Kinship, Class, and Community

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INTRODUCTION: KINSHIP NETWORKS AND COHESION

This review presents studies in various world regions. Each uses network analysis software designed explicitly for kinship studies with explicit network measures of cohesion. It presents evidence of fundamental differences in the forms of marital cohesion that show profoundly variable effects over a wide range of social phenomena, regional scales, and diverse cultures. Social cohesion is the basis of mutuality, cooperation, and well-being in human societies (Council of Europe, 2009). It includes the modes by which people are assimilated into societies, how groups hold power, stratify social relations, and manage the flow of resources. Kinship networks embedded in the civil societies of nation-states, in contrast to smaller-scale societies, are far too rarely studied as a basis of social cohesion. Networks, the social tissues of our lives, are only partially visible to us; thus we fail to see how these are wrapped and embedded in larger networks. Thus the importance, as emphasized here, of an explicit science of social network analysis for kinship studies both at local and larger scales. The analyses of cohesive subsets show how kinship networks involve constructions of social class, ethnicity, migration, inheritance, social movements, and other large- as well as small-scale social phenomena.

A *kinship network* is composed of relations of parentage (parent-child *arcs*, oriented by time) and couples (e.g., marriage). The nodes in an Ore-graph (Ore, 1960) are individuals, or, in a P-graph (White and Jorion, 1992), couples and individuals. The latter embeds the matrimonial or parental couple relation *within* the appropriate nodes: a person from a family of orientation parental-node joins one or more partners to form their own parental-couple node(s) (families of procreation). This makes it easy to trace matrimonial circuits, where one or more couples have common ancestors (see Hamberger et al., 2011: Chapter 35) so the last in their series of marriages (ordered in time), or a single marriage, *relinks* the families that were already linked. It is these relinking circuits that create kinship cohesion through marriage. Ore-graphs have to separate the cohesiveness of parent-child 3-cliques (mother-father-child) from the broader of cohesiveness of shared ancestries, which is directly captured by P-graph circuitry. To reconcile these differences, Harary and White (2001) defined a P-system as a parental (kinship) network that orders the inclusion relations, at multiple levels of embedding, of individuals, marriage, nuclear family, descent lines, and cohesive groups. People are in one or more family, one or more marriage, and embedded in groups of higher levels of organization. The higher-order analyses of kinship networks offer integrative perspectives that are more veridical as to how individuals and communities are connected, one that also takes into account how different kinds of groups are embedded in one another.

New ways of imaging and analyzing kinship networks as objects in their own right, with tens to millions of people, make it possible to see social phenomena in ways that open a new series of sociological and anthropological questions.

Ninety-odd case studies of kinship network research among anthropologists and fellow scientists have been contributed on-line (at http://kinsource.net) that enable using these new approaches to gain unexpected insights about "big structures" and "large processes" (Tilly, 1984). These allow us to view marriage and descent, community, class, and other topics through the new lens of kinship cohesion created through marriage. Some main results presented here in regional and historical terms give a sense of spread and variation in social structure. Methods used are developed and reviewed in White and Jorion (1992) and Hamberger et al. (2004: Chapter 35, 2011). The most important of these in terms of kinship translates as bounded structural endogamy (White, 1997), which derives from the general sociological concepts of structural cohesion (White and Harary, 2001; Moody and White, 2003). These methods may prove especially useful in new studies needed to gauge the effects of globalization on kinship networks and the new ways in which kinship networks are implicated in constructions of community, social class, ethnicity, migration, social movements, and other phenomena.

Relinking theorem, cycle rank, and measures of cohesion

Barring sibling unions, marriage cohesion or *relinking* is unavoidable in human populations that are not undergoing population collapse.

Proof

This is self-evident if the average number of children per couple is $k > 2$. For N living people, the number of their *personal* ancestors relative to the current population grows exponentially each generation back: $N/1$, $2N/k$, $4N/k^2$, . . . , $N(2^{g-1})/k^{g-1} = N(2/k)^{g-1}$ for successive ancestral generations g = 1,2, . . . m. This also holds if $kg > 2$ for each generation. From generation to generation with $k = 2$ there are Ng–Ng–1 = r new relinkings and more cohesive marriages.

