types: the *aam bal men* [mouth band bilum], the *uun kon men* [bird feather bilum], and the *men amem* [secret, sacred bilum]. These three forms are traditional bilums.[26] The *aam bal men* is the most common principal form. It is made and carried by women in quotidian contexts to assist them in their productive, nurturing, and procreative tasks. The *uun kon men* and *men amem* are elaborated forms of the *aam bal men*, which are defined by the additional attributes of the bag, the former with external decorations, and the latter with permanent internal contents. *Men amem* are no longer constructed due to the dissolution of the male cult system after the evangelization of the *min* territories, but these cult sacra remain significant for showing the temporal and social qualities immanent within bilums and are therefore worth consideration.

These distinctions are key to my discussion, so I continue to refer to individual bilums as either a principal or elaborated form, using this distinction to mark the shift from processes of making to the object as it exists in flux. The looping techniques I describe constitute the processes of production, while the object in flux refers to the *aam bal men* as it is either carried by a woman or taken by a man to be elaborated in the ritual complex. In making this distinction, I show how the bilum is a processual object and undergoes constant transformation, from bast fiber to container bag. Thus, I use MacKenzie's distinction of forms to emphasize the serial nature of the string object. By reconfiguring her distinction as processual phases of the object in its construction and use, rather than exclusively as a means of differentiating the sexual division of labor, I hope to reiterate the androgynous nature of the bag in a fuller social context.

26 I make this distinction, because the social contexts of bilums have changed over time with the influence of colonization and missionization in the region. I discuss the distinction between traditional and contemporary forms later in this chapter.

III. Making: Material in Flux

Materials and Tools

Tools for constructing a bilum include the bark fibers used to make *sok* [string], *a ding*, or mesh gauge used to create evenly spaced loops, and arguably the most significant tool, the body of the looper (MacKenzie 1991:73). Fingers and hands are the primary tools, but bilum-makers also use their head, toes, thighs, and other body parts throughout the various processes of construction (*ibid*).

Sok is "the strong, virtually unbreakable two-ply string" spun together with various fibers to become the fabric of the bilum (MacKenzie 1991:66). There are many classifications of trees from which these bast fibers can be manufactured. However, for Telefol women there are two indigenous trees that are favored due to the ease of access and preparation: *farom sok* [*Ficus elastica* and *Ficus augusta*] and *kafal sok* [*Ficus dammaropsis*] (*ibid*:70). The inner bark of these Ficus species yields a greater number of processable fibers than other species. Fibers are not gathered exclusively by women. Before airstrips were accessible to the Telefolmin, men would acquire *temsok* [*Gnetum gnemon*] via trade with the Duranmin and Miyanmin. *Temsok* is the most desirable form of *sok* for bilum production, referred to as 'real string' [*rop tru* in pidgin] and valued for its elasticity, flexibility, strength, and 'pure white color' (*ibid*:70-71). The *ding*, used to ensure that loops are consistent and of equal size throughout the looping process, is a pliable strip of pandanus leaf. There are many different species of pandanus used for the *ding*, which women know exhaustively. Consequently, women identify the many subspecies of the plant as subtypes of *ding* rather than as subtypes of *sel* [pandanus] (MacKenzie 1991:64).

From Tree to Sok: Spinning Bast Fiber String

The first step toward making a bilum requires women to spin the *sok* [string] used to make the fabric of the bilum. Before the string can be spun, the bark of a tree must be transformed from a dense log into individual, spinnable fibers. *Temsok* is made by cutting the bark directly from the trunk of the sapling and immersing the bark in water. After soaking, the needlelike projections are scraped from the inside of the bark. The wet, smoothed bark is then beaten with two flat stones repeatedly, until the fibers loosen to "four times the original width of the diameter of the sapling trunk" (MacKenzie 1991:72). Now a fibrous sheet of bark resembling *tapa* [barkcloth], is left to dry, removing any remaining moisture. The fibers separate but remain loosely attached to the inner bark backing. The process of collecting materials, separating the bast, and drying the fibers takes up to 14 hours over two weeks (*ibid*:76).

Figure 24. *Otu removes the outer bark from the tree. She will then beat the fibers into a flat sheet of bark and leave them to dry in the sun.* Bena Bena Village, Eastern Highlands, PNG (Vuong 2018c).

Before the bast fibers can be made into string, they must first absorb moisture to become more supple for spinning. The preferred method is to wrap the fibers in a taro leaf and leave them out overnight to absorb the dew (MacKenzie 1991:62).[27] Now that the fibers are workable, they can be spun into *sok*. Spinning is done by hand and is very time consuming, more so than looping the bag itself. A strand of twine that "can readily be reeled during the construction of each loop, is four to five metres long" (*ibid*:76). With indigenous *Ficus* sp. fibers like *farom sok* or *kafal sok*, it takes 25-30 minutes to spin a five-meter strand, while *temsok* takes 10-15 minutes to spin a strand of the same length (*ibid*).

There are three steps involved in spinning string which takes bast fiber and transforms it into workable string: shredding, roving, and plying. Shredding requires tearing bark into strips, roving consists of separating the individual shreds of filament and combining them into a lengthened strand, and the final step, plying, involves twisting the strands into a single thread. Despite the multi-step process, the Telefolmin have one all-encompassing term for spinning or 'turning string' [*sok ulimb-in*] (MacKenzie 1991:74). The single strands, created after shredding and roving, are referred to as *yan bii sok*, literally 'return gift/until/string,' which describes the way the first ply awaits its union with the second (*ibid*). *Yan bii sok* physically and conceptually imbues the bilum with cohesion and integration, mimicking the solidarity and reciprocity integral to the productivity of the social system. The implication is that the coordinated effort of cosmological oppositions works to reinforce the strength of the social fabric, especially since this process is one of the foremost in the entire ongoing process of construction.

27 In Telefol cosmology, dew is associated with regenerative powers, as "a symbol of increase and growth" (MacKenzie 1991:62).

` Shredding and Roving. Plying. Adding Fiber.

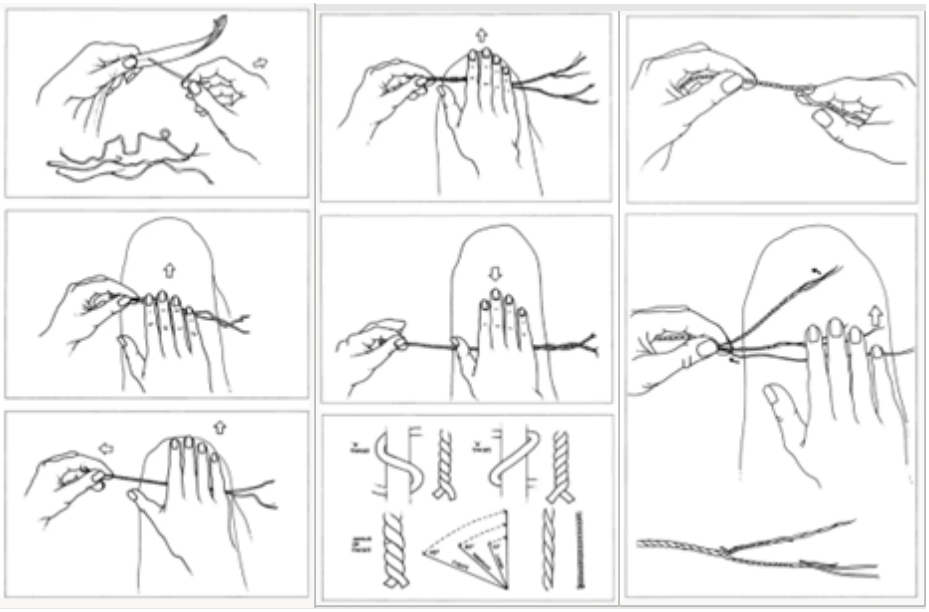


Figure 25. *Step by step process of* sok ulimb-in *[turning string], specifically two-ply* sok. (MacKenzie 1991:78-80).

Because the *sok* used to loop bilums must be a singular strand,[28] extra fibers are twisted and roved to the free ends of the existing strand until the desired length is spun. Then, "it is straightened by pulling it under tension through the thumbnail and index finger of the right hand" to rid the strand of any remaining kinks (MacKenzie 1991:76). Many Telefol women wrap the newly spun string around their heads to remove any extra twists. "Spinning the 87-90 workable lengths of string for an average sized *aam bal men* takes up to 60 hours when made with indigenous Ficus fibers and about half the time for *temsok* or other imported yarns" (*ibid*:76-82). Thus, spinning the string for bilums is a laborious and time consuming process.

28 Recall the maindshe (Ingold 2010b) from Chapter 1.

Looping a Bilum

Looping an average size *aam bal men* (60cm wide by 40cm deep) takes 100 to 160 hours of productive labor (MacKenzie 1991:83). As with spinning, Ficus fibers, which are coarser and tangle more easily, take considerably longer than the favored *temsok*. On average, it takes 45 to 60 minutes to loop a five-meter length Ficus string, whereas *temsok* takes about half the time (*ibid*). Given that women tend to loop from three to four hours a day, the rate at which an *aam bal men* is constructed is anywhere from one to two months (*ibid*).

Before engaging the processes involved in looping a bilum, it must be stated that there are many different techniques of looping that can be used to make an *aam bal men*, particularly in reference to the handle, mouth band, and body of the bag. I do not explore all the possible techniques but discuss the ones that MacKenzie (1991) provides with the most detailed descriptions and those that are the most common amongst the Telefol. These details convey how processes of making reflect lived social phenomena. As such, I examine these processes and engage how they reflect social organizing principles for their makers, Telefol women.

In constructing an *aam bal men*, women begin with the *aam* [mouth band], which consists of two long flat strips of fabric four to eight centimeters in width (MacKenzie 1991:84), which are then joined together. To 'make the mouth band,' the Telefol use the term *aam tamb-in* (*ibid*). *Tam* literally means 'inside/outside/the other side up' (*ibid*). In its verb form, *tamb-in* differentiates the lateral forward and backward motion involved in constructing the rows of the mouth band, as opposed to the continuous looping technique used for the base of the bag (*ibid*). *Tam* has greater implications for the social framework within which bilums are made, because the term refers to two opposite concepts, inside/outside, in a singular notion. I posit that this linguistic concept stems from the consistent theme of cosmological oppositions in

Telefol social structure. The conflation of these opposing ideas into a singular term reflects the same organizing principles that inform the linguistic analogy for 'turning string,' above, which encompasses all steps of the process into one term (i.e., inside/outside, shredding/roving/plying). The recurrence of integrating opposites to create stability is one that is made relevant in my final chapter. For now, it is sufficient to note that these concepts are not considered to be separate entities but are understood as integrated wholes or parts of the same, cohesive process.

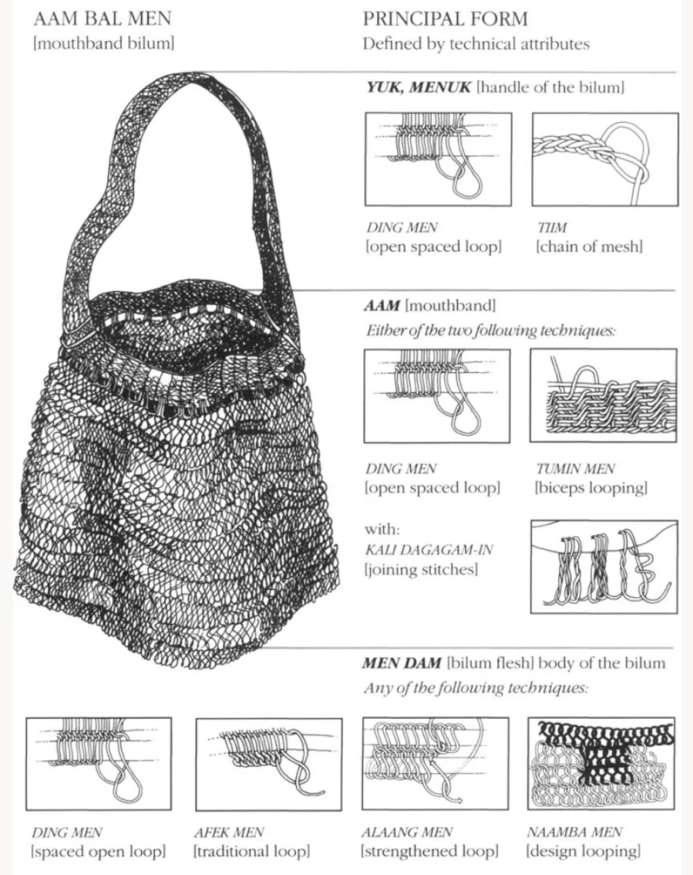


Figure 26. *Telefol techniques of construction used to make the* aam bal men (MacKenzie 1991:52).

Ding men ['mesh gauge looping' or 'open spaced looping'] is the most common looping technique for the domestic bilum (MacKenzie 1991:85). So, to make the *aam*, women

construct figure-eight shaped loops around the *ding*, each one connected to the one before it. Once the row is about four to eight centimeters, the *ding* is turned over so that the working thread is once again on the left side. Another strip of *ding* is then added for the successive row and the looping begins again, connecting into the preceding rows as it is looped. The process is replicated "until the *aam* is about 60 centimetres long" (*ibid*:87). Depending on the skill of the maker and the fiber used, the *aam* can take anywhere from three to eight hours to construct (*ibid*). The process is then repeated, creating a second strip of fabric made in the same fashion.

Another looping strategy for the mouth band is *tumin men* [biceps looping] (MacKenzie 1991:87). This traditional looping form, "now virtually forgotten," was used to make headbands and armbands, in addition to the mouth band of the *aam bal men* (*ibid*:216).[29] Although I do not discuss this looping technique in the context of its construction, the social significance of the technique is striking and worth considering. The *tumin men* technique is different from the *ding men*, consisting of *tiim* [chained mesh looping] (*ibid*:87), and it also requires a tension frame to keep the loops taut throughout the days of its construction. The name for the technique, *tumin men*, is made apparent when people traverse fast-flowing rivers. The method reflects how people hold each other's biceps to form a human chain. This congealed action makes them stronger and better capable of getting across the river than they might alone. An *aam* looped in the *tumin men* technique is strong, with a "ridged appearance reminiscent of the linked arms and heads of a human chain" (*ibid*:87). The language of the bilum and its technical construction reflects the cohesion of social labor. I suggest that this technique is not only valued for its strength, but the overall *stability* it provides the mouth

29 MacKenzie learned tumin men from an old Duranmin woman because she could not find anyone amongst the Telefolmin who knew of the technique. Her insistence to learn the method encouraged other local women to learn the technique, ensuring its continued production (1991:108).

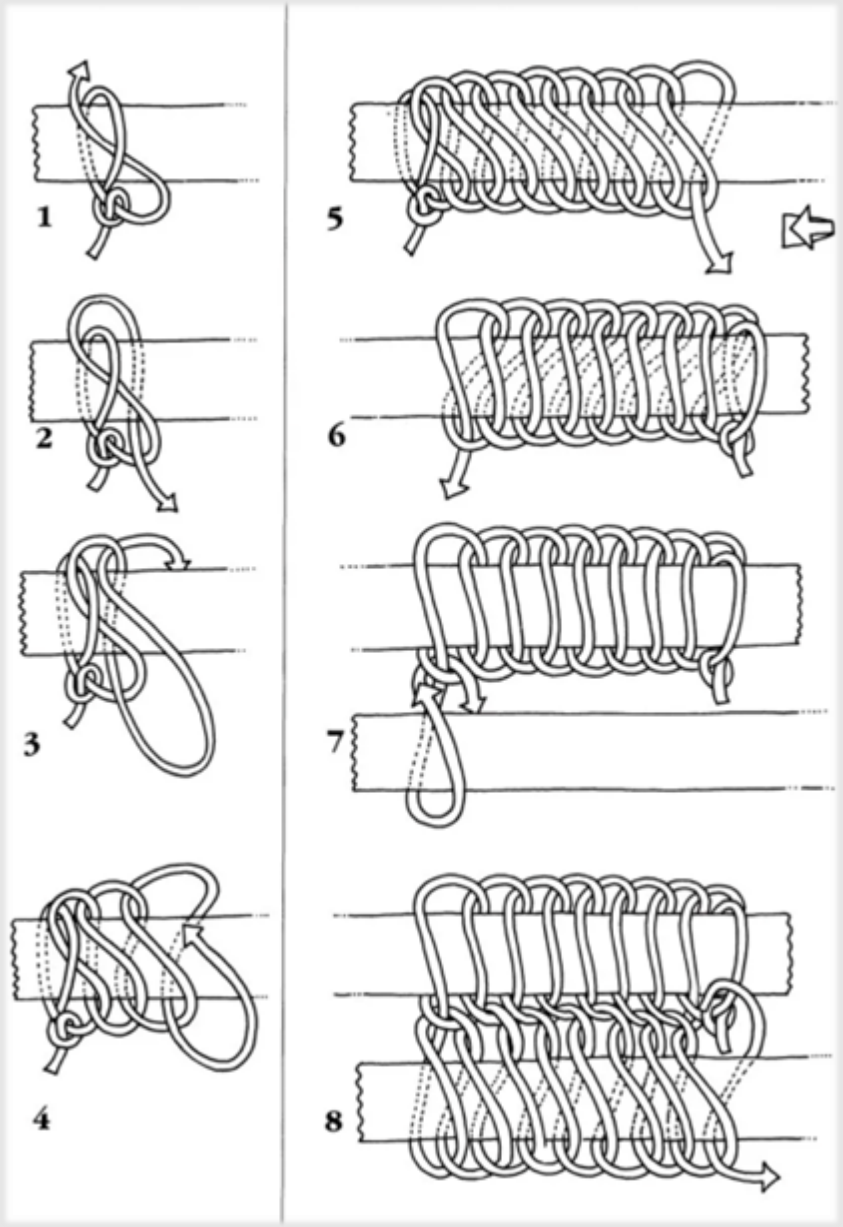


Figure 27. *Beginning* aam tamb-in*, making a flat strip of fabric with* ding men *technique* (MacKenzie 1991:86)

band. The term implies there is strength in numbers and in the mutual efforts of groups of people, suggesting that a cooperative collective is more stable than an individual. Combining the labor of the collective whole functions to combat the innate entropy of ecological variables, in this context the river. Furthermore, this example conveys how bilums mimetically

convey social organizing principles not exclusively related to the bilum itself, but the social system at large. Bilums then become a model that exceeds the sum of its parts, physically and conceptually, much like string figures.

Figure 28. *A woman loops a patterned bilum, requiring her to have first conceived of the design in her mind, which she enacts from memory*. Bena Bena Village, Eastern Highlands, PNG (Vuong 2018d).

Once the mouth band has been looped, the next step in the process is laying the base of the handle, *magat ii tom-in* (MacKenzie 1991:89). The two parallel strips of fabric are adjoined at their ends with a chain of *tiim.* The *tiim* forms the base of the handle and simultaneously encloses the mouth band into a circular shape. Alternating between techniques of *ding men* and *tiim*, women work in the same linear, left-to-right fashion as the *aam* [mouth band] to form the *magat* [base] for the *yuk* [handle] (*ibid*:90-91). Next, women loop the joining stitches,

kali dagagam-in, literally "to fix it down" (*ibid*:91). These stitches are designed to support the body of the bilum and are referred to as *muuk* [breast/aerial root of the pandanus tree] or *sagaal* [fingers] (*ibid*:91). They are made via a loop and twist technique, produced in spaced out clusters of three to five (*ibid*). The loops accumulate from left to right, one on top of the other, around the *aam*. As the bilum is constructed, it is identified as having body parts, *muuk* and *sagaal*. Given the intimate relationship of bilums to personhood, it is logical that they would be anatomically connected to their producers. *Muuk*, as exclusively female features, anatomically and cognitively links womanhood to bilum production.

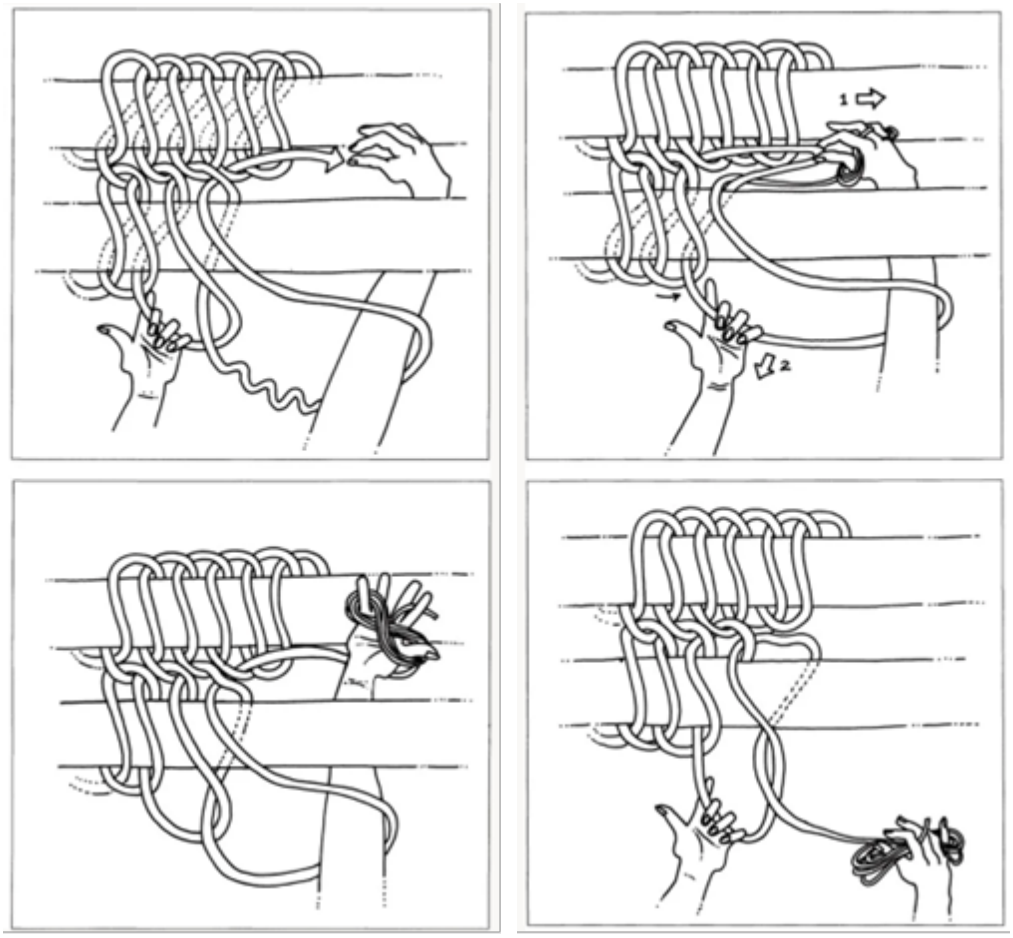


Figure 29. *Telefol step-by-step process of looping* ding men (MacKenzie 1991:94-95).

Having looped the joining stitches, *men faamb-in* [looping the body of the bilum] begins (MacKenzie 1991:93). The body is looped using the *ding men* method, as was used for the *aam*, or some other form of flexible, interconnected open looping technique. If using the *ding men* technique, a larger, wider *ding* is used than the one used for constructing the *aam* to make the meshwork more open. Rather than the linear, back and forth motion required for the *aam*, the loops of the body are continuous in motion and build upon each other sequentially in a "spiraling form" (West 1980 in MacKenzie 1991:93). The bag never needs to be rotated to start a new row due to its continuous nature. When the loops have obscured the entirety of the *ding*, a new piece is added, and the maker continues looping. Once the body of the bilum is the desired depth, approximately an arm's length from the tip of the fingers to the base of the elbow, the bottom of the bag is looped together to fasten the cylindrical shape of the netting into a receptacle. The process is done via figure eight loops which connect to each side of the bag and are referred to as joining the *oltem* [anus] (MacKenzie 1991:98).

After the cylindrical shape becomes a closed container, women make the handle in the same linear and open looping process as the *aam*. Approximately four lengths of string are worked from each side of the mouth band and then are joined using the same technique as joining the base of the bag (MacKenzie 1991). At this point the principal form is complete. The only remaining task is to remove the strips of *ding*, which have remained throughout the construction of the bag to help the bilum remain taut. Once removed, the bag becomes more limber and yielding, and is ready to be carried.

