



# *The Indigenous Australian Marriage Paradox*

*Small-World Dynamics on a Continental Scale*

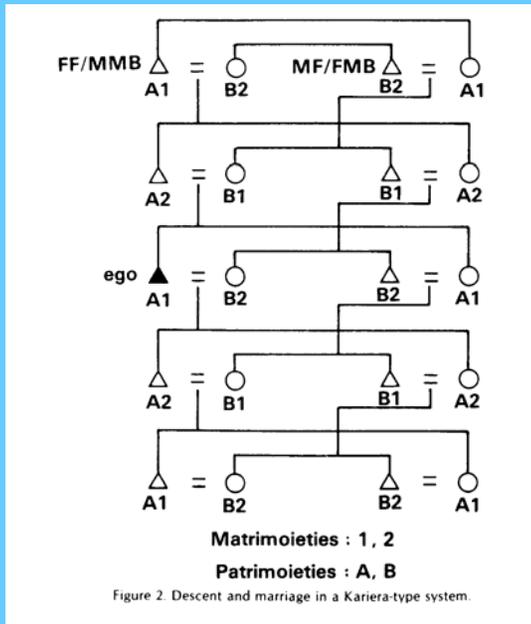
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# Data - Problematic but Generally Accepted



- Ethnographers estimate that the populations of Indigenous Australian language groups were consistently small, averaging perhaps 500 people each.



- Classical models of Indigenous Australian kinship systems consistently embody endogamous marriage as both a norm and a logical requirement.

# The Australian Paradox

- Paleodemographers argue that small reproductively closed human populations are doomed due to stochastic variations in birth rates and sex ratios.
- If both the population estimates and the models are right, how did these small closed societies avoid extinction and indeed persist in Australia for 40,000 years and more?

# Analogy with the Natchez Paradox



- Swanton (1911) thought “the Honoreds” among the Natchez Indians constituted a *descent group* that included men and women, rather than a category of *rank* among men that did not apply to women.
- Based on that error, he showed that the Honoreds’ population would swell thru time at the expense of commoners so there would be too few commoners for the nobility to marry under the rules of exogamy.

# Analogy with the Natchez Paradox



- By re-interpreting the Honoreds as a *rank* instead of a *descent group*, White et al (1971) relaxed the unrealistic constraint Swanton had mistakenly placed on the data, and the paradox simply vanished.
- Likewise, we suggest that traditionally strong axioms favoring endogamy and reproductive closure generate the Australian Paradox, and that weakening those axioms yields a much better fit between models and reality.

# A Wealth of Concepts: Problems

- Weil (1949); abstract closure of marriage classes
- Hammel (1960): descent groups; exogamous moieties, sections, subsections; endogamous language groups
- Harrison White (1963): abstract closure as endogamy
- Failure to distinguish among *endogamy*, *prescription*, and *abstract closure*.
  - **Prescriptive marriage rules plus actual endogamy within spatially and socially bounded groups**
    - *are not the same as*
  - **Categorical closure within classificatory kinship systems**

# A Wealth of Concepts: Solutions

- Levi-Strauss (1949): open systems: consecutive kinship terminology + open-system generalized exchange vs. alternating terminology + delayed reciprocal marriages. Marriage rules that allow linkages with neighboring societies can hardly be called prescriptive.
- Lounsbury (1964): discovery of Dravidian logic, directed marriage chains
- Houseman + White (1998): sidedness producing behaviorally defined but unnamed moieties

# A Counter-Intuitive Approach

- We weaken the axiom for endogamy simply to a preference, one that might vary through time.
- We argue that widespread restrictions on marriages, especially when mates are scarce, may reduce choices locally, but facilitate integration of populations globally by forcing people to marry outside their own language groups.
- **Simply put, local restrictions encourage the dispersion of marriages.**

# A Counter-Intuitive Approach

- To this end, we introduce a mathematical model of Aboriginal descent, marriage and kinship that is reproductively open to local exogamy in sibling-in-law generations rather than closed.
- We show how this more realistic openness articulates with traditional closed models.
- And we show how the resulting system might maintain dynamic population stability despite internal and external stresses that could otherwise lead to extinction.

