

UC Irvine

World Cultures eJournal

Title

The Moon Makes Yams Grow: Tongans (Polynesians) and Nature

Permalink

<https://escholarship.org/uc/item/8px932k3>

Journal

World Cultures eJournal, 22(2)

Author

Bennardo, Giovanni

Publication Date

2017

Copyright Information

Copyright 2017 by the author(s). All rights reserved unless otherwise indicated. Contact the author(s) for any necessary permissions. Learn more at <https://escholarship.org/terms>

Peer reviewed

The Moon Makes Yams Grow: Tongans (Polynesians) and Nature

Giovanni Bennardo, Northern Illinois University, DeKalb, IL

Introduction

Climate change is affecting communities all over the world. Local populations perceive a number of changes in their environment due to climate change and explain them using the knowledge they have and the beliefs they hold about their world. We have labeled the encompassing knowledge structure—organized and related units of knowledge—about various components of one’s physical, mental and spiritual world, a Cultural Model (from now on, CM) of Nature.¹ This CM is a major component of local knowledge and it plays a fundamental role in the perception and interpretation of any phenomena related to changes in the environment, including climate change.

This work is about the preliminary results from the analyses conducted on data collected in the Kingdom of Tonga (from now on, Tonga), Polynesia, in search of a Tongan CM of Nature. Tongan communities are deeply affected by changes in the climate such as weather unpredictability (including increasing number of typhoons and length and occurrence of dry and wet seasons), the raising level of the ocean waters, and the variability of fish supplies (changes in quantity and size, place, and time of the year).

This work is organized in several sections. In the first section, I provide a brief introductory description of Tonga and specifically of the small community I investigated. In the second, I describe the methodology used to collect and analyze the data. Then, in the third section, I report about the preliminary results of the analyses. In the fourth section, I present an hypothesis about the Tongan CM of Nature I was able to infer from the results of the analyses. Then, I continue the work by looking at the internal causal structure of this CM. Finally, I look at possible future activities—data collection and analyses—that could answer some of the questions arising from the preliminary results presented.

1. Place of Research

The Kingdom of Tonga (Tonga) lies in a south-west to north-east line in the South Pacific ocean. Most of the islands are raised coral islands, some are volcanic, and a few are atolls. Coral beaches lined with palm trees and emerald lagoons with luxuriant tropical vegetation are characteristic features. The Kingdom consists of approximately one hundred fifty islands, thirty-six of which are inhabited and divided into three groups: Vava’u in the north (also the name of the major island in this group), Ha’apai in the center, and Tongatapu in the south (also the name of the major island in this group). The capital town Nuku’alofa is on Tongatapu island. The total population reached 103,036 according to the latest census (2011), and more than a third (35,778) lives in the capital.

Tonga is a constitutional monarchy headed by King Tupou VI. He is the direct descendant of King George Tupou I who introduced the Tongan Constitution in 1875. Traditional Tongan society had at its top the *ha’a tu’i* ‘royal line,’ followed by

the *hou'eiki* 'chiefs,' *ha'a matāpule* 'talking chiefs,' *kau mu'a* 'virtual or would-be talking chiefs,' and *kau tu'a* 'commoners' (Gifford, 1929). All the titles were inheritable. The 1875 Constitution introduced the figure of the *nōpele* 'noble' in an attempt to substitute that of the chief in some of its traditional prerogative (such as owning land), but this latter figure still exist. Moreover, an increasing market oriented economy and an expanding bureaucracy have lately added a middle class that spans some of the traditional strata from commoners to chiefs (Gailey, 1987; Linkels, 1992; van der Grijp, 1993; James, 2003).

Kinship ties are of paramount importance in Tongan society. The two major kin groups are *fāmili* and *kāinga*. A *fāmili* 'family' is made up of a married couple and their children living together in the same house and it usually includes some male and/or female collaterals and affinals (usually, son-in-law or daughter-in-law). The *'ulumotu'a* 'head' presides over this group. The *kāinga* 'extended family' is a group of people living in different households, mostly in the same village, but often including residences in other villages. They are related to one another by a bilateral relationship of consanguinity (cognatic system or kindred). A specific *'ulumotu'a* 'head' presides over this group besides his own family. In a changing contemporary Tongan society, membership to this kin group is not strictly following traditional guidelines and inclusion is more and more restricted to closer relatives than in the past (van der Grijp, 1993:135, 2004; Evans, 2001). The basic parameters that are applied in establishing hierarchy at any level are gender and age, with the former preceding the latter. A female is always considered higher in rank than a male.

Nobody visiting Tonga will fail to notice the overwhelming presence of Christianity throughout the Kingdom. From the first failed attempt in 1797 to Christianize the islands by Wesleyan missionaries, the middle of last century saw an increasing presence of Christian religions (Lātūkefu, 1974). The contemporary religious landscape of Tonga is characterized by many Churches, The major one is the Free Wesleyan Church (37.3 %) that is also the 'official' religion of the Monarchy.

Tongan is an Austronesian language of the Oceanic subgroup. It belongs to the Western Polynesian languages, specifically the Tongic group. Seventy years as a British protectorate (until 1970) has resulted in the introduction of English. Much of the village population still knows little of this language, however, in Nuku'alofa and other major towns, most business transactions are conducted in it. While English is taught in elementary schools and is the language of most high school instruction, Tongan is the language commonly spoken in the streets, shops, markets, schools, offices, and churches.

The first European visitors in the late 1700s spoke of a population scattered throughout a densely cultivated land (Ferdon, 1987). Contemporary Tongans are now concentrated in villages and small towns. Most villages lie around an empty area, called *mala'e*, used for social gatherings and games. Contemporary houses are usually rectangular and made of timber with corrugated iron roofs. The toilet and the kitchen are traditionally in separate huts, but modern houses have them indoor. Little furniture is used.

The village where I conducted the data collection is located on the island of Vava'u, in the northern archipelago by the same name. It is a small village of approximately one hundred and seventy inhabitants living in thirty-six houses. In the village, there is one main church (Free Wesleyan Church) with an adjacent hall for communal activities and another smaller church (Latter Day Saints). The elementary school is placed outside the village perimeter. Junior high and older students go to school in the main town of Neiafu, site of the local government and Governor.

The village lacks a noble, but has a residing chief. A *mataāpule* 'talking chief,' is also in residence. The local Wesleyan minister is an important member of the community. Ministers, however, are rotated every four years, and only their office and not them as individuals is part of the long lasting social fabric of the village. Another prominent figure is the elected '*ofisa kolo* 'town officer.' Thus, the village social structure suggests three formal positions: a chief, a ceremonial officer, and an elected town officer. One needs also to add the '*ulumotu'a* of the nine *kāinga* in which the population is divided. The main income of the villagers comes from subsistence. Farming, shell gathering and fishing are the most common activities. However, there are also a number of wage laborers earning cash and the cash economy has become more significant in the last couple of decades. Cash and goods from relative abroad—New Zealand, Australia, and the US, mainly—has also recently become a relevant source of income for the villagers.

