

# Multiple Measures of Alyawarra Kinship

Woodrow W. Denham and Douglas R. White

3 March 2003

For submission to *Field Methods*, special issue edited by Dwight Read

## Abstract

A field experiment conducted in Central Australia in 1971-72 explored differences between what Aborigines actually did and what they said they did when anthropologists interviewed them. Fieldwork entailed observing behavior and recording it in numerically coded forms; analysis entails extracting patterns computationally that would not appear in traditional ethnographic data. This paper focuses on discrepancies between expected and observed with regard to descent, marriage and kinship. First it examines field methods and the resulting dataset, then it reviews a wide range of analytical methods that have been used to interpret the data. The alternative analytical methods reviewed here serve to test “competing hypotheses” about the nature and operation of Alyawarra descent, marriage and kinship. At the same time, however, the cumulative result of using these diverse methods has been increasingly complex and subtle understandings of previously unknown aspects of Central Australian social organization. The fact that the data continue to repay increasingly sophisticated analyses thirty years after they were recorded attests to the success of the field experiment.

## 1. Field Methods

Denham conducted the Alyawarra project in 1971-72 using methods being developed for observational field studies of nonhuman primate behavior, but studied people with human cognitive and linguistic capacities. A comprehensive review of the field methods appears in Denham (1978); the following paragraphs deal in greater detail with methods used to collect data related to descent, marriage and kinship.

Denham worked for 11 months with 264 Alyawarra speaking Aborigines at MacDonald Downs and Derry Downs (MD-DD) Stations about 160 miles northeast of Alice Springs, Northern Territory. The Chalmers family who operated these and adjacent cattle stations were highly sympathetic to the Aboriginal people whom they had known intimately since homesteading there in 1923 and served as a buffer against the encroaching White world.

The Alyawarra lived in four semi-permanent camps spread over a distance of 54 road miles. The camp where Denham lived had a typical population of about 100 and was the most isolated. The people were not nomadic in the traditional sense, but remained highly mobile within the cluster of four camps, and between the cluster and other camps, cattle stations and towns in the region. They hunted kangaroos for most of their meat, but also received rations of flour, sugar, tea, bread and fruit. Under conditions of semi-

provisioning, they maintained much of their traditional lifestyle with little interference from Whites or "detrribalized" Aborigines. Alcohol was prohibited.

Fieldwork emphasized what people actually did in their day-to-day lives. That focus never precluded traditional ethnographic data collection, but always emphasized primarily what they did and secondarily what they said they did. It employed numerically coded data collection that was compatible from the outset with computer assisted data analysis. Each component of the fieldwork was as systematic and exhaustive as possible, but some components required sampling.

The project yielded the Alyawarra Ethnographic Archive (Denham 2003), now available on CD and becoming available on the web. It contains 46,156 numerically coded data records in 78 files, plus 563 photographs, 37 maps and ground plans, 17 genealogical diagrams including all 377 members of the research population, 500+ pages of field notes, 77 minutes of edited audio recordings, about 2000 pages of published and unpublished papers in any way related to the Alyawarra project. Also derived from the Alyawarra project is the Group Compositions in Band Societies Database (Denham 2002) containing 41 numerically coded genealogical censuses from hunter-gatherer societies worldwide, including the Alyawarra. The Alyawarra project was designed initially to yield the Archive, and each step in the research has presupposed the existence or development of applicable methods.

Since this paper deals specifically with genealogical, demographic and kinship data, the remainder of this section reviews methods used to generate these datasets.

**Photodeck** Denham recorded vital statistics, genealogies and kinship data on printed 6 x 8 inch cards, one card per person (Figure 1). The front upper right corner holds a Polaroid portrait of the person to whom the card is assigned (ego), the upper left corner holds vital statistics and genealogical data, and the lower half contains a form for recording kinship terms used by ego. The back holds census data, data from sortings discussed below, and miscellaneous notes.

Early in the project, Denham made two portraits of each of 225 Aboriginal people at MD-DD, mounted one on the card assigned to ego and gave the other to ego for his or her own use, entered a unique Personal Identification Number (ID) on the card, and proceeded to fill in the blanks. That procedure, without portraits, was used for an additional 41 living members of the population and 113 deceased ancestors, yielding a total of 377 data cards.

**Vital Statistics** The following data was fundamental to the entire project and was coded for all 377 people:

- ◆ Sample: First of 377 Vital Statistics and Genealogical Data records  
01 0001 001 1 92 19 1 1 1 44 2 001 294 0 305 363 154 1 Jim Austin
- ◆ Key: required/*optional*/[computed]: [File#], [Record#], ID#, sex (SX), date of birth (DB), [age in years], [age cohort], language group, moiety, section (S), patrilineage or country (C), current marital status (M1), day person joined and/or left the population (IN / OUT); *nature + day of status changes: puberty (DP), marital status (M2, M2D); date of death of parent (P), spouse (S), or self (OUT);* identities of father



verify all age data (Denham 1978). Undetected age errors, if any, are infrequent and small enough to be disregarded safely and almost certainly pertain only to the very old.

The people learned to sort, order and label the cards using their own criteria and criteria that Denham proposed. Almost everyone participated frequently in sorting, ordering, and labeling, but nobody became a “key informant” for this or any other purpose.

**Sorting: Language Group Affiliations** Early on Denham was told that everyone at MD-DD was Alyawarra, but it became obvious that, while everyone understood and spoke the Alyawarra dialect, some used it as a second language. Late in the project, Denham asked four groups of people to sort 217 cards from the photodeck, indicating his interest in “tribal affiliations” but with the meaning of the concept unclear to him and unspecified to them. The four groups consisted of five men, five women, three women, and three men. The first two groups sorted the cards on a single afternoon at one camp, and the last two sorted them the following morning at another camp. There were no known contacts between members of these groups while these data were being collected. Each group reached a consensus before a card went into a final category. Each time the cards were sorted, Denham marked each card to designate the linguistic group to which ego was said to belong. This process identified four dialect groups: Alyawarra, Aranda, Anmitjira, and Warramunga.

All sorting groups agreed that 173 people were Alyawarra and 13 were Aranda. Three of four groups said 12 of the remaining 31 people were Alyawarra and 1 was Aranda. That left 18 people with unclear linguistic affiliations despite vigorous debates surrounding some decisions. Although Anmitjira and Warramunga were mentioned several times, no one was classified unambiguously as being a member of either.

Using genealogical data for people whose portraits were not available, Denham determined that 220 of 264 people were Alyawarra (100% or 75% agreement), 21 were Aranda (100% or 75% agreement), and 23 were of unclear linguistic affiliations. Although the research focused on the Alyawarra, Aranda speakers and those with unclear linguistic affiliations were active members of the population and their genealogies and kinterms are used below. The procedure described here was laborious, but we have confidence in the end result.