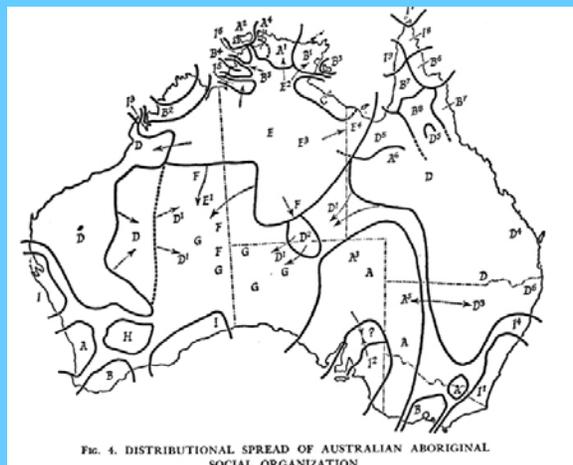
# Diffusional Evidence for Reproductively Open Systems

Berndt (1965); Radcliffe-Brown (1930); Elkin (1938)

Continent-wide distribution of common features of Indigenous Australian social organization

Moieties, sections, subsections: a multitude of variations on a common theme.

*What is the common theme?*

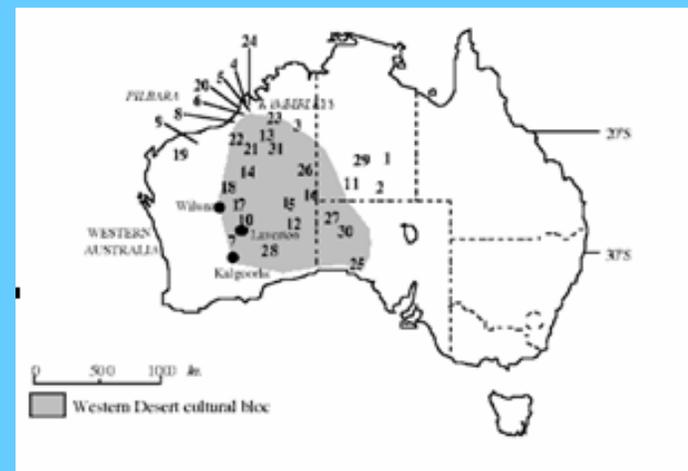


Dousset (2005): Western Desert

Trade + travel networks, dreaming tracks, ritual interactions at boundaries

Ubiquitous generation and descent moieties underlie region-wide relational system: source, direction, onset, rate, process (*valeurs*), product

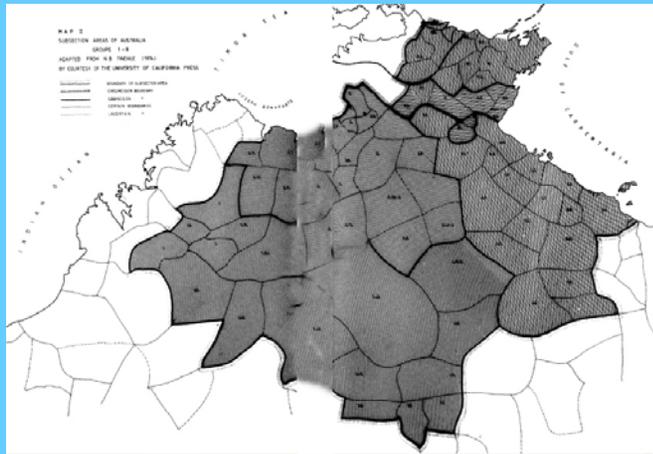
Diffusion of four-section *names* is not same as diffusion of *section system*:



# Diffusional Evidence for Reproductively Open Systems

**Brandenstein (1982):**  
 diffusion of eight-subsection names,  
 Northern + Northwestern  
 Australia

Source, direction,  
 onset, rate, process,  
 product



**McConvell and Alpher (2002):** diffusion of Omaha kinship terms,  
 Northern Australia

Source, direction  
 onset, rate, process,  
 product

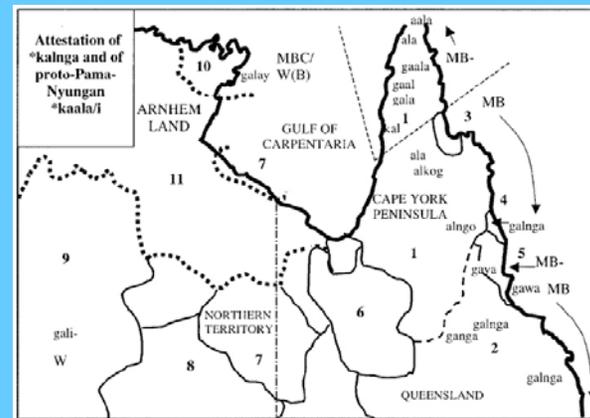


Figure 4. Attestation of \*kalnga and of proto-Pama-Nyungan \*kaala/i.

# Diffusional Evidence for Reproductively Open Systems

- Are all of these major diffusional processes happening concurrently by coincidence?
- Is it coincidence that all rest on the same foundations?
- Is it plausible that each of them is a unique event, with no connection to the others?
- Is the European invasion the *deus ex machina* that triggered all of them?
- We suggest that all are pieces of the same puzzle and that reproductively open systems, which facilitate such diffusional processes, have characterized Indigenous Australian societies continent-wide for many millennia.