Definition of cycle rank

When the number of (ancestral, m) links in a network surpasses the number of (kinship, n) parental nodes in a network with c components, the *cycle rank*$=m - n + 1$ of ancestral links – those involved in relinking marriage cycles, as in Figure 10.1 – will overlap. Here, in P-graph notation, focal marriages A and B (temporally the lowermost nodes where the couple represented by the node was already related *before* the marriage) are shown to have ancestral male♂ or female♀ links that lead to common ancestors (two or more couples could also have several common ancestors by which they are relinked). Keeping track of those links we see that couple A (persons 3 and 4) have a MBD (mother's brother's daughter) marriage and B (6 and 7) have a MZD (mother's sister's daughter) marriage. (In a P-graph the numbered lines represent individuals, offspring of their parental node, and members of their family[ies] of procreation.) Wife 4♀, however, is M of 6♂, so these two cohesive marriages overlap by sharing a common arc. Adding the arcs and nodes of two cycles and removing their overlap is a *graph-union*, as shown for marriage C, where a new matrimonial circuit is created (6–3-1–2-5–7-6) by the A-B union. Cohesive marriage cycles with ancestral overlaps, as in graph D, form *bicomponents* with two or more independent paths between every pair of nodes. This forms a unit

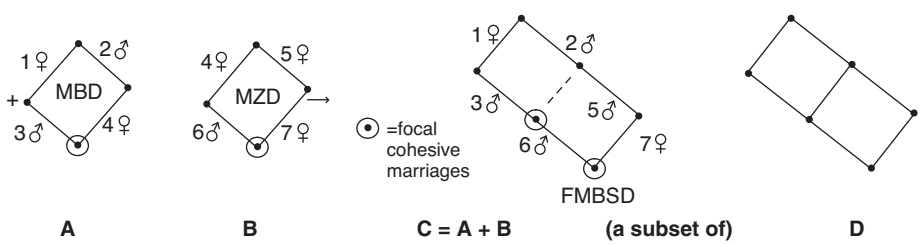

Figure 10.1 Shared-edge cycle unions produce other cycles (e.g., removing the dotted line 4 ♀ in graph C). The *cycle rank* γ (cyclomatic number) is the smallest number of edges that must be removed from a connected graph with *m* edges and *n* nodes. Removal of $\gamma = m - n + 1$ leaves only a tree. In this case $\gamma = 2$ for the full graph D (C with line 4 restored). γ is also the minimum number of cycles whose iterative unions produce all the cycles in the graph. The nodes here are couples or families, and the upward-oriented edges link to parental couples

of *structural endogamy*. Pairwise cohesion (White and Newman, 2001) in a kinship graph gives the number of disjoint cohesive paths between pairs of individuals or couples. Thus the persons connected by the dotted parent-child link 4♀ in Figure 10.1 P-graphs C and D have three disjoint paths with others in these marriage circuits, whereas others have only two. Cohesion can thus be measured at the inter-individual or interfamily levels and measured for pairs or identified for groups or subnetworks.

Reconceptualizing endogamy: segregation and cohesion

Mapping the skeleton of kinship networks begins with generative genealogical relationships. Demographers, historians, geneticists, genealogical societies, Mormon baptismal projects, GEDCOM databases, social registers, and many other sources provide massive amounts of genealogical data. They come with varying amounts of other data of variable quality and supplementary contextual data. Anthropologists collect genealogical data of high quality about communities, with protected or historical personal identities, dense ethnography, narrative, or household survey data.

Speaking of endogamy, sociologists think of intermarriage within or between social units as defined by attributes that specify loci of endogamy (community, territory, occupational group, level of wealth, or combinations thereof). This leads to a fractured view of social structure, a myriad of separate attribute-defined groups with varying degrees of overlap depending on the regions studied or how samples are drawn. Surprisingly, endogamy has rarely ever been *defined in terms of the boundaries of emergent network entities* although it is always assumed that endogamous marriages do somehow constitute themselves in this way. But how? One approach is the "segregation measure" game of finding which individual attributes best partition networks to detect endogamous groups. Another is "community detection" (a literature inaugurated by Girvan and Newman, 2002) based on the questionable assumption that communities must be separately partitioned according to maximum density within and minimum density between groups. These are segregative (even segregationist) models. The real world is not so categorical: communities overlap, social modules and roles intersect, individuals are members of multiple communities, and social formations are complex. What "kinds" or aspects of networks actually *define endogamy* rather than merely correlate densities of endogamy with varying subgroups defined by attributes or partitions?

