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A SUMMARY**

**WOODROW W. DENHAM, PH. D.**  
RETIRED INDEPENDENT SCHOLAR  
WWDENHAM@GMAIL.COM

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**WOODROW W. DENHAM, PH. D.**  
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**WWDENHAM@GMAIL.COM**

***Abstract.***

*Between 2012 and 2015, I published four long articles or short monographs (Denham 2012, 2013, 2014a, 2015a) in Mathematical Anthropology and Cultural Theory concerning kinship and related topics among the Alyawarra speaking people of Central Australia in 1971-72. They contained a great deal of data and had a total length of 400 pages plus comments and replies. The article that you are reading now is a 28-page overview of that four item set. It can serve as an introduction for people who are new to my work and want a brief introduction to my data and methods, or as a summary for those who are familiar with my work and want to see new interconnections that emerged after the separate items and accompanying comments were published. The paper deals broadly with methods, data, theory and findings.*

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***Introduction.***

**Objectives.**

This paper is an overview of selected aspects of the biological bases of human social behavior, sometimes known as gene-culture co-evolution (Wilson 1998). Since its inception in 1969, my Alyawarra project has focused on the individual people who constituted my research population in 1971-72. In this paper and in my other work with the Alyawarra, I argue “up” from

individuals to culture and “down” from individuals to genes. My analytical strategy always has been serendipitous pattern detection in which I have expected the unexpected (Burnet 1920 [Heraclitus]) and often have found it. My goal is to relax needless constraints on Darwinian evolutionism, making that body of biological theory apply better to human life in harsh habitats.

Here I deal specifically with five principal topics related to mutual aid and societal openness from the perspective of methodological reductionism, the idea that complex phenomena can be understood by the analysis of their simpler components. Wilson (1998:59) calls it “the search strategy employed to find points of entry into otherwise impenetrably complex systems”. The major topics addressed here include the following: Dreamtime social structure; generational asymmetry and openness; laterality, mobility and societal openness; alloparenting and mutual aid; and the Tragedy of the Commons.

This paper has a long history that is reflected in my use of “traditional” in the text. As I use it, “traditional” refers to the behavior of anthropologists, *not* to the behavior of Aboriginal people. It is deliberately imprecise and amorphous, meaning something like: “my interpretation of received wisdom in ethnography and anthropological theory as of roughly 1970”. Certainly “traditional” is *not* a formal and precise consensus; to the best of my knowledge anthropology does not work that way; it is *not* a “straw man” as I have shown in my long papers referenced above; and it is *not* “state of the art” anthropology as of 2016. Thus the paper is an informal personal commentary on selected aspects of the history of anthropological research in Aboriginal Australia prior to 1970. For a formal critique of the discipline, see Hiatt (1996 *passim*).

Further caveats include the following: Due to prohibitions against displaying certain kinds of activities and objects that I photographed among the Alyawarra in 1971-72, some illustrations used here come from neighboring societies. I often say “about” or “approximately” when I was unable to achieve optimal precision in a non-numerate, nomadic society that prohibited discussion of deceased members’ lives. Paternity testing was impossible, but the multiple, highly complex and redundant relational networks revealed only one “wrong” marriage out of 113.

The paper summarizes recent findings using the Alyawarra data. For detailed discussions of methods, data and findings, see Denham (2012, 2013, 2014a, 2015a), Denham, McDaniel and Atkins (1979), and Denham and White (2005). To examine the datasets that yielded these findings, see Denham (2007, 2014b, 2015b, 2015c).

#### **Data.**

Key. Use this key as a guide to the items in the following inventory of data types.

- Data files available at the KinSources Archive (Denham 2015b, 2015c).
- ❖ Data files available in the Alyawarra Ethnographic Archive (Denham 2014b) but not at the KinSources Archive.

Genealogical data. These data are at the core of the Alyawarra data files. In my field research in 1971-72, I recorded much of my data on 6x8 inch data cards, 1 card per person, 377 people. In my archival research in 2005-06, I recorded my data on 80-column data entry pads, 1 record per person, 1361 people. The 377 people in the field data are a subset of the 1361 people in the archival data.

- Genealogical data: Ego's Id# plus Id# of Father, Mother, Spouse1, Spouse2, Spouse3, Spouse4.

Attribute data. The following data are attributes that are attached directly to each Id# in the genealogies.

- ❖ Names, portraits.
- Vital statistics: sex, age/year of birth, language, Country, section, etc.
- ❖ Maps and plans: 43 regions, countries, camps, residences.
- Censuses: 16 censuses per person.
- Kinship term applications data:  $104 \times 225 = 23,400$  kinship term applications.
- Observational behavior records (see Figure 1): 191 hours; 41,814 records on 80-column data entry pads.

All of these data were used to prepare this paper.



**Figure 1.** Observing at Gurlanda.



**Visual orientation.**

The photographs that appear below introduce the setting of my field research with the Alyawarra. I place the images here, with minimal captions, so you can form your own impressions of location, terrain, climate, vegetation, housing, residential practices, tool use, artistic skills and physical appearance of the people.



**Figure 2.** Alyawarra research location about 250 km northeast of Alice Springs.



**Figure 3.** Gurlanda camp from above showing desert habitat and residences among sand hills and spinifex grass.





Figure 4. Resting at her residence.



Figure 5. Cooking kangaroo.



Figure 6. Single women's residence, *alugera*.



Figure 7. Single family residence, *anoardegan*.





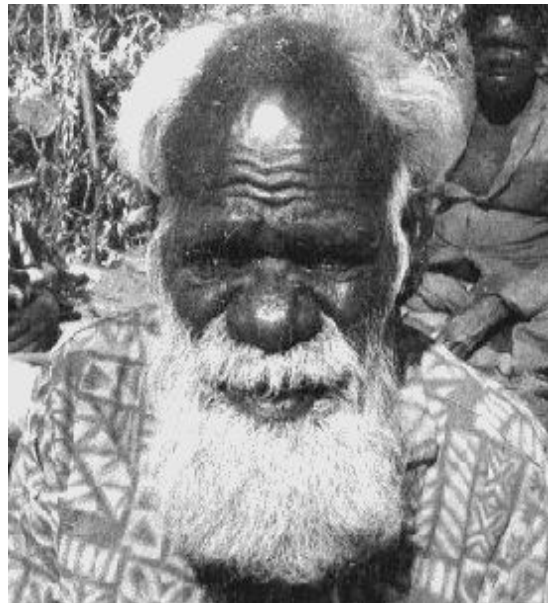
**Figure 8.** Men painting shields.



**Figure 9.** Man with damaged Kangaroo Dreaming.



**Figure 10.** Women singing Dreaming songs.



**Figure 11.** Elderly father of 3 small children.



**Harsh and capricious desert habitat with flash flooding.**



**Figure 12.**Bunday River flash flood begins during La Niña.

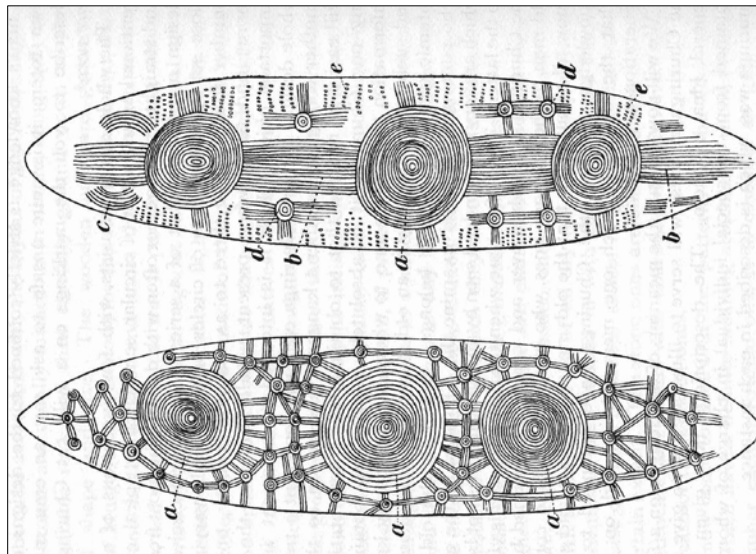


**Figure 13.** Todd River in full flood during La Niña.

*Dreamtime social structure emphasizing top to bottom relations.*

Among the Alyawarra in 1971, Dreamings were primordial ancestors, egalitarian and timeless, who resembled Platonic forms such as kangaroo, emu, seeds, insects, water, stars, etc. There may have been a hundred or more Alyawarra Dreamings. Here I focus on Kangaroo Dreaming as an example; I could have chosen any of the others (for details, see Denham 2012, 2015a).

Unlike Platonic forms, Dreamings jumped up from the Earth, travelled extensively, established Dreaming sites at hills, waterholes, etc., and descended back into the Earth leaving narratives, songs, dances, sculpture, and stone and wooden artifacts as depicted in Figures 8, 9, 10 and 14.