# The Mathematical Model

- How is it built?
  - Emphasis on similarities among components
  - Helical structures
  - Local systems with global integration
- How does it work?
  - Internal and external stresses
  - **Sociodemographic mechanisms that respond to the stresses**
  - Integration yields resilience and stability
- How can we test it?

# The Helical Model

## Local Double Helix

### Moiety system

- Generation + descent moieties unnamed or named
- Implicit sections, unnamed
- Lowest common denominator

### Flat four-section system

- Derived from intersection of generation + descent moieties
- Sections generally named
- Horizontally layered generations
- Indefinite number of generations
- Symmetrical exchange
- **(Low) stress outcomes predict correlation with no age skew & reproductive closure; use marriage census data to test.**

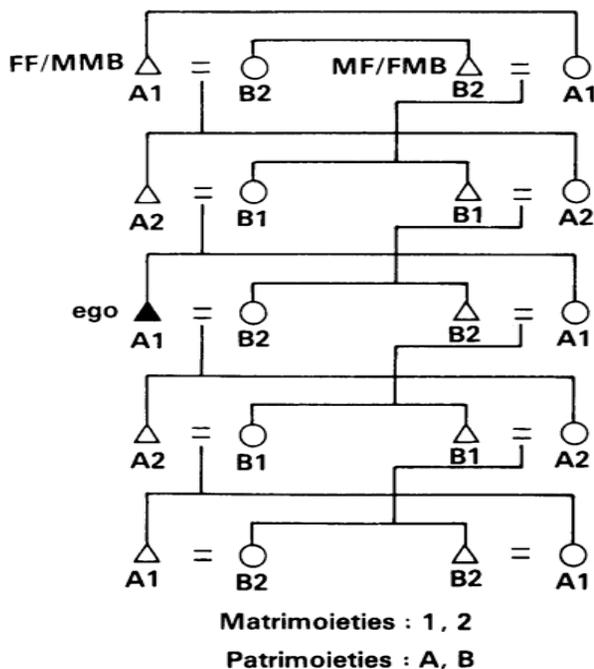
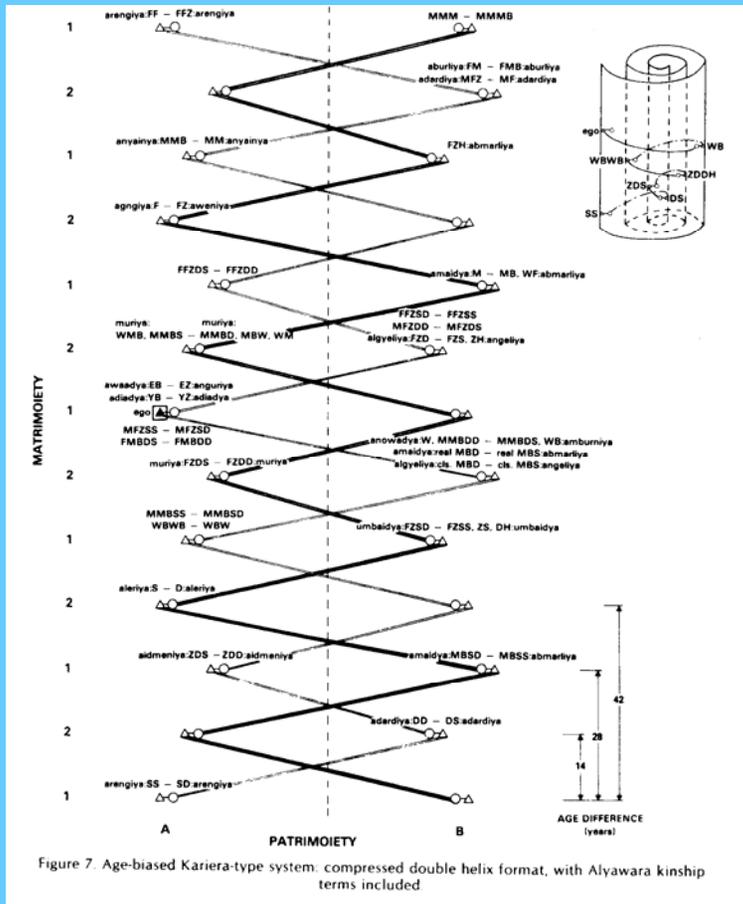


Figure 2. Descent and marriage in a Karia-type system.