The bicomponent answer to the question of endogamy (White, 1997) offers a clearly defined and demarcated form of cohesion within a kinship network. A *bicomponent* of a (kinship) network is a(n) (induced) subgraph with a maximal node set <*S*> wherein (1) every pair of nodes is multiply connected through paths among nodes in *S* that have no common intermediaries; (2) these are the *units of structural endogamy*; (3) they conform to a minimal definition of *structural cohesion* (White and Harary, 2001), connectivity-2; and (4) they are a *maximal* unit of *biconnectedness*. Bicomponents don't *partition* a network but may *overlap*, and a higher multipath measure *k* of *structural k-cohesion* allows more overlap. Bicomponent computation is subquadratic (Gibbons, 1985), accomplished in networks of unlimited size.

Similarly, a *cohesive marriage* (marital relinking) is a smaller set <S> of nodes in a kinship network, one that includes one or more husband-wife pairs and some of their common ancestors, for which the induced subgraph <S> (nodes in S and all edges between them) in the network is a *cycle* (White and Jorion, 1992; White, 1997, White, 2004; see also Hamberger et al., 2011: Chapter 35). These are *minimal* units of *biconnectedness* in that (1) every node in a cycle has degree 2, density is minimal; (2) a cycle is only disconnected by removal of two or more nodes; and (3) every pair of nodes is connected by two paths that have no common intermediaries, that is, by one or more cycles.

Given that overlaps of marriage cycles form other cycles, as illustrated in Figure 10.1, with sufficient population growth (Relinking theorem), these will form bicomponents composed of overlapping cohesive marriages, each of which has well-defined boundaries in the population. Empirically, temporally deeper and more accurate memory of fatherhood and motherhood as ancestral ties will expand and densify marriage bicomponents.

Bicomponent scale

We do not see much marital cohesion or structural endogamy (marriage within varying degrees such as those of cousinhood) within the extended families or kindreds of European societies. This is a consequence of the stamping out of polygamy by the Christian church during the Middle Ages and the prohibition of marriages up to six canonical kin degrees. These proscriptions reduced the internal marital cohesiveness of corporate kinship groups and tended to destroy corporate

kin groups altogether for all but nobilities, royalties, and merchant elites. "This influence was [most] profound when the Christian church was backed by the state" (Korotayev, 2003: 12).

Historical and ethnographic background of world kinship networks

The influence on features of kinship by world religions – Christian, Islamic, Hindu, Hinayana, and Vajrayana Buddhist (and the extent to which cultures traditionally combined in different proportions Mahayana Buddhism and Confucianist ideology, or varied in the intensity to which Christianity or Islam were combined with local religions that were not world-scale) – was studied by Korotayev and Kazankov (2002) and Korotayev (2003, 2004). Once they had coded the 1,472 societies of the Ethnographic Atlas (Murdock, 1967) for world religion, they found, for the complex societies of Eurasia, that clusters of societies with similar features, purely on the basis of kinship, were extremely well discriminated by world religion. Kinship "systems" and religion (Latin *religio* = bonds) have the capacity to spread, diffuse, and extend cohesion through marriage practices. They can form large-scale subcontinent-level systems in terms of world religion and can form smaller and more variable patchworks in areas of nonworld religions. Lévi-Strauss (1949), for example, identifies huge contiguous areas of matrimonial "dual organization," and regional axes of directed exchange such as brothers-in-law among whom the marriages involve members of one gender moving in a coordinated direction to join their spouses, often counterbalanced by flows of gifts, obligations, or statuses. Other ethnographers (Leach, 1954; subsequent Cambridge scholars) have found that oscillations between directed asymmetric and cyclical exchange along these axes may coordinate with oscillations between the opening (asymmetric exchange) and closing (marriage cycles) of trade routes.

Still, in proximal times and social spaces, at moderate and large territorial scales, and with sufficiently dense sampling, we expect and see structurally endogamous communities in localities all over the world and also local contrasts in varying proportions of emigrants and immigrants and those who marry locally and those who do not. Within multigenerational community kinship networks today, bicomponent cohesion is dissipating in later generations with higher globalization rates of outmigration so that larger frameworks for study are needed to see the effects on more broadly distributed cohesion.