The effects of climate changes have not left this small Polynesian kingdom untouched. The level of the ocean water has increased and tides are finding their way inland causing damage to cultivated plots. Typhoons have become more frequent with occasional loss of lives in addition to the destruction of houses and vegetation, including numerous trees (almost all fruit-bearing, e.g., coconut tree, mango, papaya, and banana). A well-established weather pattern—alternating between rainy and dry seasons—has also been affected with longer drought spells and with rain that has become unpredictable in its quantity and distribution over the yearly cycle. The availability, quantity and size of fish has also been affected in such a way that villagers rely less on their own fishing activities and more on the fish market² in the main town and port of the island.

2. Methodology.

The methodology employed within this project regards both data collection and data analysis. I conducted my field work in Tonga for 5 weeks, from May 8 through June 12, 2015. The village in the northern Tongan archipelago of Vava'u, where I collected the data, is very familiar to me because I have spent a total of more than 21 months in it since my first visit in 1991.

Data Collection. The data was collected using a variety of methods, including: Nature walks, open interviews, semi-structured interviews, free-listing tasks, and space tasks. Given the extensive familiarity I have with Tonga and specifically with the community focused on, I started my data collection with a few nature walks and open interviews. The reason being that of familiarizing myself again with the Tongan physical environment, both spatially/visually and linguistically, while freely talking about it (in Tongan).

Later, I conducted semi-structured interviews (see Appendix 1 for content) with a sample (N=18) of the community/village population obtained keeping in mind parameters such as age, gender, education, kāinga 'extended family' membership, occupation, and religion. All the interviews were video-recorded and later transcribed in the field with the help of native speakers.

I also administered free listing tasks to 27 individuals—representing a similarly composed sample of the local population—about the major components of Nature: plants, animals, physical environment, weather, humans, and supernatural. I must add that the term fangamanu 'animals' did not elicit the intended comprehensive list, but only few mammals. So, I administered two other free list tasks about two other terms, that is, manupuna 'birds' and ika 'fish.'

Data Analyses. I conducted five types of analyses on the transcriptions of the semi-structured interviews: a gist analysis, a key words analysis, a semantic roles analysis, a metaphor analysis, and a reasoning/causality analysis. The first analysis is intended to obtain reduced versions of the interviews while maintaining the language used by the interviewees. The second analysis highlights the most frequent words used to refer to Nature during the interviews. These terms function as building blocks of the CM of Nature to be hypothesized and will also be later compared with the ones obtained from the free listing tasks.

The semantic roles analysis is conducted on the most frequent and thus salient key words and elicits which of them is used as agent or patient, thus indicating a specific relationship between terms/concepts. The analysis of metaphor follows wherein all the metaphors used are counted and classified according to Lakoff and Johnson's typology (1980). Concepts used as sources and/or targets of the metaphors used were also detected. Finally, reasoning passages and those implicitly or explicitly indicating causality were found and classified. The intention of this last analysis is to acquire insights into the type of relationships—implicit or explicit—interviewees establish between the various terms/concepts about Nature.

The results of the free listing tasks were analyzed to discover the frequency of occurrence of each item mentioned in all the lists obtained. The common assumption behind any free listing task is that 'first listed' items stand for 'more salient' items. Thus, the lists obtained provide an excellent comparison/verification opportunity between the results of the analyses on the linguistic data and those on this experimental/memory task. Other tasks, e.g., sorting tasks and rating tasks, will be administered in a second data acquisition visit to the field and a larger and more extensive comparison/verification will then become possible—including also a consensus analysis.

3. Results of the Analyses.

Below, I report first about the results of the analyses conducted on the data collected during nature walks and open interviews. Then, I report about the results of the five analyses on the transcribed semi-structured interviews. Finally, I follow by briefly commenting on the results of the free listing tasks.

What Interviewees Said about Changes. During the nature walks and the open interviews, the subjects often mentioned changes in their environment and many of

them happen to be related to climate change (many others referred to the composition of their social environment). The following is a list of those locally perceived changes:

- Pattern of Heat/Sunny Days;
- Pattern of Rain Downpour;
- Pattern of Typhoon Occurrence;
- Rising Level of Ocean;
- Availability and Size of Fish;
- Availability and Size of Shellfish.

These same issues were found present also in the semi-structured interviews. I now introduce examples of sentences from the transcriptions and will later make some inferences from them that contribute to my hypothesis of a CM of Nature for Tongans. The sentences represent examples of statements often repeated across the sample of subjects interviewed.

1) *tó 'a e 'ufi ('i) he mahina katoa*
'plant yams with full moon'

koe'uhi:
'because'

ko e 'ufi ma'u ('a) e ivi mei ia
'yams get force from it'

I put *koe'uhi* 'because' on a separate line because it was not always explicitly included as a link between the two sentence in (1), but it was definitely implied. In (2), further salient propositions are introduced.

2) "when the moon is full, it gives energy to the soil and then the yams grow"
"yams get energy from sun, soil, and from water"
"soil gets energy from full moon and water"
"weeds get energy from soil"
"we must weed otherwise yams do not grow well"
"nature masters yams, etc."

Some of the propositions were explicitly addressing the concept of Nature as in (3).

3) "humans belong to nature"
"humans cannot separate from nature"
"God, humans, nature belong together"
"when I see nature, I see God"
"God is in nature, but masters it"
"*they* [supernatural beings] are separated from nature because one cannot see them"

Inferences from what Interviewees Said. From the content of these shared ideas interviewees felt compelled to express linguistically in the interviews, I inferred a number of concepts that are presented individually in (4). These concepts (in bold) immediately follow the statements to which they refer more directly.

- 4) “when the moon is full, it gives energy to the soil and then the yams grow”
physical environment (moon, soil) are related to plants (yams)
 “yams get energy from sun, soil, and from water”
 “soil gets energy from full moon and water”
 “weeds get energy from soil”
energy is transferred among physical environment and plants
 “we must weed otherwise yams do not grow well”
energy is limited
 “nature masters yams, etc.”
nature is ruled by its internal laws
 “humans belong to nature”
 “humans cannot separate from nature”
nature includes humans
 “God, humans, nature belong together”
 “when I see nature, I see God”
supernatural is included in nature
 “God is in nature, but masters it”
 “*they* [supernatural beings] are separated from nature because one cannot see them”
supernatural is separated from nature

Gist Analysis. The transcribed texts of the interviews were reduced to their gist by paying careful attention to using the words and sentences produced by the interviewees. This type of activity obtained an increased familiarity with the content of the texts while at the same time reducing the amount of interview content to be analyzed. In addition, the gist obtained for each interview function as a reference point for further analyses.

Key Words Analysis. I conducted a word frequency analysis on the texts of the transcribed interviews.³ For each text I excluded from the analysis the part in which I was asking questions or in any way producing language during the interview. The resulting list of words was greatly reduced (from 1170 to 495) by focusing on those, now key words, that were used to talk about Nature or nature related activities (see Appendix A). These key words were later classified as nouns (150), verbs (190), and adjectives (85), among other parts of speech (70). I must point out that Tongan lexical items are not classifiable as nouns or verbs or adjectives, but they acquire a syntactic denomination by their appearance in a specific syntactic position. Then, the attribution of the key words to the various syntactic classes was done by typicality of occurrence, that is, each word was assigned to the most frequently occurring syntactic class in the texts analyzed.