# The Helical Model

## Local Double Helix



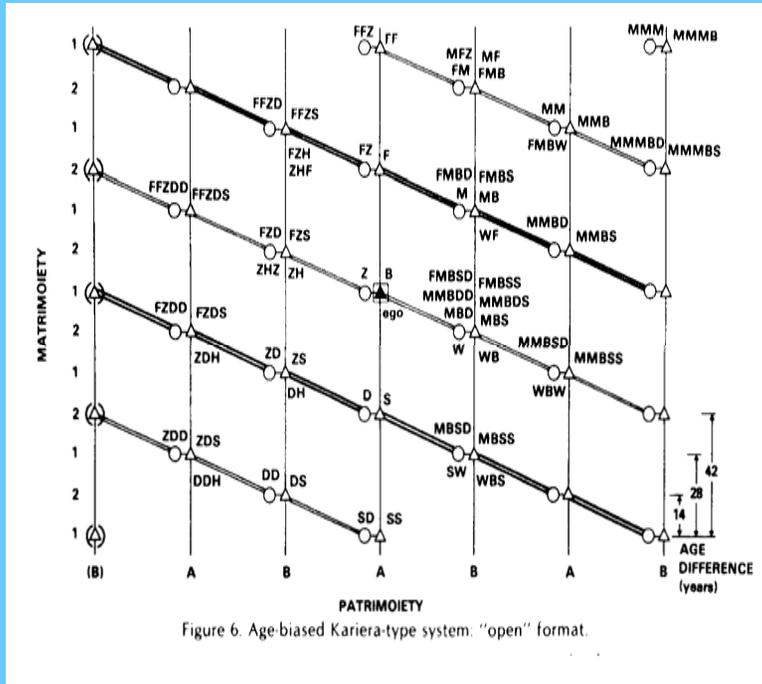
### Closed helical system

- Age biased diagonal generations based on significant mean H-W age difference among Alyawarra
- Systematic symmetrical sibling exchange is impossible, asymmetrical exchange is mandatory
- Exactly two generations, Ego's and Ego's Parents'/Childs'
- (Moderate) stress outcomes predict correlation with moderate age skew and exogamy; use marriage census data to test.

# The Helical Model

## Local Double Helix

### Open helical system



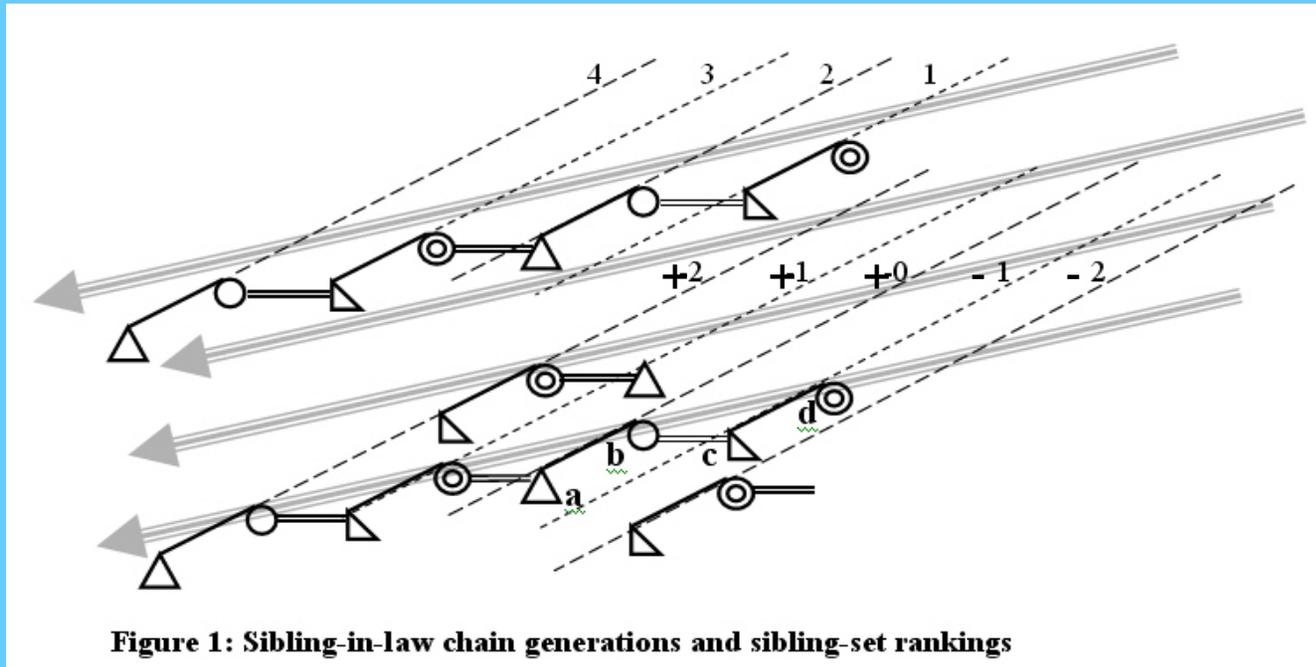
- Age biased diagonal generations based on significant mean H-W age difference
- Systematic symmetrical sibling exchange is impossible, asymmetrical exchange is mandatory
- Exactly two generations, Ego's and Ego's Parents'/Childs'
- (High) stress outcomes predict correlation with maximal age skew, maximal exogamy; porous boundaries, use marriage census data to test.