Scalability and organization

Every pair of new descendants that marry in a bicomponent enlarges its structurally endogamous community through marriage although it may be reduced by the forgetting of ancestors. It is easy for the sizes of structurally endogamous communities to grow large and for smaller, denser communities to combine into a larger bicomponent with decreased density. As members of relatively dense socially contiguous communities (territorial, religious, class, etc.) migrate away from their home communities, or marry exogamously, local boundaries of structural endogamy may shrink, altering their local densities.

Features of kinship, however, do not so easily diffuse through marriage. Kinship is linked to beliefs about social rights, privileges, and expectations. The founding charter of Judaism establishes equal rights for younger sons and the sanctity of mothers as the transmitters of the covenant (as discussed for Figure 10.2); Christianity has a belief in the sanctity of the married monogamous couple; Arabic kinship as modified by Islam establishes limits of polygamy and the rights of daughters to inherit half-shares relative to brothers. But kinship establishes an interlock of networks at three levels: the actual ties of marriage and parentage; the separate calculus of the kinship terms; and the role relations established by the moral expectations associated with the kin-naming calculus ("mother," "sister," etc). These normative but individualized expectations (support, love, mediated competition, etc.) apply to particular persons within the marriage and parentage networks. The first two levels have separate generative structures for their respective networks: concatenations of actual ties as social networks and concatenations of terms as semantic networks (Read, 2000). The social ties have their units of network cohesion bounded by bicomponents; the terminological ties have their limits of extension, while the third interlock – role relations – is the mediated outcome of interaction, memory, language, and emotion. Kinship interactions within a community do not establish a kinship "system" that is somehow culturally shared through proximity and diffusion but a pragmatic systematicity (Leaf, 2007) both stronger and restrictive: an *organization* with established members and succession, interlocking roles and expectations, ways of doing things, and ways of adjusting rights, obligations, and differences. It is within communities and organizations, or concrete social institutions where people interact more intensively that "cultures" of shared meanings are formed in beliefs, cognition, the reading of expression, behaviors, and components of structure and dynamics in social

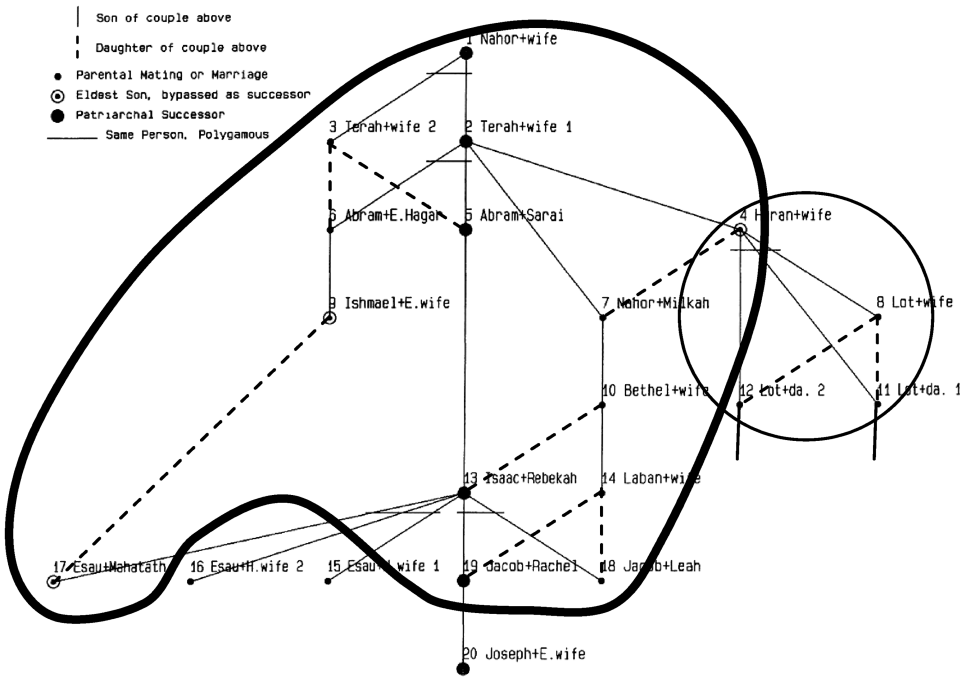

Figure 10.2 Marriage and succession in the Genesis genealogy of Canaan in P-graph format

and kinship networks. Tacit acceptance through usage of the terminology for kin *and* the behavioral interaction within the network of actual parentage and marriage relations solves the coordination problem – who is whom to who and how to collaborate or compete under mediated supervision – for the organization. The boundaries of these organizations, ranging from corporate groups to loose kindreds and even social classes linked through marriage, are tighter and often more exclusive than the well-defined boundaries of structural endogamy. Kinship *organizations*, however, are much less permeable and more resilient than the scalability of bicomponents would suggest.