Semantic Role Analysis of Key Words (Nouns). Out of the 150 nouns used by the interviewees, I selected 15 that were most frequent while at the same time being topically salient, i.e., they referred to Nature. I present these selected key words in Table 1.

While frequency and saliency were used to select the key words in Table 1, it remained to be seen what type of semantic role/s they played in the texts in which they were used. A semantic role is the role that a noun phrase (e.g., a noun) plays in

the event that is described in an utterance. For example, an ‘agent’ is the noun to whom the speaker assigns the role of initiating or performing an action, while a ‘patient’ is the receiver of that same action. Such types of expressed relationships may provide insights into the types of relationships among key words (e.g., concepts) that contribute to the structure of a CM of Nature. Then, I conducted a further analyses in which I determined the semantic role, e.g., patient or agent, of the selected 15 key words.

Table 1: Salient Key Words

	NOUN	Frequency
1	<i>Kelekele</i> ‘soil’	120
2	<i>Tahi</i> ‘sea’	114
3	<i>Vao</i> ‘weed’	113
4	<i>‘Akau</i> ‘plant/tree’	80
5	<i>Kakai</i> ‘people’	78
6	<i>Ivi</i> ‘power/energy’	71
7	<i>La’ā</i> ‘sun’	71
8	<i>Natula</i> ‘nature’	64
9	<i>‘Ea</i> ‘weather’	63
10	<i>‘Uha</i> ‘rain’	46
11	<i>Vai</i> ‘water’	40
12	<i>Mahina</i> ‘moon’	32
13	<i>Ika</i> ‘fish’	28
14	<i>Fangamanu</i> ‘animal’	26
15	<i>Puaka</i> ‘pig’	20

The results of the analysis in Table 2 indicate a slight preference (286 or 57% vs. 211 or 43%) for the use of the key words in the role of patient over that of agent. This finding is in line with a widespread Polynesian tendency to avoid expression of agency (Duranti, 1994, Bennardo, 2009). The key words most frequently used in the role of agent are the weather 55 (sun 28, weather 14, and rain 13), followed by weeds 42, people 27, and animals 24 (animals 14 and pig 11). The key words most frequently used in the role of patient are tree 51, power/energy 45, soil 41, nature 24, water 19, and sea 13.

When we consider that the interviews are about events related to daily subsistence events/activities, these results point toward a frequent assignment of agency to the weather (55) over the ‘living’ environment such as humans (27) and animals

(24). The role of patient instead is most frequently assigned to the physical environment 73 (soil 41, water 19, and sea 13) and to plants 51. These findings indicate the saliency assigned to the weather as it comes into relationships with humans, animals, and plants. While at the same time the physical environment and plants are conceived as being typically acted upon by a number of agents, e.g., weather, humans, and animals.

Table 2: Semantic Roles of Key Words.

KEY WORD	Frequency	AGENT	PATIENT
<i>Kelekele</i> 'soil'	120	12	41
<i>Tahi</i> 'sea'	114	5	13
<i>Vao</i> 'weed'	113	42	28
<i>'Akau</i> 'tree'	80	3	51
<i>Kakai</i> 'people'	78	27	9
<i>Ivi</i> 'power/energy'	71	7	45
<i>La'ā</i> 'sun'	71	28	11
<i>N a t u l a</i> 'nature'	64	12	24
<i>'Ea</i> 'weather'	63	14	9
<i>'Uha</i> 'rain'	46	13	7
<i>Vai</i> 'water'	40	8	19
<i>M a h i n a</i> 'moon'	32	7	7
<i>Ika</i> 'fish'	28	8	8
<i>F a n g a m a n u</i> 'animal'	26	13	11
<i>Puaka</i> 'pig'	20	11	2
TOTAL		210	285

Metaphor (and Source/Target) Analysis. Metaphors are essential rhetorical devices and according to Lakoff and Johnson (1980) they represent a fundamental cognition (i.e., knowledge) building activity (see also Lakoff, 1987). An analysis of the metaphors used in the interviews conducted should provide further insight into the sought for CM of Nature (see Strauss and Quinn, 1997; Quinn, 2005; Bennardo, 2009).

I found 179 metaphors used in the texts analyzed. Each interviewee used an average of 9.94 and the range was 1-23. Using Lakoff and Johnson's (1980) typology,

the metaphors found are classified into four different types: ontological, 91 or 51% (either personification, 73 or 80%, or objectification, 18 or 20%); structural 81 or 45%; and orientational, 7 or 4% (see Table 3; in the same Table, the first column refers to the subjects indicated as a number.).

Table 3: Types of Metaphor

	Ontological		Structural	Orientational	Frequency
	Personification	Objectification			
1	1	3	6		10
2	6		2		8
3		2			2
4	6	1	5		12
5	3	1	6		10
6	9	3	6	1	19
7	2	1	4	1	8
8	10	1	3		14
9	3				3
10			1		1
11	2	2	7		11
12	3		7		10
13	1	1	1	1	4
14	14		6	3	23
15	2		4		6
16	10		8		18
17			4		4
18	1	3	11	1	16
	73	18	81	7	179

Any metaphor is rooted in a 'source' domain or concept whose known content (i.e., structural characteristics) are projected onto a 'target' domain or concept to make this latter familiar and often understandable and explainable. The various types of sources and targets used may also provide insights into the CM of Nature employed by the interviewees.

In Table 4, I present the results of a source/target analysis of the metaphors found. It is apparent from looking at the content of the table that the world/environment of living entities (e.g., people and animals) is the preferred one that is used

as source for metaphors (see sources in Ontological as Personification metaphors and Structural metaphors). On the contrary, it is the physical environment (e.g., weather, plants, physical objects) and abstract concepts (e.g., time, growth, and action) that are targeted by metaphors in order to find possible ways to be explained and understood (see targets in Ontological as Personification metaphors, Structural metaphors, and Ontological as Objectification metaphors).

These findings dovetails with those of the previous section about the semantic role analysis in which agency was predominantly assigned to the weather. In fact, for any aspect (or object) of the physical environment, e.g., weather, to be assigned agency it needs to be treated as a living entity. Since we have just found out that living entities are the main sources for targeted aspects of the physical environment, we can now understand even better why this latter is spoken about and thought of as having agency.

Reasoning (Including Causality) Analysis. I organized the results of the reasoning analysis on the texts of the semi-structured interviews according to the topics the interviewees chose to reason about (a total of 615). In Table 5, the 15 topics are presented and ranked according to frequency of occurrence, while in Table 6 they are ranked according to frequency of use by subjects (N=18).

The most frequent topics happen to be also the most highly distributed among subjects. The only relevant difference I feel obliged to mention is that all subjects (18) reasoned about the ‘salience of humans/group’—thus, it ranks 1st in Table 6—while this same topic is only 4th in the frequency by topic ranking in Table 5.