# The Helical Model

## Generalized Global Helix

### Sibling-in-law Generations

- Axiom for alternating generation exogamy
- Concept of generation: siblings-in-law chains
- Weak axiom for generation: with or without age skew
- Faster generations for females  than for males 

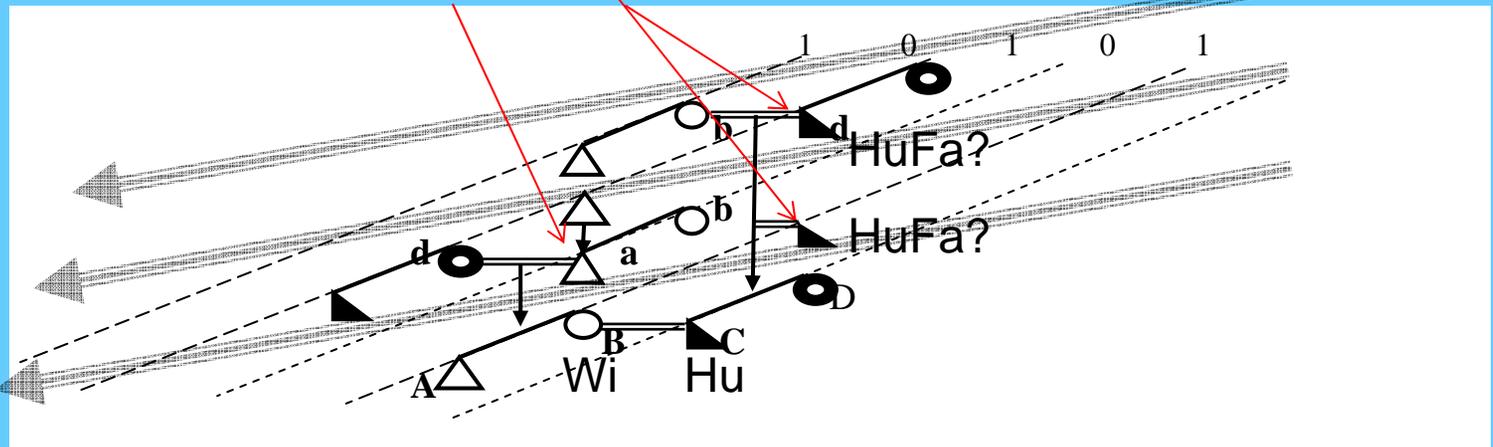


# The Helical Model

## Generalized Global Helix

Sections: axioms

- 2 alternating generations
- $x$  modulo 1-5 for sibling sets = 2,4,6,8,10 sections
- WiFa usually younger than HuFa (younger Wife age skew)
- WiFa may be 1 (a) or 3 (d) generations below HuFa



Sections: theorem (i.e., consequences)

- Consistent marriage by egocentric modulo rules produces a consistent section system.

# Reproductive Stress

- *How does the mathematical model enable each language group to create and maintain a “small world” in a large space of continent-wide connections?*
- Forager paleodemographics may be steady state at the continental level, but show temporal variations in response to changing reproductive stress levels locally.
- These reproductive stresses, and the mechanisms for responding to them, constitute the motive force that “powers” our model.

# Reproductive Stress

- No “stress index” yet – intuitive only at this time
- Demographic or internal stress
  - Stochastic fluctuations in population size and sex ratios.
- Environmental or external stress
  - Extinction of the megafauna
  - Possible continent-wide bushfires
  - Medium or long term climate change
  - European colonization

# Reproductive Stress

- We seek general adaptive social and demographic mechanisms that adjust the behavior of the descent / marriage / kinship system as reproductive stresses wax and wane.
- We seek quantifiable, measurable processes that push the system toward openness when stresses increase, and pull it toward closure when they decrease.