IV. Using: The Object in Flux

Aam bal men: A Telefol Woman's Constant Companion

Once a woman completes an *aam bal men*, she may keep the bag for herself or give it to a female friend, sister, or daughter. In these contexts, the *aam bal men* is used as a domestic carrier bag. It is inappropriate for a woman to be seen without her bilum, so she carries the *aam bal men* everywhere (MacKenzie 1991). It is particularly useful in women's social activities, such as gardening and childbearing. While tending a garden, a woman carries different items in her bag depending on the phase of cultivation. For example, she might carry tools in her bilum for planting and maintaining the growth of the garden, and at harvest, she fills her bilum with the fruits of her labor: taro, cassava, and sweet potatoes. Once a woman becomes a mother, her *aam bal men* is a cradle for her newborn. The baby sleeps in the bilum while his/her mother performs her daily gardening work. Thus, in use, an *aam bal men* is filled with contents that index a woman's abilities to cultivate plants and people. When full, the *aam bal men* looks like a bulging womb, associating a woman's bilum with her own procreative powers.

Women also make *aam bal men* for their male relatives, husbands, affines, and sons. In this case, the *aam bal men* undergoes another series of transformations. Men take the *aam bal men* for their use in the ritual complex and to mark phases of initiation in the male cult (MacKenzie 1991). Elaborated forms have different social implications for men than principal forms do for women. However, because the *aam bal men* is a female form, qualities of Telefol femininity continue to be realized in the object despite its differentiation as a 'new' form of male labor. Despite being re-made and used in the male context, bilums are always a reminder of the

woman who made them. The care and intention of the woman who made the bilum become recontextualized in the present as men and children use these bags for their own purposes. I now turn to the elaborated form of bilums to convey the way in which these bilums, *uun kon men* [bird feather bilums] and *men amem* [secret, sacred bilums] are a conjunction of male and female differentiation.

Men's Elaborations: Making Masculinity

The process of making the male, elaborated form consists of adding decorations onto the outside of the principal form or inserting contents within the bag. Unlike women's making which is communal and quotidian, men's bilum production is intermittent and occurs in concealed, ritualized spaces as an individualized task (MacKenzie 1991). This secretive construction occurs exclusively inside men's houses (*ibid*). Some have interpreted the elaborations of men as a means of exerting power or control over their female counterparts, by concealing the work of women with male decoration (Barth 1975). However, bilums and their dual authorship work in conjunction with the cosmological schema in the sexual division of labor, where concealment is associated with the realm of men's work and openness with women's work.[30]

Men's elaborations require them to first obtain a completed *aam bal men*. This is the preferred primary form to produce either an *uun kon men* [bird feather bilum] or a *men amem* [secret, sacred bilum]. As the bag is repurposed and transformed into an elaborated form, it becomes associated with the male identity and intimately tied to the male social context. A man carries his bilum "until it breaks, or he dies" (MacKenzie 1991:160). Therefore, the process of making

30 For more on concealment as it relates to social oppositions and bilums, see Strathern (2015).

an elaborated bilum is the conjunction of labor between men and women, where they combine their gendered labor to produce an object that mediates the opposite nature of their social roles into a positive value transformation. The bilum, as a product of their mutual labor, recalls their affinal relationship and contextualizes the maker in the present form of the bag as it is carried and used in the male context.

Figure 30. *Ceremonial Bilum at the Goroka Show* (Vuong 2018a).

I first discuss the *uun kon men* [bird feather bilum] as men produce them, describing the process as a re-making of the object and considering the associated social implications that come with these transformations. Then, I move on to discuss the production of *men amem* [secret, sacred bilum] in the ritual complex, discussing its social significance as a renewed object. Ultimately, I show how, although these forms take a different trajectory than the *aam bal men* from which they are re-made, they reproduce and build upon the cultural knowledge imbued in making the principal form. The elaborated form is embellished both physically and

cognitively to reinforce the social organizing principles embodied in the processual string object.

Uun Kon Men [Bird Feather Bilums]

Types

There are six different kinds of *uun kon men.*[31] There is the *dagasaal men,* which used to be the first initiation bilum, decorated with feathers from wild bush fowl (MacKenzie 1991:115). However, the *kabeel men* [hornbill bilum], ornamented with hornbill feathers, has now replaced the *dagasaal men* as the initiation bilum (*ibid*). Only adult men can make bird feather bilums, so the first initiation bilum is made by a father specifically for his son. Once youths are initiated, only then are they deemed capable of elaborating bilums, such as the third type of bird feather bilum the *nong men.* Initiates decorate this ceremonial bilum with red, white, and black, incorporating red, female parrot feathers, white cockatoo feathers, and iridescent black feathers (*ibid*).

The next two bird feather bilums were relevant to the two men's cults: the taro cult and the arrow cult. A *dafaal men*, or red feather bilum, was constructed for use by the ritual leader of the taro cult in the *iman ban* [taro ceremony] (MacKenzie 1991). The *bogol men*, or eagle bilum, was worn by the arrow cult leader in the *bogol ban* [eagle ceremony] (*ibid*). The final and most elaborate of the bird feather bilums is the *tiyaap men* or *tumsop men* [cassowary bilum], which is carried by all senior initiates (*ibid*:116). From the different categories of bird feather bilums,

31 MacKenzie (1991) lists a seventh bird feather bilum, namal falaak men [white flashing bilum], like the nong men. However, I have not included it in my analysis because the form was introduced by the Miyanmin and I have tried to stick to traditional Telefol forms. For more information on the namal falaak men, see MacKenzie (1991).

one can discern based on the distinctions of style and their relationship to the cult hierarchy, that labor divisions are not exclusive to sex, but involve age, as well. The *dagasaal men*, *kabeel men*, and *tiyaap men*, all have associations with specific stages of initiation, and "also have everyday uses" (*ibid*:161). Thus, a man carries these bilums as a daily carrier bag like a woman's *aam bal men*, transporting personal items, like tobacco, or bringing game meat back from a hunt (*ibid*).

(Re-)Making

Men must first acquire an *aam bal men* to begin construction of a bird feather bilum. Once acquired, they collect certain types of bird feathers, depending on which is relevant to their stage of initiation. Bamboo blades are used to split the quills of the feathers for most *uun kon men*. However, cassowary bilums require *tiin* [bees' wax] or *drii* [resin from the sacred hoop pines] to secure cassowary plumes into bundles (MacKenzie 1991:116). Men use unspun bast fibers to bind the bundles of plumes and feathers on the ceremonial cassowary bilums. Each bird feather bilum requires men to rely on their hunting skills to obtain the materials needed to make elaborated forms. Before construction of the *uun kon men* even begins, the bilum requires men to hone their skills and enhance their masculine qualities by proving their prowess as a hunter. Recall that men's social role is defined by their hunting, ability to protect the village, and through political engagements. Now that warfare is less common and the cult system has dissolved due to missionary intervention, hunting is the primary way in which men define their masculinity (*ibid*). As such, not only are elaborated forms contextually specific for men as a group, but the individual prowess of a man, too.

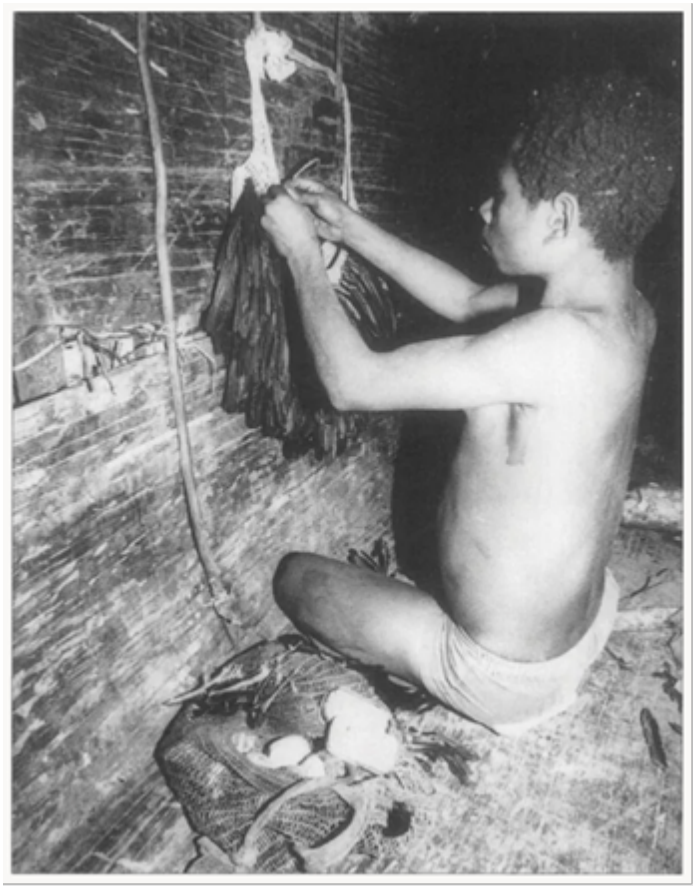
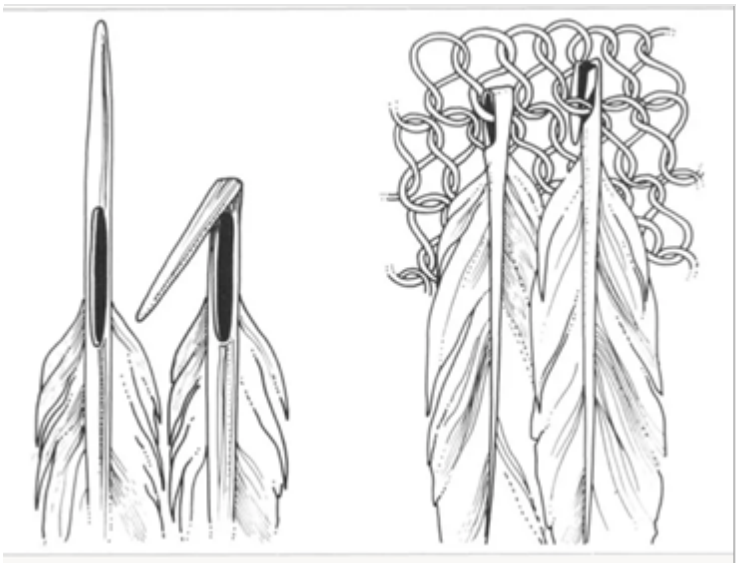


Figure 31. *A Baktaman initiate inside the* yolam *[men's house] applies feathers to an* uun kon men *indicating his third stage of initiation,* Wok Tenbip village, 1982 (MacKenzie 1991:118).

Once a man has acquired enough feathers, he can begin construction. To apply the feathers, men suspend the bilum on the wall of the men's house. Beginning from the base of the bag and moving upwards, they attach the feathers around the open loops of the bilum. For the application of most bird feather bilums, men cut a slit in the feather near the base of the plume and wrap the quill around one of the open loops. The tip of the quill is then tucked into the slit, securing the feather around the loop of the bilum. Thus, men engage in their own form of looping, when they wrap feathers around the open weave of the bilum. They repeat this process for 10-15 rows, depending on the size of the bilum, applying 40 to 50 feathers per row (MacKenzie 1991:120). The feathers are only applied to the outward-facing side of the bilum,

attached so that they hang vertically, flush with the bag. The strap and the side which is held against the body are left undecorated (*ibid*).



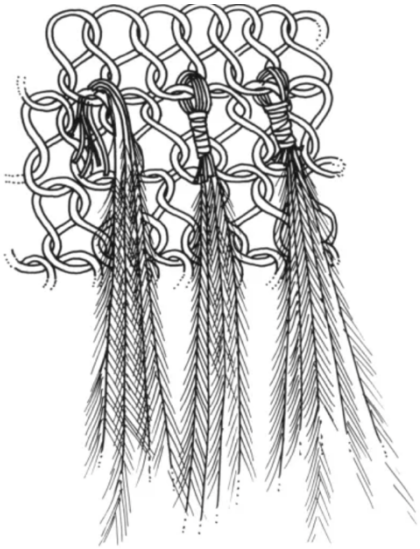


Figure 32. Left: *Telefol method for applying quills to the* aam bal men (MacKenzie 1991:117).

Figure 33. Right: *Telefol method for applying cassowary plumage to the* aam bal men (*ibid*:119).

Cassowary bilums are an exception to the application process outlined above, requiring more time and attention because their feathers do not have quills that can be easily attached. The *tiyaap men* is constructed to look like the tail of a cassowary. The tail consists of 20-25 plumes which are bound with unspun bast fiber to a pliable loop of *dagan* [lawyer cane] (MacKenzie 1991:116). These clusters are then threaded through 13-15 central loops of the bag in two successive rows above the base (*ibid*:121). Additional bunched plumes are added to the row above the cane-bound plumes to make the tail bushier. The remaining exposed mesh of the bag is covered with bunched plumes. Sometimes men add an individualized feature, adorning the bilum with a bit of personal flair such as a piece of colored plumage from another bird species. In total, the bag is covered with 10-20 rows of approximately 80-100 sprays of plumes per row (*ibid*). These bilums are particularly rare, as they are created and carried by those who

achieve the final stage of initiation. Due to the complexity and time-consuming nature of *tiyaap men*, some men have instead attached the entire hide to the bilum, rather than taking the time to attach individual plumage. This form does not have a tail and is the *tumsop men* version of the cassowary bilum (*ibid*:122).

The Social Logic and Significance of Bird Feather Bilums

For the Telefolmin, certain species of birds, like the wildfowl, hornbill, and cassowary, are distinct from others acting as a "male mother" (MacKenzie 1991:170). The male of each of these species is responsible for "incubation, nurturance, and protection of the young; activities which are unequivocally associated with the mother in human reproduction" (*ibid*:170). Even though the *dagasaal men* [first initiation bilum] has been replaced by the *kabeel men* [hornbill bilum], I posit that the decision informing this change derives from their similar sexual obligations. By using these specific feathers, initiates come to understand a Telefol woman's social role in the male sphere of influence, gaining insight into the qualities that make a good mother. Knowledge of these birds, however, is twofold. Traditionally, warfare and hunting were integral to a Telefol man's social duties, tasks that are protective and nurturing, providing food (game meat) and safeguarding women and children. Thus, the birds as 'male mothers,' also convey a form of male care compatible with that of a woman's nurturing responsibilities.

The process of constructing an *uun kon men* involves men physically covering the *aam bal men*. In doing so, the man's feather decorations are visually dominant over the open loops of the bag, containing the work of his female counterpart. This process of 'containment' (Strathern 2015), rather than concealment, reflects the way a man is responsible for the protection and well-being of the social collective. Containment can then be perceived as a protective measure rather than a controlling one, as Fredrik Barth (1975) suggested. The process of applying these

Figure 34. Left: *The* tiyaap men *[cassowary bilum] complete with plumes and tail* (MacKenzie 1991:121).

Figure 35. Right: *First initiation bilum from Bolovip,* PNG (ibid:IV).

feathers requires initiates to recall the cultural significance of the bird species, which functions to inform their own social roles, whilst recalling the role of the woman who made the bag to which he adds these feathers. As a man applies feathers to the principal form of the bilum, he transforms the female form of the bilum into an object of multiple authorship, allowing initiates to explore both men's and women's social obligations by conflating them. As Victor Turner says, "liminality implies that the high could not be high unless the low existed, and he who is high must experience what it is like to be low" (1995:97). The cognitive process imbued in making the *uun kon men* furnishes initiates with the understanding that "women provide a necessary contribution which is a prerequisite of all male activity" (MacKenzie 1991:56).

Therefore, men cannot provide for the social collective without the reciprocal efforts of a woman. This reciprocity promotes balance within the social framework, where cosmological oppositions understand differentiation as "a point of departure for thought and action, not the desired result of either" (Damon 1990:172).

The conflation of sexual responsibilities is not limited to the bush fowl, hornbills, and cassowaries. The same can be said for the creator ancestress, Afek. In Telefol mythology, cassowaries are symbolically synonymous with Afek. "So, when Telefol elders attach the plumes of the cassowary to the *aam bal men*, already a specifically uterine symbol, they are in fact creating a portable embodiment of Afek's womb" (MacKenzie 1991:173). I suggest that there is no true origin myth for Afek — "the Primal Mother herself does not have an origin story" (*ibid*:45) — because she alone is capable of procreativity, literally carrying its embodied form with her. She represents and enacts the socially valued roles of women, through masculine associations of the ritual context. As such, Afek conflates the social responsibilities of men and women into a singular entity. Although she is provided with her cosmological opposite, Umoin, her brother/husband, it seems she herself originated without the conjunctive labor of the cosmological oppositions.

I suggest this is possible on account of Afek's primordial, cosmological identity. In the *Anthropology of Time,* Alfred Gell discusses the way in which people interpret the passage of time in relation to the cosmos, saying that when "we encounter the flux of our own spiritual powers, which we reify and project onto the cosmos, which simply *is,* and knows nothing of past, present, and future" (1992:237). I postulate that the state of the cosmos as simply 'being,' extends to deities, in which people 'reify and project' their own conceived notions — in this case the sexual division of labor — back onto the cosmological embodiment of Afek. In the

way that time is a personal and socially constructed experience, so too are the distinct social roles and sexual divisions attributed to Telefol men and women. Just as the cassowary feathers (a masculine elaboration) contribute to the procreative powers of the *aam bal men* (a feminine form), Afek is represented by both cassowaries and bilums, "primordially placing men and women in an interdependent partnership to produce and reproduce Telefol social and cultural life" (MacKenzie 1991:146). Afek cosmologically manifests "the paradox that despite the apparent autonomy of male cult activities, the cooperation and involvement of women is necessary and crucial for all of men's projects" (*ibid*:180), by embodying the conjunction of the male and female cultural identities. Therefore, Afek's identification with bilums and cassowaries conflates the antithetical roles of men and women into one cosmological form. In doing so, Afek herself symbolically reflects the qualities of integration and productivity physically embodied in the string object she carries. The bilum is an extension of Afek and her procreativity. Given this cosmological framework, with which bilums are intimately connected, I suggest that bilum bags objectify and instantiate the value transformations of men's and women's social roles and activities.

It is significant that MacKenzie refers to the seemingly autonomous male cult as a 'paradox' of the actuality of social relations which requires the combination of female labor. This claim reinforces the paradox of string as a model for social stability via an unstable topology, much like I highlighted in string figures. However, it seems that paradox characterizes the social framework of the Telefolmin. String objects, especially bilums, become a means of communicating these structural organizing principles, which require cohesion amongst opposites in order to thwart the entropic nature of social life. Hence, string and its products inhere the features of social life and enact forms that make the patterns of their construction coherent.

Men Amem [Secret, Sacred Bilums]

Types

I now move on to the other form of male elaboration of the *aam bal men*, the *men amem* [secret, sacred bilum]. Although these objects are no longer produced, they are significant to understanding the processual nature of bilums and the generative powers immanent within these forms. MacKenzie defines *men amem* as a "generic term for all the sacred open-looped bilums which contain the bones of ancestor spirits, *usong*, or other cult sacra, created and curated by ritual experts," identifying six different subtypes: *un men*, *iman men*, *olkupmen*, *kong men*, *unang miliip men*, and *sa men* (1991:223). *Men amem* were rare and their construction was dependent upon the death of a well-respected hunter or gardener. According to MacKenzie, "whole generations may pass without the production of this type of bilum" (1991:113). *Men amem* were of great importance to the ritual complex, because they contained the bones of individual *usong* [ancestor spirits], which are considered a valuable source of economic and spiritual aid for the living (*ibid*:182).

These bilums were created by ritual specialists. The practice originated from myths surrounding Afek, who made the first *men amem* from her brother Umoin's bones. In placing the bones into the bilum with the proper ritual accompaniments, the deceased would transform into an ancestor. Prior to the dissolution of the cult system, each cult had sacred bilums, the *iman men* [taro sacred bilum] and the *un men* [arrow sacred bilum]. I focus on the use of the *iman men* and the ritual in which they were constructed, primarily because the *iman men* was relevant to the production of taro in the region. *Iman men* were associated with the taro cult and helped to inform the ecological cycles of these tubers. The taro cult is significant

given that its participation was exclusively for men while socially alluding to the reproductive features of women (*ibid*).

(Re-)Making

The process of making an *iman men* was highly ritualistic. Bones of the deceased were entreated to become an ancestor spirit to assist the Telefol in the living realm, rather than becoming a ghost who moves on to the land of the dead (MacKenzie 1991). Members of the cult moved the recently deceased into their garden to expose the bones of the corpse. The body would have been placed on an exposed platform, layered with *ilub* and *driim* leaves (*ibid*:122). These leaves were chosen for their associations with women and men. *Ilub* leaves are red in color, and women used them to wrap the umbilical cord of their babies in order to protect it (*ibid*). On the other hand, *driim* [hoop pine] trees surrounded the *yolam* [men's house], a secret, sacred ritual space, at Telefolip (*ibid*). When the altar had been lined with the leaves and the deceased was placed upon the platform, heat-softened taro leaves were placed on the head of the deceased, and taro leaves were placed in the mouth of man or *bagan* [red ochre clay] if it was a woman (*ibid*:123). After inciting the *sinik* [spirit] to remain with the Telefolmin as an *usong* [ancestor spirit], the cult leader would mark the space as taboo to everyone by planting *tobaal* [red cordyline bush] (*ibid*). This space remained taboo for four to five months, leaving the flesh to rot and reveal the bones, whilst also leaving the garden to die. Once the transformation of red flesh into white bones was complete, the ritual specialist would collect the bones and place them in the bilum using tongs. The bones could not be touched with the bare hand, for they were "too potent to be touched directly" (*ibid*:123). The bilum was lined with the same leaves that adorned the altar, *ilub* (red leaves), and *driim* (hoop pine) leaves, so that the ancestor could be reborn with the productive and conjunctive powers of the sexes

(*ibid*). Once again, the conflation of male and female substances and forms is required to harness the procreative powers needed for the positive value transformation of (re-)birth.

The bilum used to make an *iman men* could be any, whether it was new or had been well used, but the open-looped, *aam bal men* was preferred for the *men amem*. MacKenzie states that the use of "any bilum" alleviated men from having to rely on women to produce a bilum in the male sphere of ritual (1991:123). Once the bilum had been selected and filled with the appropriate contents, the completed *men amem* was delivered to its resting place in the *yolam* (or if in Telefolip, the appropriate women's house), hanging at eye level on the back wall (*ibid*:124). The *aam bal men* was ideal to produce a *men amem* because the open loops allowed ancestors to be comfortable, while giving them the ability to see, so they could watch over and protect the village. While the taro ritual specialist asked the new *usong* for help, beckoning them to remain as an ancestor spirit, a sacrifice and feast of two pigs was prepared and cooked to propitiate the spirit (*ibid*). If after a night of celebration in honor of the *usong,* the *mem amem* failed to be efficacious, the men disposed of the bones with the understanding that the spirit had moved on to the land of the dead. Thus, the *men amem* that are hung are implicitly understood to be filled with very powerful and benevolent *usong* (*ibid*).

In the way that I have argued string figures are both object and process, I argue the same for all bilums, but especially the *men amem,* producing a container of knowledge and physical containment. "Telefol men frequently refer to the collection of *men amem* as a library. The analogy is a good one, for much like our books and writing they contain Telefol knowledge" (MacKenzie 1991:185). String is a material that, by the hands of a woman, is transformed into the principal form of the bag (*aam bal men*), then the female-constructed form is passed to a man to become the base for male elaborations. These objects are transformed from material

to final product and back again, undergoing processes of making and re-making. Therefore, their identity as material or object is never static and far from a stable category. Like string figures, the transformational life of a bilum, as seen in the transition of the *aam bal men* into a *men amem,* shows that they are highly processual objects.