**Figure 14.** Shields with carved or painted designs (Spencer and Gillen 1899).

Kangaroo Dreaming sites were surrounded by larger areas with similar names such as Kangaroo Country. Biological kangaroos lived there. People lived in Kangaroo Country too, and some had hereditary ties to it. These members of “Kangaroo Country” did NOT own it; rather they “belonged” to it, and they “Dreamed Kangaroo”. Thus Countries were of primary importance to the Alyawarra with regard to responsibilities for the Dreamings and access to land and resources. Everybody used kangaroo as food, but those who Dreamed Kangaroo were caretakers as well. They had to insure the wellbeing of kangaroo populations in perpetuity for the benefit of all. All people Dreamed something, and all “took care” of whatever they Dreamed. “We take care of them” was an all-inclusive Dreamtime ethic that embodied mutual aid.



In Figure 15, Dreaming tracks – pathways or ecological corridors - linked ancestors, Dreaming sites and Countries among most language groups throughout Australia.

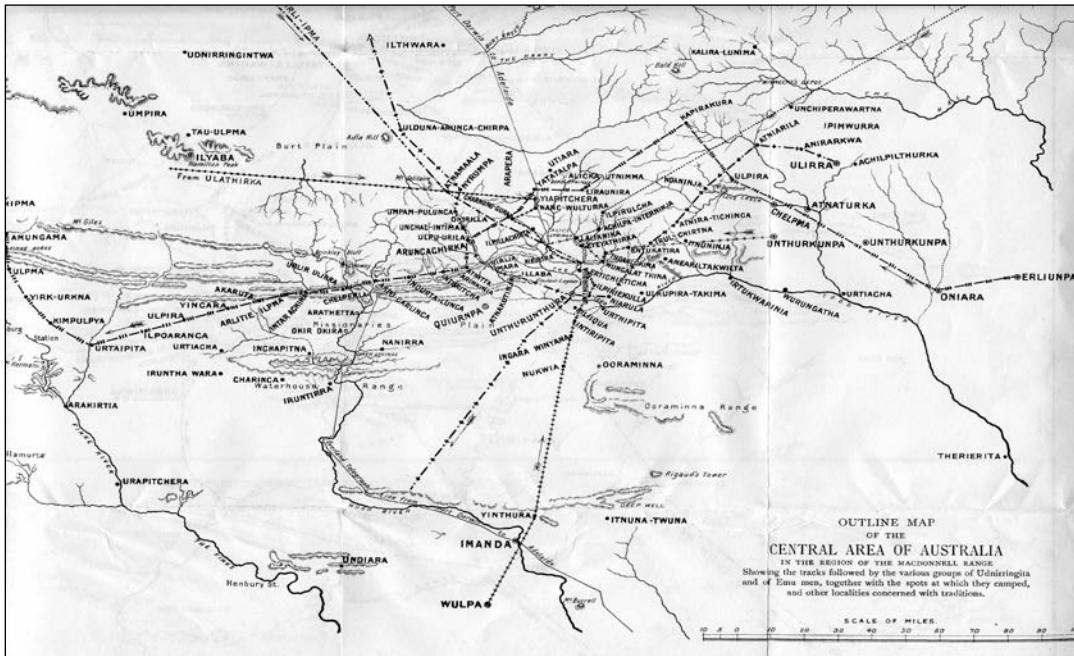


Figure 15. Dreaming tracks among the Aranda (from Spencer and Gillen 1899).

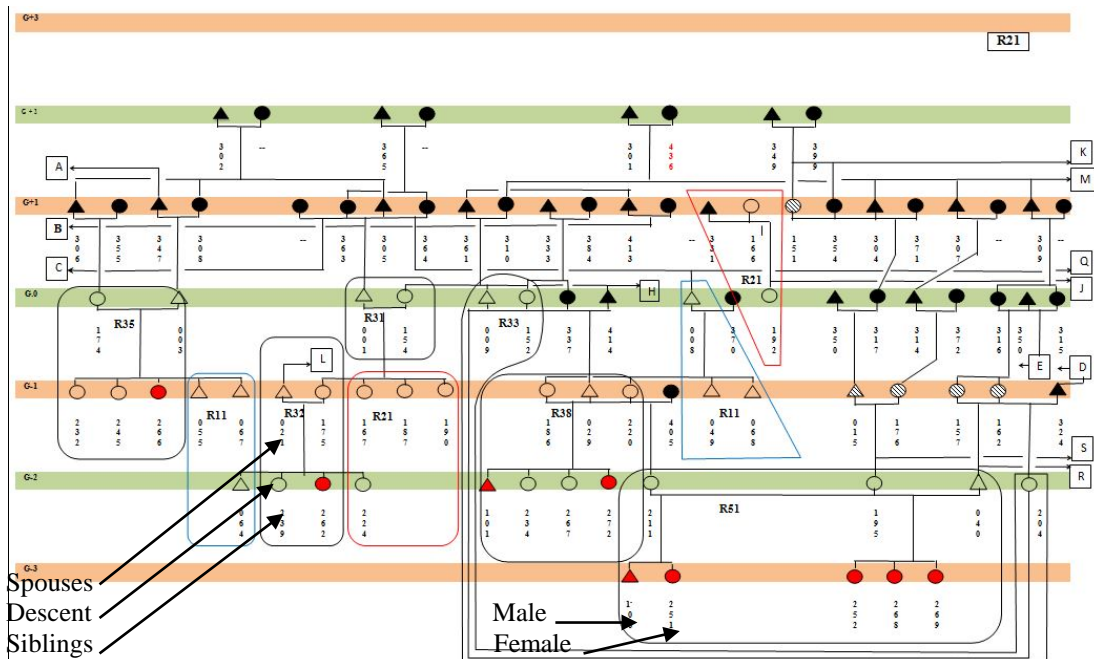


Figure 16. Genealogical diagram, Gurlanda alugera R21, 27 December 1971.

Key: triangle=male, circle=female; black=dead, open=alive, red=infants carried (see pp.22-26 below).



In Figure 16, biological genealogies linked individual people just as Dreaming tracks linked ancestors and Dreaming sites.

The genealogical diagram in Figure 16 represents only one of the four densely interconnected subcommunities within Gurlanda camp on 27 December 1971 and is one of a great many ways to graphically depict those relationships. See Figure 3 for a photograph of Gurlanda camp, Figure 25 for a plan of the camp and Figure 27 for a genealogical diagram of all four of the camp's subcommunities. All of these Figures contain nuances that I ignore in this summary.

The relationships represented in the genealogical diagram constituted the biological infrastructure that underlay the cultural superstructure manifested in two distinctly human cognitive networks introduced next; viz., egocentric kin terms and sociocentric section terms.

Egocentric reference terms among the Alyawarra, often glossed as "kin terms", entailed relative rather than absolute membership in kin categories. By "relative membership" I mean that different speakers used 24 different terms corresponding in part to biological kin types (F=father, M, B, Z, S, D, W, H, etc.), plus combining forms (FZ=father's sister, etc.), to denote individuals or groups linked to them sociologically and biologically by alternative genealogical pathways.

As is true of most Australian Aboriginal societies, the Alyawarra terms formed one of many variants on the Dravidianate (Godelier, Trautmann, Tjon Sie Fat 1998) type of classificatory terminology that designated kin types or people in multiple genealogical relationships to a speaker (*amaidya* = M, MZ; *angiyi* = F, FB, FFBS). The terms and rules constituted a terminology that was universally applicable within their own local society; i.e., all members of the Alyawarra language group, and their spouses, were encompassed by the Alyawarra kin terminology, but members of other language groups used their own locally universal kin terminologies.

These classificatory terms functioned also as descriptive terms when used with a 1<sup>st</sup> person singular possessive pronoun modifier that was translated into Alyawarra-English as "proper" meaning "my own". "Proper M" was one's own biological mother as distinguished from the other women to whom *amaidya* could refer, and "proper wife" was one's own spouse as distinguished from the other women to whom *anowaidya* could refer. This was a most important feature which, if attended to, might have prevented the early misinterpretation of classificatory kinship terms as evidence of group marriage in Aboriginal Australia. Alyawarra terms also denoted the birth order (Elder/Younger: EZ=elder sister, etc.) of proper and classificatory siblings, and had a range of four degrees of biological relatedness (close consanguineal; intermediate collateral; distant collateral; remote non-biological kin).

Table 1 shows a cross-tabulation of egocentric kin term applications when they were superimposed on genealogies. Terms in the matrix were applied reciprocally within the language group, but ordinarily not between language groups. The matrix demonstrates consistency of reciprocal kin term usage among the Alyawarra.