# Mechanisms

## HELIX

- As stress increases, the slope of the age skew increases
  - The slope of the helix is an *indicator* of the system's response to stress
  - It is *not* causal: mechanisms that deal with reproductive stress are causal, influenced by shortages of mates
  - The slope of the helix roughly indexes the intensity of demographic and environmental stress, and the system's response to it

# Mechanisms

## POLYGyny

- ***Sororal polygyny*** features cooperation among a small number of sisters / cowives; enhances survival of all their children
- Predominates in the arid zone among the Pama-Nyungan language group, with Dravidian kinship and Omaha skewing (7/8th of Australia)
- As reproductive stress increases, sisters (or their mothers) select older men with good paternal histories as spouses for young women.
- Mean H-W age dif + slope of helix both increase.
- ***Young men are expendable and are marginalized. They must marry out or die out.***
- ***Nonsororal polygyny*** features male aggrandizement with competition among large numbers of unrelated cowives where other women's children pose threats to one's own
- Predominates on richer north coast among non-Pama-Nyungan language group, with Iroquois kinship and Crow skewing (1/8th of Australia)
- Prediction concerning frequency of polygyny fails here. Something else is happening here that we do not yet understand. Our focus has been on understanding Omaha skewing. Perhaps this anomaly is related to restrictions against marrying into certain related lineages associated with Crow skewing.
- Can you help?

# Mechanisms

## MARRIAGE CLASS STRUCTURE + PREFERENCES

- Changing the moiety / section / subsection system “upward” from 2 to 4 to 6 to 8 classes, all of which are fully compatible with the structure of the foundation, pushes marriages outward.
- Without altering the marriage classes, changing closeness of marriage preferences pushes marriages outward
  - From closest “proper” kin (1<sup>st</sup> cousin)
  - To more distant “proper” kin (2<sup>nd</sup> cousin)
  - To close classificatory kin
  - To distant classificatory kin

# Mechanisms

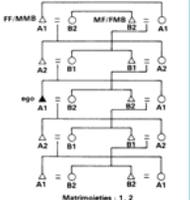
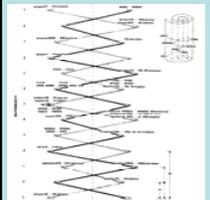
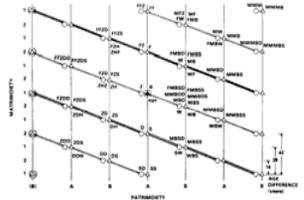
## OMAHA KINTERMS / GENETICS + INFANTICIDE

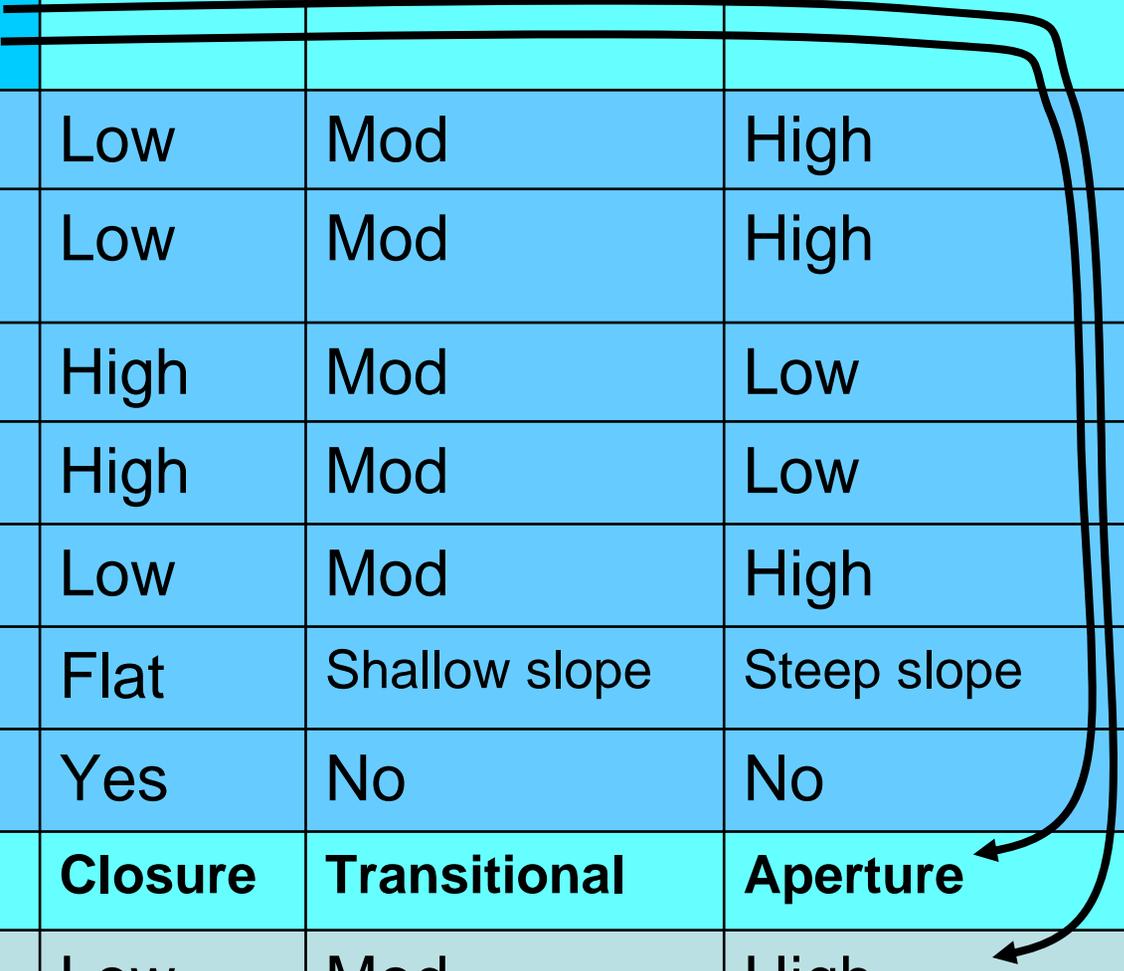
- Omaha terminology
  - Converts the kinterm used for a potential spouse to a term used for a member of a prohibited category; e.g, MBD (a potential spouse) becomes M (prohibited)
  - Thereby disperses marriages outward
- Genetic closure implied by reproductive closure
  - When stress is low, system displays more closure, thus more inbreeding; may retard population growth
  - When stress is high, system displays less closure, thus less inbreeding; may accelerate population growth
  - Infanticide probably was not common among Indigenous Australians, but frequent inbreeding might be equivalent