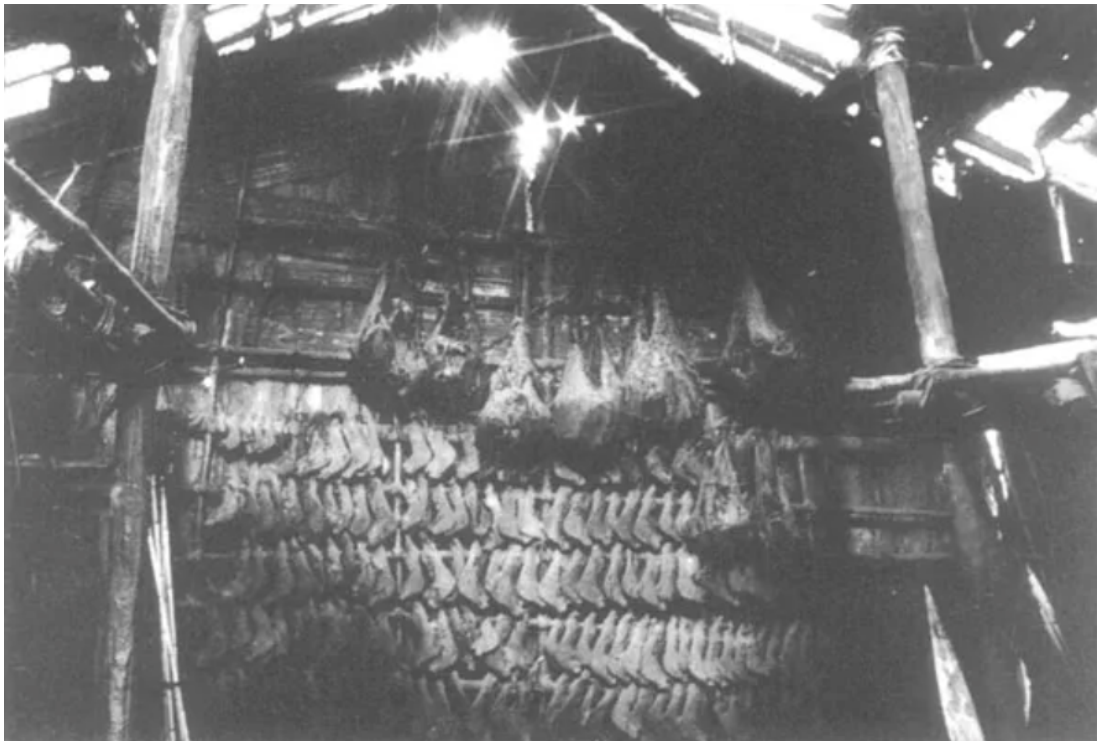


Figure 36. *In Telefolip village,* men amem *hang on the back wall of the women's house* (MacKenzie 1991:124).

Men Amem in flux: Timing Taro Cultivation

Men amem and their associated rituals had distinct sequential and organizational relations to the horticultural cycles of taro gardening. The creation of an *iman men* was accompanied by a taro fertility and initiation rite, known as *iman ban*. This ritual was performed in Telefolip, which dictated the planting cycles for taro gardens throughout the region. Upon the completion of the ritual in Telefolip, participants in the *iman ban* would return to their villages to plant the bones from their own sacred taro bilums in the center of a new garden. The taro

was only to be harvested once the sacred taro in the heart of the ritual garden at Telefolip was ready. The sacred bilums and their associated rites ensured a successful harvest throughout the region. The ritual was always scheduled in conjunction with the current state of gardens and consisted of the following:

> "The bones from the original men amem, the large sacred taro bilum called Olkupmen [the bilum of decay], which contains the bones of Afek's deceased brother/husband Umoin, were planted with one of each kind of taro, the iman tobaal [red taro] and the iman dumeen [white taro] within a fence of red cordyline" (MacKenzie 1991:186).

These three plants, which elders refer to as 'siblings' (created from Afek's vaginal secretions), formed the heart of the garden, and served to monitor growth (*ibid.*). It is significant that the center of the garden consisted of socially antithetical colors to create a productive environment capable of nurturing growth and development. The bilum ritual was indicative of social difference but contributed to the greater framework of cooperation for the collective good, as seen in the practice of giving and sharing food, where the group supersedes the individual. In this case, the string object conveys the idea that cooperation between cosmological oppositions helps to maintain the social fabric and sustained positive value transformations of conjoined social labor into taro crops.

Innovations and Change

Bilums in Contemporary PNG

Now that I have discussed the indigenous looping techniques of the Telefolmin, I turn to contemporary bilum techniques and styles as they persist and change in Papua New Guinea.

As of the 1930s, the Telefol imported wool and later acrylic and nylon yarns, allowing bilum makers to produce increasingly colorful bilums with ornate designs. Along with colorful synthetic fibers and woolen yarns came non-indigenous techniques from the Central Highlands, introduced by migrant women such as nurses and the wives of policemen. These colorful bags are called *naamba men* [insignia bilum]. *Naamba*, a term imported to the lingua franca, means 'authority' and "by extension the bird of paradise on the first PNG native police *laplaps* [sarong type clothes worn like a skirt or a kilt]" (MacKenzie 1991:53). Thus, the police force represented authority, with which the bird of paradise was symbolically associated, as the insignia of authority. Carrying a *naamba men* became a token of wealth and prestige, as "brightly coloured yarns needed to make them are not available in the bush but have to be bought with cash from tradestores" (*ibid*:53). Both men and women appreciate these prestige items and carry their personal possessions in them to marketplaces and communal meetings (*ibid*).

Naamba men are unique in that, no matter the method of looping or process of construction, it is always referred to as *naamba men*. The *naamba men* technique is unlike traditional methods of looping because the looping technique itself is the "distinctive referential feature" (MacKenzie 1991:53). By contrast, the dominant feature of the domestic bilum is the *aam*, for which the bilum is named. Furthermore, in constructing the *aam bal men*, the looping technique used is directly related to the specific phase of construction. Looping *naamba men* differs because the bag is constructed of colorful patchwork blocks of looped fabric, which are "looped in freeform shapes that eventually build into symmetric patterns" (*ibid*:107). Telefol women do not use any dyes for the *aam bal men*; instead, they "create aesthetically pleasing forms by combining different looping techniques to create textural effects" (*ibid*:70). Despite

these distinctions and differences, *naamba men* offer women a level of creativity and innovation in design that traditional looping techniques of the *aam bal men* do not allow.

These colorful bilums remain popular alongside traditional forms. Barbara Andersen considers how bilums have changed since MacKenzie wrote her ethnography on the Telefolmin, claiming that bilums remain "one of the most culturally significant" (2015:16) objects in contemporary PNG, describing them as "multifunctional, and symbolically dense" (*ibid*:20). While distinctions of gender and initiation stage are still represented, growing social inequalities are now being expressed in bilum production. Bilums have always been a means of conveying difference, and continue to do so, looping distinctions of class, education, region, generation, urban and rural residence, and so on into the bags. I briefly discuss some of these changes and the implications they have for a 'traditional' craft that recreates these forms to facilitate the "pursuit of cosmopolitan goals of mobility and freedom" in contemporary PNG (*ibid*:16).

Changes in habits of consumption, lifestyle, and technological influences have led to changes in traditional bilum production and wear, especially for women. As in the case of the Telefolmin, large, open-looped bilums are traditionally used by women to transport tubers and vegetables, firewood, and babies. However, women's bilums have been getting smaller over time, due to changing urban lifestyles. Urban women carry bilums that are small, tightly woven, and worn over the shoulder rather than the head. The urban bilum lacks "the major indices of traditional female tasks — expansiveness and the capacity to be carried on the head" and can be carried by either sex (Andersen 2015:16). There are several reasons for this change. First and foremost, there is utilitarian logic governing these changes; in towns, the items women carry differ from those carried by women who live in the bush. An urban woman may

only carry money, a cell phone, or a pack of cigarettes. Second, bilum innovations respond to social problems, such as crime, which further reveals the conditions that make pickpocketing possible, such as "labour migration and dislocation, resource extraction projects, the Australian colonial legacy and globalization" (*ibid:*20). A rectangular bilum with a shorter handle can be worn close to the body while a tighter weave obscures its contents, features designed to prevent pickpocketing and theft. Innovation has adapted to changing social circumstances, however not all these changes are negative. Small bilums are attractive to young women, because they "provide the ideal canvas for innovations in technique, materials, texture and colour," and even shape, depending on stitching technique (*ibid*:20). These innovations offer more opportunity for self-expression and artistic creativity of design.

The way in which bilums mark social groups is more apparent "when people carry them in incongruous ways," which Andersen refers to as 'bilum-drag,' where people carry bilums for comic or subversive purposes (2015:18). She notes "one of the first things I was told about an individual described as a 'gay man,' whose effeminate public behaviour made him a minor celebrity, was that he carried his bilum on his head" (*ibid:*18). A means of self-expression, this man indexed his identity by publicly carrying his bilum in traditional female fashion. Andersen also describes a young female nursing student dressed as a Highlands grandmother for a health education skit about tuberculosis (*ibid*). To index old age, rural residence, and a presumed 'traditional' ignorance about TB, the student donned a bulky hooded coat and large bilum worn from the head. People continue to engage in self-construction via bilums but in such a way that reflects the complexities of the social system as it changes over time, allowing for a more robust expression of personae.

Contemporary bilum production also has developed in tandem with what Andersen calls the "technology of display" (2015:20). The internet offers bilum makers an expanded global market, and the ability to contact overseas patrons rather than "working through handicraft cooperatives or selling in tourist markets, which are monopolized by older women" (*ibid:*20). The advent of the internet also provides solutions to the issues faced by MacKenzie in the 1980s, where certain techniques of looping have been lost entirely or are on the verge of going extinct.[32] Technology at the tip of one's fingers provides the opportunity to document and record these different methods and techniques, promoting "the uptake and preservation of bilum production among young women" (*ibid:*20). Innovative bilum practices and the advent of technological resources show how women have adapted bilum practices to changing times and circumstances while continuing to use the medium for self-expression.

From Container to Clothing: Bilumwear

New methods and designs are not the only innovations that looping techniques have offered. On a smaller scale bilum techniques and fabric have been used as outerwear. Although still a container, an empty *aam bal men* protected a Telefol woman's back from the elements as she worked (MacKenzie 1991). By contrast, tighter looping techniques were once employed to make traditional armor (*ibid*:11), and when Christian preachers condemned showing bare breasts in public, Sepik women utilized bilums, tied at the neck and waist to cover themselves. Since then, "bilumwear — a term for clothing made from looping techniques" — has entered

32 MacKenzie cites the molop men [tail hairs bilum] as one such example of extinct bilum technique, which had not been made for a generation at the time in which she did her fieldwork (1991:108). She describes the remaining molop men in use, but no one knew how to make the form anymore.

the realm of art and fashion (Garnier 2009: NP).[33] The earliest of these garments were made of red, black, and yellow fibers, reflecting PNG's national flag, and were designed for special occasions such as graduations and national celebrations. Previously on such occasions, men and women would have adorned the western introduced "Meri blouse," made popular in the 19th century by missionaries (Garnier 2009, Gnecchi-Ruscone 2019). Bilumwear has since then become a contemporary form of dress reflective of the "modern Papua New Guinean way of life" (Garnier 2009:NP).

Bilumwear production is comparatively limited as opposed to the global production of bilums. Yet those who produce bilumwear have unique and varying styles. However, there is a "traditional" style which is "a sheath with two straps attached at the shoulder, similar to those stitched onto a bilum bag" (Garnier 2009:NP). From this basic dress design, women have developed variations to sell in the markets at Port Moresby and Goroka. Bilumwear is more expensive than bilums or Western garments, directly related to the amount of time, materials, and labor involved in its production. Looping clothing is becoming more and more popular in PNG, and there are several women influential to the production and dissemination of bilumwear, in both the international and the local markets.

33 The use of open-looped string products for the purposes of bilum fabric as container and garment recalls my critique in Chapter 1 of Tim Ingold, who claims that the wrapping cultures of Polynesia and the tying cultures of Melanesia are "radically different" (2010b:23). This example conflates wrapping and tying as interchangeable and dependent upon context and changing circumstances, further disproving Ingold's distinction.

Figure 37. *Florence Jaukae Kamel's 2019 bilumwear collection at the Goroka Bilum Festival* (Gnecchi-Ruscone 2019:64).

On the international front, Maggie Wilson, an artist from the Western Highlands, was presumably the first to make bilumwear for a formal exhibition in Sydney in 1996 (Cochrane 1997 in Garnier 2009:NP). Shortly thereafter, Sharon Brissoni, a PNG-born Italian, employed women from the Morata settlement in Port Moresby to loop bilum clothing that she had designed (Gnecchi-Ruscone 2019), giving these women the opportunity to apply traditional knowledge and skill in a new way. Brissoni's bilum dresses were made with indigenous bark fibers and required experimentation with looping techniques to provide a light and flexible fabric. Garnier says that "the success of this first collection was largely due to this unique combination of traditional knowledge and techniques that provided a preview of how bilum techniques and fibres from the natural environment could be adapted for an international market" (2009:NP).

Local, entrepreneurial women have taken up the niche production of bilumwear, such as Florence Jaukae, whose parents are from the East Sepik and Eastern Highlands, and Cathy

Kata, who is from the Western Highlands (Garnier 2009), both of whom are considered “the main protagonists of the current fashion trend” (Gnecchi-Ruscone 2019:65). The process of making bilumwear is “a risky operation” because making bilumwear “is time-consuming and looping a dress may take weeks and even months to be completed” (Garnier 2009:NP). Brissoni, Jaukae, and Kata have employed female cooperatives, who work together to produce these garments, giving women in difficult economic and social circumstances the chance to earn money and support their families. This collaborative method of production "represents a departure from customary bilum making” (Gnecchi-Ruscone 2019:67), as it is new to bilum production. Previously, bilum production was such that women would “arrange their daily work activities so their context is communal even though their production is individual” (MacKenzie 1991:63). Bilumwear, however, invokes the communal in process and product, making it a collaborative endeavor throughout.

Figure 38. Florence Jaukae in bilumwear (https://emtv.com.pg/florence-jaukae-turning-negativity-into-success-with-bilumwear/)

Florence Jaukae and Cathy Kata have developed a client-based mode of production, which allows them to experiment with designs based on client requests and their own creativity, rather than Sharon Brissoni, who is subject to the international market and the expectations of global fashion. In Port Moresby, fashion shows for charity events such as the Salvation Army Gala Night (2007) and the Election of Miss PNG Red Cross (2008) display bilumwear down the runway (Garnier 2009), while Jaukae puts her work on display at the Goroka Bilum Festival (Gnecchi-Ruscone 2019). PNG women have innovated looping techniques to create attire reflecting a PNG identity, especially in urban areas. For example, Kata has begun integrating feathers into her bilum fashion, "drawing on customs of twisting feathers into bilums found in the Simbu Province" (Garnier 2009:NP). In contemporary bilum production, however, if a particular innovation or design is successful in the market, it is quickly adapted by other bilum makers. The same occurs in the production of bilumwear as popular patterns are adapted to garment designs. Like the ghost-net sculptures from Chapter 1, innovative bilum practices show how string objects provide the opportunity for innovation of 'traditional' practices, requiring makers to draw on previous knowledge in new and different ways. As such, bilumwear allows contemporary PNG women "to choose clothes which fit with the construction of new feminine subjectivities involved with modernity yet wishing to acknowledge and display a recognition of and connection to local traditions" (Gnecchi-Ruscone 2019:64).

In summary, bilumwear takes traditional practices and shifts them into new innovative contexts, where women can assert autonomy in new ways and utilize traditional skills and knowledge, reflecting the changing social circumstances of PNG life. Bilumwear collectives promote a collaborative space where women co-produce objects, offering these women stability, income, and solidarity in an ever-changing social framework. Bilumwear encourages

the continued legacy of looping techniques and cultural transmission of skills between generations, while allowing women a new identity that is compatible with the contemporary context of PNG. Thus, in producing bilumwear women take past bilum practices and traditions and recreate them in the present context, preserving these traditions and taking them into the future. The production of bilumwear is a manifestation of the temporal principles I have discussed in Chapter 1, where past and future are conflated into the singularity of production in the present. Although a new and changing medium, bilumwear manifests traditional concepts of Melanesian time and sociality based on continuity and cohesion.

Part II: Fishing Nets

I. The Ethnographic Context

Nets are commonly used string objects in the island communities of Oceania, especially on the island of Muyuw. Like bilums, they are a functional tool for the quotidian subsistence activity of acquiring food. Nets are handcrafted with the same care, attention, and specialized labor as bilums, but utilize different methods. Yet, they still employ similar structural principles of organization. Although not all nets are still crafted by hand due to the industrialization of fishing, there are traditional forms that survive. On Muyuw, there are several different types of nets that have distinct names, dictating their shape and size. For example, the traditional fishing net is called *wot*, a rectangular shape three to six feet top to bottom and about 60 feet long (Damon 1990:243). There is also the *teikw*, which is a mesh square of two meters used to catch *tanin* — a sardine-like fish — off the shores of the island (Damon 2017:279). I focus on *wot* as it is made, used, and re-made, showing how the production and use of this string object reinforces balance and reciprocity between cosmological oppositions as a model for cohesion and stability. Although the cosmological oppositions vary (i.e., male/female, old/new), they model complementary relations as the net is made and used. I begin with a description of the net itself and follow with an analysis of the social implications of making and using *wot*.

Figure 39. *Talibonas, one of Damon's interlocutors, holding the tension frame of a* teikw. *The frame is exclusively used in its construction (or reconstruction)* (Photo courtesy of Fred Damon).

II. Form

The Anatomy of Wot

The top of the net is referred to as *kayon* [throat], to which *kut* [wooden floats] are fastened. Going from left to right (or vice versa), the net is divided from the *kayon* to the *kakein* [foot] into four distinct quarters, two of which are called *asan* and the other two *daban*. *Asan* refers to the two outermost quarters of the net and *daban* [forehead] refers to the central two quarters. The *daban* is divided symmetrically into two sections by the *pwason* [navel], which also runs from the *kayon* at the top of the net to the *kakein* at the bottom. The *pwason* is significant because this is the line that is cut when a *say* [new section of net] needs to be

attached, making it a liminal point in the net. "The various uses of the word *pwason* suggest that it denotes transition points, especially between old and new, rather than just a body part" (Damon 1990:243).

The *asan* [outer sides of the net] are also further differentiated by their positionality. On the left, *asan* is referred to as *simugwey*, which derives from the verb *mug* [lead], where the right outer side is referred to as *sinoyem*, from the word *wankuyem* [back, behind, or after]. On the bottom of the net, shells are attached to weigh it down, referred to as *lag* and *kiyak*. *Lag* are larger and heavier than *kiyak.* Consequently, *lag* are exclusively attached to the base of the *daban*, while along the base of the *asan*, an alternating pattern of a singular *lag* are followed by three pairs of *kiyak*, which are stacked two per unit. The heaviest weight, *benebin* [cylindrical piece of greenstone] is about six to eight inches long and is attached to the center of the *kakein.* At the opposite end of the *pwason* is the largest of the floats, *amusukw. Amusukw* is attached at one end to the *kayon*, while the other end is tied to a string connected to a stick, called *adadout. Adadout* is approximately six feet long with feathers attached to the end, functioning as an indicator of a full net. When the net is empty the *adadout* rests idly on the surface of the water, but when the net is full and taut, the *adadout* is pulled perpendicular to the water, standing to attention, swaying proudly as to signify a successful catch (Damon 1990:243).

The morphology of *wot* associates the human body with the string object and vice versa, physically through construction and metaphorically through the linguistic norms that characterize their form. In this way, *wot* becomes an extension of the human body. I posit that the haptic process of construction and the anatomical attribution of human body parts to the morphology of the net itself helps to incite the social action that makes it a productive object.

In thinking through the object's construction and employing the human body to make the form, people are provided with the association of action, thought, and coordination embodied in the hands (and by extension, the men) that make it. Therefore, it is easy to mentally connect embodied thought and action employed in production to the same principles that inform its use. Using a net also requires collective, embodied labor, mirrored in the physical connection and the action of the net itself, which I discuss later in this chapter.

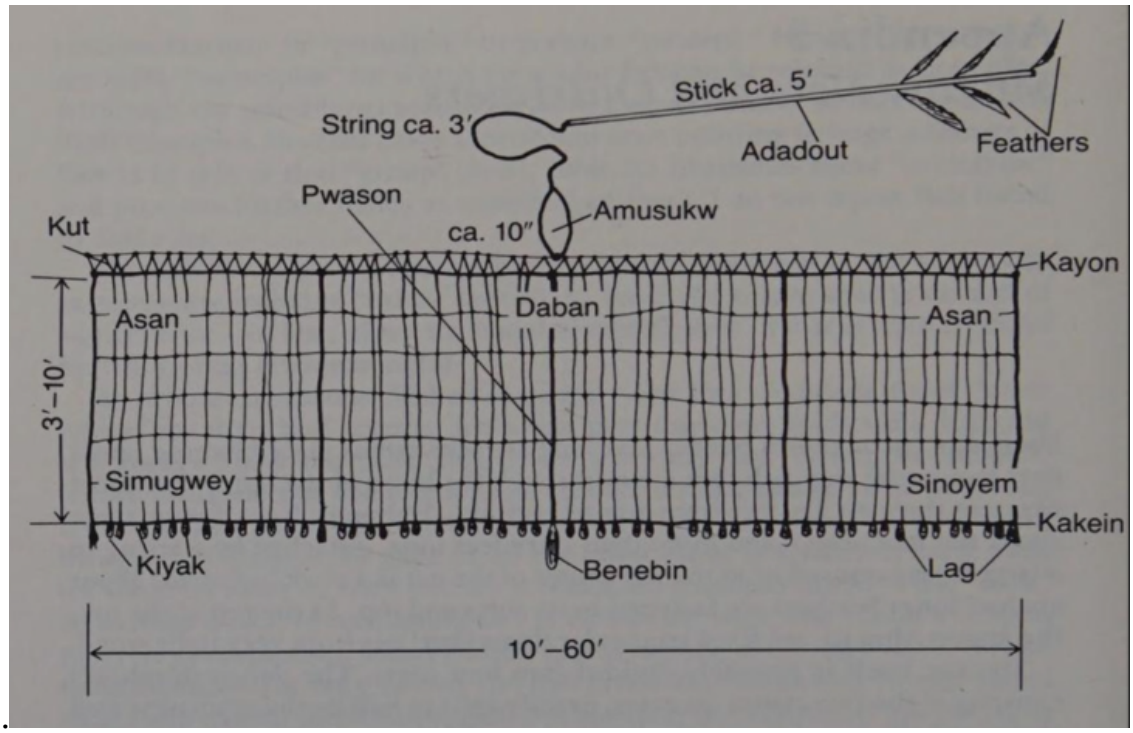


Figure 40. *Depiction of Muyuw* wot (Damon 1990:244).

III. Making: Material in Flux

Materials and Tools

The materials required to make a net coalesce the resources of different regions across the island. The bark used to make the bast fiber string for nets comes from *gudugud* (*Pipturus*

argenteus) saplings in early garden fallows (*digadag*) (Damon 2017:115). The bast fiber may also come from the same vine *im* used to make string figures, and when these fibers are woven together, they are relatively strong and exude friction, making them easy to manipulate (Damon, *personal communication*). The floats for the top of the net come from *ayovay* trees, known for having exceptionally light wood, planted in or near the village (*ibid:*160). The shells and *benebin* for the bottom of the net are acquired from the Sulog area, the south-central region of the island, while a shark's tooth from Budibud is required to make the first cut from the old net (ibid). By combining materials from across the island into a productive whole, social interrelations reflect the connections formed in the net itself, a powerful notion for cohesion in this region. As for tools, there are few required, simply the maker's body, especially his hands.