Mura R21		Women										
GenLevel		G+1	G.0			G-1						G-2
Country#		C61	C30	C42	C41	C44	C44	C44	C44	C44	C44	C15
ID#		166 ^	152*	154*	192*	167*	187*	190*	175*	186*	220*	204*
G+1	166	24 Self	8 M	7 FZ	17 D	22 HZBW	22 HZBW	22 HZBW	22 HZBW	22 HZBW	22 HZBW	17 D
G.0	152	17 D	24 Self	22 HZBW	3 DD	16 BD	16 BD	16 BD	16 BD	16 BD	16 BD	3 DD
	192	8 M	2 MM	4 FM	24 Self	7 FZ	7 FZ	7 FZ	7 FZ	23 BWM	23 BWM	12 YZ
G-1	187	22 HZBW	7 FZ	8 M	16 BD	11 EZ	24 Self	12 YZ	11 EZ	12 YZ	12 YZ	16 BD
	190	22 HZBW	7 FZ	8 M	16 BD	11 EZ	11 EZ	24 Self	11 EZ	12 YZ	12 YZ	16 BD
	175	22 HZBW	7 FZ	8 M	16 BD	11 EZ	12 YZ	12 YZ	24 Self	12 YZ	12 YZ	16 BD
	186	14 FZD,MBD	7 FZ	8 M	23 BWM	11 EZ	11 EZ	11 EZ	11 EZ	24 Self	12 YZ	23 BWM
	220	14 FZD,MBD	7 FZ	8 M	23 BWM	11 EZ	11 EZ	11 EZ	11 EZ	11 EZ	24 Self	11 EZ
	204	8 M	2 MM	4	11 EZ	7 FZ	23 BWM	7 FZ	7 FZ	23 BWM	23 BWM	24 Self

**Table 1.** Matrix showing the distribution of reciprocal applications of egocentric kin terms among women in a single subcommunity.

Among the Alyawarra, sociocentric reference terms entailed absolute rather than relative membership in fixed social categories often glossed by anthropologists as skins, moieties, sections, subsections, marriage classes and so on. The Alyawarra used 4 of these named categories which, for convenience, I call “sections”: *Kamara*, *Pitjara*, *Burla* and *Ngwariya*. By “absolute membership” I mean that each person was assigned permanently to a specific category at birth on the basis of his parents’ category memberships. The 4 sociocentric section terms then were superimposed on genealogies in a manner analogous to that of the 24 egocentric terms described above and generalized broadly in conjunction with the Dreamtime, the ancestral Dreamings and the Countries to which all people belonged.

Each speaker used only one term to denote members of his or her own section and used the other three terms to denote members of the other three sections; e.g., if a man’s own section = *Burla*, then his Father’s = *Kamara*, his Mother’s = *Pitjara*, and his Wife’s = *Ngwariya*. These, too, were classificatory terms that designated people in multiple genealogical relationships to a speaker; e.g., if a speaker’s F was a member of *Kamara* section, so too were his FFF, FB, FZ, S, D and SSS. Also, they constituted a universal global terminology in which all people (all Alyawarra people, all Arandic-speaking people, all Aboriginal people) were covered by inter-translatable section terms in the many forms listed above (i.e., moieties, sections, subsections, etc.). The distribution map in Figure 17 shows commonalities in terms and usage patterns across various neighboring language groups in Central Australia (for details, see Denham 2012).





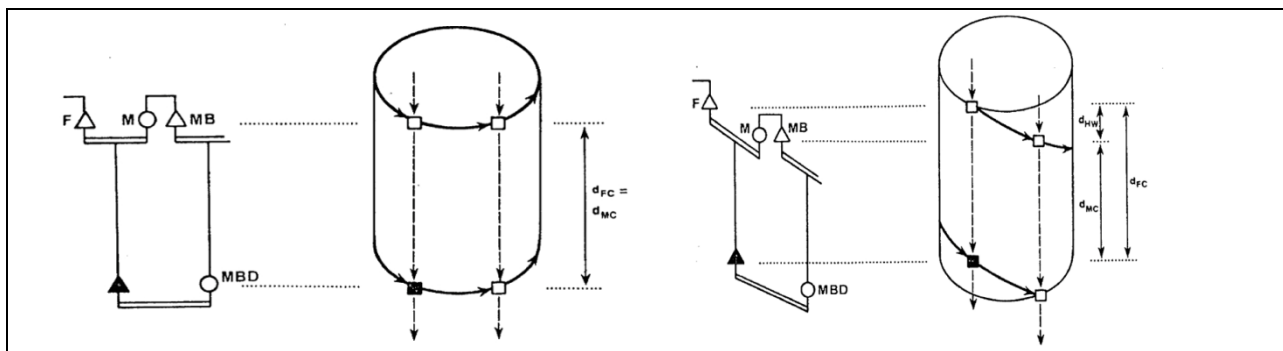
“knowledge base” - that comprehends, organizes and processes virtually everything in the known universe within the abstract structure of the Dreamings embedded in a metaphor of kinship. It is not coincidental that the Alyawarra referred to all nodes in all of these networks with egocentric and sociocentric reference terms, and applied the all-encompassing ethic summarized as “we take care of them”.

L1.	Primordial ancestors. <ul style="list-style-type: none"> <li>• Dreaming Tracks linked Ancestors, Dreaming sites and Countries.</li> </ul>
L2.	Humans, kangaroos, emus, seeds and others. <ul style="list-style-type: none"> <li>• Genealogies linked people biologically to each other, linked them cognitively to their Countries, and perhaps most importantly linked them directly to the species and individuals who constituted the natural world.</li> <li>• Egocentric kinship linked people cognitively within societies.</li> <li>• Sociocentric kinship linked people cognitively both within and between societies.</li> <li>• Both forms of universal classificatory kinship encompassed all people and linked multiple societies.</li> </ul>
L3.	Artifacts and traditions left behind when the ancestral Dreamings sank back into the sand. <ul style="list-style-type: none"> <li>• The kinship idiom linked Ancestors and living people to stone and wooden artifacts, oral traditions, music, dance, painting, sculpture, etc.</li> </ul>

**Table 2.** Dreamtime “levels” with their kinship characteristics.

*Asymmetry and generational openness emphasizing bottom to top relations.*

Traditionally, mean mother-child and father-child age differences were of no interest to those who engaged in the study of uniquely human Australian Aboriginal kinship terminologies. Thus age differences were assumed, tacitly and ethnocentrically, to be equal to each other as in Figure 18a. However, data from the Alyawarra show that male and female generation intervals were significantly unequal as in Figure 18b. The resulting age differences merit careful consideration by those whose interests extend beyond strictly human kinship terminologies to deal comprehensively with the biological bases of human and nonhuman social behavior.



**Figure 18.** a. Horizontal WBWB chain with generational closure

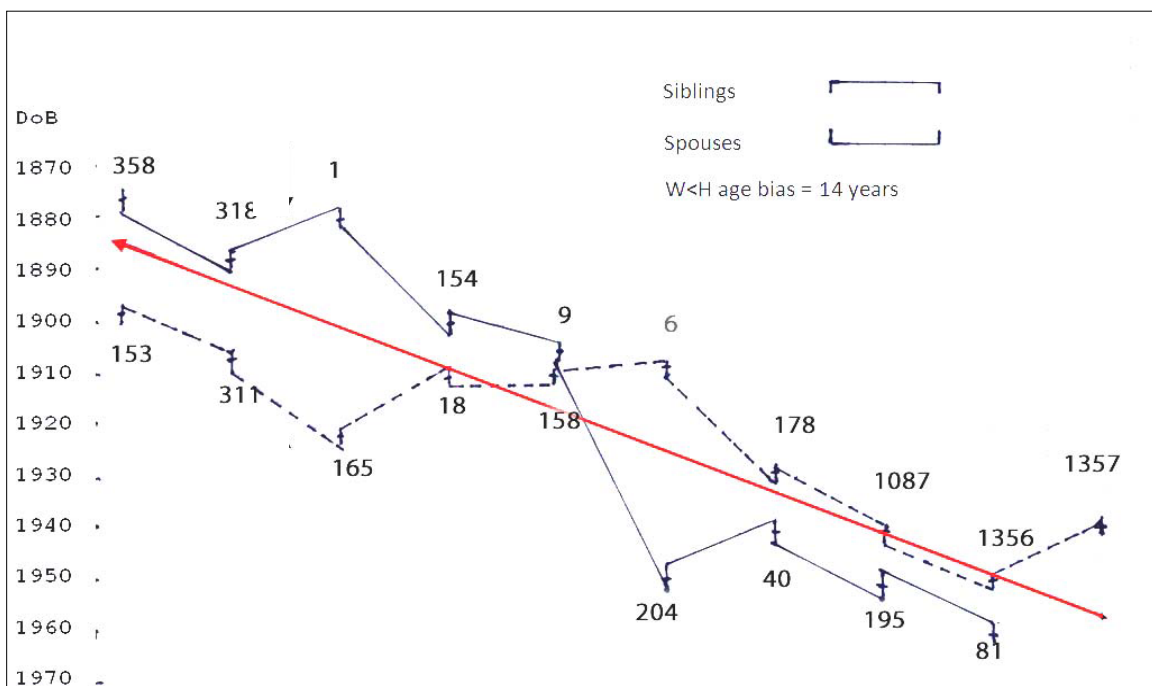
b. Oblique, lateral or diagonal WBWB chain with generational openness

(Figure by Tjon Sie Fat 1983:588-9)

On average, Alyawarra women began to menstruate, marry and reproduce when they were about 14 years old (precise timings are unknown). Their maturational pattern was quite different from that of Alyawarra men who were initiated when they were about 14 years old, and underwent intensive training in their Dreamings for about 14 more years during their novitiate until they passed their “tests” and were judged socially mature enough to marry and begin to reproduce. That generally happened when they were about 28 years old (for details, see Denham 2012).