# Integrated Dynamic Model

- Mathematical model suggests continent-wide antiquity of foundational structure
- Rapid modern diffusion of section, subsection and Omaha terms suggests continent-wide network of networks with properties described here
- Famous discussions among Aranda and Ambrym suggest that adjustments may be based on conscious decisions or unconscious adaptations that have positive selection value.
- **Put them all together.** An integrated set of mechanisms that produces measurable adjustments to naturally occurring changes in stress levels, thereby enhancing long term survival

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Level of stress S	Low	Mod	High
Stress responses SR			
Freq of polygyny	Low	Mod	High
# marriage classes	Low	Mod	High
Marriage to close kin	High	Mod	Low
Genetic load inbreeding	High	Mod	Low
Exogamy	Low	Mod	High
Stratification	Flat	Shallow slope	Steep slope
Symmetric marriage	Yes	No	No
Closure/Aperture <b>EXO</b>	<b>Closure</b>	<b>Transitional</b>	<b>Aperture</b>
H-W age difference	Low	Mod	High
Cognitive Model icon <b>C</b>			



# Testing the Model

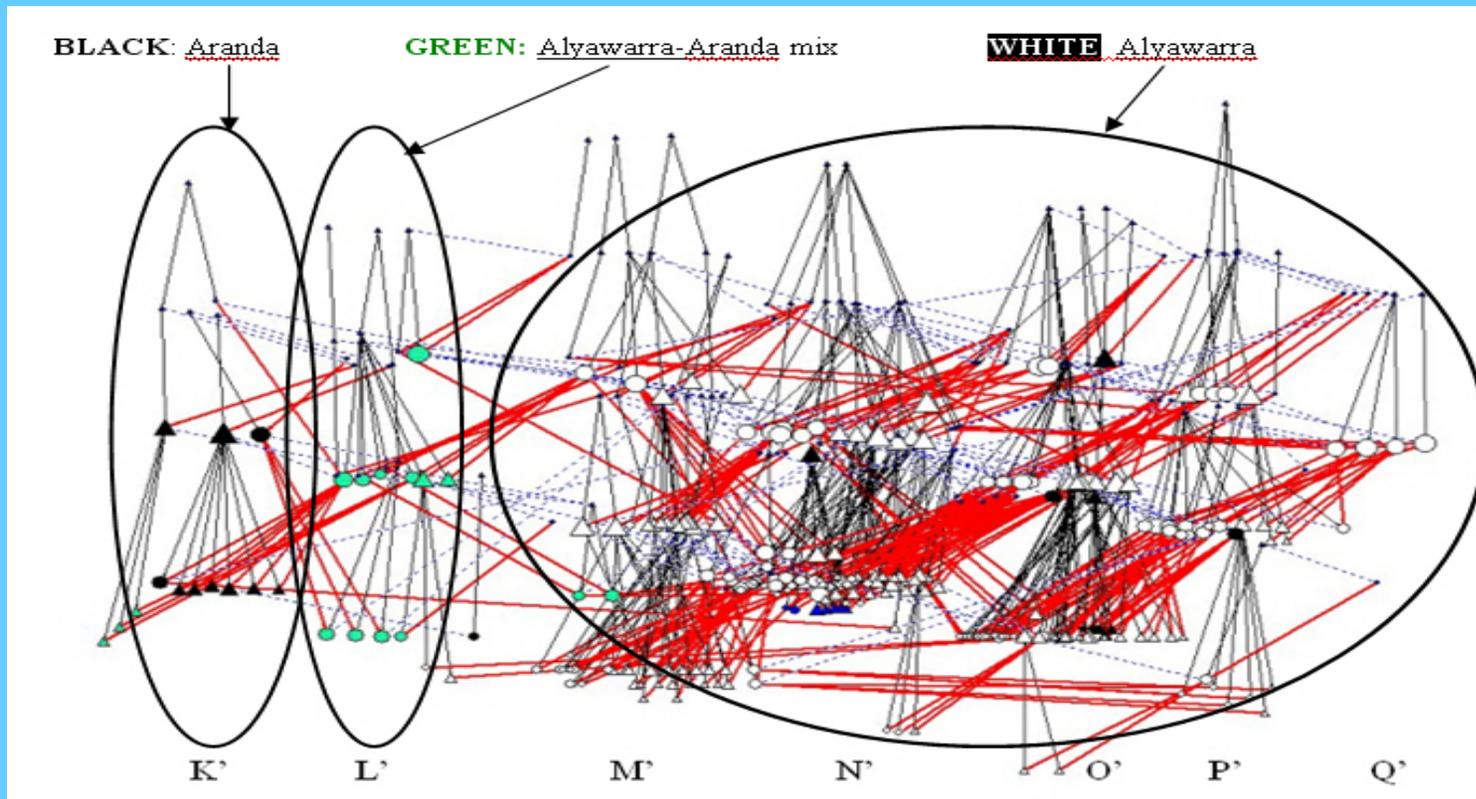
- A 3-level suite
  - TOP Cognitive superstructure: traditional anthropological models of descent, marriage, kinship
    - Used locally by Indigenous Australians to describe, monitor and fine tune their own behavior
    - Basis: insightful discovery, not creative invention
  - MIDDLE Adaptive mechanisms: regional sociodemographic processes that maintain population stability
  - BOTTOM Mathematical foundation: global network of sibling-in-law chains right across Australia
- How well do the levels work, separately and together? This is an intrinsically statistical question concerning events for which statistics are exceedingly rare.