Constructing Wot

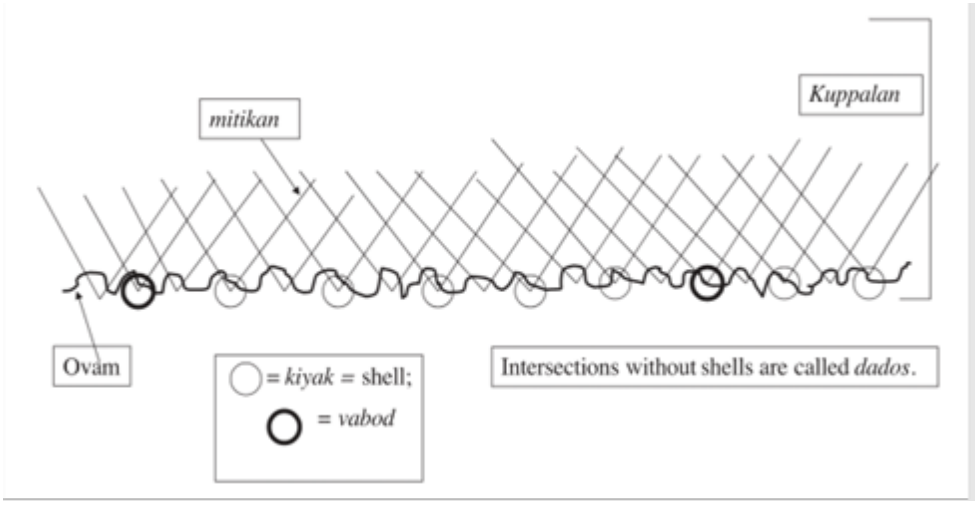


Figure 41. *Base of a Muyuw Fishing Net, showing where the* vabod *method attach shells to the net* (Damon 2017:280).

The body of *wot* employs a weaving technique that is combined with *siptawau* knots to produce a diamond-shaped weave. Each end of the net consists of a triangular weave at the

very top and bottom of the net. A thick string called *ovam* is then threaded through these triangular sections, attaching *kut* [wooden floats] to the top of the net and *kiyak* and *lag* [shell weights] to the bottom (Damon 2017). The *ovam* is threaded through the triangle-shaped weave from left to right, its maker holding a shell or float with the left hand and threading the *ovam* with the right. To add shells to the base of the *wot*, a hole is poked through the top of the shell so that it can be threaded with the *ovam* and secured to the net. The *vabod* method, used in securing shells to the base of the net, is named as such because every seventh shell is tied with the "vabod" knot (*ibid:*281). Like with bilums, the name for the process and thing, in this case the knot and the method of tying, are identified by the same term. This lack of distinction between object and process reiterates that these objects are highly processual and encapsulate ongoingness.

Figure 42. *Gumiya showing the* vabod *sequence, each hand holding the beginning and end of the sequence in which the knot form appears* (Photo courtesy of Fred Damon).

Because of their constant use, *wot* wear out quickly and undergo continuous processes of making every few years. Old, worn fragments on the ends of the net are cut out and replaced with new sections, *say*, which are spliced into the middle (Damon 2000). When the net is spliced, the left side must be tied first, then the right and is tied from top to bottom. As *wot* are of different shapes and sizes, the newly woven section of net is matched up identically to the portion it replaced. The construction of a *say* is a process of renewal, where a new section is woven and then joined with the older, original body of the net.

Thinking about the conjunction of the old and new, Nancy Munn says that yam "planting requires the use of some part of the material substance of a previous harvest, such that renewal involves the generations of the "new" from some part of the "old"' (1986:81). The process of making nets models a positive value transformation where old and new unite to create a productive entity, tied up with associations of renewal. Once again, string products reflect the processes of growing and tending yam gardens. Given that string figures are a cognitive paradigm for other string objects, as well as yam gardens, it is logical that nets would continue to reflect and reproduce these same patterns, showing a "pattern's capacity to move freely from one form to another" (Were 2010:1). Hence, string as a model conflates patterns of sequential organization so that this knowledge is easily accessible and readily produced in a variety of social contexts. As a result, reproducing patterns inculcate the processes by which positive value transformations occur.

Weaving nets is a form of specialized labor reserved exclusively for elder men. Nets are constructed by the masculine method of tying, which is sturdy and holds firm. Elders take turns constructing the new segments in a communal effort and then, once completed and

Figure 43. *Takanayob, a Muyuw elder, takes a turn weaving a* say *[new net section]* (Photo courtesy of Fred Damon).

rejoined, they distribute the net to younger men for use. The net becomes a "repository of their energies that should last through time" (Damon 2000:56). The transmission of process from making to use, goes from the top of the social hierarchy (elders) to the bottom (young men), where it becomes clear that age is important to the division of labor. The net becomes an effective and productive entity by congealing the labor of old and new, past and present. The process of production physically combines the old net section and the newly woven one, reflecting the conjunction of labor between elder men (past) who weave and join the sections, and the younger men (present) who acquire the refurbished net to conjoin their own productive labor into acquiring fish. As such, renewal would seem to be a powerful positive value transformation associated with nets, where the action combining these polarized opposites unite to create highly productive embodiments of action.

Elders mend an old *wot* in front of the owner's house, in a space referred to as *takoven* (Damon 1990:128).[34] A large pole is stuck into the ground in the *takoven*, and any associated magic or craftsmanship occurs between the pole and the inside of the house. The tying of the net and splicing it onto the existing piece takes only a day, but the process is not complete until the new net section "is bleached to the same white as the older part of the net" (*ibid:*129). The brownish, new section of netting may take months to change hue. During this time, there are a series of taboos surrounding the net and its use, indicated by the pole which remains in the *takoven* until the net is completely white. For instance, any fish caught with the net must be boiled, as they cannot encounter flame until the net has transitioned. The man in charge of the ritual may not eat any fish that come from the net. And finally, until the net is white, pregnant women should not have physical contact with the net (*ibid*). Thus, these rules seem to indicate that (re-)making a net is not complete until the time at which it becomes white. Hence, making is not reduced to exclusively technical processes enacted by makers, but includes ongoing organic processes which 'construct' the item while it is in use.

IV. Using: The Object in Flux

Using Wot: Social Cohesion

I now highlight the success of the model as fishing nets exist in flux, showing how string objects in use reinforce the concepts immanent in their manufacture and accrete meaning within the object. As shown in processes of making, interconnection and cohesion are socially valuable qualities of the artifactual model. Once construction of the object is complete, string

34 Takoven is male-dominated space and the focal point for public, community-wide, or extra-community discussion and decision (Damon 1990:128). The front of the house faces this central square, and thus is where the ritual process of making a net takes place.

objects continue to model cohesion and order by translating those qualities into actions taken by those who use the object. Hence, action modeled by maker and string become realized in social practice via use of the object.

To further illustrate this point, I discuss how fishing nets in use reinforce communal labor, which Malinowski describes as "performing the same work, without any technical division of labor, or social differentiation of function" (2014 [1922]:170). Fishing nets consist of communal labor in their use, requiring the concerted incorporations of bodies and action of young men and their canoes. Both *teikw* and *wot* can be maneuvered by a lone individual, but they are considered more efficient if used by groups of men (Damon 2017). With *teikw*, men operate individual nets, but they should do so in the communal context of other men so that it becomes a coordinated, systematic effort. The processes of intertwining and binding string in the production of the net become lived social action as men conjoin their labor to catch fish: "a net is realized by binding together people already defined by the tension of specific affinal and generation relations" (*ibid:*281). In sum, the form is most efficient when it congeals labor. The net in use maintains the qualities and social principles employed in its construction, such as binding and interconnectivity, functioning as a mimetic model for communal labor. To highlight the success of the model embodied in fishing nets, I now turn to the process by which *wot* are operated.

Wot are deployed in *sal* [depressions] located on *salupoy* [reefs] and are set in U or V shapes toward the back of these depressions (Damon 1990:243). The *kut* [floats] rest on top of the water, while the *lag* and *kiyak* sit on the reef. Men strategically locate themselves around the net to successfully corral fish into the net. Several men position themselves near each *asan* and throw rocks, spooking the fish towards the center of the net (*ibid:*244). Meanwhile, men in

outriggers position themselves about a hundred yards away from the net, behind the fish, and then row directly towards the net making cacophonous sounds and beating the water, chasing the fish into the net (*ibid*). When the canoes reach the center of the net, the men jump into the water to roll the fish into the net. The rolled-up net is laid into the largest outrigger and the fish are detangled from the net. The group then moves onto the next *sal* [depression] to repeat the process. Although a single person can operate *wot*, it is considered most efficient when it congeals the labor of many men. Hence, the net not only "reflects," but also "requires a totality" (Damon 2000:56).

Although *wot* requires physical action to be successful, I argue that it is still a highly cognitive form. It recalls patterns of structure and organization from string figures and other artifactual forms to inform the most efficient means of use and productive social action. The net commissions the smaller scale principles of the cultural mnemonic to be shifted to the larger scale, becoming realized as it enacts social labor. Congealing and connecting ideas, the model informs and performs social organizing principles as they are made, causing people to act in accordance with these same organizational principles.

However, it is not only in use that the object models social organizing principles. Once a net is used, it must be hung to dry before it can be returned to its corner of the house. The net is folded in half and staked up, so the weights are at the bottom and the floats are at the top (Mosko & Damon 2005). The directionality in which it is arranged to dry is significant in that it reflects the structure of a village layout, where the *wowun* [base] or *pwason* [navel] of the net is to the east and the two *asan* are staked to the west (*ibid*). Even when the net is not actively

in use, it remains a model for social organizing principles, reflecting the order of villages.[35] Thus, the object itself is a processual model of patterns experienced in the greater social framework. Just as this object goes through constant processes of making and re-making, due to its frequent and arduous use, it undergoes cycles reflective of the ecologies from which its materials are derived. Therefore, it too has a cyclical identity, like string figures. The social patterns imbued within *wot* are seen in various landscapes across Muyuw. The ongoingness of *wot* is something that makes cognitive patterns transmissible and operational in social life. Gardens, forests, and villages all structurally reflect its patterns, making the string object a powerful cultural mnemonic for ecological and social relations.

Conclusion

Within these ongoing forms, several social concepts become realized across these two string objects and relate back to my previous discussion of string figures. Central to my discussion of bilums has been the gendered division of labor and differentiated social roles of men and women. The opposition of in/out is one that is modeled in the production of bilums. The *aam bal men* is transformed and decorated by men when it becomes an *uun kon men*. This process involves men physically covering the labor of their female counterparts, where visually the man's feather decorations are dominant over the looped bag. Women's work becomes internal to the bag, while men's elaborations are external. Hence, the bilum manifests in/out in its processual construction and re-making. Some have perceived this act as obscuring a woman's labor and showing men's dominance over women (Barth 1975), while others have suggested

35 The directionality of drying is directly proportional to the significance of the cosmological oppositions east/west and left/right (see Damon 1990, Chapter 5).

that men's elaborations are less about dominance and more about containment (Strathern 2015). Yet, there are social norms that recontextualize this information. First, there are the spatial implications of men's and women's social obligations. Tasks of hunting and warfare take men outside the village, while women's domestic work as gardeners and caretakers keeps them within the confines of the village. The bilum replicates this social phenomenon in its construction, reinforced by the processes in which the bilum is made in the term *aam tamb-in* [making the mouth band]. Recalling that *tam* means inside/outside/the other side up, the term and the process amalgamate these opposite concepts into a single notion. In applying this notion to making a bilum, women can make a stable and durable piece of fabric for the mouth band, the foundation for the process of *aam bal men* production. By combining men and women's differentiations, this same stability is applied to the social fabric of Telefol culture.

Bilums also prefigure social cohesion by physically binding string together to make a complex and durable object, which then — like the *tumin men* [biceps looping] example — mimics the way in which people engage in collective action to make a human chain to traverse rivers. The binding and cohesive processes enacted in making the bags become lived social action in practice. This cohesion extends to people and to ecologies, as once again string objects are related to gardening activities. As with the *iman ban*, there is a coordinated effort to regulate and maintain taro garden cycles. The processual and serial nature of bilums allows for them to mark temporal processes in the social framework. Bilums are continuous like string figures. For example, the looping process of the body of the *aam bal men* is a continuous motion that builds upon itself sequentially. The sequences and process help to reflect the temporal flux of social life and provide a mechanism by which social activities can be organized.

However, these abilities are not exclusive to bilums. Fishing nets also combine the labor of cosmological oppositions as they are used in the conjunction of labor between elders and young men. This cohesive effort combines the procreative qualities of past and present to make a productive object that continues through time. Making the net is a cooperative task, as elders take turns weaving a new section of net. Rather than in/out, nets manifest the balance between the cosmological oppositions of old/new or past/present.[36] Elders make and remake the nets and once completed, pass them along to younger men for use. The process of re-making requires elders to cut out the old section of the net and add a new piece. The *pwason* [navel] of the net, as Damon says, is more a transitional point than a body part, because this is where the new and old sections of netting are detached and rejoined. This phenomenon is reflected in the way that older men make the net and then give the net for younger men to use. There is the transition of old/new or past/present in conjunction with (re-)making and use. This same conjunction of opposites old and new, past and present is also reiterated in yam gardening, where the differentiation of opposites contributes to the productivity of the garden and growth. In addition to renewal, the theme of cohesion becomes relevant once again. The act of weaving and combining threads becomes realized as groups of men use a fishing net to acquire food. The string object mimetically reflects the social experiences of its makers and users.

In sum, when analyzing bilums and fishing nets, the processuality of string objects continues to be realized in traditional and contemporary practices. What may at first glance appear to be a pair of objects with distinct phases of form, construction, and use, quickly become realized

36 I use old/new to refer to materials and past/present to refer to people in the context of generations. These opposites are used in conjunction to one another to convey transition and opposition between different scales, such as the object and the people who engage with it. I retain old/new from Damon (2017) and employ past/present to include social actors in this dichotomy.

as serial processes of making, using, and re-making at various points throughout their life project. These string objects are much like string figures in their ongoing nature as they are made and used. Similarities between bilums and nets include their morphology, as they are both identified structurally with human body parts. There is a sexual division of labor in making each form, one that is further reinforced by age, as well. Furthermore, bilums and *wot* encompass cosmological oppositions in their flux of construction and use, such as man/woman, old/new or past/present, in/out, and left/right. String objects can produce and reproduce social organizing principles despite their specific form as either a bilum or a fishing net. Like string figures, garden cycles are enacted and regulated by string objects. They are both made and used in conjunction with gardening processes and cycles. String continues to bind people together, cognitively and physically, through making and using its various object forms. These objects model social stability through differentiation and unstable topologies. These string objects, bilums and fishing nets, model similar social concepts despite their individual differences. For example, the *tumin men* bilum looping technique reflects the cooperative labor employed in traversing dicey waters. While fishing nets in their construction bind string, and then bind people together as it is used to catch fish, especially combining the labor of cosmological oppositions. All of these concepts are realized throughout the processes of making and using these objects, making them an apt model for the social organizing principles of Melanesia. I now turn to my final chapter to discuss the qualities of these string objects, string figures, bilums, and fishing nets that make them an apt model for regeneration and growth.

Chapter 3:

Enabling Life: String as a Model for Futurity

> *"Time is not a line between happenings; it lies in the capacity of an image to evoke past and future simultaneously...it is the effectiveness of an image in making the observer think of both here and there, of oneself and others" (Strathern 2015:161).*

Figure 44. *Muyuw women walking with yam baskets atop their heads in a funeral procession, taking the yams to the nominal father of the deceased* (Photo courtesy of Fred Damon).

In this chapter, I discuss how string objects model continuity, produced first in the object, and then instantiated in social practice. I look at materiality, temporality, the cohesion of cosmological oppositions, and the positive value transformations that take difference as a point of departure from which continuity and stability are produced. Next, I turn to social praxis where these concepts are put into action, sustaining the organizing principles of Melanesian culture through different scales of pattern, process, and praxis. In sum, I show how string objects function as a microcosmic model for social continuity and contingency.

Once social actors are familiar with the patterns and processes of producing string objects, they are then able to apply similar patterns and processes to other facets of social life, whether it be the production of other artifacts or social relations. In thinking through the small-scale processes of producing string figures or fishing nets, social actors can then employ those same processes into motivic action in the macrocosm of social life. Thus, cognitive processes are concretized and instantiated within the string object. As Küchler & Carroll put it, "it is the relational nature of action inscribed in objects that serve as models which gives rise to the higher-order intellectual processes of abstraction emerging out of double description" (2020:11-12).[37] Looking at the social phenomena encapsulated in string objects via processes of making and/or use, one can see how the action associated with these objects can be transmitted into the larger social framework due to the *relational nature* of action. For example, binding and tying methods as a source of strength for string objects reflects the same strength of collective action in the act of catching fish or gardening tubers. This action is conceived and reproduced through similar processes on different scales of praxis, to which I now turn.

37 Double description is the "recognition of formal resemblance and difference" and "leads to the possibility of change within the system, not open ended, but infinitely variable within a bounded system of generative forms" (Küchler & Carroll 2020:8).

Up to this point, I have discussed numerous social, temporal, and spatial relations produced in string objects. I now address how all three of these objects — string figures, bilum bags, and fishing nets — model continuity. In doing so, I address how string objects manifest temporal flux and sequence in their materiality, as well as in form and process. I then examine how these qualities of materials, forms, and processes are instantiated in the organization of social activities, first analyzing the relational nature of action between string objects and tuber gardening, before then extending my analysis to sexual reproduction and the regeneration of the social line. Ongoingness, as I now discuss it, is relevant to the relations of people, praxis, and the flux of time. I re-engage the social relations immanent in string objects as outlined in Chapters 1 and 2 and consider how they sustain and produce contingency. I provide a comparative study of self-construction and futurity that supports Sipum's claim that "these string/*vatul enabled life*" (Damon 2017:248, *my emphasis*). To convey how string objects are generative of life processes, I first briefly discuss how the materiality of string manifests the organizing principles for social relationships and time. Then, I discuss how string figures, bilum bags, and fishing nets are microcosmic models for choreographing social praxis, specifically in reference to tuber gardens and sexual reproduction.

I. Materiality

Enacting Relations: Affordances of String

String objects as a model are effective, because they engage social organizing principles on different levels. In chapters 1 and 2, I closely considered how manufacturing and using string objects reproduce ways of relating. The model is not complete, however, without considering one of the smallest scales of social organizing principles: the material itself. Thus, one must consider what string allows its makers to do with it. These allowances are called "affordances,"

which describe what an object, specifically its surface, permits a person to do with it (Küchler & Carroll 2020). As Were says, the choice of materials is "an informed decision-making process situated in the human activity of design" (2013:583).[38] Due to its flexibility, strength, and highly manipulable form, string is not only apt as a binding agent, but it can also be transformed into more complex forms through techniques of weaving, looping, knotting, etc. Looking at affordances shifts the focus to the capacities of materials, which are chosen to best "facilitate the contemplation of the prototype" (*ibid*:168). On the smallest scale of the model, string, as a material, also manifests the social organizing principles of Melanesia, where mind and material connect. The region's reliance on string comes in part from harnessing the power of available resources, but string also reflects the concatenative nature of social life in the region. Divulging the affordances of string, "opens up the terrain of what is 'inherent' and 'embodied' in" these objects (Küchler & Carroll 2020*:*155). In establishing these affordances more generally, I show the capacity of string as a model for social relations and time-reckoning. I first discuss how affordances relate to the patterns of social relations made relevant in the previous chapters and then demonstrate how time is encapsulated in string materials, as well.

If "specific materials are sought out in order to allow the kind of thinking necessary for the contemplation of the prototype" (Küchler & Carroll 2020*:*15), then to understand the complexity of the model, one must consider how affordances elicit social relations. String's affordances are realized through haptic interaction, engaging the senses, the mind, and the body. People think through the different levels of the object, making their materials, construction, and use a cumulative cognitive framework. In making string objects, people

38 Were (2013) discusses affordances in reference to mat making amongst the Nalik of New Ireland. His analysis explicates how the stitching and layering of amotmot (type of pandanus) mimics and "creates an image of the expansive and co-dependent nature" of Nalik relations in constructing an araazira (Nalik mat), demonstrating the need for mutual cooperation (ibid:591).

physically bind and connect threads to constitute a larger fabric. This is not the case for string figures which are designed to be readily dissolvable, but as with the Tongan example of Hina and Sinilau, some string figures require more than one maker. This joint performance engages shared cultural knowledge, turn-taking, and cooperation among its makers. Consequently, string objects impart that interconnection and cohesion are important to the sturdiness and stability of the overall fabric, an apt metaphor for the social system within which people live and interact.

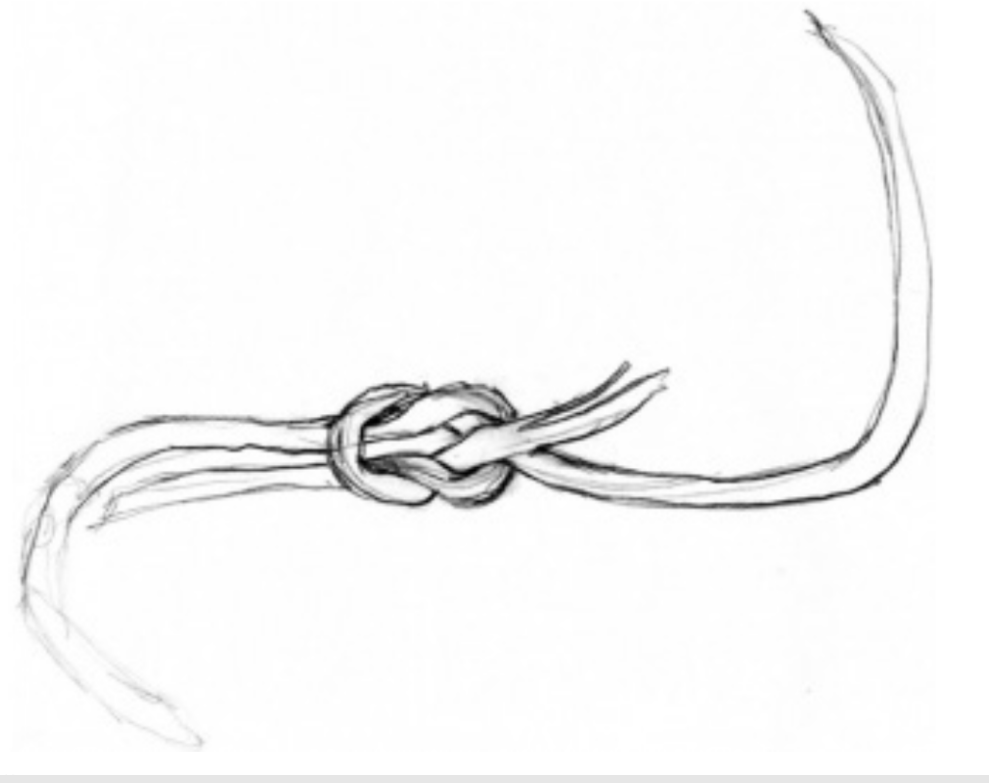


Figure 45. *Sketch of a* sipvinay *[female knot] from Muyuw* (Photo courtesy of Fred Damon).

As I have shown, string figures, bilums, and fishing nets each embody cohesion in their flux, physically in their construction and mimetically in the actions they elicit from social actors in praxis. However, while there is cohesion among social actors, there is also tension that characterizes these relationships, as seen in the positive value transformations of cosmological

oppositions.[39] Tension is pertinent to the cohesion and structure of the body of the fabric of a net or bilum and for the successful performance of string figure. This tension is a fundamental aspect of society, and through the reciprocal action of cosmological oppositions stability is maintained without rupturing the fabric. In maintaining tension, string objects do not just reflect ideals of the social framework, but the reality of the experiential world. By looking at the materiality of string, one can see how prototypical social relations manifest in the string itself. In an interview, Sharleen, an indigenous bilum entrepreneur of Papua New Guinea (PNG), says:

> "...every single person is like one of those loops in that bilum. Some of us may be dyed, so we have a bit of color, some of us may be the plain ones and some of us differ in functionality…but everything is twisted together and woven together, so it's like the fabric of our society. And if one loop unravels or is cut off, eventually, slowly but surely everything else unravels, so we're all connected" (Interview on Bilum Significance: Sharleen 2018).

Sharleen articulates how the affordances of string allow for cerebral and mimetic processes to permeate string objects, in this case bilums. Sharleen conveys "how design decisions create visible and logical outcomes in the social world" (Were 2013:585). As Sharleen describes, the material, string, is manifest with social relations, representing individuals and their integration into a cohesive whole. Sharleen's description is rich with the social implications of bilums and gives merit to Haraway's claim that "it matters what matters we think other matters with" (2016:12). For example, the affordances and properties of string encapsulate differences through varying colors and functions. Sharleen elicits the precarious topology of string,

39 The root 'ten,' meaning "to stretch," is related to the ancient Sanskrit, Persian, and Greek words for "string" (Anderson 2005:358).

mirroring the entropic nature of society, always on the brink of dissolution and chaos.[40] And finally, she demonstrates that the connectivity of string is integral to bilums *and* the social system. These qualities appear in string figures and fishing nets, as well, maintaining manifold relationships and working cognitively to reinforce and reproduce the social organizing principles of Melanesia. It is for this reason that in Chapter 1, I referred to string objects as the 'total social object' for this region. Now that I have established the way in which string as a material manifests social relations, I present how string as a material manifests time, both as continuous and discrete.