Due to the desynchronization that occurred at about 14 years of age when women were married and men were initiated, the mean husband-wife age difference was about 14 years, the mean mother-child age difference was about 28 years, and the mean father-child age difference was about 42 years.

The cultural practices that generated these significant age differences had a great many implications some of which I introduce below, some of which are problematic, some of which are not. For example, since the age at which men generally began to reproduce was twice the age at which women began, the Alyawarra practices would have selected for increased male longevity and decreased male fertility (Harris, et al 2011). The purely genetic implications of this selection are unknown.

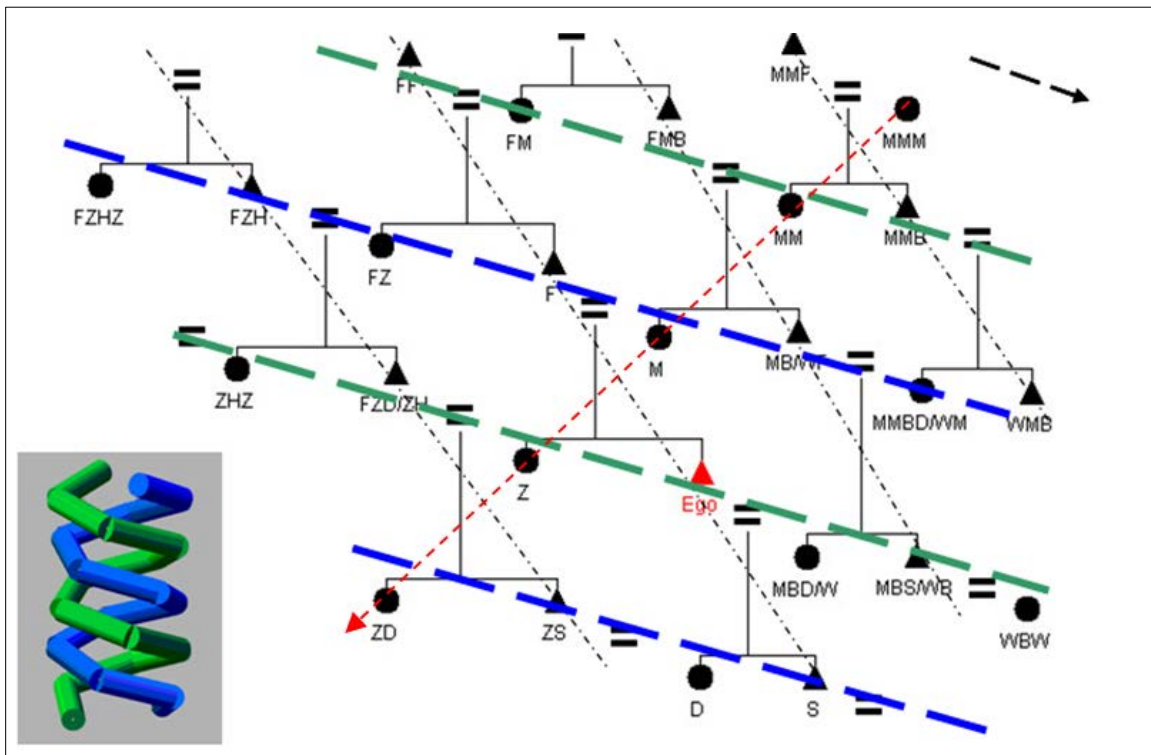


**Figure 19.** Age biased marriage chains taken directly from Alyawarra genealogies.

Figure 19 alters the minimal pattern in Figure 18b by taking a step “upward”, by which I mean that this synthesis shows two examples of multi-family age biased marriage chains that resulted from the 14-year W < H age difference, both taken directly from the Alyawarra genealogies. The solid chain consists primarily of preferred marriages with MBD in which H almost always was

older than W, while the dashed chain that is somewhat less regular contains two adjacent acceptable marriages with FZD amidst preferred MBD marriages. According to egocentric and sociocentric kinship terminologies, both kinds of 1<sup>st</sup> cousins, MBD and FZD, were equally suitable spouses; however, the observed ratio of MBD to FZD marriages was 3:1, in keeping with Hammel's (1976) theoretical argument that a significant systematic W<H age difference precludes systematic bilateral sibling exchange marriage.

Again synthesizing upward, the age biased marriage chains in Figure 19 lead to two asymmetrical models in Figure 20, one closed, the other open. Both are fundamentally different from traditional Aranda and Kariëra kinship models (Radcliffe-Brown 1931, Lévi-Strauss 1949/1969) that misrepresented Australian Aboriginal marriage practices. Figure 20a shows a hypothetical closed double helix that would have underlain egocentric and sociocentric kinship terminologies as they might have existed in closed, strictly (but unrealistically) endogamous societies such as those depicted in traditional models of Aranda and Kariëra kinship. Figure 20b shows realistic open generations that underlay marriage practices in exogamous societies such as the Alyawarra and many Western Desert societies (Dousset 2013).



a.

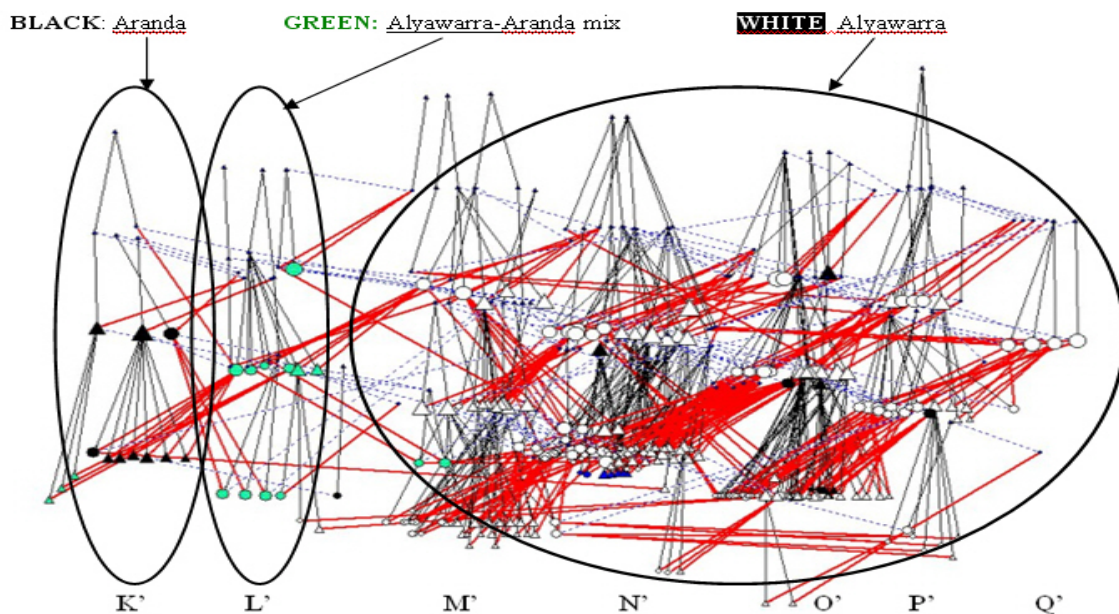
b.

**Figure 20.** a. hypothetical closed double helix (endogamous); b. realistic open double helix (exogamous).  
Black dash = patriline, red dash = matriline, blue / green helix = alternating generations.

(Developed by John R. Atkins; Denham, et al 1979)



Using Figure 20 as a guide to a higher synthesis, Figure 21 shows data concerning Alyawarra genealogies, ages and languages as they formed a complex age biased marriage network, not just as an abstraction but as a direct representation of all 113 marriages in the AU01 dataset. Figure 21 shows that Alyawarra society was largely endogamous, but links between it and its Aranda speaking neighbors, and other societies, show that it was exogamous as well, which can and should be treated quantitatively.