**Ordering: Genealogies** Denham obtained genealogical data by recording the identities of parents and spouses at the time each person officially joined the research population and verifying them later, but many people did not have living parents or spouses. Furthermore, the people would not willingly mention the names of the dead or acknowledge the prior existence of deceased infants.

Denham did not attempt to obtain information about deceased infants, but learned to use the photodeck to reconstruct genealogies upwards through deceased ancestors without violating the injunction against directly mentioning the dead. By arranging portraits of living people showing known parent-child, sibling and spouse relationships, then extending the process upwards with blank cards representing deceased ancestors and their

siblings, he obtained the information without resistance. To each deceased person identified this way, Denham assigned a unique ID number in a sequence separate from that of living people, and added that person to the dataset. Finding no restrictions on discussing lineage and section affiliations of deceased ancestors, he recorded this information as he constructed the genealogies.

Because of tight logical connections among moiety, section, and country affiliations, and parent-child and spouse relationships, most errors in these data were detected and corrected in the field. Remaining errors in patrilineage memberships, if any, almost certainly are confined to small descent groups and long deceased female ancestors. Without the photodeck this job would have been virtually impossible; with it, constructing genealogies for all 264 people was straightforward but time-consuming.

**Labeling: Kinship Data** Denham collected normative and pragmatic kinship data.

*Normative* After Denham made the portraits and mounted them on the cards, he used the portraits and known genealogical relations between selected, well-known and well-documented pairs of people to elicit kinship terms and their relational *significata* in strict accordance with Tax's (1937) six rules or principles that serve as structural features of kinship terminologies (Scheffler 1982). In other words, Denham used Rivers' genealogical method to learn the Alyawarra kinship vocabulary and to define the normative kinship data relationally. He simply could not imagine another thorough, systematic way to obtain an initial understanding of Alyawarra kinship.

*Pragmatic* Next, in a move that proved controversial, Denham recorded one and only one kinship term that each ego applied to each alter, and gave the Aboriginal speakers complete control over which term to use. Denham selected a person whose portrait was in the deck and showed that person, one card at a time, all of the portraits in the deck, including his or her own. As each portrait appeared, ego gave Denham one kinship term that he or she used to refer to the person in the portrait (alter). Denham entered a code corresponding to that term on ego's card in the cell corresponding to alter's personal identification number. The result was a list of 225 terms from each of 104 carefully selected and broadly representative egos, yielding a total of 23,400 pragmatic kinship responses elicited under standardized conditions. The sample data record, which is the first of 104 Kinship Data records, lists File#, Record#, EgoID# and 225 2-digit codes corresponding to the kinships term that ego applied to each of 225 alters.

Sample: 22 0001 001

24101317211016121310121921171716212121281717101719051216172117211616171617171603051716  
161717051616161705161717170916030516160505161617160917051605160505010505050516050503  
09051616010109161605090509050505090903190505012103172617081111181716171102281117111918  
17161117281616031216161618030316030305031616180316180305160503160316031805160316160816  
09080516160801161608161608010805161608161608161708050317051605050816081617160816051619  
19010505050116080805

The resulting dataset is based on terms of *reference*, not terms of address. In fact Denham rarely heard kinship terms used for either reference or address. Generally speaking, people used other kinds of group membership terms, augmented by informal contextual

cues, for address and reference, including terms denoting section, country, age-group and residential group memberships. For example, to refer to Jim Austin, you could say "that old Burla" and point your chin in the direction of his body, residence, country, photo, whatever ... so that as much of the message rested on your chin as on your words. Likewise to call Jim from across the *ngundy*, you could look in his direction and shout "Hey you Burla". Two or three Burla men might look up, but since it was clear who you were looking at, the ones who were irrelevant went on about their business and old Jim responded.

Hence the kinship terms in use here seemed to constitute a "technical vocabulary" of reference terms used mainly in discussions where context was not sufficient, where you had to have absolute identifications that were precise and unambiguous. Examples of such situations included discussing relations among participants in initiations and discussing relations between people and the sacred stones who were classified as Fa, FaFa, etc.

In addition to "typographical" errors, the kinship data could contain errors of identification made as informants responded to the portraits. Denham attempted to prevent this problem by giving most people a great deal of practice in using the photodeck before kinterm elicitation began, and by encouraging more than one person to be present when kinterms were being elicited.

Sometimes ego easily arrived at a kinterm for alter, but at other times he or she engaged in lengthy debates with other participants before deciding on a term. It was common to hear people say, "Tell him the proper Alyawarra way" as these discussions proceeded. On a few occasions informants came to Denham several days later, with other people, to correct an earlier response based on continued discussions that followed elicitation sessions. We conclude that everyone attempted to provide the "best" term in all cases, and the last half of this paper represents various attempts to decide precisely what "best" means in this context.

As the data accumulated, they contained many nonuniform kinterm reciprocals; i.e., the pair of kinship terms that ego and alter used for each other often did not agree with normative data described above. Denham was acutely aware that each pair of people could be related through no known geneapath, one and only one geneapath, or multiple nonredundant geneapaths of equal or unequal length. To deal with this fact, he assumed that *all* of the nonuniform kinterm reciprocals could have been resolved in accordance with the reciprocal relations embedded in the terminology based on Tax's rules.

Following traditional anthropological practice, Denham might have investigated what the people *could* have done had he asked them to resolve those discrepancies. Instead, he investigated the discrepancies themselves. The rest of this paper focuses on relationships between what the people *could* have done (*viz.*, use their kinship terms as uniform reciprocals in accordance with Tax's rules) and what they *actually did* under standardized elicitation conditions (*viz.*, apply the terms such that the blooming, buzzing confusion of the real world prevailed over the sterility of the ivory tower).

## 2. Analytical Methods

The Alyawarra data introduced above are amenable to analysis from many perspectives using various methods to test alternative hypotheses concerning the nature and operation of descent, marriage and kinship among the Alyawarra. Here we review five analytical approaches that have been used to interpret the Alyawarra data, each of which has yielded important insights into Central Australian Aboriginal social organization.

**Method1. RB Normative Model** The Alyawarra are neighbors of the Aranda. Their kinship system resembles the Eastern Aranda 4-section system, but differs from Aranda further west who use 8-subsection systems. Nevertheless Alyawarra kinship terms closely resemble those reported by Spencer and Gillen (1927) for Aranda in the Alice Springs area at the beginning of the 20<sup>th</sup> century, and the normative structure that underlies those terms closely resembles that built into the Kariera model used by Radcliffe-Brown (1930) and his intellectual heirs.

Figure 2. Radcliffe-Brownian model.