Ongoingness: Temporal Flux in String

As I have now demonstrated, affordances allow social actors to think through the objects they make and use. The question now is how string objects materialize the flux of time. The processuality of string objects reflects continuity, as in the case of the string figure design *Gumeau* in Muyuw, whose moves are not all named because they are designed to reflect the passage of time in relation to stars, seafaring, and yam gardens. As seen with social relations above, the affordances of string also reproduce time and continuity within these objects. Firstly, string as a material can be tied or spliced into a loop, oscillating between tension and flexibility as it is manipulated. The flexibility and malleability of the medium in conjunction with its transformative abilities make string apt for structuring and organizing the time and the context in which social organizing principles are enacted. String objects are also capable

40 Malinowski (2014 [1922]) makes a similar claim about canoe lashings in the Kula Ring. "Only one species of creeper is used for the lashing of boats, and it is of the utmost importance that this creeper should be sound and strong. It is this alone that maintains the cohesion of the various parts, and in rough weather, very much depends on how the lashings will stand the strain…Thus the element of danger and uncertainty in a canoe is due mainly to the creeper" (ibid:144-145). Cordage is renowned for its instability in this region and paradoxically becomes a means by which people establish stability through proper transformative sequences and mastery of skill and understanding of the affordances of the medium.

Figure 46. Woman looping a bilum, Bena Bena Village, Eastern Highlands (Vuong 2018b).

of organizing discrete sequences, which are reflected in the patterned transformations instantiated to create or reproduce a design. String objects help to interiorize concepts that structure the flux of time as both continuous and discrete, infinite and definite. They construct and organize sequential information, while simultaneously sustaining a continuum of time, where past, present, and future converge. Marilyn Strathern (2015) discusses this concept of conflated time in relation to Melanesian contact with Europeans. She explains that Melanesians were not 'surprised' by the appearance of these strange newcomers (and would not have even considered their appearance strange or new) because they were understood as "previously known beings 'returned' or manifest in new form" (*ibid:*157). She suggests that Europeans were conceived similarly to Melanesian cargo cults, where the "two were conflated insofar as the second coming would bring not the generations unborn but the generations

already deceased, in the form of ancestors" (*ibid:*157). Thus, according to Strathern, the Melanesian concept of time as continuous is related to artifactual systems and images.

One such image can be seen in the case of string figures, as the loop of string itself is continuous, although limited in space. "They [string figures] are both what they are, and what they will become" (Eastop 2007:203). This claim also extends to my previous discussion put forth about bilums and fishing nets, which do not have the same spatial restrictions, but are equally capable of sustaining continuity. Cyclical in their form and action, string figures are mathematical unknots, following the same trajectory as their form being made, unmade, and remade tirelessly. Like string figures, bilums also maintain this continuity in their materiality before the process of construction even begins. Recall that the *maindshe* is the singular strand of string used to construct the bilum. As string is turned, extra strands must be plied to the ends of existing strands to make a continuous line from which the bag is made. The same pattern of form and praxis are seen in bilums as seen in string figures, where the material itself is constructed to be continuous. Making the body of the bag is also a continuous process that builds sequentially. I cannot speak to this pattern of materiality in fishing nets because the literature does not address the process of spinning string for them.[41] However, in form nets sustain continuity and regeneration, where the same net is recycled and rejuvenated over time, as sections of the net are removed and renewed. This process is ongoing as nets wear out frequently with continual use. The processuality and continuity of form and process are prominent amongst string objects and help to establish them as a model for futurity.

41 Because my data on wot and kananik come from the same source (Damon 1990, 2017) and are sometimes made of the same type of vatul (im), it is reasonable to assume these two forms are likely to be similar in the process of making string.

String objects organize flux into sequential information, embodied in the transformations of string as it undergoes making, re-making, using and re-using. Damon (2017) discusses how people segment *vatul* [string] into separate parts, much like the way the flux of social activity and time are sequential. In Muyuw, tying materials have the "tip," "top," or "point" (*matan*); the midsection (*tapwan*), the same word used for a body's back and trunk of a tree; and the "base" (*wowun*). The "tip" refers to the end of the string used for tying or sewing and the "midsection" exists between the endpoints of the string. When two or more things are tied together, the original point of anchoring the cord is called *atusip,* which then becomes the "base" of the structure (*ibid:*261). Thus, what may seem to be an inseparable and indistinguishable material is broken down into recognizable parts.[42] This tripartite structure is seen in the *Fame of Gawa*, when Nancy Munn (1986) discusses the same sequential paradigm in the context of spells. She identifies the *wouwura* [foundation] as the initial segment of a tripartite arrangement of the spell structure. Once *tapwara* [trunk] and *dabwara* [top]) have been articulated, the speaker should return to the *wouwura* as the final utterance of the spell. Munn says that "by returning to the *wouwura* (foundation) base, the speaker returns to the capacity for constituting a future out of the past" (*ibid:*84). Like string figures, the spell cycle is completed with a successive return to the beginning in order to conclude. In this way, time accretes in the object, subsuming the past, present, and future. Time, then, is conceived to be both continuous and discrete. Sequential and transformative action parses the flux of social life into individual, temporal units, which come together as an organized series of events. Objects undergo the ongoing processes of social and temporal flux that they embody, showing how they exist both *in* and *through* time.

42 A similar pattern is seen within the materiality of string in Japan, where "A cord or string is a himo, but it was also written with the character o, which means both "cord" and "beginning" and could signify "life" because of the way the strands of a cord intertwine and grow longer" (Tanaka 2013:149). String physically and cognitively embodies principles of continuity and ongoingness outside of Oceania, as well.

I now turn to the temporal implications of each string object and how they structure and choreograph social activity, specifically in relation to tuber gardening as subsistence, and sexual reproduction as continuity of the social line.

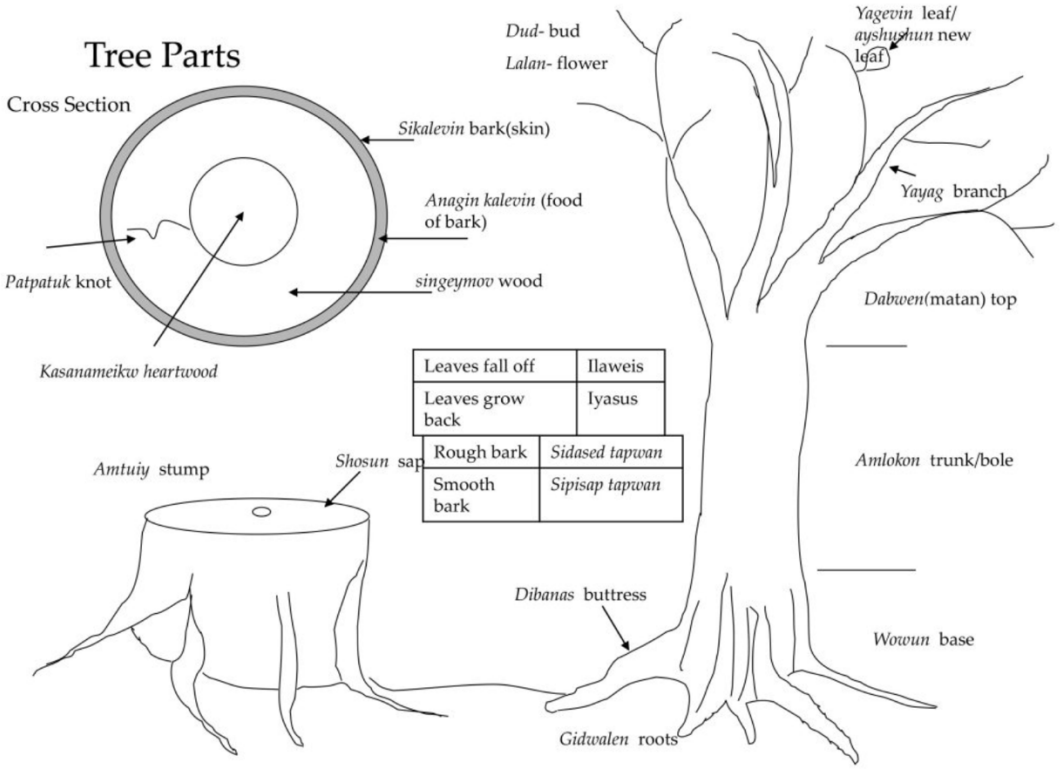


Figure 47. *The same patterns in cordage and spells are reproduced in trees, tip/trunk/base* (Photo courtesy of Fred Damon).

II. Intentionality

Intentions in String Objects

Throughout my discussion of string figures, bilums, and fishing nets, I demonstrate how string objects are processual by nature, with recurrent and perpetual transformations. This ongoingness is understood in the present moment at which the object is made. However, the

context or knowledge associated with these objects in the form of narratives, for example, might be associated with the past or the future, telling of mythical origins or portending happenstance. In making string objects, much like the spell structure discussed by Munn (1986), the past can be reconstructed in the present. By conflating the two into a singular form, one engages the temporality of the object in the perceptual present. Using Husserlian categories of "intentions," which Gell defines as "all relations linking noesis (process of cognition) and noema (that which is cognized)" (1992:224), I show how string objects are laden with these intentions. Husserlian intentions are broken down into two subtypes, retentions and protentions. Retentions are projected 'now-moments' that index the mind to past events, while protentions do the same, but are future oriented. As Gell notes, "Husserl treats 'retention' and its future-oriented counterpart 'protention' not as fantasied memories or anticipations of other 'nows' associated with the present 'now,' but as horizons of a temporally extended present" (*ibid*:223). This temporally extended present provides a relevant context for the traditions and potential futures of the social organizing principles imbued within the object.

In looking at the retentions and protentions of string objects, one can see how the system is organized and related, looking at the precedence for social action and the potential for it in the future. Gell uses the idea of protentions and retentions to show how objects within an artist's or culture group's *oeuvre* are related to each other (Küchler & Carroll 2020). In *Art and Agency*, Gell discusses the individual agency of Duchamp's *oeuvre*, suggesting the painting "A Network of Stoppages," is an example of these related internal intentionalities, describing it as "Duchamp's consciousness, the very flux of his being as agent" subsumed in the object itself (1998:250). More salient to my discussion of time in regard to string objects is his expanded discussion of an *oeuvre* in the collective context of the Māori meeting house (*ibid*). In looking

at the protentions and retentions of these collective gathering spaces, the house becomes a "distributed object structurally isomorphous to consciousness as a temporal process" (*ibid*:251). These houses are constructed as "a collective, intentional, action," where action is "intrinsically future-oriented," making them a protention upon which other houses will be based (*ibid*:256). Meanwhile, the house is also a "recapitulation of the model," becoming the "objectification of memory," thus a retention of previously enacted forms (*ibid*:255). Understanding the retentions and protentions of the collective artifact makes relevant the cultural significance of the meeting houses in the Māori social framework. These serially interconnected intentionalities are what Gell refers to as "temporal perches" (*ibid*:250), which can be used to understand the social organization in which these objects are made and used. The object is not only "in time" in its transformational life, but it also "engages in time via its intentions" (Küchler & Carroll 2020:32).

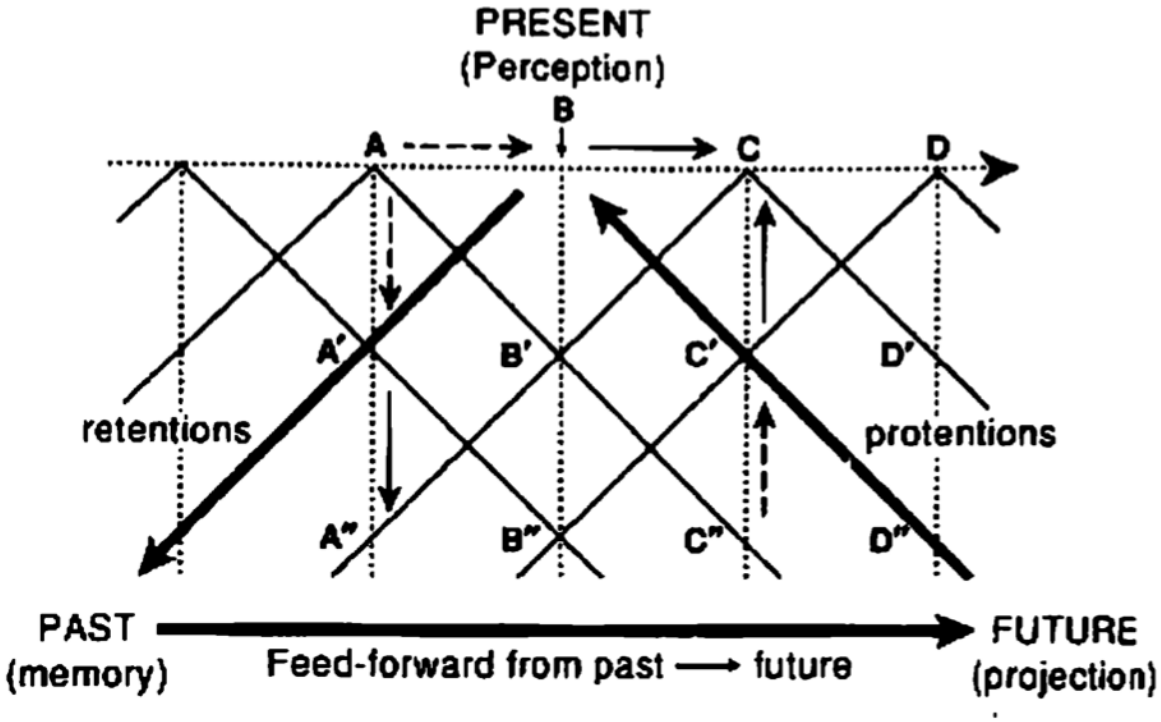


Figure 48. *Husserl's diagram of internal time-consciousness, showing the relationship of retentions and protentions to the perceptual present* (Gell 1992:225).

Figure 49. *A Māori meeting house* (Gell 1998:252).

I posit that the highly transformative nature of string objects is what allows for there to be so many different retentions and protentions within a singular form, and that the more transformable the medium, the more capable the object is in sustaining an ongoing present. Furthermore, it is the transformational aspect of string objects that enable them to reflect the observed phenomena of stars moving across the sky, daily and annually, wind patterns, and other meteorological processes throughout the year, as well as seasonal shifts in the environment and ecological cycles of growth. "The genesis of life is attuned to the movements of the sun and the moon...to come into being, life requires a certain amount of time and a certain sequence of events." (Tanaka 2013:90). String objects, such as those I have described, also require a certain amount of time and specific sequences, encapsulating and instantiating the genesis of life. These phenomena become a form of embodied knowledge encapsulated,

rehearsed, and reproduced in the string object. The object reflects patterns of social life providing a "degree of abstraction about their cultural milieu and gives them ultimate standards of reference" (Turner 1970:108). This level of abstraction allows for temporal structures to permeate and generate in string objects, which then act as a framework guiding other social activities in the system. Here, I engage the *oeuvre* of string objects as they relate to, protend, and sustain futures in their habitual patterns of construction and use.

I have already indicated that string and its products encapsulate the flux of ongoing temporality (continuity) structured through sequential (discrete) units of praxis. I now look at how both continuity and discrete moments of time embody contingency within string objects. On the one hand, ongoingness allows for the development of protentions. While sequences sever the temporal flux into organized, discrete units, manifesting structure in social praxis. String objects as temporal perches show how the social organizing principles of this region are enacted and related to the greater social fabric. One must then understand how contingency and causality are embedded in the model. In the *Anthropology of Time*, Gell discusses the concept of chrono-geography, which he describes as a "time-geographic model-building process" (1992:191). It is "an analysis of the theoretical possibilities of 'choreographing' social activities," because tasks "have to be carried out in specific places, at specific times, by specific actors, in conjunction with specific others" (*ibid*:191). I argue chrono-geography can usefully be applied to string objects on account of their cyclical and patterned nature. In looking at the protended relations of string objects, I convey the ways in which they model potential futures and choreograph the reproductive properties and sequences required of tuber gardens and people to sustain and maintain social continuity and lineage. Considering these specific contexts, I show how making and using string objects makes immanent the temporal frameworks that provide context to activities in the social framework. String figures, bilums,

and fishing nets all have protentions and retentions associated with their making and use. Although I cannot address them all here, there are certain 'intentions' that permeate all three forms, the strongest of which is the protention of gardening activities and human sexual reproduction. I show how the processual nature of these three objects establishes a form for the potential futures of tuber gardens and people.

It is important to note that retentions and protentions are not limited to a sense of singularity, either. Because intentions are temporally extended, there can be retentions of retentions and protentions of protentions and so on. "This trend is projected into the future in the form of protentions, i.e., anticipations of the pattern updating of current perceptual beliefs which will be necessitated in the next proximate future, the next most proximate future, and the next" (Gell 1992:225). Given Gell's definition of protentions, I propose that string objects first protend the proximate future of tuber gardens, and then further protend the growth and reproduction of people. I suggest that this progression is possible due to fractals. Fractals occur "across different phenomena and at different scales" where "the same pattern appears to repeat itself" (Mosko & Damon 2005:82). String objects are a fractal of the microcosm, and hence why I refer to them as the model, because they develop these self-similar patterns on a miniature scale. Then, tuber gardening produces and instantiates these same patterns on a larger scale within the social framework. Finally, sexual reproduction generates life on the largest of scales, enabling the production of culture itself. Thus, I first engage string figures, exploring the ways in which the futurity of tuber gardens is produced and sustained in the act of making these string objects; then I show how the circumstances and social contexts of tuber gardening further protend the future of people. I complete the same analysis of bilums and fishing nets. Once I have discussed the intentions within these objects, I look at how string objects succeed in modeling time. As a temporal perch, common themes of regeneration

amongst these objects are made apparent, as are their ability to organize the social frameworks in which they are situated. Finally, I look at how social praxis takes these potential futures objectified in the model and instantiates them through social action, fulfilling the claim that string 'enables life.'

III. Protentions

String Figures: Potential Futures in Gardens and People

Here, I address how in Muyuw and Nuakata the production of string figures is associated with the yam harvest, modeling the desired form of healthy yam vines, observing and organizing the sequences of their development, and acting as a causal and generative mechanism for the growth of yams. I first address Muyuw and then continue to discuss the Nuakatan context.

Yam Gardens

Kananik

As I previously mentioned, in Muyuw *kananik* [string figures] are conceived to be visually like yam vines in their form. In Chapter 1, I addressed yam vines as supportive 'rope-like structures' (Coupaye 2013). Sipum's definition of *vatul*, which indicates the strength and beauty of intertwined yam vines parallel to string, recalls that yam vines are structurally isomorphous to string (Damon 2017). The convolutions of string figures, being visually like yam vines, cognitively incite cooperation as a means of supporting the social framework. This interconnected and entangled nature of string figures and yam vines are understood to be beautiful, reflecting the idea that interconnection is an important part of generating life and invokes a positive value transformation, first enacted in the string figure and then the yam

garden. The physical act of planting integrates this same cognitive principle of support as *parawog* (female yam) and *kuv* (male yam) are planted proximate to one another "as if they are husband and wife" (Damon 1990:170) so that they can climb up the same pole. Recall in Chapter 1 that I suggested string figures are an amalgamation of men's and women's styles of tying. I now suggest that this same process is invoked in planting yams.

Figure 50. *Damon's* kananik *expert, Aligeuna, performing* kalavis *[paddle]* (Photo courtesy of Fred Damon).

Indicative of a preference for this form, the planting of cosmological oppositions near one another reinforces the social cohesion required to plant and harvest yams. In Muyuw, "men chop down the forest and plant the crops while women tend and distribute a garden's produce" (Damon 2017:86). Once again, social praxis is enacted via the methods of constructing and using string objects, where cohesion between differentiated social groups is integral. The successful performance of string figures requires tension and transformation. In yam gardens, tension is represented by polarized opposites, female and male yams, planted near one another to support each other's growth, initiating a positive value transformation that enables the successful growth of new yams. This same practice is seen in the act of gardening, where men and women contribute their reciprocal labor to grow and harvest yams. The relationship between string figures and yam gardens conveys how principles of binding and cohesion are enacted on different levels and scales.

It is not only string figure forms that invoke the growth of yams in a garden, but also the causal performance of *kananik*. "It is not just that the convolutions of string figures are like those that should be created in a yam garden. It is also that the former help *make* the latter" (Damon 2017:285-286, *my emphasis*). String figures give rise to the transformations they rehearse. Consider *katuvin* and *kilov* discussed in Chapter 1 as both string figure moves and outrigger canoe processes. These transformations are engaged in the *Gumeau* design, which translates observed environmental and cosmological relations into organized, sequential information to identify the proper temporal and seasonal conditions for seafaring and gardening. Thus, *Gumeau* makes possible the ability to sail and garden, providing context and operational sequence. Furthermore, the general context of *kananik* is temporally associated with the yam harvest, from January to April, once the yams are planted and begin to grow. The form and praxis of string figures in the temporal context of the yam harvest conveys the relational nature

of action between these two entities, where string figures are the precedent form which give rise to healthy yams.

This regenerative and causal relationship is linguistically reinforced by *kapinanig*, which I briefly introduced in the first chapter. *Kapinanig* describes "the effect that one, *kananik*, is also induced in the other, the garden" (Damon 2017:286). In sum, making string figures makes yams. *Kapinanig* highlights the causal and cyclical nature of *kananik,* where string figure convolutions and transformations are not only isomorphic but are instantiated in the garden. As indicated by Sipum's description of the term *vatul*, there is a powerful connection between vines and string, and *kapinanig* reinforces this idea by engaging their similarities in form and sequence. Damon says that "one man explained *kapinani* by twisting and tumbling his hands around and over one another" (*ibid:*286), encapsulating the cyclical and connected process of string and yams. The convoluted form and cognitive stickiness of string and yam vines give both gardens and *kananik* their beauty. Vines in a yam garden and *kananik* are understood to have the same end (*ibid*). The string of a string figure dissolves into the original loop of string, and yam gardens, after harvest, are cut back and shrivel as they dry out. The garden "growth is so interlocked that its jumbled vines obscure a person inside it; and nobody tries to figure it out" (*ibid:*286), while *kananik* is all about understanding and interiorizing concepts. It is logical that *kananik* induces healthy yam growth, because it informs the temporal context and organizes the sequences of gardening activity. Thus, string figures are capable of modeling both form and process, whilst also engaging the temporal sequences and flux within which yams and gardening activity are sustained.

Figure 51. *Drying yam vines suspended on yam stakes in Muyuw* (Photo courtesy of Fred Damon).

Ai'abi

In Nuakata, *'ai'abi* [string figures] share a similar relationship to the form and praxis of yam gardening in Muyuw. Once again, string figures are a causal mechanism for the growth of yams, sharing the temporal context proximate to the harvesting of yams. The definition of *'ai'abi* as "building or making in process" (Mallett 2003), conveys action, process, and causality, suggesting *'ai'abi are* capable of organizing and structuring social processes. The way Nuakatans use *'ai'abi* to structure praxis is indicated by the design 'pregnant woman,' which conveys continuous development and growth in discrete units, month by month. As such, the

design demonstrates how events unfold and consequently how they are structured in the flux of social life, which can be translated to the cultivation of yams. Furthermore, the emphasis *'ai'abi* imparts on 'making' and 'building' implies that social actors are actively engaged in the haptics of construction, cognitively *and* physically. Making string figures is a dexterous task; thus where someone's hands are apt for making *'ai'abi,* they are also integral to harvesting yams. Like the example of *Gumeau*, Shelley Mallett's brief ethnographic interview below suggests that the observed phenomena of yam harvests — made manifest in *'ai'abi* production — are as habitual and ongoing as the medium that represents them.