**Figure 21.** An age biased marriage network encompassing all 113 marriages in the AU01 dataset.

Key: Solid black=patrilineal, Dotted blue=marriages, Solid red=matrilineal;

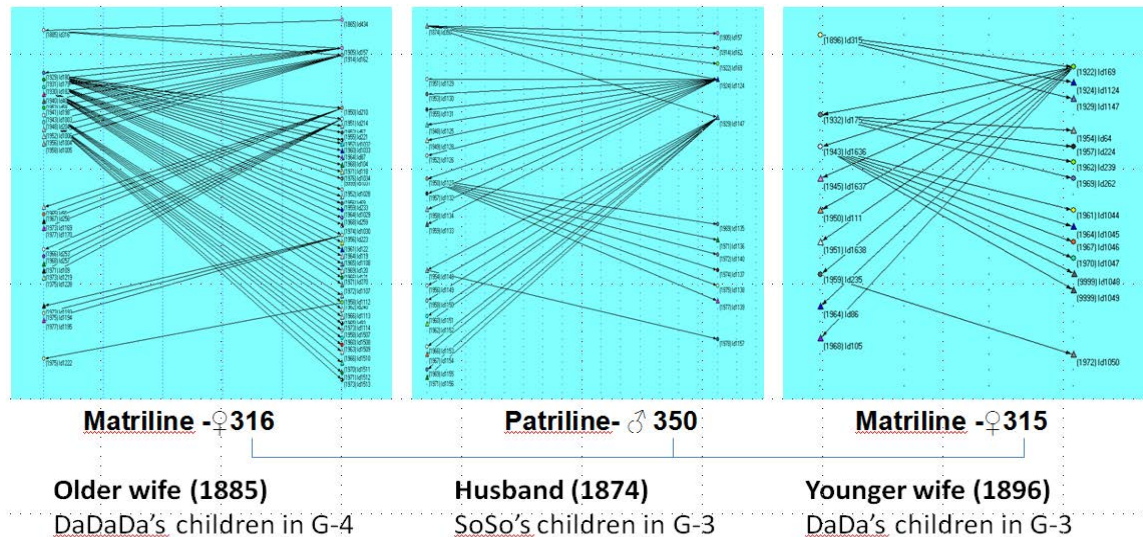
Language groups: White=Alyawarra, Green=Alyawarra-Aranda mix, Black=Aranda, Blue=Other

(Pajek diagram by D.R. White; Denham and White 2005)

In very general terms, tradition predicted that Alyawarra men's and women's reproductive histories would differ from each other in a number of ways, but not in ways that were associated with the age bias introduced in earlier Figures. However, Figure 22 uses data extracted from Figure 21 to show that the reproductive histories of men and women were systematically different from each other in keeping with the age bias depicted above.

In Figure 22, ♂350 in the middle column had two wives who were a pair of ½-sisters, his elder wife in the left column and his younger in the right. In the man's patriline in the center column (42 year mean F>S generation interval), he had S, SS and SSS by both wives, but his SSS still were about twenty years too young to begin to reproduce. In his younger wife's matriline in the right column (28 year mean M>D interval), he had D, DD and DDD; here his DDD were within a year or two of beginning to reproduce. In his older wife's matriline in the left column (same 28 year mean M>D interval), he had D, DD, DDD and DDDD; here some of his DDDD were approaching reproductive age. If descent lines within such asymmetrical marriage networks

spanned 50,000 years, then by 1971 they would have yielded 1190 male generations (50,000/42=1190) and 1786 female generations (50,000/28=1786). Genetic implications of these striking differences between male and female reproductive histories are unknown to me.



**Figure 22.** Reproductive histories from Figure 21 of a husband and his two wives who were a pair of 1/2-sisters (same F, different M).

Tradition based on observations in northern coastal Australia, where wealth accumulating polygyny (White 1988) was common, led some to suggest that gerontocracy and polygyny in Aboriginal Australia went together in a single wealth accumulating form that occurred when an old man married a large number – often in the double-digits - of unrelated young women; or more generally when old men usurped young women, generally by force, thereby depriving young men of wives. That interpretation may have applied in some societies, but it simply was not true among the Alyawarra (for details, see Denham 1975).

Rather, Table 3a shows that among the Alyawarra 70% of the married men had 1 wife each, 27.5% had 2 wives each and 1 man had 3 wives; hence marriages between men and women were distributed much more evenly than on the north coast. Table 3b shows that polygyny from a woman’s perspective was strongly concentrated (96%) in their childbearing years while polygyny from a man’s perspective was concentrated less strongly (50%) in the 40-49 year age range. Among the 12 men who were married polygynously to a total of 25 women, nearly all pairs of co-wives were full-Z, 1/2-Z or classificatory-Z. The motivation of both men and women was not lascivious greed, but rather was the Dreamtime ethic of “we take care of them” associated with the prohibition against marriage by young men during their novitiate

Number of wives per married man	Men		Women		Number of co-wives per married woman
	n	col %	n	col %	
1	28	70.0	28	52.8	0
2	11	27.5	22	41.5	1
3	1	2.5	3	5.7	2
<b>Totals</b>	<b>40</b>	<b>100.0</b>	<b>53</b>	<b>100.0</b>	<b>Totals</b>

3a.

Age	Men				Women			
	1 wife		2-3 wives		0 Co-wives		1-2 Co-wives	
	n	%	n	%	N	%	N	%
Under 20	0	0.0	0	0.0	2	7.1	4	16.0
20-29	2	7.1	1	8.3	4	14.3	9	36.0
30-39	5	17.9	2	16.7	9	32.1	5	20.0
40-49	6	21.4	6	50.0	6	21.4	6	24.0
50-59	3	10.7	2	16.7	4	14.3	0	0.0
60-69	5	17.9	1	8.3	2	7.1	0	0.0
Over 69	7	25.0	0	0.0	1	3.6	1	4.0
<b>Sub-totals</b>	<b>28</b>	<b>100.0</b>	<b>12</b>	<b>100.0</b>	<b>28</b>	<b>99.9</b>	<b>25</b>	<b>100.0</b>
<b>Totals</b>	<b>40</b>				<b>53</b>			

3b.

**Table 3a and 3b.** Age bias yielded sororal polygyny during women’s child bearing years, with no evidence of gerontocracy.

*Laterality, mobility and societal openness emphasizing physical movement.*

The anthropological tradition emphasized societal endogamy and horizontal generational closure both of which would have restricted early Aboriginal societies to virtual immobility early in their history. But in Figure 15, Dreaming tracks depicted an ancient tradition of openness that included long range Ancestral travel, perhaps concurrently with the early spread of immigrants across the continent (Douset p.c.). Here, as in Figures 19-22, I explore additional aspects of openness that are incompatible with traditional expectations concerning Aboriginal closure.

Tradition held that Northern Territory Aboriginal people and societies occupied rigidly demarcated “tribal” territories prior to European colonization, but were generally scattered and fragmented by the mid-20th century. Table 4, which summarizes data from the Alyawarra and



several adjacent language groups, confirms the presence of dispersion but not of fragmentation (Bern 1969). The problem rests in part on how we conceptualize and measure these and related matters.

Before European colonization began, Alyawarra-speaking people were responsible for the maintenance of Dreaming sites that occupied a vast area surrounding the Bunday and Sandover Rivers. In the late-19<sup>th</sup> and early-20<sup>th</sup> centuries, operating on an implicit or explicit assumption of “terra nullius” or “land belonging to no one” (Blunden 2010), colonizers occupied Aboriginal land and converted it to pastoral properties. By establishing cattle stations and building fences and roads, the colonizers imposed an alien map on the Aboriginal land, but failed in their systematic efforts to destroy Aboriginal ties to it.

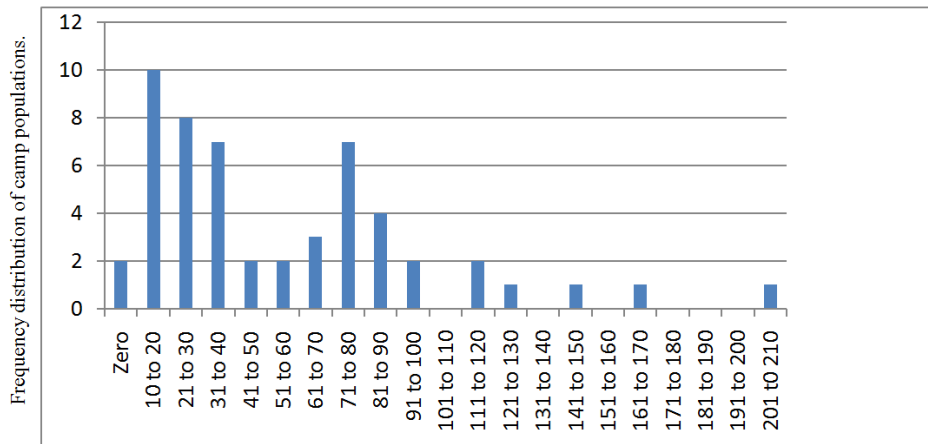
Cluster	Station↓	Language→	Arandic languages				Non-Arandic languages			DK	Row Total	Row %
			Anmatjira	Alyawarra	Aranda	Kaiditja	Luritja	Mudbara	Wailbri			
A	Aileron		77	2	-	-	1	-	-	-	80	
	Ti Tree		50	-	-	8	-	1	2	-	61	
	Woola		8	-	-	-	-	-	-	-	8	
	Yambah		4	-	2	-	4	1	-	3	14	
	<b>Subtotal</b>		<b>139</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>5</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>163</b>	<b>85.3</b>
B	MacDonald + Derry		-	167	19	-	-	-	-	-	186	
	Ooratippra		-	17	-	-	-	-	-	-	17	
	<b>Subtotal</b>		<b>-</b>	<b>184</b>	<b>19</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>203</b>	<b>90.6</b>
C	Utopia		4	9	121	4	-	-	-	-	138	
	Alcoota		-	-	45	3	-	-	-	-	48	
	Mt. Riddock		-	-	26	-	-	-	-	-	26	
	Lucy Creek		-	-	19	-	1	-	-	6	26	
	Waite River		1	3	16	-	-	-	-	-	20	
	Bushy Park		2	-	5	-	-	-	-	-	7	
	Tobermory		-	-	2	-	-	-	-	-	2	
	<b>Subtotal</b>		<b>7</b>	<b>12</b>	<b>234</b>	<b>7</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>6</b>	<b>267</b>	<b>87.6</b>
<b>Column Total</b>			<b>146</b>	<b>198</b>	<b>255</b>	<b>15</b>	<b>6</b>	<b>2</b>	<b>2</b>	<b>9</b>	<b>633</b>	