Sociological and historical examples

Given their organizational characteristics, disjoint communities with the same organization and terminology easily recognize one another as "the same" spatially extensible "zones" of structural similarity that do not blend gradually but have discrete boundaries. The simplest way to present the relevance of large-scale kinship network analysis for historical and ethnographic sociology – class, community, ethnicity, politics, and economy – is to look at different regions and religions such as Middle Eastern Hebrews and Muslims, European-origin Christians, South Asian Buddhists, and Australians of the Dreamtime.

STRUCTURAL ENDOGAMY WITH CO-DESCENDANT RELINKING (MIDDLE EAST)

Religion and relinking in a historical canaanite lineage

One variant of bicomponent endogamy, along with specific organizational features, is exemplified in Figure 10.2, from the Old Testament example used by White and Jorion (1992: 456) to show how to construct and analyze kinship networks using P-graphs in relation to historical narratives. In Figure 10.2 males are shown as solid lines, and those with several wives (Terah,

Abraham, Lot, Esau, Isaac) have multiple lines connected by a horizontal line below their parental node. Dotted lines are for females, solid circles mark the singles or couples, and the large circles mark the line of patrilineal succession to leadership.

The story behind the lineage in Figure 10.2

The narrative of this lineage of founders of monotheism is often called "the Patriarchs and Matriarchs," the latter renowned for establishing a line of male succession that passes to younger sons, not the elder ones, and recognizing that Judaic religious descent passes through mothers, not fathers. This new pattern of succession, "arranged" by mothers (the Matriarchs), occurs with lineage-mate arranged-marriages of their youngest sons to women in their patrilineage. Marrying women of one's patriline also conveys a double ancestry to one's children, who receive the religious, cultural, and lineage tradition from both the mother and the father. The change of mythological themes from the pre- to post-Abrahamic narratives include greater equality for lineage-endogamous women (the Arabic Father's brother's daughter (FBD) marriage-right, see below) and younger sons favored by their mothers over eldest sons with exogamously political marriages (succession by the most able rather than the eldest). This pattern reoccurs among the Hebrew religious elite and Sumerian, Berber, Maronite, Druze, and Arabic lineages again and again for a period of 4,000 years (Adams, 1966: 81; Korotayev, 2000: 403) up to today, often coinciding with lineage corporations (and is also found among the Merina of Madagascar and other scattered societies, see Barry, 1998, 2008).

The message of this religious-founders network narrative is also marked out by the difference between the nodes in the large bicomponent, marked out within the thick lasso, excluding Lot, versus the smaller encircled bicomponent in which Lot's incestuous fatherhood through his daughters occurs "cohesively." Thus, moral boundaries are symbolized by the immorality of drunkard Lot (with his daughters to wed in Sodom in the biblical story and wife then turned to salt [salty tears?]) reflected by limits to endogamy and the exclusion of his descendants in later generations from the larger bicomponent. Thus, the recognition of the bicomponent, added to the original Figure 10.2 of White and Jorion (1992: 456), clarifies what they called the network "core" of the Canaan genealogy, where the structural endogamy focuses around marriage within a single patrilineage. White et al.'s (1999) *index of relinking* for Figure 10.2 showed marriages in the large bicomponent (structurally endogamous group) were at 64 percent of maximum (7/11) as contrasted with 56 percent when lineage-member couples *outside* the bicomponent are included.

Hebrew and Islamic social organization, as noted for the "founder" genealogy in Figure 10.2, stem from the same root, according to this tradition, with Ishmael as an ancestor of Mohammed. They have kinship patterns that have continued and been embellished in various ways for over 4,000 years. Network data from a long-term ethnographic field study (Johansen and White, 2002) provides a Turkish case that derives historically from implantation of this system by Arab conquest (although Sunni Turks, with fewer simultaneous marriages, Sunni Arabs, Shi'a Persians, etc., have variant marriage customs, polygyny being more common in rural areas; yet there are broad similarities).