In looking more carefully at the frequency by topic, a preference for a focus on humans is detected—‘relationships between humans and results’ 213, ‘salience of humans/group’ 69, that is, a total of 282/615 or 46%. However, all the other topics about plants, animals, weather and physical environment appear to be almost as equally relevant—‘relationship time/weather and plants’ 79, ‘relationship physical environment and plants’ 76, power/energy in trees/soil’ 32, ‘relationship seed/growth’ 29, ‘animals/insects positive/negative’ 23, ‘relationship weather/fishing’ 5, ‘relationship fish/plants’ 3, ‘shellfish/fish/plants internal growth’ 2, that is, a total of 249/615 or 41%.

Other topics do not appear to have an overall salience as the previous ones. In fact, topics such as ‘humans affect/change nature’ 42, ‘relationship humans/nature’ 13, ‘separation humans/nature’ 3, total only 58/615 or 9%. And similarly, topics such as ‘relationship between God/humans/nature’ 25 and ‘God is nature’ 1, also total only 26/615 or 4%.

At times, frequency of occurrence need not to be taken at face value. That is, the nature of the questions asked might be considered a ‘determining’ factors in the prevalence of certain topics over others. However, since all interviewees were asked the same questions, the fact that some of them chose to or did not choose to ‘reason’ about certain topics (see Table 6), should be a result to be considered with attention and care.

Another factor that needs to be pointed out is that ‘reasoning’ may typically involve expressing causes or ‘causality’ and this fact might often make the topic about which the reasoning is conducted less revealing than the causality structure articulated. Causality relationships are one of the most significant type of relationship that

binds concepts and events together in mental constructions that are at the core of the structure of any cultural model (see Bennardo, 2014).

According to the results of the reasoning analysis ‘humans’ seems to be conceived as one of the major foci of the subjects’ thinking about Nature. In addition,

Table 4: Types of Sources and Targets in Metaphors

	<i>SOURCE</i>	<i>Freq uency</i>		<i>TARGET</i>	<i>Freq uency</i>
	<i>Ontological/ Objectification</i>	<i>18</i>		<i>Ontological/Objectification</i>	<i>18</i>
1	<i>Physical Object</i>	<i>18</i>	1	<i>Abstract/Responsibility</i>	<i>12</i>
	<i>Ontological/ Personification</i>	<i>73</i>	2	<i>Weather</i>	<i>5</i>
1	<i>Family/Son/Child</i>	<i>32</i>	3	<i>Time</i>	<i>1</i>
2	<i>Person</i>	<i>29</i>		<i>Ontological/Personification</i>	<i>73</i>
3	<i>Command</i>	<i>12</i>	1	<i>Nature/Plant/Weather</i>	<i>52</i>
	<i>Orientalional</i>	<i>7</i>	2	<i>Place</i>	<i>10</i>
1	<i>Something in Front</i>	<i>3</i>	3	<i>Physical Object/Chemical</i>	<i>9</i>
2	<i>Something Up</i>	<i>2</i>	4	<i>Abstract</i>	<i>1</i>
3	<i>Something in Back</i>	<i>1</i>	5	<i>Activity</i>	<i>1</i>
4	<i>Something Inside</i>	<i>1</i>		<i>Orientalional</i>	<i>7</i>
	<i>Structural</i>	<i>81</i>	1	<i>Past</i>	<i>3</i>
1	<i>Animals, Birds, People</i>	<i>55</i>	2	<i>Action</i>	<i>1</i>
2	<i>Living thing</i>	<i>20</i>	3	<i>First (Beginning)</i>	<i>1</i>
3	<i>Rest/Die (activity)</i>	<i>3</i>	4	<i>Future</i>	<i>1</i>
4	<i>Gold</i>	<i>1</i>	5	<i>Inside</i>	<i>1</i>
5	<i>Plants</i>	<i>1</i>		<i>Structural</i>	<i>81</i>
6	<i>Water</i>	<i>1</i>	1	<i>Plant</i>	<i>31</i>
			2	<i>Physical Object/ Environment/ Chemical</i>	<i>22</i>
			3	<i>Abstract/Health</i>	<i>12</i>
			4	<i>Activity/Growth</i>	<i>11</i>
			5	<i>Time</i>	<i>3</i>
			6	<i>Weather</i>	<i>2</i>
	<i>Total</i>	<i>179</i>		<i>Total</i>	<i>179</i>

humans may cause changes in their surroundings that include animals, plants, and physical environment. Causal relationships among plants, animals, and the physical environment are also very prominent, e.g., phases of the moon cause optimal plants' growth. Weather is also significantly related to plants' growth and it is conceived as causing fishing success. Furthermore, a type of power/force is thought of as characterizing the physical and botanical environment, e.g., soil and trees, thus causing growth in its own terms.

Table 5: Reasoning Topics

213	<i>Relationships Humans/Results</i>
79	<i>Relationship Time-Month-Weather/Plants</i>
76	<i>Relationship Physical Environment/Plants</i>
69	<i>Saliency of Humans/Group</i>
42	<i>Humans Affect/Change Nature</i>
32	<i>Power/Energy in Trees/Soil</i>
29	<i>Relationship Seed/Growth</i>
25	<i>Relationship God/Humans/Nature</i>
23	<i>Animals/Insects Positive/Negative</i>
13	<i>Relationship Humans/Nature</i>
5	<i>Relationship Weather/Fishing</i>
3	<i>Relationship Fish/Plants (Limu)</i>
3	<i>Separation Humans/Nature</i>
2	<i>Shellfish/Fish/Plants Internal Growth</i>
1	<i>God is Nature</i>

Table 6: Reasoning Topics by Interviewees

18	69	<i>Saliency of Humans/Group</i>
18	79	<i>Relationship Time-Month-Weather/Plants</i>
18	76	<i>Relationship Physical Environment/Plants</i>
15	42	<i>Humans Affect/Change Nature</i>
14	32	<i>Power/Energy in Trees/Soil</i>
11	25	<i>Relationship God/Humans/Nature</i>
10	13	<i>Relationship Humans/Nature</i>
9	29	<i>Relationship Seed/Growth</i>
7	23	<i>Animals/Insects Positive/Negative</i>
5	5	<i>Relationship Weather/Fishing</i>
2	2	<i>Shellfish/Fish/Plants Internal Growth</i>
2	3	<i>Relationship Fish/Plants (Limu)</i>
2	3	<i>Separation Humans/Nature</i>
1	1	<i>God is Nature</i>

Finally, and in a less frequent manner, one type of supernatural, i.e., God, is talked about as being necessarily intermingled with any aspect of Nature, but also standing in a commanding position. While not overtly expressed, 'commanding' includes 'causing' other elements to be/ behave in specific ways. Thus, God is a causal agent for the whole of nature. This idea though is also shortened in the expression 'God is nature' and no causality, not even commanding, is expressed.