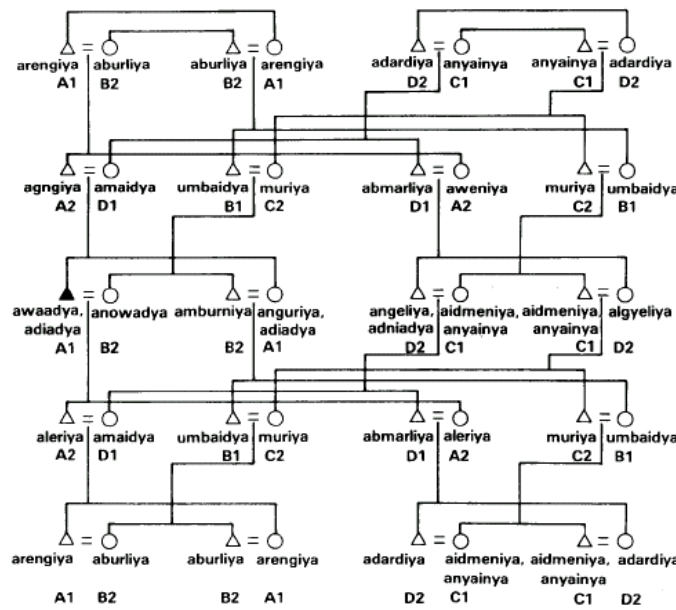


Figure 4. Alyawarra kinship terms used by a male ego.

Figure 2 is a normative model in the manner of A.R. Radcliffe-Brown (1930) – hence called the RB model below - and was the first model Denham, McDaniel and Atkins (1979) tested against the Alyawarra data. They derived it by combining Denham’s normative data with many published attempts to understand Central Australian kinship using a normative approach. It incorporates language, rules, normative data and ideal genealogical relationships as well as kinship and section terms, rests squarely on Tax's (1937) rules as elucidated by Scheffler (1982), and accurately represents what the Alyawarra said they did. Think of this kind of model as the “default option” for understanding section systems.

The RB model holds a set of genealogically based kinship “positions” that correspond to each of the Alyawarra (and Aranda) kinship terms. But the “positions” are equivalence classes that categorize genealogical relatives, and not actual genealogical relatives. According to this model, all marriages entail sister exchange with classificatory bilateral second cousins.

When Denham et al. examined actual genealogical relationships and kinship term applications, they discovered that behavior often violated the rules built into the RB model. Some have argued that a logical model constitutes only part of what determines people's behavior and cannot be tested legitimately by examining the extent to which behavior complies with it. If there were no discernible relationship between Alyawarra rules and behavior we might be sympathetic to this argument, but that is not the case here. Some Alyawarra rules and actions display close fits and some display moderate but imperfect fits. In still other ways actions are entirely systematic but so far removed from the rules as to suggest the operation of another set of rules radically different from those embedded in the RB model. Thus the RB model is convincing as a closed logical system but is of limited utility as a guide to action.

**Method2. JRA-1 and JRA-2 Age Biased Geometric Models and the Axiom of Generational Closure** Figure 3 reflects the first attempt by Denham et al. to understand widespread systematic differences between norms and pragmatics. The JRA model, named for John R. Atkins who invented it, retains as much of the RB model as possible because of its good fit with practices in some areas, but modifies RB as needed to accommodate incompatible practices.

McDaniel's quantitative analysis of the Alyawarra data in 1976 used FORTRAN, SPSS and SOCSIM software to extract 240,000 non-redundant genealogical paths connecting discrete pairs of individuals, to group together ego-alter pairs according to the nature of their linkages, to attach kinship term applications and demographic data to the pairs, and to print the results to facilitate a manual search for deeper patterns underlying the surface patterns that the computer detected. Denham et al. (1979) contains a great deal of tabular data that clearly displays exactly where the discrepancies lay.

The computations revealed that the single greatest problem with the RB model was that it was based on the what Atkins (1981:390) called the “axiom of generational closure”; i.e., “the tacit but widely accepted supposition that any ‘normal’ kinship system - or at least every proper model of such a system - must entail an infinite or open series of successive genealogical generations each of which is not only discrete but also closed.”

A large mean age difference between husbands and wives is incompatible with generational closure. Yet the Alyawarra data revealed a 14-year H>W mean age difference that is not atypical of Australian systems, and certainly is too large to be neglected by kinship theorists. This difference precluded brother-sister exchange and biased marriages by male egos in favor of real or classificatory MBD and MMBDD and against FZD (Hammel 1976). These and other profound effects of the age bias, including a strong tendency towards asymmetric exchange between patrilineages, ramified throughout the structure and operation of the system.

Thus on the basis of their computational analyses, Denham et al. concluded that a model of Alyawarra kinship, marriage and descent that deals with pragmatics as well as norms must incorporate demographic realities.

The JRA-1 model in Figure 3 is Atkins' open format diagram for an arrangement of Alyawarra classificatory lineages that accommodates (1) H>W age differences, (2) an asymmetric order of classificatory patriline that move from left to right in terms of wife-giving (leftmost in an adjacent pair) and wife-taking (rightmost in an adjacent pair), and (3) distinct kinship positions in the classificatory array that correspond to distinctive kinship terms. Spouse-giving and -taking happen asymmetrically: ego's sisters go to men on average 14 years older than ego and ego's wives come from men on average 14 years younger than ego. Thus brother-sister exchange is extremely unlikely, while a male ego's MBD or MMBDD may be a potential spouse but his FZD is not. Denham et al. called this an "age-biased *Kariera*-type system", but it incorporates kin-term distinctions consistent with eight sub-section divisions (A 1, A 2, B 1, B 2, C 1, C 2, D 1, D 2 as we have labeled them in the diagram). These designations for eight-sub-section equivalence classes for the Alyawarra kinship terms (each of which contains several distinctive kinship terms) are precisely those employed by Denham et al. (1979:7).

Figure 3. JRA-1 Open Format age biased model

Key: Assuming that ego is in section K, then K,P,B,N are section designations and K1,K2, through N1,N2 are implicit 8-subsection designations. A 1, A 2, B 1, B 2, C 1, C 2, D 1 and D 2 are distinct kin terms consistent with 8 implicit subsections.