> Shelley: But why is everyone doing this?
> Interviewee: Every year before the harvest we do this to make the yams grow.
> Shelley: How does it work?
> Interviewee: We don't know, we only do it. Our old people did it and we do it too.
> Shelley: Do you believe it's true? Do you believe it makes the yams grow?
> Interviewee: I don't know, we just do it.
> Shelley: Who does it?
> Interviewee: Everyone can do it: women, men; some children, they do it too.
> (Mallett 2003:197)

Mallett's interlocutor indicates that *'ai'abi* is a habitual practice for Nuakatans, one that has been happening for a long time, that continues into the present and will persist into the foreseeable future. *Ai'abi* practices are ongoing and continuous, related to the cosmic and temporal cycles of growing healthy yam gardens. Given this insight, *'ai'abi* are also capable of sustaining the same continuity and flux of time in their construction as *kananik* does in

Muyuw. Mallett's interview indicates the cognitive relationship between *'ai'abi* and the yam harvest; like *kapinanig* on Muyuw, the making of *'ai'abi* is done "to make the yams grow" (*ibid:*197). Thus, the positive value transformations enacted in string figures are reproduced in the act of gardening and harvesting yams.

Protentional Relations

In Melanesia, string figures reinforce the idea that if you do not do tasks in a proper order, engendering the appropriate transformations, that the system will fail, as seen in the case of yam gardens. Due to the causal and cyclical nature of string figures, their resemblance to yam vines and their similar transformational sequences in horticultural praxis, I suggest that making string figures protends healthy yam gardens. First and foremost, *kananik* and *'ai'abi* can sustain the future in the present moment of their construction, because their process is one that is designed to reflect the passage of time, while simultaneously alluding to the future growth of yams in their temporal context of the harvest. The transformations of string figures sustain the now moment through its series of alternating, performative movements, sequenced by its individual moves. Not only is the context of *kananik* and *'ai'abi* construction temporally defined in the context of the yam harvest, making string figures situates people "anterior to" the harvest in time, "at a moment when it has not yet, or is just about to come into existence" (Gell 1998:256). The protention of string figures is realized in the linguistic terminology associated with these practices. For example, in Muyuw, the term *kapinanig* means that the act of making a *kananik* in one context (the hands of an agent) makes another in the garden, alluding to ensnarled yam vines of a healthy garden. Making string figures protends yam vines into the present conscious moment, by conflating the two as structurally similar. In Nuakata, *'ai'abi* means 'building' or 'making,' verbs which are both inherently "future-oriented" (*ibid:*256). Thus, making string figures anticipates causality and contingency in the growth of

yam gardens, indexed by their isomorphy and patterned sequences of action.[43] String figures prefigure social actions designed to produce yams. As such, both activities are meaningful and impart a similar value on different social scales of practice.

Figure 52. *Harvested* kuv *yams, Muyuw* (Photo courtesy of Fred Damon).

Pregnancy and Sexual Reproduction

Having asserted the patterns of action and praxis that make regeneration of new yam gardens possible in the proximate future, I now look at how these same practices enable the growth

43 Despite Sillitoe's (1976) disdain for the study of string figures, he concedes that the act of making string figures is significant, citing the Kiwai and Goodenough Islanders as indigenous groups who use string figures to incite yams in the garden. "This association helps to ensure that growing yams are healthy because their creepers will twine like the string of cat's cradle" (ibid:21). The model, then, applies to other groups of Melanesia.

and development of people in Nuakata.[44] Particularly, the string figure form 'pregnant woman' structures and interiorizes the processes of fetal development. Like yams, the reproduction of people requires the conjunction of cosmological oppositions. Male and female combine their labor via copulation, a positive value transformation, to achieve the desired outcome of sustaining the social line. This process is not only reflected by the sequences of the form, but also through the interlinking of threads as the form is made, reflecting the process by which social actors should combine their labor in a productive and orderly manner. In making string figures such as 'pregnant woman,' people construct themselves and their future, engendering the causal transformations in the present moment at which string figures are made and extending them to the future and continuity of human development.

Protentional Relations

By making string figures in the temporal context of planting yam gardens, a protentional relation of string figures prefigures a further protention of pregnancy. Thus, "yam and taro growth provide a positive image for human behavior" (Damon 1990:170), first enacted in string figures, next the yam harvest, and then to sustain and produce new generations of social actors. Recall in Chapter 1, how Sipum described *vatul* as being like veins in the body (Damon 2017). Thus, in this region, string is not only structurally isomorphous to vines through which sustenance is spread to the body of the plant, but also structurally reflect veins which spread life-sustaining oxygen through the bodies of social actors. However, string figures are not only generative in relation to social actors through their isomorphic form, but also via the processes by which these string forms are made and then instantiated into social praxis. The pregnancy

44 I reserve my discussion about pregnancy and sexual reproduction in Muyuw for fishing nets, which have a more significant relationship to one another.

Figure 53. *Eunice Tau'owa starting the* 'ai'abi *'pregnant woman'* (Mallett 2003:199).

design is an example of what Gell (1992) refers to as updating current perception by anticipating the same pattern updated in the next proximate future. It prefigures the patterns and processes necessary to produce yams, where the ability to produce food indicates a social actor can provide for more bodies, like their offspring. The pregnancy design creates "a relation internal to itself between events and the organizing process or systems which link / explain them" (Strathern 2015:159). On a smaller scale in yam production, men and women combine their reciprocal labor to produce alimentary goods, while sexual reproduction employs the same principles on a larger scale to produce social actors and maintain the continuity of social lineages. The operational sequences elicited by the pregnancy design reinforces the needed for structured praxis to achieve desired outcomes. Furthermore, understanding the care and action associated with yam gardens can be translated to tending

to people, especially mothers as caretakers. By making string figures, people are making themselves and constructing their futures, reinforcing the care, intention, and purposive action required to sustain positive value transformations. As the *'ai'abi* 'pregnant woman' is constructed, renewal and reproduction are drawn into the current moment for the immediate purpose of facilitating the growth of yams, but with the further extended purpose of facilitating human growth in the next proximate future. String figures make the potential of growth and development immanent in the process of construction and become an iterative paradigm by which people can generate new life when enacted in larger scales of praxis.

Bilums: Potential Futures in Gardens and People

Taro Gardens

In the context of bilum production, gardening is relevant in the principal and elaborated forms, first in the *aam bal men* and then again in the *iman men*. As previously discussed, the principal form is closely associated with the social roles and responsibilities of women and taro production. Women use their *aam bal men* in subsistence and gardening activities, quite literally containing the fruits of their labor. The bag expands like a full womb, indicative of a woman's procreative powers, which she uses to cultivate food for others. Likewise, although an object of the male social domain, the *iman men* in the ritual context of the *iman ban* also associates bilums with the production of taro. The bilum as it is made and remade continues to index and sustain the procreative powers already imbued with the principal form and harnesses those in conjunction with male labor to produce the elaborated form. The conjunction of cosmological oppositions produces a positive value transformation in the system, in this case, the production and maintenance of taro gardens. I first assess how the futurity of taro is subsumed within the production and use of the *aam bal men*, and then show

the contingency of taro encapsulated in the *iman men.* Ultimately, I show how these different levels of making and using suspend the potential future of taro gardens through the reciprocal labor of men and women.

Aam bal men

In discussing the *aam bal men*, I investigate the ways in which growth and regeneration are embodied within processes of making and then demonstrate how they manifest generative processes as the bag is transformed and used in the male sphere of ritual. In the process of spinning string, the filaments — prior to being rolled and plied — are wrapped in a taro leaf and left to absorb the dew (MacKenzie 1991). The bilum, before it has even begun to be constructed, is doubly reinforced with procreative powers, those of the taro leaf which embody regeneration and growth, and dew which in Telefol cosmology increases growth. The fabric of the bilum is instilled with procreative powers in the materials themselves. When Telefol women start looping a bilum, they use the term, *men uyo dup kam-i*, which is used exclusively to refer to the initiation of this task (*ibid*). A related term *dup kam-in* means "to plant small things" (*ibid:*83). The valued qualities of Telefol 'womanness,' as caregiver and nourisher of gardens, are cognitively associated with the initial construction of the bilum. It is fitting that bilums reinforce the cultivation of taro, because both making a bilum and gardening are manual tasks. S*agaal* [fingers], a term referring to the joining stitches that provide support for the body of the bilum, reinforces the manual nature of women's work. *Sagaal* indexes the manual labor of bilum production, and extends to the dexterous tasks of horticulture, yielding produce to nourish and support other bodies. In making a bilum, the physical accretion of material coincides with the accumulation of knowledge of how to be a good Telefol woman. When a woman uses an *aam bal men* to harvest taro, the same organizing principles are made manifest as when she constructed the bag. Thus, the entirety of the processual object — form,

construction, and use — inform the self-construction of a Telefol woman as gardener and nourisher.

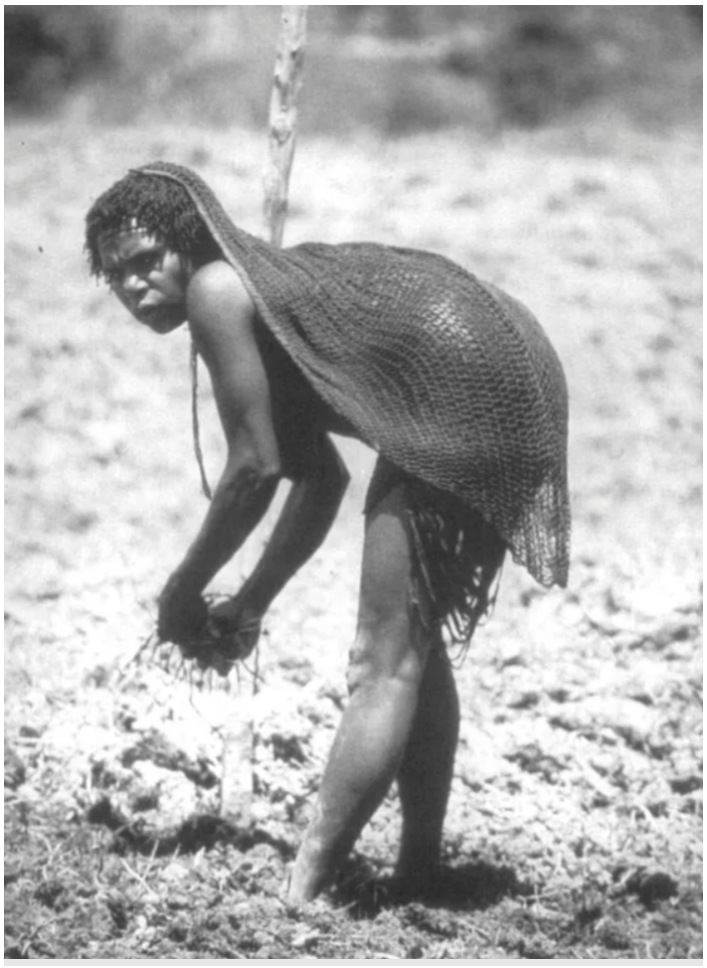


Figure 54. *Woman wearing an* aam bal men *as she performs her daily subsistence tasks* (MacKenzie 1991:174).

Iman men

Having discussed the principal form, I now turn to the elaborated form of the *iman men* to contemplate how the growth and production of taro is immanent in the production and use of the ritual bilum. This appears contrary to Telefol gender norms established in Chapter 2 and above, which associate taro production with femaleness. Consider though the relationship between the *aam bal men* and the *tiyaap men,* where the cassowary plumage represents the

reciprocal relations of men and women's differences. Taro reproduces these patterns, as well, which, much like the relationship of the *aam bal men* and *uun kon men*, are first enacted in production of the bilum and then re-engaged as the bilum is in use in the *iman ban*. To complete the taro ceremony, the bones of the *usong* [ancestor spirit] residing in the *iman men* must be planted with *iman tobaal* [red taro] and *iman dumeen* [white taro] (MacKenzie 1991). Red and white are cosmological oppositions, representing the sexual fluids of women and men, where red is associated with women and white with men. The conjunction of red/white and female/male as a cohesive endeavor provides the circumstances needed to produce growth and regeneration of taro crops. Bilums provide one such context for cohesive action between men and women, and taro horticulture is yet another.

> "Couples of men and women form the closest unit of cooperation in daily life. Each married couple maintains small green houses outside of the village where they live for days at a time, working as a productive team in the combined test of cultivating taro. It is only this unspotlighted arena of gardens and bush that the intimacy engendered by sexual complementarity can prevail... it is particularly in regard to gardening and subsistence that Telefol women and men are aware of the interdependence and interlocking of their roles" (MacKenzie 1991:203).

The interlocking and interdependence of social roles in the facilitation of growth is made explicit in the cosmological context, where Taro is "Afek's first born child" (MacKenzie 1991:42). Taro has *finik* [spirit] like a person and requires the same amount of care and attention as a person compared to other horticultural products (*ibid*). When taro is likened to a child, the conjunction of male and female labor to care for and cultivate taro becomes analogous to parenting. As Yūko Tanaka suggests, "learning to treat things with care, that's

what it's all about" (2013:182). The androgynous production and use of bilums prefigures the proper relations required of men and women in social practice. The act of growing and cultivating taro is a conjunction of male and female labor, modeled in the construction of the bilums and then enacted in their use, making explicit that "despite the ideology and practices of separation, the realms of women and men are not neatly bifurcated and autonomous" (MacKenzie 1991:192). Rather, they utilize their distinctions concomitantly to produce desired outcomes and to contribute to social stability. Upon the conclusion of the *iman ban*, participants came home to repeat the process of regeneration in their own gardens with their own sacred bilums. The *iman men* coordinated growth across the entire region. Thus, the interdependence of cosmological oppositions takes place on a variety of levels and scales within the social framework, reinforcing cohesion and opposition as a point of departure. Entropy is thus overcome with the collaborative efforts of cosmological oppositions.

Men will use any available bilum to construct a *men amem*, to avoid female construction in direct association with a ritual bilum. Telefol women "cannot exercise control over, or have direct access to, the strength and power of the past" (MacKenzie 1991:183), and as such are not meant to make physical contact with the *men amem* or obtain knowledge of the associated rituals. This also means that women are restricted from even witnessing the production of *men amem*. Despite these taboos, once a *men amem* is completed, it hangs in full view of women and non-initiates. Even though the bilums and their contents are intended to be secret from women, women see the bones of their ancestors through the open loops of the bag and know their purpose (*ibid*). Cult rituals concerning the *men amem* allow men to unlock the ancestral power for the collective good of the community. Nevertheless, men do not have *complete* control over these ancestral powers. Access to them comes via reciprocal relations with the *usong* [ancestor spirit] contained within the bilum, reflective of Telefol relations between men

and women (*ibid*). Men's engagement with the sacred bilums informs the proper social relations between men and women, first engendered in the process of making and engaging in reciprocal relations with the *usong*.

Despite the temporal connection of the *men amem* and Telefol men and the taboos surrounding women and these bilums, sacred bilums are "functionally and visually associated with women" (MacKenzie 1991:184). Men carry sacred bilums from their head or cradled like a baby, much like the way a woman carries her bilum. Furthermore, the *men amem* are a spiritual representation of Afek, harnessing her ancestral and cosmological power to gain control over the fertility of harvests and people. According to the Telefolmin, the *men amem* "is a mother to us since it takes care of us, it makes our taro grow immense and makes our pigs fat and our hunting plentiful" (Wheatcroft 1976 in MacKenzie 1991:185). Notions of the bilum as an index of care and nurture have persisted among the Telefolmin, even amidst evangelization in the Mountain Ok region. Rebaibalists [evangelist converts] now believe that God created the Telefol and their land, as opposed to Afek, and appeal to Jesus for the continued well-being of the people and landscape (MacKenzie 1991:187). The bilum previously represented the highly valued aspects of womanness in Telefol culture; now, it represents the care of Jesus for his followers. Despite these changes in the social meaning of bilums, they continue to embody the potential for futurity, as a symbol of cosmological power and regeneration. This example shows that not all colonization and missionization efforts were successful. Although social change influenced by the Rebaibal movement impacted bilum practices and ideology, the inherent qualities of nourishment and care remain associated with the object. Even in the face of change, the bilum sustained associations of care and continued to highlight the value of providing for others.

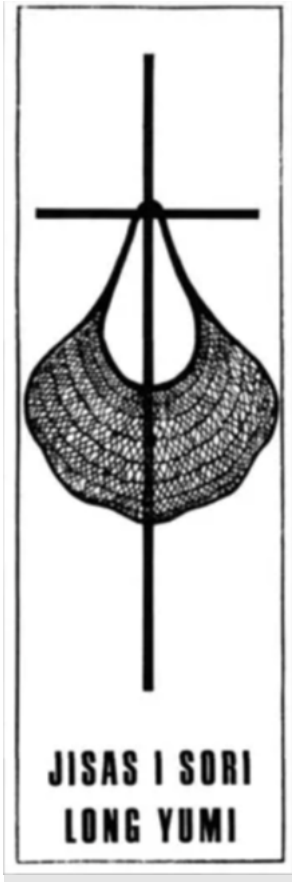


Figure 55. *A Rebaibalist bookmark from 1984. An* aam bal men *hangs on the cross, symbolizing the shift in cultural association of bilums* (MacKenzie 1991:187).

The bifurcation of past and future is embedded within the *aam bal men* and the *iman men*. The *aam bal men*, as a symbol of the procreative powers of women, indexes regeneration and futurity by accumulating and containing alimentary goods to support and nourish bodies. *Iman men* harnesses the ancestral powers of *usong*, represented by the skull and bones contained within it. By harnessing the powers of the past, men provide for the greater social system by dictating the cycles and temporal context for successful taro horticulture. The androgynous authorship of the *iman men* allows for the continuum of social time, such that the past (men) and the future (women) are subsumed in the present. "To perform a role is, among other things, to be confined in space and time in a particular way" (Gell 1992:196).

Thus, when men and women perform their social roles, they are engaging within the temporal flux in an orderly and structured manner. The positive value transformation of bilums from principal form to elaborated form requires the conjunction of manifold dichotomous pairs, such as male/female and future/past and their adherence to these social roles. The associations of men with the past and women with the future allow for their cohesive efforts to manifest continuity and sustain the social line, such that they engage *in* time and *through* time.

Before I engage the protentional relations of the *aam bal men* and *iman men* further, I first want to discuss how the practices outlined in the previous chapter and above have changed over time. In analyzing these changes, it becomes clear how integral the bilum and its associated rituals are to the growth of taro, giving true weight to the claim that string objects generate life.

Christian Influence: Tampering with Time

The introduction of Christianity to the Mountain Ok people in the late 1970s drastically changed bilum practices and traditions in the region, and, in some cases, they altogether ceased. This wave of Christianity prohibited exposed burial. Consequently, *men amem* could no longer be constructed by traditional standards, if at all. Moreover, the supernatural powers of the *men amem* were incompatible with the new Christian tenets. As a result, new converts, ironically many of whom were women, cast the sacred bilums and other cult sacra into rivers (MacKenzie 1991). However, the consequences extended further, leading to a domino effect, which reverberated through the social framework of Telefol culture. It is these consequences and their direct relation to the abolition of traditional *men amem* production and use that inform my choice to include these objects in my analysis.

Like string figures, bilums reinforce the concept that there is a correct order and sequence required to achieve desired outcomes. The salience of coordinating bilum rituals and gardening becomes glaringly apparent in the face of missionary intervention. "Significantly enough, with the destruction of the secret, sacred bilums, the staple crop taro, now fares badly in those places where the cult sacra have been destroyed" (MacKenzie 1991:186). Changes to bilum production were directly related to the failure of taro production, where "operations affecting the state of one part of the order affected that of the other" (Munn 1986:80). The positive correlation between bilum rites and taro growth shows how closely ceremonial sequences of the *men amem* were timed with the state of taro gardens. The lack of coordination and cooperation made taro cultivation too difficult in the high-altitude conditions. The inability to produce taro any longer makes clear how bilums function as a fractal through different scales of practice, where the patterns and sequences of bilum production and use were necessary to coordinate and produce taro. As a model, bilums convey the necessity for sequence and order in praxis. Not only were sacred bilums and their associated traditions fundamental to the maintenance of taro production, but the *cohesion* of this systematic effort was necessary for cultivation, as well. With the destruction of these sacred objects and elimination of associated practices, taro became practically impossible to cultivate, leaving the Telefolmin to rely more heavily on cassava and sweet potatoes (MacKenzie 1991). The inability to grow taro without the *men amem* and their associated rituals makes explicit the generative capacities of these string objects and the efficacy of their production and use.

Protentional Relations

Women and their bilums project potential futures in their subsistence activities. If a woman can care for and tend a garden appropriately, she can provide for others, a concept instilled through the care and intention a woman takes to construct her *aam bal men*. Despite the

associations of the ancestral past embodied in the *iman men*, the process by which this form is made also embodies contingency. It incites the rebirth and regeneration of life from the past, taking the corpse (death) and transforming it into a benevolent *usong* (new life). The *iman men* sustains and enables life, once again engaging the "additive technology" (Küchler 2014) of string objects where the accumulation of material reflects the accumulation of knowledge. Elaborations do not strip the bilum of its initial associations but build upon them to produce a stable and productive object of multiple authorship. The differentiation of social actors is actively combined to make their outcome productive, a schema which can then be transferred to social praxis as seen in the ways in which these string bags are used, re-made, and used again. The processual flux of the bilum as it is made and used reflects the operations required to sustain life in the greater social framework of taro gardening. By making and using bilums, the future of taro is proximate.

Pregnancy and Sexual Reproduction

Now that I have addressed how bilums model the conditions and structural sequences needed to grow taro, I consider how bilums protend sexual reproduction from the protention of taro gardening. Thus, bilums are protentional of sexual reproduction in the next proximate future. I first analyze the *aam bal men* and then address how the *iman men* complements the concepts established in the principal form, which is then instantiated in social practice.

Aam bal men

Recall that the initiation of making an *aam bal men* is referred to *men uyo dup kam-i* [to start looping a bilum], analogous to the term *dup kam-in* [to plant small things]. *Dup kam-in* also means "to give birth to a boy," while another similar term, *ban uyo dup kam-in*, translates to "initiating a boy through ceremony" (MacKenzie 1991:83). The language of bilums indexes

the reproductive powers imbued within the bag as it is made, harnessing the proficiency of productive powers in an analogy with plants and children. As these interrelated terms suggest, it is not only the development and nourishment of gardens, but also the care and nourishment of offspring that is intrinsic to a woman's identity and social responsibilities. The process by which a bilum begins is comparable to the journey a woman must take to become the quintessential Telefol woman. Through construction of the bilum, women establish themselves by the social organizing principles of the Telefol cultural framework. Bilums contribute to the growth of people and plants, accompanying women through the growth and transformative phases of their lives, as well as the domestic tasks required of them. The bilum itself undergoes these processes of change and development, making it an appropriate analogue for Telefol life cycles.

The joining loops which support the body of the bag are not only metaphorically and linguistically associated with *sagaal* [fingers] but can also be referred to as *muuk* [breasts], recalling the way in which women breastfeed their offspring. *Muuk* also refers to the 'root of the pandanus,' referencing the way in which roots acquire food to nourish and support the body of the plant. As support stitches for the body of the bilum, *muuk* encapsulates and informs how a woman should use her bilum and her procreative powers to provide for the domestic well-being of others. Thus, like string figures, forms and processes both reinforce the procreative powers of these string objects. In making a bilum, women engage in self-construction, not only as an alimentary provider, but through successful cultivation of food, can then provide for others, training her for the ultimate role of motherhood. This analogy resurfaces as a woman uses her *aam bal men* in her domestic chores, which expands when it fills, visually indexing a pregnant womb. Furthermore, when mothers of young babies are

working in the garden, they use their bilum as a portable bassinet while they accomplish their other domestic tasks, such as gardening.