4. Hypothesis about the Cultural Model of Nature in Tonga.

The results of the analyses presented so far provide an extensive set of concepts about Nature and at the same time they introduce a good set of relationships among

these concepts. I feel confident now to hypothesize the following basic/core content for the CM of Nature for Tongans:

- *physical environment, weather, plants, and animals belong together;*
- *humans belong with the above, but they may act on it and change it;*
- *supernatural/God is not separated from nature, it is everywhere and also supernatural/God is separated from nature, it masters nature.*

The major components of Nature—plants, animals, weather, physical environment, humans, and the supernatural—seem to be thought of as related to each other in a holistic manner. Interestingly, though, different types of causal relationships exist among these components. In addition, a detected focus on humans makes them stand out from other aspects of Nature insofar as they are pointed out as capable of acting and changing the quality of the other components. However, they are also acted upon ‘agentively’ by an element such as the weather. The supernatural, e.g., God, is also addressed as belonging together to all the other elements of Nature. More often, though, it is talked about as being in a commanding role, thus, in a ‘detached’ position.

This preliminary hypothesis contains some issues that need to be pointed out. First, the internal relationships among the elements making up nature—excluding humans and the supernatural—need to be investigated further. The role of animals, i.e., mammals, has been talked about very little, except for that of pigs. Similarly, the relationship between fish, birds, and mammals with plants, weather, and physical environment has been under addressed and thus requires more attention in the future.

Second, there is a contradiction in the model regarding the relationship between God and all the other components of Nature and it needs to be clarified. The immanence of the supernatural is contrasted to its being ‘separated.’ This latter allows to infer causality (from God to everything else) within the linguistically expressed ‘God masters nature.’ At the same time, humans too appear to be treated as ‘separate’ from the other components and thus thought of as capable of acting on and changing them (excluding the supernatural).

Third, in pursuing a resolution to the above stated issues, it would be useful to keep in mind the Polynesian (and Tongan) traditional concept of *mana* or ‘vital force.’ This concept was and is deeply related to a conceptualization of all the components of Nature as holistically related. The persistence of such way of thinking in Tonga has been widely documented in spite of 150 years of Christianity (see Bennardo, 2009, p. 188-89)

5. Causality Structure of CM of Nature.

In Bennardo (2014), I suggested that any CM of Nature would include a causality structure that can be represented by a causal model (see Sloman, 2009; Rips, 2011). In the same work, I introduced three possible causal models that could be eventually found across cultures. Which of those three suggested causal models can be hypothesized as representing an appropriate one to represent causality within the hypothesized Tongan CM of Nature just introduced?

It appears that the Tongan CM of Nature includes causal model one (see Figure 1a). In fact, all the components of Nature are conceived as in reciprocal relationships. And even the place of the supernatural, i.e., God, is often explicitly addressed as an essential constituent of Nature (see the *Graph* in Figure 1).

At the same time, the presence of causal model two (see Figure 2) was also detected. In fact, the wholeness and the inherent intra-relationships among the components of Nature are also explicitly denied on several intra-subjects or across subjects instances when God is assigned a 'master' position (see the *Graph* in Figure 2).

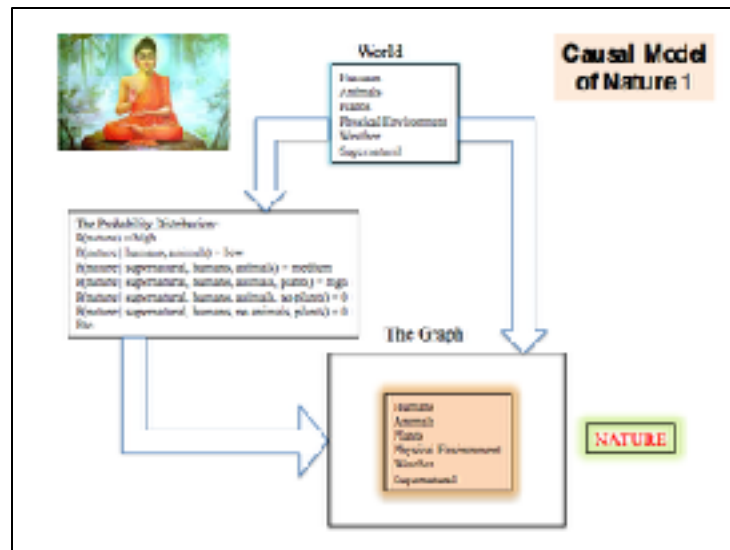


Figure 1: Causal Model of Nature 1 (from Bennardo, 2014)

The presence of this contradiction about the position of the supernatural within Nature both within (at different moments of the interview) and across subjects (subjects expressing different positions) points toward the possibility of two CM of Nature co-existing within each individuals and across the community at large. Further investigation should and could provide the opportunity to obtain insights into these matters.

6. Results of the Free Listing Tasks.

Obtaining ethnographic (participant observation)⁴ and linguistic (nature walks, open, and semi-structured interviews) data followed by an extensive set of analyses represent only two parts of the tripartite methodological trajectory suggested by Bennardo and De Munck (2014) as necessary when investigating cultural models. The third part of the methodology includes the use of experimental/memory tasks such as free listing, sorting, and rating tasks and consensus analyses (including the use of structured questionnaires).

I administered the free listing tasks about the fundamental components of Nature—plants, animals (and fish, birds, and insects), weather, physical environment, humans, and supernatural—to 27 subjects, 14 males and 13 females, ranging

in age from 28 to 80 (females range 28-76; males range 30-80). In Table 7, I am indicating the free listing categories I used—notice that the category ‘animals’ had to be emically divided in animals (mammals), birds, fish, and insects, since the word for animals in Tongan (*fangamanu*) refers only to mammals. In the same Table, I am indicating for each category the total number of words obtained across subjects, the average number of words produced by each subject, and the range.

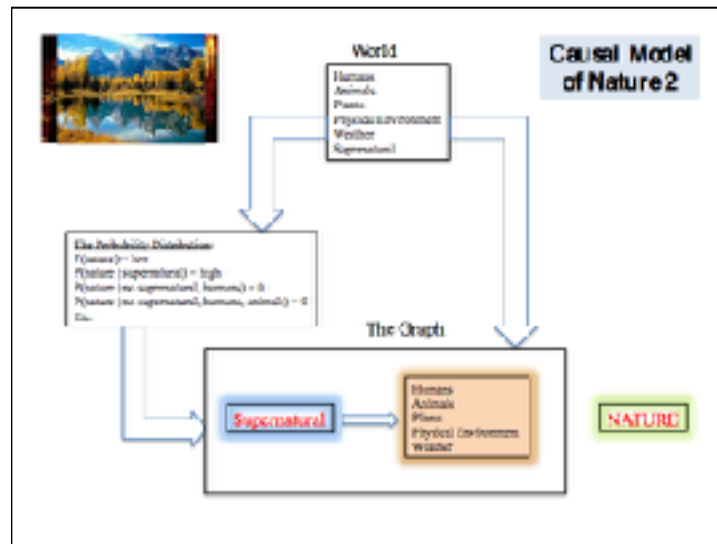


Figure 2: Causal Model of Nature 2 (from Bennardo, 2014)

Words for plants and fish top the chart with an average of 30.07 (and a 15-66 range) and 20.85 (and a 9-37 range), respectively. These results reflect the nature of the interview—it was about daily subsistence activities—but they also tell a story

Table 7: Results of Free Listing Tasks

Category	Frequency	Average	Range
plants	812	30.07	15-66
fish	563	20.85	9-37
people	385	14.26	7-28
birds	279	10.33	5-18
weather	261	9.67	5-17
physical environment	243	9.00	2-15
animals	224	8.30	5-15
supernatural	167	6.19	2-13
insects	38	1.40	0-10

about the keen attention (and memory space) members of the community devote to these two components of their environment.