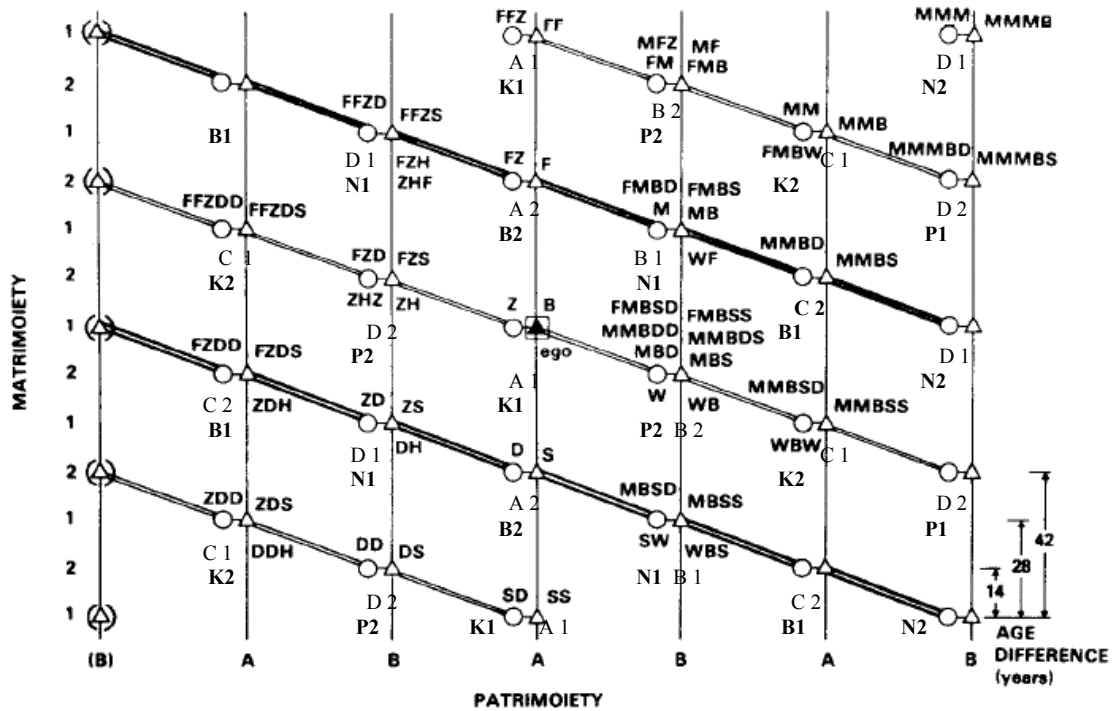


Figure 6. Age-biased *Kariera*-type system: "open" format.

Figure 3 incorporates an infinite series of discrete but open generations, but Atkins went further to derive the JRA-2 Helical Format age biased version of his model that rests on a

finite set of open generations (Figure 4, from Tjon Sie Fat 1983). In a four section system, when a small number of patrilineages engage in the asymmetrical exchanges described above, the two generations pass through each lineage in turn and spiral around each other in a manner that can be best depicted, if carried on for a sufficient number of generations, as a double helix. This model rejects ethnocentric Western notions of generations and embodies the Alyawarra conception of 2 open generations as subsequently and independently reported by Bell (1993:19). The kinship terms used here are identical with those used in the RB model but work radically differently as can be seen by comparing the RB and both JRA models.

Figure 4. JRA-2 Helical Format age biased model with double helix 'twist'

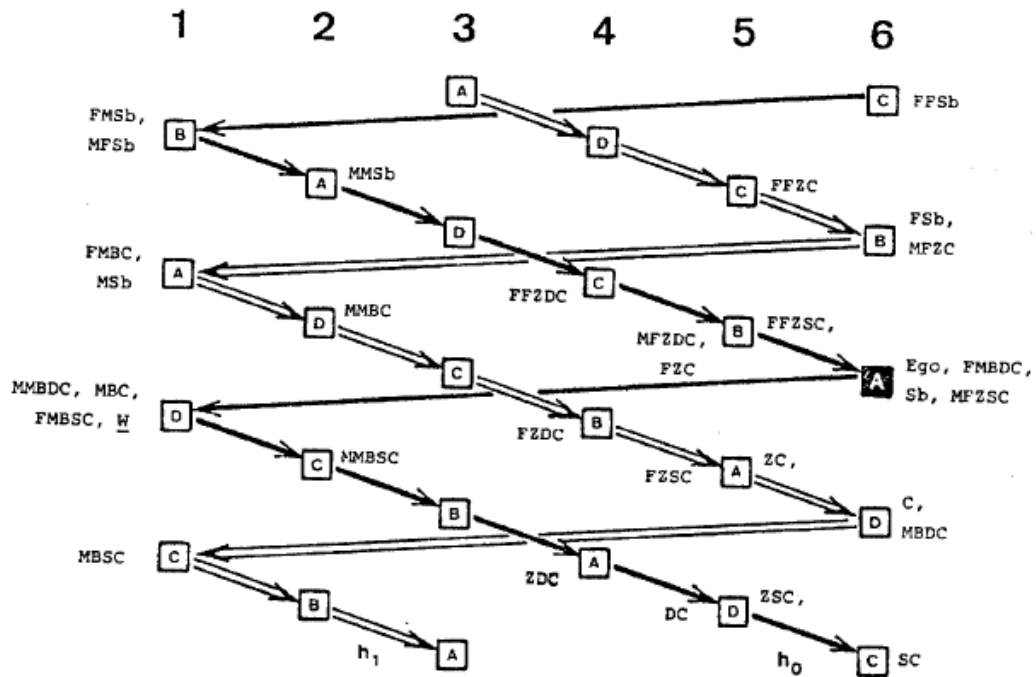


Figure 9. Helical exchange structure  $H(N_{pq}, 6, 3; r, .667)$ . Alyawarra-Wikmunkan type with direct exchange of FZDD.

**Method3. FTFS Family of Age Biased Algebraic Models** Franklin Tjon Sie Fat (1983) took the JRA-2 helical geometric Alyawarra model as a starting point for developing a generalized age biased algebraic model that accommodates both the RB normative model and the JRA-2 helical geometric model, and also accommodates other extra-normative variables including number of patriline and matriline, number of generations and H-W age differences. Furthermore his generalization accommodates McConnel's (1939-40, 1950) age biased model of Wikmunkan kinship, which fell on deaf ears when she published it.

Most importantly Tjon Sie Fat's work demonstrates that the RB model, which became fossilized early in the 20th century due in part to anthropologists' ethnocentric conception of generations and in part to their failure to consider extra-normative data, is only one instantiation of a much more general model. If a society to which RB applies has no