**Table 4.** Clustering together of Anmatjirra, Alyawarra and Aranda speaking people on adjacent cattle stations (Clusters A, B, C) in 1969 (Bern 1969).

Tribal boundaries as reported by 19<sup>th</sup> and 20<sup>th</sup> century observers almost certainly were far more rigid and precise than were the distantly related Aboriginal concepts of the Dreamtime. Table 4 shows that in 1969 three major language groups (Anmatjira, Alyawarra, Aranda) still lived in coherent clusters on lands that had been cut up superficially by Europeans. If we look at a map of Central Australia focusing on pastoral properties, it appears that Aboriginal societies were scattered and fragmented among them, but if we look at it in terms of Aboriginal responsibilities for maintaining the Dreamtime in perpetuity, a different pattern emerges. Rather, it appears that the partitioning of Aboriginal Australia into pastoral properties, contemporaneously with the European partitioning of Africa (Craven 2015) and the Ottoman Empire (Sykes-Picot Agreement 1916), did not prevent some Aboriginal populations from persisting as coherent albeit

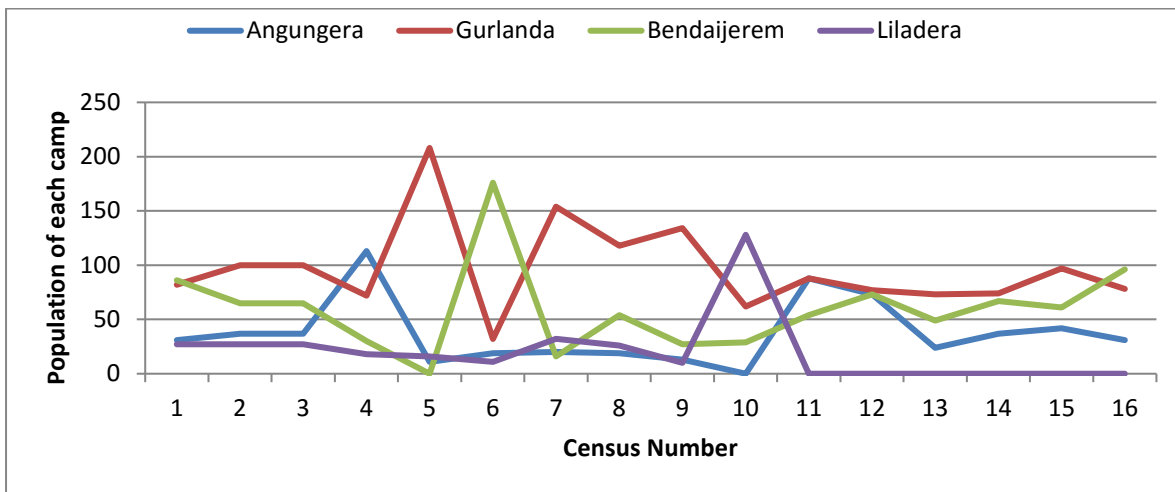
overlapping co-residential groups, similar to those of the pre-colonial era. Multiple sources of overlaps in Table 4 appear in Tables 5 and 6 and Figure 23.

Traditional estimates of mean sizes of Australian Aboriginal camps and language groups appeared as static “magic numbers” 25 and 500 (Binford et al 1968), estimates based on inadequate data (DeVore and Lee 1968) and long known to be imprecise. Tables 5 and 6, based on systematically recorded Alyawarra census data for all members of the research population on 16 census days, yield much more information (for details, see Denham 2014a).



Camp population on census days.

**Table 5.** Sizes of 4 camps on 16 census days



**Table 6.** Changes in size of 4 camps on 16 census days.

Table 5 shows the overall distribution of camp sizes when I performed each census, while Table 6 shows the pattern of changes in the size of each camp across the 16 census days. Together they summarize a great deal of complexity, mobility, dispersal and aggregation of camps and people

due to climatic events, deaths, initiations, teaching, walkabout and employment. Not surprisingly, they attest to the very high mobility of people and residences on the ground, not in the abstract. This high level of mobility occurred in the context of – and against the explicit background provided by – the complex network of kinship networks described above. The mobility was in no sense “random motion”; rather it was carefully structured motion that placed each person in specific nodes in multiple kin networks at every moment (Banks 2015).

Another manifestation of their physical mobility was societal exogamy. Figure 21 disagrees with Tindale (1953), Birdsell (1993) and others who argued that Aboriginal societies generally practiced strict societal endogamy that prescribed marriages with strictly classificatory kin and proscribed marriages with biological kin. Figure 23 addresses the same matter by showing the geographical distribution of marital ties between individuals in the AU10 dataset, spanning the period 1818-1979, who were identified explicitly by themselves or by others as first-language speakers of Alyawarra and of other specified non-Alyawarra languages. The Alyawarra data shows 22% exogamy with ten other neighboring societies. According to Small World theory (Watts and Strogatz 1998), 22% is highly significant genetically.

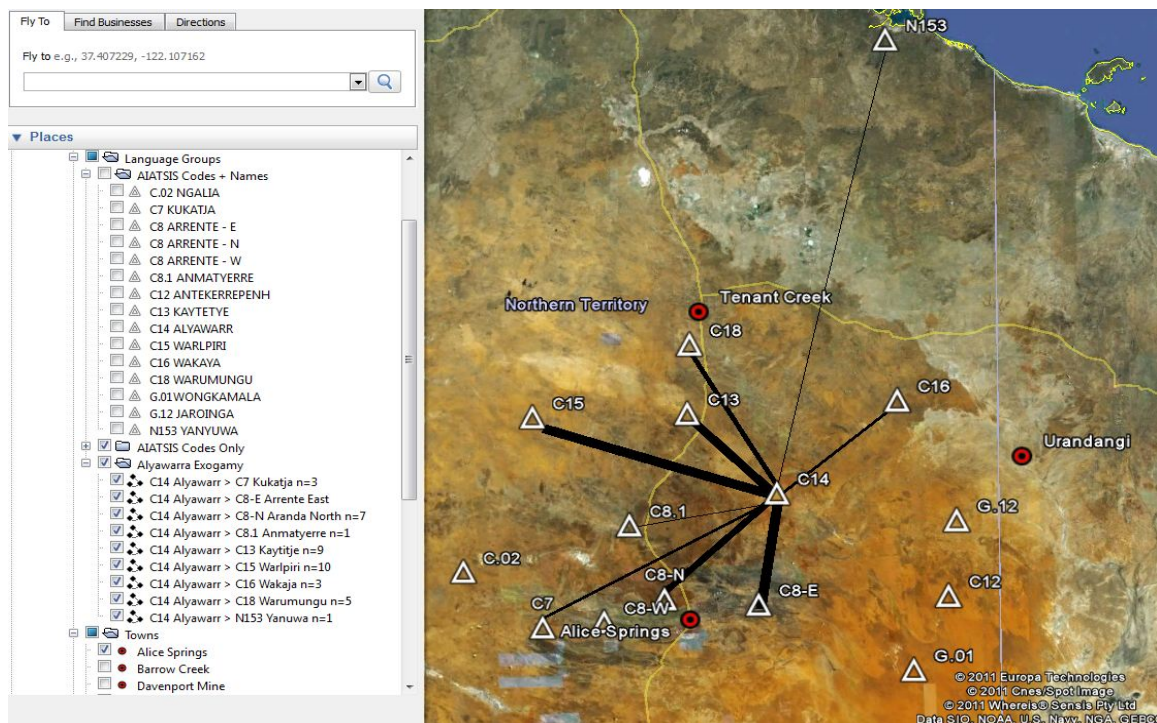


Figure 23. AU10 Alyawarra 1818-1979 dataset shows 22% societal exogamy.