Table 8 contains the adjusted results of the free listing tasks with the categories as they were suggested by the research group. That is, they represent the etic view of those components of Nature. I present these data so that it could possibly be used later for a cross-cultural comparison among all the results obtained in the various field sites for this research project.

Table 8: Adjusted Results of Free Listing Tasks

Category	Frequency
fish/birds/animals/insects	1,104
plants	812
people	385
weather	261
physical environment	243
supernatural	167
Total	2972

The content of the various lists obtained was adjusted⁵ and frequencies were aggregated. Thus, it could be determined which specific words within each emic category are collectively privileged (remembered and mentioned more often) over others co-present in the lists. The most frequent words (top 48) for plants appear in Table 9. The length of the list of top words varies for each category and it was determined by considering saliency (to the topic of Nature) and occurring gaps in the frequencies, either in the cumulative saliency ranking (sum of all individual saliency rankings) or in the actual final saliency ranking or in both.

For example, in Table 10 about the top words in the list obtained from a free listing task about fish, there are significant frequency gaps between number 2 and number 3, between 4 and 5, between 6 and 7, and between number 23 and number 24 (and others). These gaps were not considered appropriate to stop the list because words following the gaps are considered salient to the topic. However, the list was stopped for inclusion at number 36 because the gap occurring between 36 and 37, even though minimal (only .22), was regarded as significant as only 4 people had mentioned number 37 when compared to 5 people for number 36 (consider that the average number of fish recalled by subject is 20.83). In addition, 36 names of fish are considered an adequate number to conduct a sorting task in the future.

I will use the results⁶ of the free listing tasks to refine the hypothesized Tongan CM of Nature by treating the words in the lists as building blocks for the final CM that will eventually be suggested. For example, using the content of Table 9 and 10—

specific plants and fish can be used in defining the CM of Nature. In addition, the content of these lists will be used to administer further tasks, such as sorting tasks

Table 9: Results of Free Listing Task for Plants

	PLANT	Cum Saliency	Saliency		PLANT	Cum Saliency	Saliency
1	mango	24.56	0.91	25	'ai	4.65	0.17
2	niu	18.95	0.70	26	kalosipani	4.58	0.17
3	mei	15.79	0.58	27	fau	4.46	0.17
4	lesi	15.07	0.56	28	fiki	4.03	0.15
5	vavae	12.64	0.47	29	siale	4.03	0.15
6	painí	10.38	0.38	30	'ovava	3.89	0.14
7	tava	10.07	0.37	31	manonu	3.81	0.14
8	tavahi	9.12	0.34	32	lo'akau	3.78	0.14
9	kuava	8.20	0.30	33	talo	3.78	0.14
10	toi	6.96	0.26	34	'āvoka	3.72	0.14
11	moli	6.93	0.26	35	futu	3.43	0.13
12	motou	6.74	0.25	36	tongo	3.37	0.12
13	ifi	6.69	0.25	37	ngatae	3.35	0.12
14	fekika	6.15	0.23	38	loupata	3.33	0.12
15	ngatata	5.84	0.22	39	mo'ota	3.29	0.12
16	toa	5.39	0.20	40	'āpele	3.17	0.12
17	pua	5.34	0.20	41	kape	3.07	0.11
18	mo'osipo	5.07	0.19	42	koka	3.06	0.11
19	siaine	5.07	0.19	43	feta'u	2.96	0.11
20	pua tonga	5.02	0.19	44	'ufi	2.96	0.11
21	hopa	4.81	0.18	45	sipaisi	2.80	0.10
22	vī	4.77	0.18	46	kava	2.79	0.10
23	nonu	4.76	0.18	47	manioke	2.77	0.10
24	ahi	4.73	0.18	48	sinamoni	2.53	0.09

(relationships within a category) and rating tasks (relationships across categories). The former type will elucidate salient ‘concepts’—more abstract categories—used to group members of the various lists. The latter type will highlight perceived ‘relationships’ among members of the various lists, thus, providing indications about possible causal (or other) relationships among the components of Nature. Again, the future results would contribute to refine and clarify the already hypothesized causal

Table 10: Results of Free Listing Task for Fish

	FISH	Cum Salience	Salience			FISH	Cum Salience	Salience
1	ngatala	16.02	0.59		19	pone	5.07	0.19
2	‘anga	15.01	0.56		20	fai	5.03	0.19
3	tofua'a	13.09	0.48		21	tuna	4.79	0.18
4	lupo	12.30	0.46		22	‘ume	4.69	0.17
5	tanutanu	10.85	0.40		23	sifisifi	4.42	0.16
6	sokisoki	10.34	0.38		24	paka	3.29	0.12
7	te'efō	8.92	0.33		25	te'ete'e	3.24	0.12
8	matu	8.61	0.32		26	hohomo	3.21	0.12
9	toke	7.84	0.29		27	‘unomoa	3.09	0.11
10	manini	7.79	0.29		28	pōse	2.87	0.11
11	sipesipa	7.31	0.27		29	ō	2.81	0.10
12	fua	6.79	0.25		30	tenifa	2.74	0.10
13	palu	6.32	0.23		31	feke	2.73	0.10
14	nofu	5.94	0.22		32	fate	2.63	0.10
15	hakulá	5.86	0.22		33	ali	2.59	0.10
16	fonu	5.32	0.20		34	koango	2.42	0.09
17	kanahe	5.29	0.20		35	tolo	2.41	0.09
18	hapatū	5.18	0.19		36	fangamea	2.22	0.08

model/s—I actually suggested two possibilities from the results of linguistic analyses—that is/are part of the Tongan CM of Nature.

7. Conclusion.

The first set of data collected and the results of the analyses conducted on them have already allowed me to suggest a preliminary hypothesis about the Tongan CM of Nature. However, I have indicated some issues that have emerged from this hypothesis. Much more work is in front of us to clarify those issues left unclear/unsolved by the research conducted so far.

First, the role of specific components of Nature, e.g., animals, needs to be investigated further and possibly clarified. Second, it is left to be discovered and reasonably detailed which specific relationships (causal and others) may exist among the various components of Nature. And third, once the hypothesized Tongan CM of Nature (or more than one) has been refined, it needs to be seen if agreement/disagreement among subjects exists about the model/s to support and possibly validate the hypothesis.