Amongst the Umeda of PNG, the relationship of motherhood and the large open looped form are contextualized in the name of the bag. *Udapub,* the larger bilum associated with and carried by women (Gell 2006 [1975]:143) is most like the Telefol *aam bal men*. Where *uda* means bilum, *pub* is a term that connotes distension and swelling (*ibid*). The name of the form presents the bilum as a procreative symbol closely related to a woman's social obligations. Telefol women say the *aam bal men* is the superior form of the bilum "because it expands so readily, and the fuller it is the more people one can nurture… A woman's *aam bal men* thus facilitates the most highly valued Telefol act, the giving and sharing of food" (MacKenzie 1991:130). Even more to the point, *uda-midi* is the Umeda linguistic analogy used to refer to a womb, literally meaning 'spirit-womb' (Gell 2006 [1975]:143). The implication of *uda-midi* is that a bilum harnesses and reproduces the procreative powers of women cosmologically, similar to the associations of Afek and the bilum for the Telefolmin.

Figure 56. *An* aam bal men *being used as a portable cradle* (MacKenzie 1991:I).

Iman Men

Bilums encapsulate sequence and temporality in many ways — sometimes quite literally, as in the case of *men amem* which harnesses ancestral and cosmological power. Looking at the context in which the *iman men* was made, its manufacture constituted a regenerative process of life from death, as an *usong* was encouraged to remain with the Telefol as a guiding ancestor spirit.[45] The bones of a reputed gardener or hunter were placed in the bilum which is lined

45 Coupaye discusses Nyamikum cosmology as distinguishing "between the sky and the domain of the sun, moon, rain and wind, and the underground as the domain of spirits, yams and the dead" (2013:22). Maurice Bloch & Jonathan Parry (1982) make a similar point about Dobuans who conceive of yams as flesh planted in the earth like corpses. "The flesh of the living is also seen as a product of the fertility brought about by the putrescence of the dead, whose bodies regenerate the soil and feed the plants on which the living subsist, and which creates their substance" (ibid:30). The iman men follows a similar pattern regarding its relation to the regeneration of life from death.

with gender-associated materials, *ilub* and *driim*, to provide the procreative conditions necessary for rebirth. The *iman men* is pervaded with the procreative and conjunctive sexual powers of men and women to create a womb in which the *usong* can be reborn. As the bilum is filled with ritual contents and the procreative materials *ilub* and *driim*, the reproductive powers already immanent in the bag are reinforced and strengthened. The re-making of the *iman men* (which was once an *aam bal men)* congeals female and male labor to create an androgynous bag, constructed via the different yet compatible labor of men and women.

Because Taro is Afek's first born, the *iman men* indexes the cosmological associations of the creator goddess and her bilum. Meanwhile the *iman ban* — the context in which the *iman men* was used — requires the use of Umoin's bones, providing yet another layer of combinatory processes required to sustain the growth of people. As Ludovic Coupaye says, "by eating what one grows, or what has been grown by others, one ingests the appropriate combination of ancestral's and human's, female's and male's, rivals' and allies' substances" (2013:263). Thus, the bilum indexes the proper relations between cosmological oppositions, manifesting them in the process of cultivating tubers and in human sexual reproduction, through the conflated identity of Taro as a child and a horticultural product. The reproductive image of the combinatory powers of male and female procreative powers is manifest within the process of constructing bilums as well, for as Strathern says, "there would be no frame on which men fastened the feathers if there were no women to loop for them; nothing for women to put in the bags if no men to fill them up" (2015:105). Thus, the ritual implications of bilums reinforce the maternal associations of the bilum, even in strictly male contexts of ritual by combining the reciprocal labor of men and women for a common goal. Women can only fill their bilums with taro and their offspring via the give and take relations with men as their cosmological opposition.

Protentional Relations

The way a woman uses and engages her *aam bal men* as part of taro horticulture imparts the need for cohesion of effort and the need for sexual differentiation. Taro gardening prefigures sexual reproduction by manifesting the cohesion of opposites as seen in the interlocking and interdependence of gardening, which cosmologically associates Taro as more like a child rather than flora. The collaborative labor of men and women enjoined to grow taro trains the mind to the contingency of care and nourishment. Taro is a sort of vegetative prefiguring of human relational growth that trains men and women to parenthood and sustains the lineage, first produced in food, which nourishes and sustains bodies.

In the *iman ban,* initiates were "likened to growing taro stalks" (MacKenzie 1991:50), making the analogy of *dup kam-in* [to plant small things/to give birth to a boy] and the related term *ban uyo dup kam-in* [initiating a boy through ceremony] enacted as praxis in the ritual context. Another set of cosmological oppositions — red and white — relate to the sexual procreative fluids of men and women in conjunction with the male ritual and female object and the bones of Afek and her male social counterpart/kin member Umoin. These associations may seem obvious, but their accumulation of different scalar transformations, shows that regeneration requires the conjunction of *many* dichotomous pairs, as seen in the conjunction of past/future, white/red, and male/female. All these cosmologically opposed pairs combine to create and sustain the conditions needed for continuity of the social line. Tending taro models the relations and processes required to tend and care for people, specifically for the purpose of reproducing. Thus, by producing and providing food, people can provide for bodies. As I have now shown, all these relations are proximate within the bilum and extend further into the next proximate future.

Fishing Nets: Potential Futures in Gardens and People

Now, I investigate how fishing nets manifest patterns of growth first amongst yam gardens and then amongst people, looking at how they sustain and enable life in ways that are like those regarding string figures and bilums. I return to Muyuw to consider *wot* and its relationship to subsistence practices and sexual reproduction in connection with the analysis of Ludovic Coupaye (2013) on tuber production among the Nyamikum Abelam.

Yam Gardens

At first glance, fishing nets do not appear to be in direct relation to yam gardens. However, the conjunction of old/new or past/present as cosmological oppositions provides the context for renewal and growth in fishing nets and in yam gardens. As discussed in the previous chapter, *wot* undergoes constant processes of re-making, where old sections are removed, new sections are made, and the remaining section is ritualistically joined to the new at the *pwason* [middle of the net, transitional point of the net]. The same sense of ongoingness is encapsulated in the growth of yams, as well. As Munn (1986) says, regeneration in yam gardens requires a part of the old harvest with the planting of the new, which Coupaye describes as vegetative reproduction, "comparable to cloning" (2013:39). The clones maintain the same lineage of yams through time in such a way that reflects the processuality of the net.

Because tubers reproduce asexually, they "are well equipped to ensure the duration of the individual, because every year the plant coming out of a tuber will create one or many other tubers, but in fact it is the same individual. It is a clone" (Coupaye 2013:288).[46] Tubers

46 Despite asexual modes of production, tubers are often likened to people. Dobuans refer to yams as tomot [human beings] (Bloch & Parry 1982:28), while the Trobriands refer to the tip of yams as matala [eye], implying sexual passion, which enters the human body through sight, and is reproduced in the structure of the yam (Mosko 2009:683).

maintain continuity by regenerating new products from the old, where the old is still genetically similar to the new. This pattern is produced in nets, where making a new section of the net requires makers to produce a weave that matches the existing section of the net. Although the material is newly made, it is compositionally and structurally the same as the older netting. Tubers, like nets, are conceived of as a "constant becoming" (Coupaye 2021:56), showing that the contingency of regeneration is immanent within these forms. "When facing a particular tuber, one might be in the *presence of* a very ancient being, whose essence is dispersed and propagated into many places" (*ibid:55*, *emphasis original*). Yams are not limited spatially or temporally, due to the process of cloning. If anything, cloning expands their ability to exist through space and time.

As I have said of string, yams are also both continuous and discrete. While cloning produces continuity, segments of the vine represent discrete sequences. The vine itself is segmented much like tying materials in Muyuw are segmented. The term *paatë* refers to the main part of the stem of the vine, while the terminal end is called *kutë*, which is monitored and tended for growth (Coupaye 2013:31). The Nyamikum further divide *paatë* into *tulë* and *mëkëlëk,* the former referring to the stem and the latter to the knots that separate, the *tulë. Mëkëlëk* refers to a series of knots on bamboo and cane, as well, while *tulë* also defines spans of time such as seasons, i.e., *këraeka tulë* [season of taking food] (*ibid*:31). Thus, like the *vatul* of Muyuw, yam vines amongst the Nyamikum are segmented to represent sequences in the duration of ongoing time. I suggested previously that the more transformable the medium the more apt

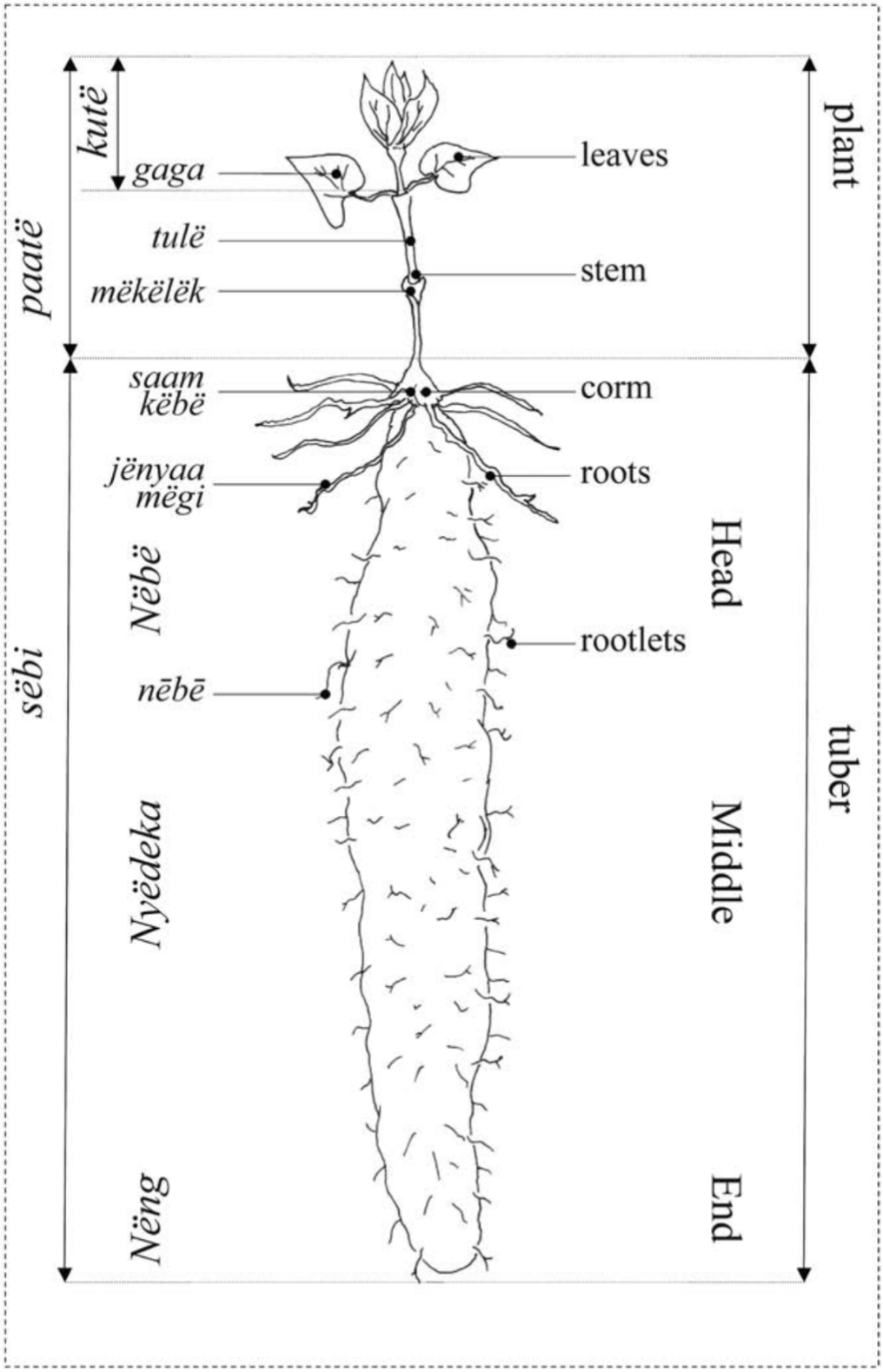


Figure 57. *Nyamikum yam terminology* (Coupaye 2013:21).

the material is in embodying Husserlian intentions. I now extend this hypothesis to yams as Coupaye says "cultivation is *vernacularly* about the control of time-creation process, and that yam ceremonies are about *presencing* — or *present-ing* both past and future relations" (2021:49, *emphasis original*). In sum, yams produce the same patterns of social organizing principles objectified in string objects, but on a larger scale within the social framework.

Once again, regeneration and temporality are sustained in the processes of making and using string objects and prefigures a similar social value in the social praxis of yam horticulture. Like bilums, fishing nets are used in subsistence activities to acquire and obtain food. It is interesting that yam planting is encapsulated within an object used for male subsistence activities. However, the interwoven threads of the net recall the image of yam vines, reinforced by Sipum's definition of *vatul* [vine/string], showing the ability of string objects to manifest relations between horticultural forms and praxis. As with string figures and bilum bags, cosmological oppositions are used to produce a stable and productive social object. The combination of socially opposed pairs, old/past and new/present makes it so that these distinctions are combined in such a way that they transcend their differences and combine their labor for the collective good of either producing yams or catching fish.

Even though there may not appear to be direct correlation to yam gardens through male subsistence activities such as fishing, the principles employed in either activity require the same conjunction of cosmological oppositions into a positive value transformation for the purposes of acquiring or producing food. With *wot*, the conjunction of labor is between elder men who make the net and younger men who acquire the net for use. As the net is used, it requires communal labor to maneuver, with groups of men working together for the same desired outcome. The same set of principles are employed in the process of growing yams,

which, like fishing, requires a coordinated, systematic effort and the balance of cosmological oppositions to produce a positive value transformation. The conjunction of male and female manifests within both yam gardening and fishing, as in the case of *parawog* (female) and *kuv* (male) yams. The same pattern is reproduced in the ideation of the net as *vin* [woman]. The conjunction of male labor with the reciprocal action of the female net produces the desired outcome of fish. When men use a net, they are enacting the same positive value transformation as employed when *kuv* and *parawog* are planted next to one another. Despite the differences of nets and sea-based activities as a male dominated social sphere, the act of producing food as either a man or woman, require the reciprocal labor of their cosmological opposite. These social organizing principles are reinforced for both men and women in their social duties as providers and fecund agents and amongst elder men and younger men as they enable the productivity of the net. The net, then, conveys the nexus of generational and gendered social roles, as they relate to productivity and socially desired outcomes.

Protentional Relations

Fishing nets, like other string objects, protend the next proximate future of yams. The net models the future of yams in its materiality as it combines old and new materials to sustain the object. Thinking about vegetative reproduction employed to produce new yams, while simultaneously allowing one to be in the presence of an ancient being, one can see how yams conflate temporality in a manner akin to string objects. Their constant becoming indicates an ongoingness of form and praxis, as well as a conflated concept of time. In the way that yams relate to past/present as I discussed above, I suggest they do the same for present/future, where the next future of yam gardens is equally proximal as the ancient and longstanding past enabled by vegetative reproduction. The habitual practice of cloning yams, which have been sustained for generations, suggests that the recapitulation of the practice sets

the precedent for the future. Thinking back to the Māori meeting house discussed by Gell (1998), yams function as a similarly distributed object. Given the causal relationship between *wot* and the growth of yams, each is a collective, intentional, act, combining the productivity of cosmological oppositions to obtain food. By producing food, yams or fish, social actors can sustain the future of other yams and then people. String objects then model the microcosmic scale of social organizing principles, reflecting the same patterns on larger scales within the social framework. This instantiation of pattern and practice on multivalent levels gives weight to the life enabling capacities of string objects. "It is as if this botanical entanglement with the complex socio-technical processes from which they emerge, was part of what makes yams appropriate for embodying life-giving capacity" (Coupaye 2013:263). As yam production emerges from the socio-technical processes of making and using fishing nets, they protend the future of more yams, following the same pattern of production that make these acts meaningful, while reflecting the productive conjunction of cosmological oppositions on different social scales. In sum, the act of making and using fishing nets protends the future of yam gardens and their sustained production through time.

Pregnancy and Sexual Reproduction

Wot have powerful implications for childbirth and pregnancy in Muyuw. "In complex ways netting, a prototypically male form of production, is correlated with and opposed to the birthing of children" (Damon 1990:129). This is represented in numerous ways within the object itself. First and foremost, nets are likened to female bodies. They are often referred to as *vin* [woman] and are attributed qualities associated with women; they are heavy, slow, and large, but exceedingly productive (*ibid*). The different sections of the net are identified using body part terminology, presenting the net as an anthropomorphized structure. The net is efficacious when it is combines the speed and agility of men and their boats (masculine

Figure 58. *Gisaw, one of three elders, taking his turn weaving the* say *[new net section],* Muyuw, December 1974 (Photo courtesy of Fred Damon).

objects) with the antithetical qualities of the female net, becoming complementary to the action of men, where the two opposites unite to engage in reciprocal production. Like bilums, the cohesion of masculine and feminine energies creates a productive object.

Due to the productive conjunction of male/female as the net is used, the process becomes laden with sexual connotations. While in use, the net is equated to sexual intercourse, an action which combines the productive powers of men and women. "A basic principle for gender relations — complementarity — is encased in its [the nets] use" (Damon 2000:56). The act of men charging the female net is perhaps the most obvious sexual association, where men penetrate the water and vigorously approach the net in pursuit of the fish. In catching fish, the most desirable quality of fish is how 'greasy' they are, and the oilier the better (Damon 1990).

Grease is a metaphor for sexual fluids in the region (*ibid*). When men and women copulate, they produce 'grease.' So, the better the combination of productive efforts between men and nets (feminine objects), the greasier the fish they hope to catch. Meanwhile, the linguistic term for 'acquiring fish to eat' is *kabwaloug*. The root of the word, *bwaloug*, means "shellfish," specifically referring to the meat of the shellfish, while *ka-* is a causative (*ibid:*244). Figuratively, *bwaloug* refers to a vagina (*ibid*). The linguistic analogy indexes the female body, specifically her reproductive organs, in conjunction with the productive action of men and their boats. The successful collection of greasy fish is the positive value transformation of the productive efforts of male and female labor into the accumulation of food. There is a visual element to this process, as well, where like a bilum, the net swells like a pregnant belly when it is full of fish. This feature of the net indicates that men can provide not only for themselves, but for the collective, too. Fish, as a product of this labor, then contribute to the greater social good, feeding fellow villagers. The action and results of the net's use exceed the sum of the its parts, reproducing the principles required to produce food and produce people. These acts are designed to sustain the social line and draw the potential future of other bodies into the immediate processes of catching fish, in form and praxis.

Like other string objects, there are other cosmological oppositions in conjunction with female/male that increase the productivity of an object, such as left/right and in/out. These dichotomous pairs relate to the complementarity and differentiation of gender relations. In Muyuw, if two tying materials are spliced together the "tips" are further distinguished between "left" (*kimau*) and "right" (*katay*), where the former becomes the base, and the latter leads (Damon 2017). It is not until the tying processes are put into motion that a female/male contrast governs the process (*ibid*). The gender contrast does not become relevant until action is employed suggesting that string objects reproduce the social organizing principles employed

to produce people. "The left part of the structure, the "base" (*atusip*) is "female" (*kudavin*) since it remains stationary; the right part becomes "male" (*kudataw*) because it moves, providing strength to the ensemble" (*ibid:*261). This concept aligns with the Muyuw idea of sexual reproduction discussed above, where the men actively corral fish into the passive, lumbering female net. Many of the processes involved in the construction of *wot* require that the technical processes begin from the left and move right. For example, when the net is spliced, it must be tied first on the left and then on the right. The *ovam* used to thread the *lag* and *kiak* to the base of the net, leads from left to right, with the maker holding a float or shell with the left hand and threading with the right hand. The left *asan* is referred to as *simugwey*, which derives from the verb *mug* [lead], where the right outer side is referred to as *sinoyem*, from the word *wankuyem* [back, behind, or after], indicating the correct order of net processes. In analyzing the relationship of left/right to gender distinctions, the net is laden with sexual connotations and gendered norms for Muyuw men and women. Like bilums, men can perform their social role with the knowledge of women's role in tandem and inherent within the objects they make and use. Muyuw men, like Telefol men, do not have to permeate the female domestic sphere to understand the reciprocity and complementarity of their social labor.

In the previous chapter, I discussed the ritualistic process by which a new net section becomes white, as *wot* is remade. This is reflective of a first pregnancy ritual, where the net, as it is made, undergoes processes similar to that of pregnant women. The new *say* is brown once it has been made, but then once it is attached onto the existing net, a ritual period is declared until the material turns a bleached white (Damon 1990:98). Meanwhile, in a woman's first pregnancy ritual, after she has given birth, she is smoked over a fire in an enclosed space in her mother's house (*ibid*). This is done so that the woman turns 'white,' a quality that is supposed to enhance her productivity. The same productivity and fecundity of women are associated with nets,

which are also considered to be productive female entities. As the net is woven, left/right directional processes relate to female/male mobility and social activities. Once the technical acts of construction cease, the object more closely reflects womanhood, undergoing a first pregnancy ritual, represented by the transition of the material from brown to white. There is, however, a spatial element to this ritual which contrasts pregnancy with nets. As stated in the previous chapter, men weave a net in front of the house in *takoven*, a public space associated with men. The first pregnancy ritual and the act of giving birth, by contrast, all take place within the back of the house, where out/in spatially aligns with male/female gender relations. "While at one level there is cooperation and complementarity there are nonetheless tensions between same sex and cross-sex loyalties" (MacKenzie 1991:43-44). The spatial implications reinforce the distinction between the sexes and their social responsibilities. The net is capable of not only conveying the complementary relations of the sexes, but also their differences and oppositional nature. Given that the net is a female object in the male dominated sphere of production and use, it is logical that there would be contrast as well as complementarity. The object models the proper social relations required to sustain the social framework, with men and women performing their social roles in the proper context and reproducing the ways in which they are meant to relate and interact with one another within the temporal flux of social life.

Before synthesizing how the fishing net manifests productivity and correct social relations, I briefly return to the old/new dichotomy that rules the process of making and using the net. As discussed in the previous section, the net models the reproduction of yams, where old material from the previous harvest must be planted with the new to make more yams through cloning. Amongst many different Melanesian groups, yams and other tubers are conceived of as people, like I discussed amongst the Telefolmin and taro (MacKenzie 1991, see also Bloch

& Parry 1982, Damon 1990, Coupaye 2013). The same process is seen in the labor of the men who make the net (elders) and then those who use it (young men). Muyuw people "refer to the old seed and the new tubers as if they are tabu-, the dying elder generation and the oncoming new one" (Damon 1990:170), indicating that age is as important to the division of labor as gender relations are. This distinction points to the continuity of lineages, where the object ages inverse to those who make and use it, beginning anew by the hands of elders and wearing out over time by the hands of young men.

Figure 59. *Trobriand hearths used to prepare cooked food, such as yams* (Mosko 2009:692).

This sense of ongoingness produced in yams is analogously extended to people and lineages. For example, the term *paatë* not only refers to yam vines, but is also used to indicate lineages and sequences (Coupaye 2013). The *taakwi* [sett] also refers to the placenta, which the Nyamikum understand to feed the human fetus (*ibid*:40). Thus, the production of tubers engenders life in such a way that it can sustain not only itself but others (i.e., humans), as well. Yams are conceived of as a sequitur between string and people, because as either food or valuables, yams "intervene in the very process of reproduction, they are also themselves reproducible" *(ibid:*263). For the Nyamikum, like Muyuw, "clans (*këm*) too are seen as tubers emerging from one another, and can thus also be considered as variations of one another... Some are older than others, some came first, others followed" (*ibid*:290). Thus, the value of plants and humans are produced within the string object and instantiated in different levels of praxis, modelled in horticulture and the sexual reproduction of people. Renewal is enabled by the cohesive labor of all members of the social line to create a productive entity, passing the net to the younger men who are responsible for sexual reproduction and sustaining life as older generations die out. Young men eventually become old men capable of making the new sections of the net. Skills become passed down to younger generations as a process of continuity, adapting to changes in the system (i.e., aging and dying). Therefore, processes associated with the production and use of *wot* prefigure the processes of reproducing yams, which then protend people.