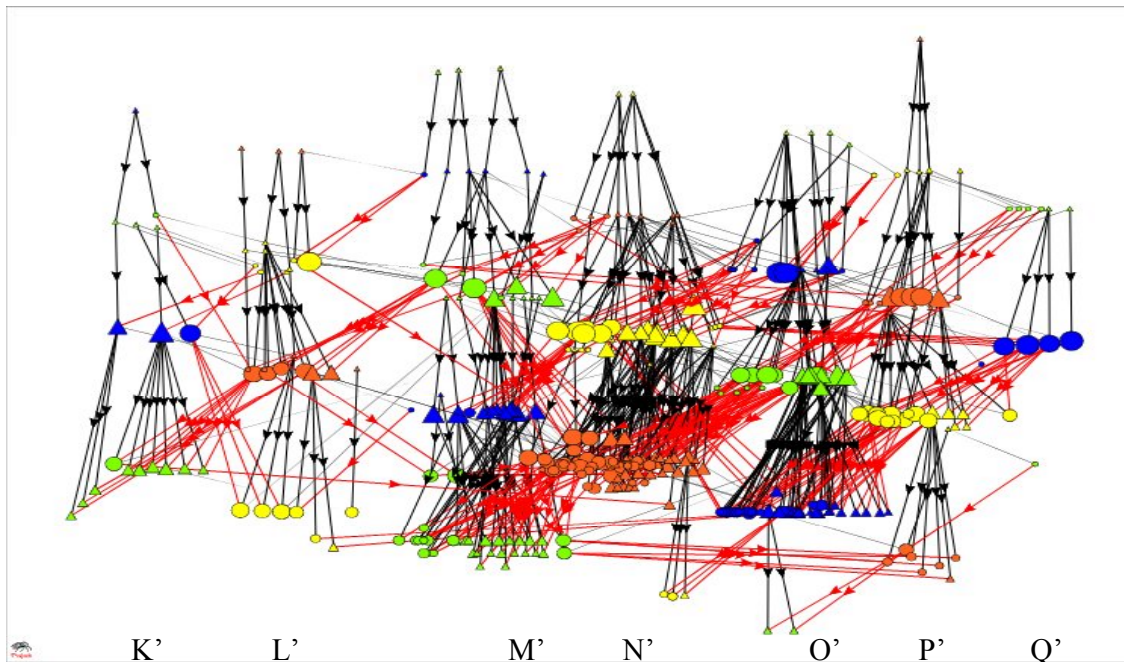
systematic H-W age difference, RB may be sufficient, in some sense, to represent the kinship system. But if the society is characterized by a systematic H-W age difference, then the axiom of generational closure fails, the default option fails, and an age biased model such as the JRA model *must* be invoked if there is to be any meaningful relationship between norms and pragmatics. The precise nature of the resulting age biased system is determined by the values of the variables in the FTSF family of models (also see Atkins 1982, Atkins and Denham 1981, Tjon Sie Fat 1981).

**Method4. DRW-1 Model** Yet another approach to the Alyawarra data shows that the JRA-2 double helix model may be too neat as it stands. The JRA model and the FTSF family of models based on it are abstractions not unlike the RB model. Both JRA-1 and JRA-2 took into consideration Denham's quantitative field data, but the models were not generated computationally, and Denham et al. had no technology with which to determine the precise fit between the JRA models and the Alyawarra data. Likewise this matter was not addressed in the FTSF Family of Models. However, it is possible now to measure the fit between the JRA models and the Alyawarra data.

At this point D.R. White (DRW) joins the cast of characters bringing with him long experience with computer-based analysis of genealogical networks (Brudner and White 1997, White 1997, Houseman and White 1998, White and Houseman 2002, White and Schweizer 1998) and the use of Pajek software designed and developed by V. Batagelj and A. Mrvar (1998). Pajek, like White's earlier Pgraph software (White and Jorion 1992, 1996), is designed for the analysis and visual display of very large networks of any kind, including genealogical and marriage networks (de Nooy, Batagelj and Mrvar 2002). This section is a summary of DRW's methods and results from Denham and White (2002).

Figure 5 is organized into classificatory patriline determined by a simple algorithm for matching genealogical and inter-lineage marriage relationships to the JRA model. The algorithm, applied manually, begins by taking the pair of lineages with the greatest number of intermarriages, and placing the lineage that predominates as wife-takers to the left of the one that predominates as wife-givers. The vertical alignment of individuals in each generational cohort is then arranged so that the age-cohorts match across lineages. This alignment is usually not horizontal, as will be seen, but staggered. Let us call these two seed lineages M and N, out of a total of 54 lineages defined by patrilineal descent from a common (known) apical ancestor. Next, all other lineages that are predominantly wife-givers to M are added to a superclass of lineages that contains N, and now designated as a classificatory patriline, N'. Next, all other lineages that are predominantly wife-takers from lineages in N' are added to a new classificatory patriline, M', that contains M. This process is now repeated to identify potential classificatory patriline. To the right of N' are added successive wife-givers O', P', Q', etc., until no more can be added. To the left of M' are added successive wife-takers L', K', J', etc., until no more can be added. At each stage the relative age cohorts are adjusted so that they are uniform across the diagram in the sense that the average age of each cohort for each classificatory patriline follows a regular progression. The arrows at the bottom of the figure show the dividing points between the classificatory patriline derived by this procedure.

Figure 5. Fit between Alyawarra behavior and the JRA model: by Section



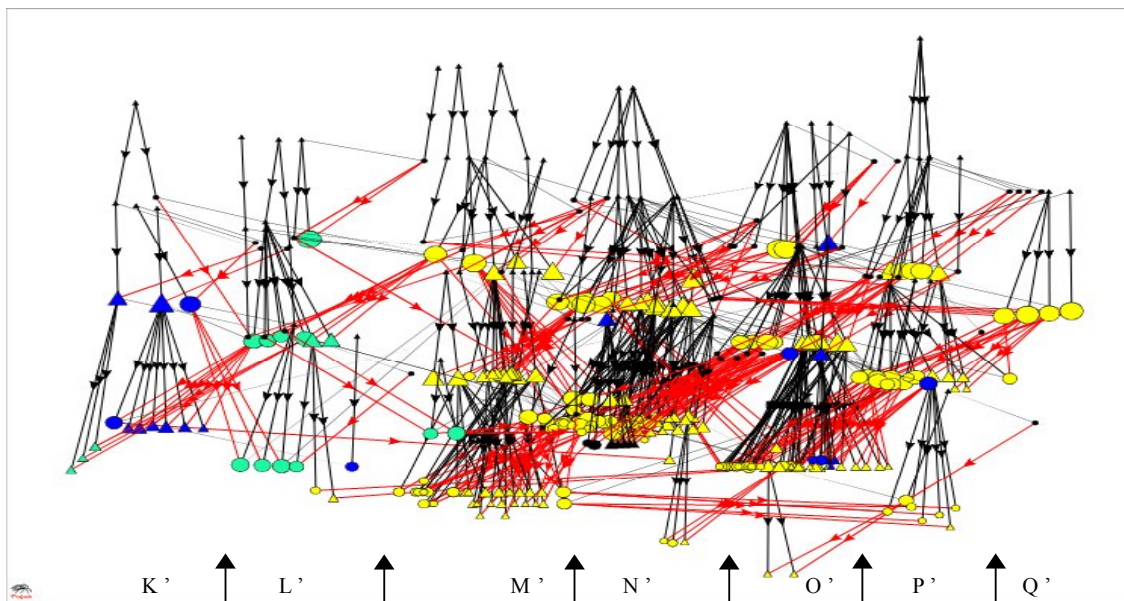
By displaying real relationships among all of the real people in the Alyawarra database, Figure 5 invites us to measure things that are not measurable in Figures 2-4. For example, in Figure 5 there are seven classificatory patrilineal sections K' through Q'. This is an empirical determination based on the algorithm; there is no *a priori* cutoff for how many classificatory patrilineal sections there should be. The algorithm that grouped lineages into classificatory patrilineal sections, as described above, uses a well-established analytical algorithm based on regular equivalence (White and Reitz 1983, Reitz and White 1989; see also Hanneman 1998). Historically, social scientists used attributes of actors to define social roles and to understand how they give rise to patterns of interaction. Regular equivalence analysis takes the opposite approach. It seeks to identify social roles by identifying regularities in patterns of network ties whether or not the occupants of the roles have names for their positions. Thus actual patterns of interaction are the regularities out of which roles emerge. After applying the algorithm iteratively to its conclusion in the case of the Alyawarra data, regular-equivalent lineages are those that are wife-givers to regular-equivalent others as well as wife-takers from a different set of regular-equivalent others.