Thus, in addition to the mentioned sorting and rating tasks, I plan to conduct a consensus analysis in the community investigated about the CM/s suggested. For this analysis I will use a questionnaire generated from the final CM of Nature suggested. The results of such an activity may eventually elucidate/highlight and support the presence of one specific (or more than one) CM and/or culture. Finally, if more than one CM are discovered, their distribution within the community would highly enhance our understanding of the various type of local knowledge used by community members once climate change effects impact and modify their traditional expectations about how Nature works.

References.

- Bennardo, G. (2009). *Language, Space and Social Relationships: A Foundational Cultural Model in Polynesia*. Cambridge: Cambridge University Press.
- Bennardo, G. (2014). The Fundamental Role of Causal Models in Cultural Models of Nature. *Frontiers in Psychology*, 10 October, 2014, <http://dx.doi.org/10.3389/fpsyg.2014.01140>
- Bennardo, G. and V. C. De Munck. (2014). *Cultural Models: Genesis, Methods, and Experiences*. Oxford, Oxford University Press.
- Duranti, A. (1994). *From Grammar to Politics: Linguistic Anthropology in a Western Samoan Village*. Los Angeles: University of California Press.
- Evans, M. (2001). *Persistence of the Gift: Tongan Tradition and Transnational Context*. Waterloo, Ontario: Wilfrid Laurier University Press.
- Ferdon, E. N. (1987). *Early Tonga: As the Explorers Saw it 1616-1810*. Tucson: The University of Arizona Press.
- Gailey, C. W. (1987). *Kinship to Kinship: Gender Hierarchy and State Formation in the Tongan Islands*. Austin: University of Texas Press.
- Gifford, E. W. (1929). *Tongan Society*. Honolulu, Hawai'i: Bernice P. Bishop Museum.

- James, K. E. (2003). Is There a Tongan Middle Class? Hierarchy and Protest in Contemporary Tonga. *The Contemporary Pacific*, 15, 2: 309-336.
- Lakoff, G. (1987). *Women, Fire, and Dangerous Things: What Categories Reveal about the Mind*. Chicago: The University of Chicago Press.
- Lakoff, G. and M. Johnson (1980). *Metaphors we Live By*. Chicago: University of Chicago Press.
- Lātūkefu, S. (1974). *Church and State in Tonga*. Honolulu: The University of Hawai'i Press.
- Linkels, A. (1992). *Sounds of Change in Tonga*. Nuku'alofa, Tonga: Friendly Islands Book Shop.
- Quinn, Naomi. (2005). *Finding Culture in Talk: A Collections of Methods*. New York: Palgrave Macmillan.
- Rips, L. J. (2011). *Lines of Thought: Central Concepts in Cognitive Psychology*. Oxford: Oxford University Press.
- Slooman, S. A. (2009). *Causal Models: How People Think About the World and its Alternatives*. Oxford: Oxford University Press.
- Tonga National Population Census 2011; Preliminary Count.
- van der Grijp, P. (1993). *Islanders of the South*. Leiden: KITLV Press.
- van der Grijp, P. (2004). *Identity and Development: Tongan Culture, Agriculture, and the Perenniality of the Gift*. Leiden: KITLV Press.
- Selin, H. (Ed.) (2003). *Nature Across Cultures: Views of Nature and the Environment in Non-Western Cultures*. Dordrecht, The Netherlands: Kluwer Academic Publishers.
- Smith, J. J. (1993). Using ANTHROPAC 3.5 and a Spreadsheet to Compute a Free List Salience Index. *Cultural anthropology Methods*, 5 (3): 1-3.
- Strauss, Claudia, and Naomi Quinn. (1997). *A Cognitive Theory of Cultural Meaning*. Cambridge: CUP.

APPENDIX 1

SEMI-STRUCTURED INTERVIEW

Questions About Daily Activities

1. Personal Questions Precede the Following Ones:
2. Describe your work/job (which relates to primary food production).
3. What is your typical work/work-day?
4. What is the rhythm of work in this area... Or actual activities?
5. What are some of the essential knowledge, skills, experience you need to be a successful food producer?
6. What are considered 'productive activities'?

7. Which fields/sea areas/etc. are productive?
8. What affects productivity? What forces have an influence on production success?
9. What is meant by growth, why do plants grow?
10. What are the key decisions __x__ must make to be successful?
11. What information do you need to make decisions?
12. How do you choose what crops to grow, what to fish, what to go after?
13. What are some of the constraints/problems you face as a food producer?
14. Who or what affects your environment (fields, forest, sea, etc) the most?
15. What is worst/best thing humans can do in fishing/farming/etc.?
16. What do you like/not like about what you're doing (satisfaction)?

Questions About Climate Change

17. What changes have occurred in your work/environment?
18. Why are there these changes/variations?
19. Weather change, how?
20. What can humans do about it?
21. Can humans/human activity affect nature/weather/wind/currents?

SEMI-STRUCTURED INTERVIEW TRANSLATED IN TONGAN

Questions About Daily Activities

1. Personal Questions Precede the following ones:
2. Fakamatala'i Mai Ho'o Ngaue
3. Ko e ha' Ho'o Ongo'i Ki Ho'o 'Aho Ngaue Tu'uma'u?
4. Ko e ha' e Hokohoko Ho'o Ngaue Faka'aho/Uike/Mahina?
5. (Toota'u = Planting)
Ko e ha' Ho'o 'Ilo, Poto Ngaue, Mo Ho'o Taukei 'Oku Fiema'u Ke Hoko Ko Ha Fefine Ngaue Tu'umalie?
6. Ko e ha' e Ngaahi Me'a/Ngaue 'e Fai Ke Hoko' (Ngaahi Me'a) Ke Fakatu'umalie?
7. Ko e ha' e Ngaahi Mala'e 'I he Ngaue' 'Oku Hoko Ko e Fakatu'umalieanga?
8. Ko e ha' e Me'a 'Oku Nau Fakafe'atungia'i?
9. Ko e ha' e Me'a 'Oku Tupu Ai e 'Akau'?
10. Ko e ha' e Me'a 'Oku Ke Fakapapau'i 'e Hoko Ko E Fakatu'umalie Kiate Koe ('I Ho'o Ngaue)?
11. Ko e ha' 'a e Taukei/'Ilo 'Oku Ke Fiema'u Ke Fai'aki Ho'o Tu'utu'uni?
12. Anga Fefe' Ho'o Fili 'a e Fala Ke Ngaue: Lalanga/Fingota?
13. Ko e ha' e Ngaahi Palopolema 'Oku Ke Fetaulaki Mo Ia 'I Ho'o Ngaue?
14. Ko Hai Pe' Ko e Ha e Me'a 'Oku Ne Fakafe'atungia'i Ho 'Atakai?

15. Ko e ha' e Me'a Lelei Taha Pe' Kovi Taha 'Oku Lava Fai 'e Ha Fefine 'I He'ene Ngaue?

16. Ko e ha' e e Me'a 'Oku Sai'ia Lahi 'I Ho'o Ngaue?

Questions About Climate Change

17. Ko e ha' 'a e Ngaahi Liliu 'Oku Hoko 'I he 'Atakai Ho'o Ngaue?

18. Ko e ha' e Uhinga 'Oku Hoko Ai e Ngaahi Liliu Ko Ia'?

19. Kuo 'I Ai Ha Ngaahi Liliu 'I he 'Ea?

20. Ko e ha' e Me'a 'E Malava e Tangata Ke Fai Ki Ai?

21. 'E Lava e Ngaahi Ngaue 'a e Tangata 'o Fakafe'atungia'i 'a Natula, ea, au, La'a, Havili, Afa'?