Arab lineages and endoconical clans

An endoconical clan is one where cohesion is generated by marital relinking through remembered ties, like those in Figure 10.2, that go back to a "founder core" of common ancestral roots extending from a compact bicomponent of common ancestors. As defined by White and Johansen (2005: xxxiv), "a loose and flexible system of interpersonal ranking based on respect for age and experience" "allows each family line to bring capable members forward in promoting alternative adaptations." Their monographic study of an Arabized Turkish nomad clan, one of the clans of Aydınlı, shows a social organization very similar to that discussed for the Old Testament lineage core of patriarchs and matriarchs. The scale at which endogamy is viewed here, however, is expanded from a single lineage to a set of lineages integrated by structural endogamy that now includes both marital relinking within and *between* lineages and, at a much lower density, to taking wives from outside clans and smaller, less sustainable families moving out through migration to towns. Families with more siblings and siblings-in-law are more competitive because they have more allies.

Historical background to Arab lineages and endoconical clans

The unusual and distinctive feature of Arabized and Arabic lineages, which Korotayev (2000) has traced out to show correspondence to the limits of the Arabic conquests, is matrimonial relinking within the patriline. These are male rights to marry with lineage members like FBD rather than obligations (hence the frequency of exercise of

these rights will vary). The lineage segment that is cohesively reinforced, when this right is exercised, varies according to whether the wife shares a patrilineage ancestor two to five generations back (i.e., first-, second-, third-, or fourth-cousin patrilineal parallel marriage). This creates, and does throughout the entire Arabic and Arabized zone, a whole series of fractally cohesive marriages generated by marriages at different depths and branches of these deep patrilines. (The leadership of classical tribes or clans usually has genealogical scrolls recording ancestries; these lines are memorized in stylized ways in both classical and nonclassical leading tribal families.) The ways that different lineages can be welded together ancestrally again create fractal patterns of ties between lineage pairs or triples. Marriages that family *a* made with *b* and *b* with *c* may be reciprocated, *c* to *b* and *b* to *a*, forming broadcast strong-tie chains of reciprocated ties across pairs, triples, and so forth *between the lineages of these families.* These reciprocated ties may be repeated between same or different branches of the same lineages, or cast anew. White and Johansen (2005) found that in the Aydınlı clan of some 2,000 people (counting ancestors plus others who had settled in towns), these chains formed a navigable network of hubs (White and Houseman, 2002) that connected everyone in the clan by strong (that is, reciprocated) ties. This contrasts with Granovetter's (1973) "strength of weak ties" model where strong ties tend to cluster while the weak ties form the only navigable long-range paths. The strong ties of the endoconical clan thus form a kind of invisible social-highway system, with routes composed of reciprocated ties that provide meeting places for others at different points along the chain, places to get to know more intimately the men and women not only from an ally but the ally's allies who often visit and thus meet in intermediary families. Ideally, every reciprocally linked pair of families on these chains, allies due to the reciprocated exchanges, had relations of intimacy and mutual trust. In Middle Eastern merchant and commercial networks, kinship "highways" of this sort also provide in large part the most common ties for transacting business (Berkowitz et al., 2006).

The Aydınlı society, then, like many in the Arabic region, is a fractally segmentary lineage system (see Peters, 1967 for another classic segmentary lineage study) with subcorporations affiliated with clans and lineages at every fractal level, claiming rights over resources and property through relations of trust based on in-married, lineage-endogamous women. These women are important lineage members who exercise rights in the corporation, and out-married reciprocal relinking between units at all fractal levels (clan-clan, lineage-lineage, sublineage-sublineage, etc.). Women who marry in from other lineages, to the extent they have reciprocal and repeated marriages, are considered allies and have lineage sisters who are also allies, and are in some sense able to negotiate for their home lineage, if it is allied, thereby gaining greater rights and privilege in their husbands' lineages. In a segmentary system with reciprocal alliances at all these fractal levels, the response to an outside opportunity or threat can begin at one place and spread over time, scaling up to a level that will depend on the magnitude of opportunity or threat. When crimes or offenses are committed, revenge can be mobilized if compensation is not forthcoming, at levels of cooperation that will adjust to the extent of the opposition; and similarly in mobilizing for new cooperative opportunities. Leadership in this context, as among the Aydınlı, can be emergent, with reputation for performance gaining adherence – often for a lifetime – by people's willingness to come to deliberative council in the emergent leader's home. Moreover, this form of organization, very different from Europe, is one that has been used effectively in business, business corporations that involve kinship, and in short- and long-range mercantile trade. It is in this manner that Jewish trading families spread as an ethnic kin-linked diaspora throughout Islamic territories and then into Europe and elsewhere. White and Johansen (2005) explicate how network analytic methods are mobilized to study kinship and complexity in this Judeo-Arabic context.