About 74% of the marriages are consistent with the 14-year age bias of the JRA models (with an average Fa-Child difference of 42 years and Mo-Child difference of 28 years, roughly a 3:2 ratio), but the regular equivalence algorithm, as applied manually to produce Figure 5, reveals two exceptional marriage patterns that occur with lesser frequency. One represents men with a much younger cohort of wives ( $H > W \cong 28$  years), the other represents men with a same age cohort of wives ( $H > W \cong 0$  years). Thus a system such as this can have RB and several variants of JRA operating concurrently but with different frequencies of occurrence. If the mean H-W age difference were to change, we would expect to see changes in those frequencies; if the mean were to drop to zero, the

system would revert to “pure” RB. The co-occurrence of multiple variants in a single system is compatible with the FTSF family of models.

Figure 6 shows that among the Alyawarra speakers proper, there are five classificatory patriline M' through Q' and five classificatory matriline, mostly formed by the red lines running diagonally from sets of nodes at the upper right to other sets at the lower left. But the asymmetric JRA marriage structure extends beyond the Alyawarra proper. One of the matriline runs far to the left to connect to children of patriline of Aranda-Alyawarra and Aranda speakers who have intermarried with Alyawarra and intermarry in turn with Aranda patriline. This pattern is compatible with the open universe depicted in the JRA1 model but is incompatible with the JRA2 double helix model.

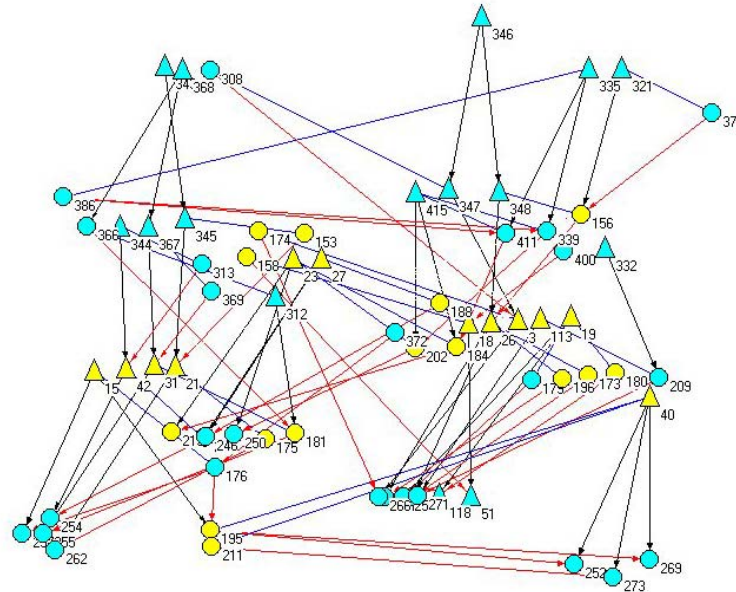
**Figure 6.** Fit between Alyawarra behavior and the JRA model, by Language.  
Color key to language: blue=Aranda, yellow=Alyawarra, green=intermediate



**Method5. DRW-2 Model and the Axiom of Universal Reciprocity** Alyawarra kinship terms (Denham, McDaniel, Atkins 1979: 7, 19), almost identical to Aranda terms, are consistent from grandparent down to grandchild with the RB model and with the finer distinctions of both JRA models. Thus at the level of terminology alone, without asking how the terms are realized with respect to specific alters, there is little to distinguish RB from JRA.

But in their initial quantitative analysis of the Alyawarra data, Denham et al. (1979) discovered that about 23% of 3,200 kinterm applications displayed an anomalous "Omaha" pattern deeply imbedded in the so-called alternating generation pattern of the RB model that typifies Central Australian kinship. In this anomaly a male ego applies the kinterm that normally glosses as "mother" to his own mother, to his mother's brother's daughter, and to his mother's brother's son's daughter. A systematic deviation of this magnitude from the standard alternating generation pattern could not be dismissed as

random noise. Denham et al. were unable to demonstrate any connection between the Omaha anomaly and the demographic factors that generated the age biased JRA models, and left it as an unsolved problem in their 1979 paper.



**Figure 7.** Known Kin Terms for those in blood relinkings

In the blood marriage subnetwork that appears in Figure 7, some of the nodes are colored to show the individuals for whom Denham collected reciprocal kinship terms. Reciprocals do not, in general, follow Tax's (1937) "law of uniform reciprocals," at least not for the single terms elicited reciprocally from each ego with respect to an alter. The most common departure is where a term for potential spouse (terms 13,14) are used reciprocally (in a gender appropriate manner) with a term for a matrilineal relative (terms 8,9). One person is saying same generation "potential spouse" (classificatory MMBDD or MBD) and the other is saying "mother" or "mother's brother" (M=MBD, MB=MBS). These two most basic generation-merging equations of an Omaha type terminology "raise" the potential spouse to an unmarriageable category in the senior generation.

There is clear evidence for asymmetric use of Omaha terminology in the fact that when ego and alter are in "potential spouse" genealogical positions, they never shift to a reciprocal use of Omaha terms: only one person shifts, not the other. That is, one person is made "senior," but the other is never made reciprocally "junior." Hence, even if Denham had collected alternate terms (2nd or 3rd most preferred terms), there is no hint in the pattern of first-term responses that the use of Omaha terms would turn out to be reciprocal. No such instances occurred in the blood-marriage subnetwork data.

In sum, ego's terms for "potential spouse" and "potential spouse's siblings" have two distinctly different reciprocals, in violation of the axiom of universal reciprocity. On the one hand, alter may reciprocate with a term that agrees with the "potential spouse"

designation in accordance with Tax's (1937) law of uniform reciprocals; on the other hand, alter may reciprocate with an equally legitimate term that designates ego as a member of "other generation" in terms of the JRA model thereby saying "don't marry here." Denham failed to grasp this distinction in the field at least in part because of his mistaken assumption that Tax's (1937) law of uniform reciprocals applied universally.