APPENDIX 2

RESULTS OF FREE LISTING TASKS:

Table 11: Results of Free Listing Task for Animals

	ANIMAL	Cum Salience	Salience
1	puaka	22.63	0.84
2	pulu	18.57	0.69
3	hoosi	17.37	0.64
4	kulī	14.5	0.54
5	kosi	9.13	0.34
6	pusi	7.46	0.28
7	kumā	5.78	0.21
8	sipi	5.43	0.20

Table 12: Results of Free Listing Task for Birds

	BIRD	Cum Salience	Salience		BIRD	Cum Salience	Salience
1	sikiviu	18.08	0.67	17	kokí	3.22	0.12
2	lupe	17.91	0.66	18	ngongo	3.19	0.12
3	peka	15.12	0.56	19	pato	2.42	0.09
4	sikotā	11.52	0.43	20	pekepeka	1.36	0.05
5	lulu	8.86	0.33	21	manu'uli	1.26	0.05
6	kulukulu	7.03	0.26	22	manutea	0.75	0.03
7	tala	7.03	0.26	23	toloa	0.70	0.03
8	moa	6.92	0.26	24	ngutulei	0.67	0.02
9	kiu	6.57	0.24	25	lofa	0.61	0.02
10	motuku	6.47	0.24	26	helekosi	0.55	0.02
11	kalae	6.07	0.22	27	malau	0.48	0.02
12	misi	6.03	0.22	28	‘īkale	0.45	0.02
13	veka	4.70	0.17	29	tavake	0.44	0.02
14	fuleheu	4.45	0.16	30	fata	0.25	0.01
15	misi'uli	4.25	0.16	31	kapatoka	0.16	0.01
16	henga	3.53	0.13	32	ngutuenga	0.09	0.00

Table 13: Results of Free Listing Task for Weather

	WEATHER	Cum Salience	Salience			WEATHER	Cum Salience	Salience
1	momo ko	21.24	0.79		16	fakapöp ō'uli	1.65	0.06
2	māfan a	19.47	0.72		17	mālohi	1.42	0.05
3	afā	9.98	0.37		18	malū	1.36	0.05
4	'afu	9.36	0.35		19	matangi	1.35	0.05
5	la'ā	8.86	0.33		20	'alotām aki	1.27	0.05
6	havili	8.70	0.32		21	tafitong a	1.20	0.04
7	vela	8.47	0.31		22	langi	1.00	0.04
8	'uha	8.40	0.31		23	pupuha	1.00	0.04
9	moko moko	7.67	0.28		24	'uho'uh a	1.00	0.04
10	hakoh ako	3.96	0.15		25	'alomāl ie	0.97	0.04
11	'ao'ao fia	3.95	0.15		26	hahau	0.74	0.03
12	'ahioh io	2.81	0.10		27	matama ta'uha	0.38	0.01
13	mofui ke	2.52	0.09		28	mana	0.22	0.01
14	havili vili	1.83	0.07		29	fatulisi	0.11	0.00
15	hako	1.67	0.06		30	pakukā	0.06	0.00

Table 14: Results of Free Listing Task for Physical Environment

	PHYS ENVIRON	Cum Salience	Salience			PHYS ENVIRON	Cum Salience	Salience
1	kelekele	18.95	0.70		17	'ea	1.61	0.06
2	tahi	16.73	0.62		18	kele	1.60	0.06
3	maka	16.07	0.60		19	tele'a	1.51	0.06
4	'one'one	15.69	0.58		20	makamaka	1.47	0.05
5	vai	6.82	0.25		21	mo'ungaafi	1.35	0.05
6	mo'unga	5.55	0.21		22	loloto	1.29	0.05
7	hakau	5.12	0.19		23	moana	1.17	0.04
8	lilifa	3.61	0.13		24	'ulu'ulu	1.13	0.04
9	fonua	3.59	0.13		25	liku	1.11	0.04
10	feo	3.17	0.12		26	vaitafe	1.04	0.04
11	matātahi	3.06	0.11		27	tāfea	1.00	0.04
12	langi	2.38	0.09		28	vao	1.00	0.04
13	māhina	2.22	0.08		29	efu	0.92	0.03
14	fetu'u	1.82	0.07		30	ngoue	0.89	0.03
15	'ao	1.73	0.06		31	vavā	0.87	0.03
16	la'ā	1.62	0.06					

Table 15: Results of Free Listing Task for Supernatural

	SUPERNAT URAL	Cum Salience	Salie nce		SUPERNAT URAL	Cum Salience	Salie nce
1	‘Otua	25.85	0.96	16	kalaisi	0.50	0.02
2	tēvolo	12.12	0.45	17	Palōfita	0.44	0.02
3	sētane	9.25	0.34	18	me'akehe	0.43	0.02
4	Sīsū	7.33	0.27	19	‘afiona	0.40	0.01
5	laumalie	6.48	0.24	20	fili	0.40	0.01
6	Sihova	4.80	0.18	21	satulō	0.36	0.01
7	‘angelo	2.34	0.09	22	laumālie kovi	0.33	0.01
8	Ta'ehāmai	1.47	0.05	23	tafeuni	0.23	0.01
9	lusefā	1.45	0.05	24	fakapouli	0.20	0.01
10	‘Atonai	1.43	0.05	25	‘ata	0.17	0.01
11	laumaāie 'uli	1.16	0.04	26	laumaāie ma'a	0.17	0.01
12	pinono	1.16	0.04	27	felehuuni	0.15	0.01
13	Sātai	1.16	0.04	28	laumālie lelei	0.13	0.00
14	tēmeniō	0.85	0.03	29	angahala	0.09	0.00
15	palepalengāk au	0.75	0.03	30	taufatahi	0.08	0.00

Notes

- 1 I capitalize Nature when the word appears as defining a CM. I also want to draw attention to the fact that capital letter 'Nature' and small letter 'nature' have two distinct meanings. The latter is typically intended to mean a specific part and type of the environment (e.g., woods, trees, rivers, etc.) or some biological given aspect of existence (i.e., instinct), while the former may include anything that exists (e.g., humans, plants, animals, weather, physical environment, and the supernatural).
- 2 The fish sold in this market is sometimes caught locally, but it often comes from larger commercial fishing boats.
- 3 I conducted the same word frequency analysis on the gist texts and results were extremely similar.
- 4 My personal ethnographic knowledge about Tongan culture and the village within which I collected the data spans 25 years, since 1991, and comprises a total of more than two years of residence.
- 5 For the formulas used, see Bennardo, 2009: 289 (these formulas were developed independently of Smith, 1993 and they turned out to be the same).
- 6 The results of the free listing tasks about animals, birds, weather, physical environment, and supernatural are found in Appendix 2.1