The balance between societal endogamy and societal exogamy is a key factor in maintaining a viable human society. If inbreeding is excessive, the genetic load resulting from random mutations can be quite harmful; if outbreeding is excessive, the reproductive process itself can fail. It goes without saying that I refer exclusively to mating within the same species even though



recent reports of mating between *H.s. sapiens* and *H.s. neandertalensis* (Sankararaman et al 2014) suggest other options in early human history.

Table 7 may say something of value concerning optimal inbreeding and optimal outbreeding in small human societies. Computing a theoretical optimum would require skills far greater than mine, but the Alyawarra seem to have developed *ad hoc* policies and practices that yielded something approaching an optimal balance. The numbers that I discovered in the field data appear in Table 7. They were not based on genetic or demographic theory, but they appear intuitively to have worked. No doubt, the numbers were ever-varying in a dynamic equilibrium as multiple factors tracked ever-changing values of environmental variables.

<p><b>Close inbreeding</b></p> <ul style="list-style-type: none"> <li>• marriage to close consanguineal kin with incest avoidance</li> <li>• e.g., spouses from same language group, same Country</li> </ul>	49%
<p><b>Distant inbreeding</b></p> <ul style="list-style-type: none"> <li>• marriage to close and distant classificatory kin who were distant consanguineal kin</li> <li>• e.g., spouses from same language group, different Countries</li> </ul>	29%
<p><b>Remote outbreeding</b></p> <ul style="list-style-type: none"> <li>• marriage to remote classificatory kin with miscegenation avoidance</li> <li>• e.g., spouses from different language group, different Countries</li> </ul>	22%

**Table 7.** Balance of inbreeding and outbreeding among the Alyawarra.

Very simply, the consequences of the *de facto* balance of inbreeding and outbreeding were that inbreeding enhanced certain aspects of kin selection and altruism, while outbreeding reduced the impacts of harmful mutations (Shields 1982, Waldman 1988). Perhaps the middle category of distant inbreeding served as a buffer against imprecision in the operation of the other two categories. Contrary to traditional proposals, the middle category alone was not a viable solution to the problems addressed here (for details, see Denham 2015a).

*Alloparenting and mutual aid emphasizing bottom to top relations.*

“Who carries infants and children?” addresses important issues in human biological and cultural evolution. Traditionally Darwinian (1872) theory emphasized the importance of natural selection based on intense competition among members of human populations (Malthus 1798). Against that background, the carrying of infants and children primarily or exclusively by mothers was interpreted traditionally as beneficial to the group. By sharply **reducing** the nutritional status of women and the frequency with which they reproduced (i.e., by increasing birth spacing), it presumably imposed natural constraints that suppressed population growth, and might have been intensified by the use of systematic preferential female infanticide (Birdsell 1968:239). This

highly sexist interpretation could have been defensible with regard to human societies in rich habitats with bountiful resources, but as a species-wide generalization it came under severe scrutiny in the late 20<sup>th</sup> century, especially with regard to human societies such as the Alyawarra living in harsh and capricious habitats with minimal resources (Figures 3-13, Denham 2015a).

Research in recent decades (Stack 1974, Hawkes et al 1998, Hawkes and Blurton Jones 2005, Hrdy 2009, Denham 1974, 2015) has focused increasingly on the importance of alloparents, defined as “people other than a child’s parents who provide care for a child”. A child care strategy based on mutual aid from alloparents **enhances** the nutritional status of women and the frequency with which they can give birth, thereby enabling people who live in harsh and capricious habitats to produce and raise more and healthier children who live to reproduce in subsequent generations. Thus it keeps the population UP and VIABLE - rather than DOWN and NONVIABLE - in harsh and capricious habitats with minimal resources.



Figure 24. Representative alloparents and some of the children they carried.

“Who carries infants and children?” was one of many questions not asked by 19<sup>th</sup> and early 20<sup>th</sup> century ethnographers. Answering it meaningfully required a quantitative methodology at a time when quantification was rare, and it was ignored in part because the assumed answer - mothers – was treated as a self-evident truth that required no further research. Thus, through no fault of its

authors, this matter is not addressed in Murdock and White's (1969, 2013) *Standard Cross-Cultural Sample Codebook*.

One way to answer the question is to systematically count all observed cases in which infants and children are carried by members of kin and non-kin categories such as parents (M,F), siblings (B,Z), parents' parents and siblings (e.g., MM,MF,MZ), distant kin (e.g., "cousins" and "in-laws" of various kinds), and non-kin (e.g., non-kin friends). I used this technique with the Alyawarra (for details, see Denham 2015a).

Gurlanda Camp, where I lived during the Alyawarra project and where I recorded infant and child carrying, had a highly variable population of about 100 people as shown in Table 6. Figure 24 shows some residents of Gurlanda camp who were representative alloparents and representative children whom they carried.

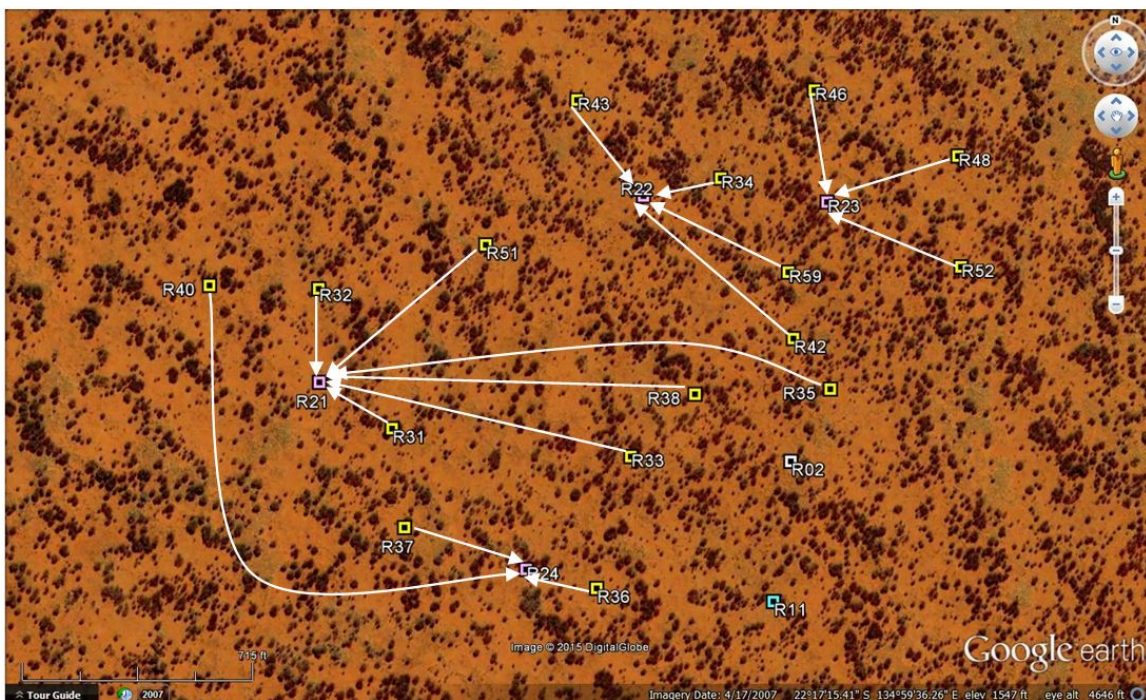


Figure 25. Subcommunities within Gurlanda Camp, 27 December 1971.