Data and analyses introduced here raise serious questions concerning the "axiom of algebraic closure" on which the JRA double helix model was based. It says that for any given culture to operate coherently, only a single logic is possible. Yet our investigation of relationships amongst RB, JRA1+2 and DRW1+2 at the level of practice shows how they form a coherent dynamical system oriented towards demographically and strategically inflected adaptation. In other words, we are discovering that the interplay of different logics can be a key to understanding system dynamics and evolutionary change. The "axiom of algebraic closure" is very widely used in modeling kinship "systems" as entirely self-contained and static. Our findings for the Alyawarra suggest that this axiom lacks general validity and its use should be very carefully circumscribed lest we assume out of existence the dynamical elements operating within the domains associated with kinship networks.

In the Alyawarra case the full double helix of JRA-2 never exists at any one time. Rather it is a projection into an unknown future and back to an obliterated or unremembered past. The fact that variant practices are available and that their frequencies change over time allows JRA-1 to be dynamic, not static as RB or helical JRA-2 suggest. For example, two generations hence, instead of completing a "double helix" future, there may be fewer patrilineages and larger age differences, and the earlier two generations may no longer be remembered. Something like that was happening in 1971 when members of localized patrilineages no longer remembered the matrilineal ties of deceased ancestors. When that happens, the system may easily transform itself into a different age-skewed model (Tjon Sie Fat 1983) without abandoning the logic of sections or subsections in the RB model. Likewise intermarriages with neighboring Aranda patrilineages induce additional transformations.

**Method6. DRW-3 Model of Cohesion and Coloring versus Regular Equivalent Roles** To test the convergence properties and reliability of the manually implemented algorithm that produced Figure 5, DRW attempted to replicate the model by two different means. One was the use of computer algorithms for finding regularly equivalent groups. These proved to be too sensitive to missing data to produce a single reliable solution. Using the most advanced generalized blockmodeling approach (Batagelj 2002; Doreian, Ferligoj and Doreian 2002), different random starting configurations produced alternate configurations that fit various models, but none conclusively. The second approach was more successful, using a different type of blockmodeling based on graph coloring. Model DRW-3 is an outgrowth of that approach, and produces a simpler and more determinate understanding of Alyawarra equivalence logic and social structure.

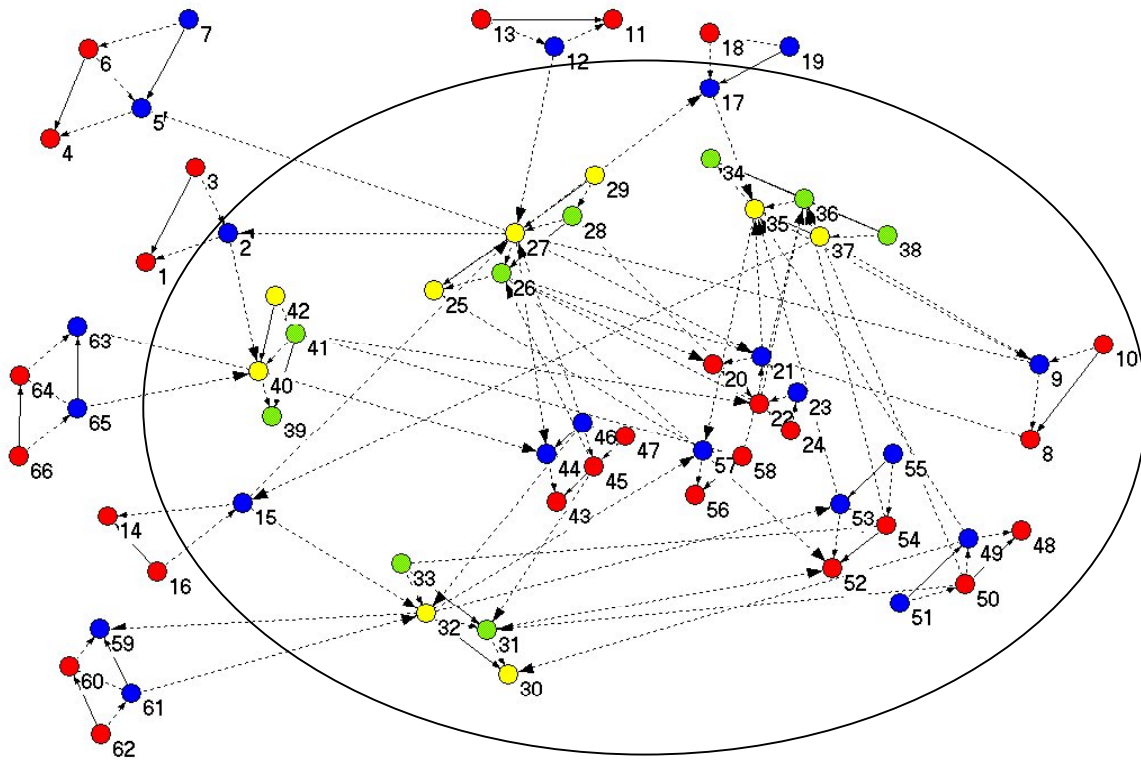
Figure 8 shows a graph coloring based on generalized sibling sets and their actual section memberships. Generalized sibling sets were calculated for the 17 actual patrilineages that

had more than two generations by making male lineage members into equivalence sets according to their distance from the apical ancestor. These lineages, then, had from three to five equivalence sets where each set other than the ancestor had a father in the next higher generation. These sets constitute the nodes of Figure 8. Given the rules of section membership, they alternate between colors red/blue in adjacent patrilineal generations (side 1 of the global moiety-like configuration of sections), or between colors green/yellow (side 2). The relation between generationally adjacent nodes with alternating colors is coded with dotted lines and treated as ‘negative relations.’ This is consistent with the coloring of a graph in which all negative relations are of different colors. The lineages, then, are the spatially contiguous clusters of nodes with dotted lines connecting alternating colors for actual section memberships of each generalized sibling-equivalence set. Between these clusters we have added a second set of negative arcs that indicate, for the men in that set, the links to their fathers-in-law, indicative of marriages between lineages. It is evident from the rules of section membership that these arcs will connect particular pairs of section colors from opposite sides. In fact, as can be seen from the figure, these connections are always between blue and yellow and between red and green, with the father-in-law/son-in-law link running in either direction but never reciprocally.

The coloring model in Figure 8 is very close to how the Alywarra section rules are laid out, and therefore to how Alywarra conceive of section rules. The portion of this graph with 45 sibling sets enclosed in an oval are those equivalence sets in which there is “role interlock,” that is, there are two or more independent relationships between pairs of nodes within the oval. Technically, this is the bicomponent of the kinship network and it contains no cutnode whose removal would separate the interlocked set of 45 nodes. The nodes outside the interlocked set are distinguished by the fact that there is a single node in each case whose removal would disconnect them from the rest of the graph. The structural arrangement of the loosely connected nodes will fit any model of Alywarra social structure that is consistent with section memberships. Not so with the interlocked set of 45 nodes: their structure may be more tightly constrained and thus provide a key to unlocking further models of Alywarra social structure. Applying the regular equivalence algorithm used manually to produce Figure 5 to these 45 leads to a very simple and highly determinate model of the structure, shown in Figure 9. Although the model in Figure 9 is not the only one that fits the structure, it is uniquely the simplest model.