Protentional Relations

Fishing nets protend continuity and ongoingness of the social line in many ways as they are made and used, engaging many cosmological oppositions for the purpose of creating stability and combatting entropy. "By the (dangerous but necessary, thus requiring talent) combination of opposites and contrastive domains (components) in the process of creation, one thus

participates in the production of culture" (Coupaye 2013:263-264). In combining the labor of old/new as past/present, male/female, out/in and right/left the fishing net models the production of culture. These same fractals are produced at different levels, first in the production of yams and then in the production of people, which sustains the cultural and social life of this region. The net makes relevant the nexus of gender and generation, where the division of labor relies on both distinctions to combine their productive energies. By modeling procreative acts between male and female social counterparts first in string, then in yams, and finally in human sexual reproduction, one can see how combinations of social opposites are configured to protend contingency. The cognitive associations of production embedded in making and using a net prefigures the sequences and conditions required to produce yams. Once food is available for subsistence and can be continuously reproduced, social actors can maintain their own continuity through time on various levels, generationally and sexually. Although fishing nets are associated with seafaring subsistence, they model and protend the conditions necessary to sustain the production of culture, first in providing food, and then in the development of people.

IV. Enabling the Future: Social Praxis in The Macrocosm

String Objects: Sustaining and Enabling Life

As I have now shown, each string object contains the potential for futurity in its construction and use. However, it is engaging in social praxis that makes the future more certain rather than a mere potential. The translation of patterns and schema instantiated in the object as a processual entity allows social actors to sustain continuity in the flux of social life. Throughout this thesis, I have shown how the patterns of string objects are a microcosm for the social organizing principles of Melanesia and, to a degree, Oceania, as well. String objects convey the

potential for ongoingness and social continuity, and the transmission from objects to social agents is what allows the potential of futurity to become lived praxis in gardening tubers and sexual reproduction. The model reinforces that effective action occurs in sequential and organized patterns that require social agents to adhere to specific social roles. Furthermore, it requires social actors to be knowledgeable about the roles of their opposites in order to manifest the reciprocity that sustains the social life, first by producing food and then by producing people. It is the transformation of the cognitive processes embedded in the act of making the microcosm translated into the social action of the macrocosm, to which I now turn.

In this section, I address how all the string objects I have analyzed thus far are engendering and engaging in the same social organizing principles, making them the ideal model for regeneration and continuity. First and foremost, I addressed the ways in which the materiality of these objects allows social actors to think through their construction and use, producing the flux of time, while organizing and structuring discrete units amongst the processual nature of social life. These materials are chosen to reflect the unstable and entropic nature of social life. They demonstrate that constructing and organizing in meaningful ways helps to create stability and order amongst chaos. The material itself is an unstable topology through which construction and use produce stability and social order by engaging the social organizing principles of the region. "It is from the irreversible trajectory of the entropic universe that higher levels of structure emerge" (Mosko & Damon 2005:33). String as a material, then, manifests this reality as cordage transforms into more complex objects, layered with complex cognitive principles through different scales and praxes. This entropy is reflected in the manifold assortment of cosmological oppositions embedded in string practices in different scales of praxis, enhancing their productivity as an object, while informing the roles of social

actors for the same purpose — sustaining life and maintaining social order. As I have shown, string objects manifest in/out, old/new & past/present, left/right, red/white, and female/male, as they are made and used.[47] In looking at the ways in which these cosmological oppositions manifest futurity of plants and people, it becomes clear that it is the cohesive efforts of many cosmological oppositions that produce continuity. Social order and balance are produced when opposites are engaged in activities which emphasize their differences while complementing each other in such a way that they sustain positive value transformations.

Cohesion is also an important aspect of the relations modeled within string objects. The interconnected strings of string figures, bilums, and fishing nets are nonlinear, and appear to represent indiscernible chaos, but this is not so. In Muyuw a beautiful garden "is one in which the growth is so bountiful that all of these distinctions have disappeared...vines are so intermingled that they cannot be separated by the eye, much less by hand" (Damon 1990:171). It is not so much that these distinctions need to be upheld in such a way that they are incompatible with others, in fact much to the contrary. They receive their strength from their ability to transform difference into reciprocal action which contributes to the ongoingness of social life. The social framework is one that requires give and take, tension, cohesion, and productive action. These concepts are interiorized throughout the processual nature of these objects. Social actors come to understand their individual social roles and the ways in which people are meant to relate to and interact with others. One of the important ways in which integration and interaction are realized within objects comes from the physical binding enacted in the processes of construction and the cohesion of social labor engaged when using

47 This is not a comprehensive list of existing cosmological oppositions but is comprehensive of those I have chosen for my analysis. Tip/base is popular amongst the analyses of Coupaye (2013), Mosko (2009), and Damon (2017).

or re-making an object. When these processes and principles combine with action to produce positive value transformations, the social organizing principles are always immanent within the string object.

The processual nature of these string objects enables them to protend tubers and to then protend people. The continuity of form and process draws the future into the present moment, cognizing the sequences, structure, and processes required to enact and build the future. This is what Sipum means when he says that string 'enables life.' String objects outline the methods and sequences by which these courses of action should be undertaken. The materiality of string represents the fragility, uncertainty, and overall entropy inherent in the social system, while eliciting meaningful ways of relating. The form of the string objects realizes the roles and circumstances expected of cosmological oppositions, while they are constructed and as they are used. These objects continue to cognitively accrete the information as the material itself accretes physically in the string figure, bilum, or fishing net. These objects engage social actors in their construction and use, modeling the ways in which social actors should work together and become productive as individuals and within the larger social framework. Thus, the "transformations in the form, function and meaning" of string objects "as it passes from one social context to another point to the fact that value is not inherent" in a string figure, bilum bag, or fishing net "but multivalent and variously realized" (MacKenzie 1991:27), i.e., value is located in artifactual relations. In each context, the string object is invested with complex social information and meaning, which are then utilized in the process of constructing and maintaining the social fabric of the Melanesian region. These objects not only protend the continuity of tubers as food sources or people as social lineage, but they also manifest this continuity, where people can translate the microcosmic order of string objects into a schema that instantiates these patterns as social praxis.

Conclusion

In addressing string objects as a model for the social organizing principles of Melanesia, I have shown the multivalence and iterative nature of the model itself, capable of representing time, space, interartefactual relations, kinship relations, causality, and contingency. I suggest the success of string objects as model stems from their processuality, encapsulating the flux of materials, construction, use, and social life on the microcosmic scale. String figures, bilums, and fishing nets all have different capabilities for modeling social relations and temporal flux, demonstrated in Chapters 1 and 2. However, these three objects also have shared capabilities as a model due to their material affordances and ability to reflect sequential and continuous temporal processes as an abstraction of concrete social practices. These objects model the relations and circumstances required to engage positive value transformations in the system, by combining the compatible yet differentiated labor of cosmological oppositions to achieve desired outcomes in the system. Thus, these objects represent a nexus of social relations.

String figures are more than a mere act of play; they interiorize abstract concepts into something concrete via the transmission of pattern and transformational sequences. String figures, as a cognitive tool, are apt for conveying cultural knowledge and concepts, while their endless transformational possibilities enable the medium to encapsulate innovation and change. The interartefactual relations sustained in string figures show that the model is not simply mere representation but requires action and motion for it to be efficacious. String figures train the mind to think of actions as ordered and structured patterns to be carried out in specific ways, at specific times, in specific contexts. As the first of the string objects of my study, string figures established the ongoing and processual framework of social life in

Oceania, reflected in the ephemeral and continuous processes of string figure construction. I offer numerous ethnographic examples of string figures across Oceania as evidence of the string model as the total social object, showing the concatenative nature of social life reproduced in the object itself.

Bilum bags and fishing nets, from a Western perspective, might at first seem 'static' compared to the fluidity of string figures. Instead, I have shown that these larger, more permanent forms exhibit the same object-as-process form and function as string figures. Bilum bags objectify the valued social roles of their wearers, where ideal gender roles are embodied within these transformational container bags. As women make and use their *aam bal men,* the bag prefigures and reproduces the quintessential values of a Telefol woman. For men, the process of re-making the *aam bal men* into an elaborated form such as the *uun kon men* or the *iman men* recontextualizes the bilum, making it an object of male production, in such a way that does not eliminate the social values imparted by its female makers. Thus, the bilum represents the reciprocal conjunction of cosmological oppositions into a meaningful social object for both men and women. Contemporary bilums and their innovations continue to rely on traditional methods and cognitive principles, as well as innovative designs, techniques, and mediums, like bilumwear. The meanings and social implications of wearers have changed through time, but the ability of the bilum to model social identity and relations remains immanent in these forms.

Fishing nets, like bilums, model ideal social relationships and proper combinations of gender and generation amongst social actors, stressing the need for cohesion and differentiation between social actors. Elders make and re-make nets, while young men use and re-use them, reflective of different life stages and the continuity of knowledge and skill between them.

Regarding gender, the relations of men and nets, as female objects, make clear the social differences of men and women, like those seen in the case of bilums, both of which are used for subsistence activities. The object models the reproduction of tubers and people, making it a regenerative form and relating further to the other objects described in this thesis. Fishing nets convey processuality throughout their life project, as they are made and re-made, recycled endlessly, and renewed with the labor of cosmological oppositions. The fishing net as a model conveys the reciprocity required of social actors to sustain the collective. Men do not make and remake these objects for individual purposes, but with the intention of providing for others, concepts elicited throughout the production and use of the object. Fishing nets concretize and make visible the invisible, abstract cognitive principles that inform their processual life in tandem with the social agents who engage with them.

While string objects are capable of objectifying different social organizing principles, the ability to protend growth and regeneration is a thread that binds them into a unified category as 'model.' String objects, as a model, reflect the operational sequences and cognitive practices on different scales that prefigure tuber gardening and sexual reproduction. String figures, bilums, and fishing nets embody the cognitive and physical processes that make abstract concepts concrete and achievable. String objects are fractals, "a process that somehow produces the same pattern through different levels of reality" (Mosko & Damon 2005:85). The material chosen is an unstable topology designed to reproduce the entropy of the social system, which people manipulate to create stable forms and sequences. The transformations and operational sequences applied to constitute form, process, and use work to further stabilize these objects, reproducing the proper order and relations in which social actors should perform in practice to make the social system stable and orderly. Through different scales of practice, string objects prefigure the relations that make social practice meaningful, as seen in

the protentions embedded within string objects as a cultural *oeuvre*, capable of enabling the future of taro and people. The flux of these processual objects reproduces the temporal flux within which meaningful action is structured and organized. Thus, string objects not only objectify but render the social system of Melanesia meaningful in an interactive model of mind and social practice, reproduced on many levels of the social framework.

Although this thesis aims to close the gap between string research in Melanesia, it poses new questions, as well. The model of futurity and growth presented in my final chapter may be too polished to truly represent social practice, but the model is designed to represent the ideal from which different actualizations stem. This prompts the question as to how the model applies to social practice now. Do string objects continue to manifest similar social organizing principles through the last hundred years of research? How has it changed in the face of 'modernization' and technological developments? The string objects of my own discussion have manifested these principles, but does the model hold when applied to other string objects in Oceania? Consequently, I hope to test this model through future fieldwork to consider consistencies and inconsistencies between model and praxis, considering how the model persists and changes over time. Only by reviving funiculomania in the anthropological discipline will we be able to understand what string objects are truly capable of in contemporary Oceania.

Bibliography

ADAMS, M. J. 1973. Structural Aspects of a Village Art. *American Anthropologist* **75**, 265–279.

ANDERSEN, B. 2015. Style and self-making: String bag production in the Papua New Guinea Highlands. *Anthropology Today* **31**, 16–20.

ANDERSON, M. K. 2005. *Tending the Wild: Native American Knowledge and the Management of California's Natural Resources*. Berkeley: University of California Press (available on-line: *https://search.ebscohost.com/login.aspx?direct=true&AuthType=cookie,ip,athens&db=nlebk&AN=142115&site=ehost-live*, accessed 10 May 2022).

ASCHER, M. 2002. *Mathematics Elsewhere: An Exploration of Ideas Across Cultures*. Princeton University Press (available on-line: *http://www.degruyter.com/document/doi/10.1515/9780691187648/html*, accessed 29 November 2022).

AZADEH, A. 2010. Being Woven: The Transformation of the Self within Woven Spaces: Text by Alinah Azadeh Photography by David Ramkalawon and Lilian Simonsson. *TEXTILE* **8**, 36–49.

BARKER, H. M. 2019. Unsettling SpongeBob and the Legacies of Violence on Bikini Bottom. *The Contemporary Pacific* **31**, 345–379.

BARRON, J. 2021. Le dessin sur sable d'Ambrym - Tableau ethnographique d'un art éphémère. *Antipodes, Annales de la Fondation Martine Aublet* 9.

BARTH, F. 1975. *Ritual and knowledge among the Baktaman of New Guinea*. Oslo: New Haven [Conn.]: Universitetsforlaget; Yale University Press.

BATESON, G. 1979. *Mind and nature: a necessary unity*. New York: Dutton.

BLOCH, M. & J. PARRY 1982. Introduction: death and the regeneration of life. In *Death and the Regeneration of Life* (eds) J. Parry & M. Bloch, 1–44. Cambridge: Cambridge University Press (available on-line: *https://www.cambridge.org/core/books/death-and-the-regeneration-of-life/introduction-death-and-the-regeneration-of-life/9C5C411E0CE70C17BE3024D2D361A919*, accessed 2 December 2022).

BROWN, D. E. 1991. *Human universals*. New York: McGraw-Hill.

COUPAYE, L. 2013. *Growing art, displaying relationships: yams, art and technology amongst the Nyamikum Abelam of Papua New Guinea*. New York: Berghahn Book.

———— 2021. The living shape of time: Time and technics in the case of Abulës-speakers yams. In *Time and its object: a perspective from Amerindian and Melanesian societies on the temporality of images* (eds) P. Fortis & S. Küchler, 47–63. London: Routledge.

DAMON, F. H. 1990. *From Muyuw to the Trobriands: transformations along the northern side of the Kula Ring*. Tucson: University of Arizona Press.

———— 2000. From regional relations to ethnic groups?: On the transformation of value relations to property claims in the Kula Ring of Papua New Guinea. *The Asia Pacific Journal of Anthropology* **1**, 49–72.

———— 2017. *Trees, knots, and outriggers: environmental knowledge in the northeast Kula Ring*. (First edition). (Studies in environmental anthropology and ethnobiology **volume 21**). New York: Berghahn Books.

———— 2021. Asia-Pacific legacies in Eastern Kula Ring outrigger canoes. In *Time and Its Object: A Perspective from Amerindian and Melanesian Societies on the Temporality of Images* (eds) P. Fortis & S. Küchler, 23–46. London: Routledge.

DÍAZ, S. & Á. VUONG 2018a. *Bilum from Bena Village.* (available online: https://artsandculture.google.com/asset/bilum-from-bena-village/7QGKLFJbjEiveQ – accessed 17 May 2023).

———— 2018b. *Bilum from Sepik*. (available online: https://artsandculture.google.com/asset/bilum-from-sepik/hQHhnqGgZTdZ5A - accessed 17 May 2023).

DICKEY, L. A. 1928. New Hebrides String Figures, vol. I. In *String Figures From Hawaii, including some from New Hebrides and Gilbert Islands.*, 159–167. Honolulu, Hawaii: The Museum (available on-line: *http://name.umdl.umich.edu/AGZ2530.0001.054*, accessed 18 September 2022).

EASTOP, D. 2007. Playing with Haddon's String Figures. *TEXTILE* **5**, 190–205.

GARNIER, N. 2009. Fashion and bilum, from tradition to modernity, from individual creation to collective achievement. Hailans to ailans: Contemporary New Guinea art exhibition. (available on-line: http://hailanstoailans.com/art/fibre/fashion-and-bilum-essay-by-nicolas-garnier/, 9 December 2022.)

GELL, A. 1992. *The Anthropology of Time: Cultural Constructions of Temporal Maps and Images*. (Explorations in anthropology). Oxford; Providence: Berg.

———— 1998. *Art and Agency: An Anthropological Theory*. Oxford, UNITED KINGDOM: Oxford University Press, Incorporated (available on-line: *http://ebookcentral.proquest.com/lib/durham/detail.action?docID=5746790*, accessed 26 July 2022).

———— 2006 [1975]. *Metamorphosis of the Cassowaries: Umeda society, language and ritual*. (Reprinted). (London School of Economics monographs on social anthropology **51**). Oxford: Berg [u.a.].

GNECCHI-RUSCONE, E. 2019. Bilum, Bilas, Bilumwear: PNG Women Loop Stylish Dresses to Create New Identities. *ZoneModa Journal* **9**, 47–69.

HARAWAY, D. J. 2016. *Staying with the Trouble: Making Kin in the Chthulucene*. Duke University Press (available on-line:

http://www.degruyter.com/document/doi/10.1515/9780822373780/html, accessed 27 March 2022).

HARDY, K. 2008. Prehistoric string theory. How twisted fibres helped to shape the world. *Antiquity* **82**, 271–280.

HAU'OFA, E. 1994. Our Sea of Islands. The Contemporary Pacific 6, 148–161.

HERMKENS, A.-K. 2001. Bilum | The Encyclopedia of Crafts in WCC-Asia Pacific Region (EC-APR) (available on-line: https://encyclocraftsapr.com/bilum/, accessed 13 May 2023).

HUFFMAN, K. W. 1996. 'Su tuh netan'monbwei: we write on the ground': Sand-drawings and their Associations in Northern Vanuatu. In *Arts of Vanuatu*. Bathurst: Crawford house publ.

HYLAND, S. 2014. Ply, Markedness, and Redundancy: New Evidence for How Andean Khipus Encoded Information. *American Anthropologist* **116**, 643–648.

INGOLD, T. 2010a. The textility of making. *Cambridge Journal of Economics* **34**, 91–102.

———— 2010b. Transformations of the Line: Traces, Threads and Surfaces. *TEXTILE* **8**, 10–35.

Interview on Bilum Significance: Sharleen 2018. (available on-line: https://www.youtube.com/watch?v=bkbgfbCM8vo, accessed 3 May 2022).

JOSEPHIDES, L. 2008. *Melanesian odysseys: negotiating the self, narrative and modernity*. New York: Berghahn Books.

KÜCHLER, S. 2002. *Malanggan: art, memory and sacrifice*. (Materializing culture). Oxford; New York: Berg.

———— 2003. Imaging the Body Politic: The Knot in Pacific Imagination. *L'Homme* 205–222.

———— 2007. The String in Art and Science: Rediscovering the Material Mind. *TEXTILE* **5**, 124–139.

———— 2014. Additive Technology and Material Cognition: A View from Anthropology. *Journal of Cognition and Culture* **14**, 385–399.

KÜCHLER, S. & T. CARROLL 2020. *A Return to the Object: Alfred Gell, Art, and Social Theory*. London: Routledge.

MACKENZIE, M. A. 1985. Bilums. *Fibre forum* **4**, 13:-41–44.

———— 1991. *Androgynous objects: string bags and gender in central New Guinea*. (Studies in anthropology and history **v. 2**). Chur, Switzerland; Philadelphia: Harwood Academic Publishers.

MALINOWSKI, B. 2014 [1922]. *Argonauts of the Western Pacific: an account of Native Enterprise and adventure in the Archipelagos of Melanesian New Guinea*. (Routledge classics). London; New York: Routledge.

MALLETT, S. 2003. *Conceiving cultures: reproducing people & places on Nuakata, Papua New Guinea*. Ann Arbor: University of Michigan Press (available on-line: *https://catalog.hathitrust.org/Record/004323768*, accessed 26 July 2022).

MCKENZIE, R. 2021. 'Strange and complicated feats with string.' In *Ancestors, artefacts, empire: indigenous Australia in British and Irish museums* (eds) G. Sculthorpe, M. Nugent, H. Morphy, British Museum & National Museum of Australia, 216–223. London: The British Museum Press.

———— 2022. 'Such Intimate Relations': On the Process of Collecting String Figures and the Paradigm of Participant Observation Fieldwork. *Royal Anthropological Institute* **4**, 28.

MOSKO, M. S. 2009. The Fractal Yam: Botanical Imagery and Human Agency in the Trobriands. *The Journal of the Royal Anthropological Institute* **15**, 679–700.

MOSKO, M. S. & F. H. DAMON (eds) 2005. *On the Order of Chaos: Social Anthropology and the Science of Chaos*. Berghahn Books (available on-line:

http://www.degruyter.com/document/doi/10.1515/9781800735187/html, accessed 2 December 2022).

MUNN, N. D. 1986. *The Fame of Gawa: A Symbolic Study of Value Transformation in a Massim (Papua New Guinea) Society*. (The Lewis Henry Morgan lectures **1976**). Cambridge [Cambridgeshire]; New York: Cambridge University Press.

NAVARO, Y. 2020. The Aftermath of Mass Violence: A Negative Methodology. *Annual Review of Anthropology* **49**, 161–173.

PAJACZKOWSKA, C. 2007. Thread of Attachment. *TEXTILE* **5**, 140–153.

PANKENIER, D. W. 2015. Weaving Metaphors and Cosmo-political Thought in Early China. *T'oung Pao* **101**, 1–34.

SILLITOE, P. 1976. Why String Figures? *The Cambridge Journal of Anthropology* **3**, 13–26.

SOMMERVILLE, A. T. P. 2016. 'I do still have a letter:' Our Sea of Archives". In *Sources and methods in indigenous studies* (eds) C. Andersen & J. M. O'Brien, 121–127. (1st edition). London; New York: Routledge, Taylor & Francis Group.

STRATHERN, M. 1980. No Nature, No Culture: The Hagen Case. In Nature, culture and gender (eds) C. P. MacCormack & M. Strathern, 174–222. Cambridge: University Press.

———— 2015. *Learning to See in Melanesia: Four Lectures Given in the Department of Social Anthropology, Cambridge University, 1993-2008*. (Master Class Series, No. 2). Hau Books (available on-line: https://books.google.co.uk/books?id=ZX3zDAEACAAJ, accessed 21 September 2022).

TANAKA, Y. 2013. *The power of the weave: the hidden meanings of cloth* (trans G. Harcourt). (First English edition). (LTCB international library selection **no. 32**). Tokyo: International House of Japan.

TURNER, V. W. 1995. *The ritual process: structure and anti-structure*. (The Lewis Henry Morgan lectures **1966**). New York: Aldine de Gruyter.

TURNER, V. W. (VICTOR W. 1970. *The forest of symbols: aspects of Ndembu ritual*. Ithaca, N.Y.: Cornell University Press (available on-line: *http://archive.org/details/forestofsymbolsa0000turn*, accessed 27 July 2022).

VUONG, Á. 2018a. *Ceremonial Bilums at Goroka Show.* (available online: https://artsandculture.google.com/asset/ceremonial-bilum-at-the-goroka-show/awFrdpughkhg4w – accessed 17 May 2023).

–––––– 2018b. *Making: Looping the fiber.* (available online: https://artsandculture.google.com/asset/making-looping-the-fiber/AwEt0x8xGaO90Q – accessed 17 May 2023).

–––––– 2018c. *Making: Removing the bark.* (available online: https://artsandculture.google.com/asset/making-removing-the-bark/cQEfuizxhdZv4A – accessed 17 May 2023).

–––––– 2018d. *Making: Weaving the pattern.* (available online: https://artsandculture.google.com/asset/making-weaving-the-pattern/WQGtmyq7Z3Wbcw – accessed 17 May 2023).

WERE, G. 2010. *Lines That Connect: Rethinking Pattern and Mind in the Pacific*. University of Hawaii Press (available on-line: *http://www.degruyter.com/document/doi/10.1515/9780824860486/html*, accessed 10 May 2022).

–––––– 2013. On the materials of mats: thinking through design in a Melanesian society. *The Journal of the Royal Anthropological Institute* **19**, 581–599.

–––––– 2018. *How Materials Matter: Design, Innovation and Materiality in the Pacific*. New York, NY, UNITED STATES: Berghahn Books, Incorporated (available on-line:

http://ebookcentral.proquest.com/lib/durham/detail.action?docID=5521543, accessed 28 November 2022).

WEST, A. L. 1980. *Australian Aboriginal cordage and single element fabric structures.* MA thesis, La Trobe University, Melbourne.

WEST, B. A. 2009. *Encyclopedia of the peoples of Asia and Oceania*. New York: Facts On File.