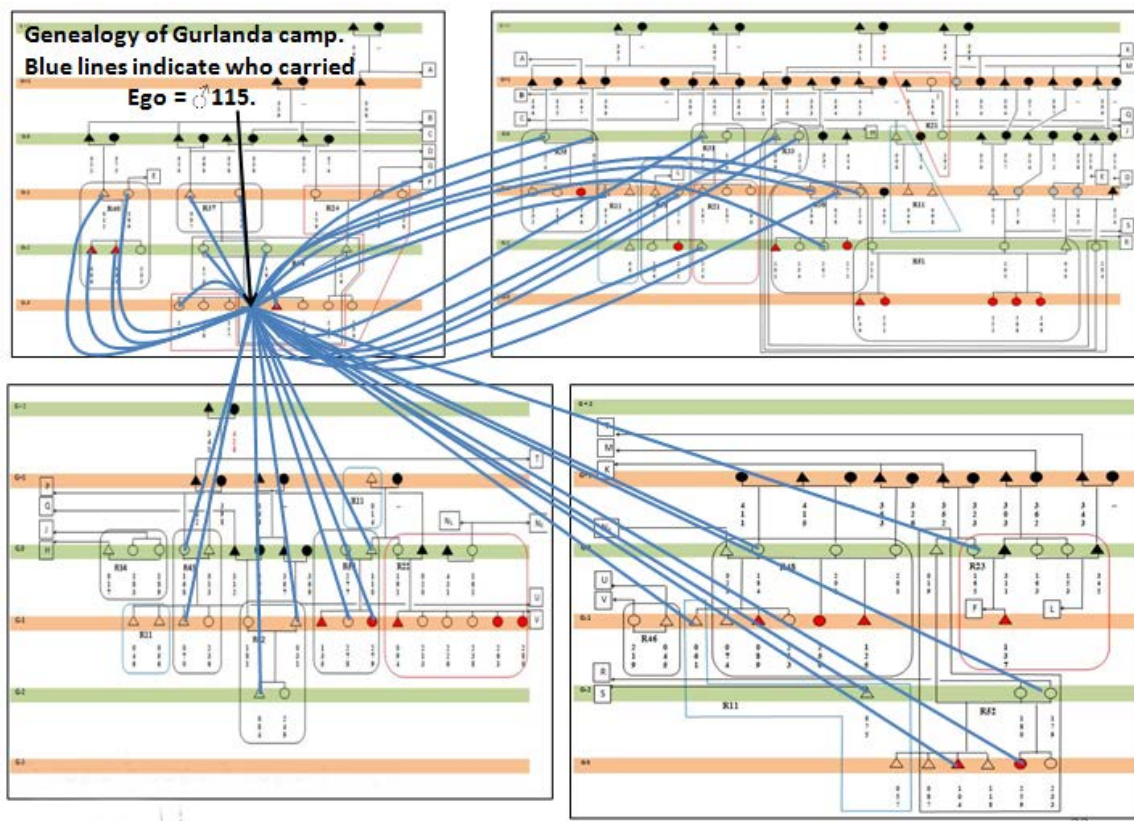
The plan in Figure 25 shows that the camp was divided into 4 subcommunities, each denoted by arrows that linked peripheral single-family residences (Figure 7) to more-centrally located residences (Figure 6) of unmarried adult women (simultaneously patri- and matri-local).

While sitting on top of my Land Rover (Figure 1) for 191 hours distributed over 51 observation days, I made 41,814 observational records including 1439 records of 71 different people carrying 24 different infants and children whose ages ranged from birth to 8 years. I made those records of behavior inside the camp where visibility was excellent, but outside of residences in which



visibility was limited. Each item in each observational record can be treated as a behavioral attribute that, by definition, was attached to the child who was carried, the person who carried the child, the locations in the camp where the event began and ended, the date and time when it occurred, and other relevant data. Most importantly, the observational records are attached directly to the genealogical data and to all of the kinship data summarized above.

Figure 26 is one example of the enormous number and complexity of structural and behavioral relationships embedded in the Alyawarra dataset. It is a simple summary of one aspect of alloparental care as it was experienced by one child (♂115), a 6 year old boy who was carried 81 times by 38 different people and in ways that I believe were fairly representative of the population as a whole.



**Figure 26.** Carrying of ♂115 by parents and alloparents at Gurlanda Camp.

The genealogical diagram in the background of Figure 26 represents the people who lived in Gurlanda camp while I recorded the behavioral observations. The diagram contains four quadrants, each corresponding to one of the subcommunities shown in Figure 25. Squares with arrows and letters such as  $\rightarrow \boxed{A} \rightarrow$  are links that connect relationships bridging gaps between subcommunities. The people who are represented by red circles (♀) and red triangles (♂) are the 24 infants and children who were carried during my observation sessions. The blue arrows

indicate that the person at the flat end of the arrow was recorded at least once as a carrier of the person at the pointed end of the arrow. Again the Figure contains nuances that I ignore here.

Notice that ♂115 lived in the upper-left quadrant with his siblings, parents, grandparents and members of his MFFBS's family, all of whom appear on the genealogical background. Several of those people carried him, but several did not, as is true with regard to residents of other quadrants.

The diagram is suggestive of the diversity of carriers who served as alloparents for ♂115, but numbers provide a more accurate measure. Tabulating the carries against the kin categories proposed above yields the distribution in Table 8.

Carrier's relationship to ♂115	Number of carries - #	Percent of carries - %
Parents (M,F)	1	1.2
Siblings (B,Z)	15	18.5
Parents' parents (e.g., MM,MF)	2	2.5
Parents' siblings (e.g., MZ)	2	2.5
Distant collateral kin (FFBSD, "cousins")	38	46.9
Agnatic kin (MMMFSW, "in-laws")	21	25.9
Non-kin (classificatory kin, "friends")	2	2.5
<b>Totals</b>	<b>81</b>	<b>100.00</b>

**Table 8.** Number of carries by each category of consanguineal and classificatory kin.

Perhaps the most striking feature of Table 8 is that the child's own parents carried him only one time (M=1, F=0). They may have carried him frequently inside their residence, but they almost never carried him elsewhere. For ♂115, most carries (91.3%) were performed by older siblings, "cousins" of various kinds, and assorted "in-laws".

For the population of the camp as a whole, the mean rate of observed carries by mothers was 2.85% and by fathers was 0.285%. On average, parents provided approximately 3% of the carries that their children received.

From a Western perspective, the numbers for ♂115 in particular, and for Alyawarra infants and children in general, could be perceived and condemned as scandalous parental neglect. But from an Alyawarra perspective, child care in general and child carrying in particular were perceived as community responsibilities based on the ethical standard that said, "We take care of them."

As I have shown in detail elsewhere (Denham 2015a), the cooperative and altruistic behavior displayed in child carrying can be interpreted in various ways, perhaps most effectively by Hamilton's (1964) theory of kin selection and Trivers' (1971) theory of reciprocal altruism.

But those bottom-to-top theories, which make valuable contributions toward our understanding of Alyawarra child care strategies, stop far short of explaining related aspects of Australian Aboriginal societies which seem to operate from top-to-bottom. Two major examples include a) Ancestral prohibitions against restricting access to land and resources, plus the absence of conflict over both of them among the Alyawarra and most other Aboriginal societies; and b) cooperative use of fire stick farming (Jones 1969) that yielded continent-wide park-like conditions that Gammage (2011) called *The Biggest Estate on Earth*. Furthermore, they say little that enlightens us about Kropotkin's (1903) *Mutual Aid* that Hiatt (1996) strongly supported, or the apparent failure of Hardin's (1968) "Tragedy of the Commons" to occur in Australia over the last 50,000 years.

The world view in question here treats Alyawarra children, along with the land and its resources, as parts of the Commons, as assets rather than as liabilities or parental properties. Everyone benefited from the children as they grew up and assumed their proper roles as adults, thus everyone was collectively responsible for insuring their survival and success as members of the society. Under these conditions Hardin's tragedy simply did not happen.

*Tragedy of the Commons averted.*

A potential understanding of the biological bases of human social behavior, or gene-culture co-evolution, among the Alyawarra, addresses both biological and cultural topics.

Biological issues include but are not limited to the following: genealogies, the age bias, optimal inbreeding and outbreeding, asymmetrical reproductive histories spanning perhaps 1200 male and 1800 female generations, selection for enhanced male longevity, kin selection and reciprocal altruism, and a harsh and capricious climate that is only a bit more hospitable than that of Australia's Western Desert which Gould (1969) described (perhaps hyperbolically) as "the harshest environment ever inhabited by humans before the industrial revolution".

Cultural issues include but are not limited to the following: Dreamtime, Dreamings, Countries and the extended novitiate for young men, the ethic that says "We take care of them", interdigitated egocentric and sociocentric kinship terminologies that are superimposed on the genealogies and are both classificatory and universal, preferred MBD marriage, single women's residences, simultaneous matrilineal residency based on genealogies and patrilineal residency based on classificatory kinship, sororal polygyny, the absence of gerontocracy, and ubiquitous fire stick farming.

I suggest that preoccupation with often-pretentious theory led earlier anthropologists in Australia to disregard Tinbergen's (1963:412) warning that "Contempt for simple observation is a lethal trait in any science". Although I am comfortable with my reductionist approach, I understand that defining "simple observation" is by no means a simple task. I have not provided a definition that specifies the necessary and sufficient conditions for when the term should be used (intensional definition); nor have I provided a definition that specifies every object that falls



under the definition (extensional definition). Rather, I have introduced many definitions that convey the meaning by pointing to examples (ostensive definitions). Perhaps my efforts in this regard offer something of value. Beyond that, however, constructing a model – however broadly defined - to integrate the simple biological and cultural observations introduced in this paper lies infinitely far beyond my expertise. Perhaps someone else with a great deal of theoretical imagination and technical skill can make it happen.

A tradition nurtured by a European folk belief in the technological and social simplicity of Australian Aboriginal societies persisted in the 20<sup>th</sup> century. But the intellectual complexity that I encountered among the Alyawarra in 1971-72 was the antithesis of simplicity in every sense.

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