# Testing the Model

## LOCALLY

114 Alyawarra marriages by language group membership (1971 data)

- 5 classificatory Alyawarra patriline, links to Aranda + Part-Aranda patriline
- 98% consistent with section memberships
- 74% consistent with 14 year mean age skew
- 15% consistent with Omaha skew
- Sororal polygyny common ... etc.



# Testing the Model

## REGIONALLY

- Ethnographic cases with good age data agree (or appear to agree) with predictions from Tjon Sie Fat's (1982) formal mathematical model of all simple helical structures with age-biased matrilateral cross-cousin marriage
  - **Alyawarra**
  - **Ambrym**
  - **Karadjeri**
  - **“Murngin”**
  - **Wikmunkan**
  - **Probably Wailbri**
  - **Probably Wanindiljaugwa**
- Seamless language group exogamy documented by Dousset and Brandenstein in northern, northwestern and western Australia

# Testing the Model

## GLOBALLY

- Define S (Stress index)
- Test its covariance with
  - SR (Stress Response indicators including polygyny, age skew, Omaha kinterms, etc.)
  - E (Exogamy with outside language groups)
  - C (Cognitive matters such as Tjon Sie Fat's helical models, and preferential marriage rules most closely associated with them)
  - E and C correlated as two results of SR
- Search for matches + mismatches with predictors of helical structures, asymmetrical marriages and language group exogamy
- Finding adequate statistical data will be difficult.

# A Classic “Small-World” Problem

- General: How to “rewire” connections among local network clusters to make them less ingrown.
- Specific: How to open relationally closed Indigenous Australian local networks to reduce average distances between marriageable members of different local groups.
- If even a few existing links within clusters are randomly rewired into the larger population, **then average distances between groups decline sharply** (Watts and Strogatz 1998).
- Possible mechanisms for rewiring:
  - Direct: marginalize expendable young men to marry out or die out.
  - Indirect: 1970s word-of-mouth “native telegrams” with “6 degrees of separation” connected potential mates through communications channels. Situation probably qualitatively similar before contact.

# A Classic “Small-World” Problem

- Faced with problems of scarcity over successive generations, each local group tinkers with its cultural models, classificatory systems, marriage rules, and ways of instantiating marriage choices within the available possibilities.
- Locally such tinkering deals with the selection of individual mates.
- Globally this tinkering could keep the system in dynamic equilibrium (e.g. 40,000 years or more)

**An  
Indigenous  
Australian  
Marriage  
Paradox?**

**Or networked  
integration?**

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**The End**