The model in Figure 9 has only four generalized equivalence classes among lineages. Marriages are arranged so that daughters of a given line and section (color) tend to marry into an equivalence set of husbands just below (older men) and to their left, such that when the leftmost lines are reached, the marriages presumably wrap around in a cylindrical manner to the rightmost lines, although there is only one such link in actuality. The ratio of generational time for men and women is 2:1. These age differences are consistent with women’s first marriages, and this pattern of marriage is consistent with classificatory MMBDD, MBD and other marriages that are expected with the various Alywarra models previously discussed. There are very few exceptional marriage links between these equivalence sets, but those that do occur are consistent with classificatory FZD marriage, and with women’s marriages later in life as widows, for example. There is

only one serious violation of these two alternative types of marriage, which is evident for node 57 of the original 66 equivalence sets.



**Figure 8.** Graph coloring based on generalized sibling sets and their actual section membership

The model in Figure 9, furthermore, is almost perfectly consistent with an 8-section system. It is a model that is possibly helical or possibly one of open format that conforms to one of FTSF's simplest models of age-skewed systems, i.e., the one in which male generational time as offspring of first marriages of women runs at twice the age span as that of female generational time. This model apparently "cohabits" with the various other models we have analyzed here, but is the simplest model that accords best with a substantial portion of the ethnographic data. It also "cohabits" with the variant usages of Omaha terminology that we have yet to fully understand, but that possibly allow a means of switching marriage strategies in midstream in a very flexible set of options within the social organization. The social "structure," on the other hand, is not uniquely determined, but a set of coexisting more or less open-ended evolutionary possibilities each of which is realized to varying degrees.

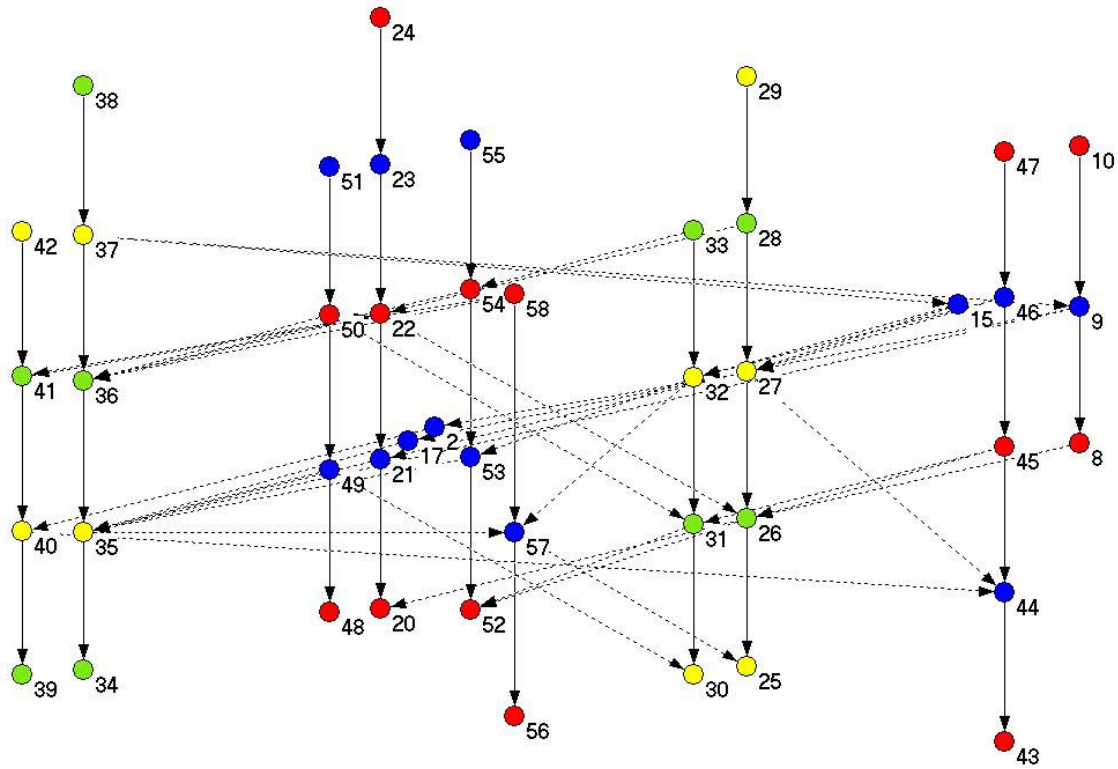


Figure 9. Graph coloring based on generalized sibling sets and their actual section membership

#### 4. Conclusion

The analyses that have been applied to the Alyawarra data show the following:

- The RB normative model functions as a kind of “cognitive core” for the Alyawarra system of descent, marriage and kinship. It is not incorrect, but it is seriously incomplete and inadequate.
- The JRA-1 open format model, the more elegant JRA-2 double helix model and the FTSF family of age biased helical models derive from the unintended effects of H>W age differences, add a degree of “reality” to the normative model, and demonstrate that Alyawarra kinship pragmatics violate the Axiom of Generational Closure.
- The DRW-1 model demonstrates that the elegance of the JRA-2 model is marred by the fact that patterns of marriage among the deceased are quickly forgotten and no longer cast their shadow as a constraint on future behaviors. Thus the “kinship system” can evolve dynamically across a class of network models influenced stochastically by age distributions at marriage in accordance with the FTSF algebraic model, and to incorporate non-Alyawarra lineages in ways that are incompatible with both the RB and the JRA models, thereby violating the Axiom of Algebraic Closure.
- The problem posed by the widespread extra-normative application of Omaha terms led DRW to discover recurring patterns in Alyawarra behavior that give the people a great deal of discretionary control over marriage by applying Omaha terms non-reciprocally in violation of the Axiom of Universal Reciprocity.

- Finally, DRW's examination of alternate models of Alyawarra social structure cannot be uniquely resolved into a single model but a nested model with a unique simplest structure embedded in models that are more complex. Each layer of models conforms to actual marriages that are in 98% agreement with the RB section memberships.

The field methods used in the Alyawarra project yielded a body of numerically coded data that are amenable to systematic analysis from a great many perspectives using a wide range of analytical methods. The alternative analytical methods are competitive in that they reveal weakness in each other, and complementary in that together they yield an increasingly detailed and exhaustive understanding of descent, marriage and kinship among the Alyawarra, and by implication among other Central Australian societies with whom they share many features in common.

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