Preference signatures and genealogical networks of the Greek gods

The possibility of "preference signatures" left by the relative frequency of each type of relinking marriage in kinship networks was investigated by White and Houseman (2002). They rank-ordered kin-type frequencies for dozens of empirical kinship networks for two types of marital relinking: (1) marriage with consanguineal relatives such as FBD or MBD (more generally: *co-descendant marriage* between co-descendants of a common ancestor) and (2) relinking *co-affinal marriage* among multiple descent lines, such as BWB (sister exchange) or ZHZ (brothers marry sisters) in two-family relinkings. Fitting these distributions by simple regression to power-law versus exponential curves (unaware as yet of better procedures, such as to use normalized cumulative probabilities and bootstrap statistics

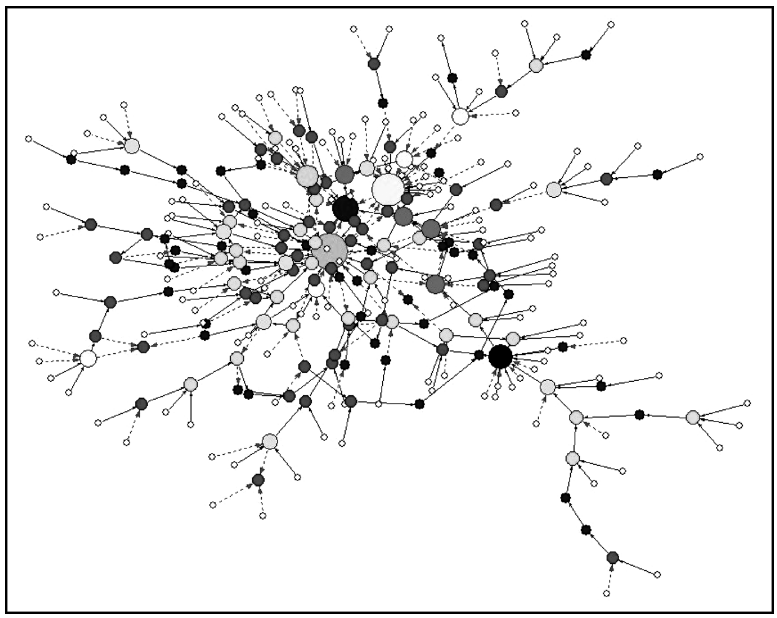

Figure 10.3 "Arab/Hebrew" genealogy of Greek gods *(temporally ordered "ancestrally," center to periphery)* in P-graph format

for curve fitting), they discovered two dominant sortings of societies:

1 Societies with a predominance of co-descendant marriage showed a power-law ranking of co-descendant marriage-type frequencies, indicative of preferential choice, and an exponential ranking of co-affinal marriage-type frequencies, expected where there are no preferences (i.e., random differences in frequencies).
2 Societies with a predominance of co-affinal marriage showed the reverse.

Thus, the overall preference (frequency) for *co-descendant versus co-affinal marriage* tends to correlate with a preference among the marriage types in the preferred class of cohesive marriage types. Within each class, societies might have a similar ranking of preferences, such as FBD as the leading co-descendant marriage preferences.

A subsequent unpublished finding is quite amazing: analysis of the genealogical network of the Greek gods (Newman and Newman, 2003) shows a preference gradient matching that of Aydınlı clan marriages and some other Arabized or Arabic societies, including the gradient first-preference for FBD (see also Barry, 2008). Little is known about the social organization of preclassical Greeks as tribal societies, but this gives a clue. Obviously, Western ideas about the "origins of Democracy" in Greek city-states should take into account the earlier foundations of Greek societies: "in the archaic period, as in the late bronze-age, Greece belonged to the single cultural and intellectual circle of the Near East," and the names of Greek gods had Hebrew roots (Sealey, 1976: 29). More generally, kinship network analysis may have potentials for historical reconstruction.

STRUCTURAL ENDOGAMY WITH CO-AFFINAL RELINKING (E.G., THE CHRISTIAN WEST)

Here, social class tends to be constituted as distributed marital cohesion and elite pedigrees.

The Christian West

A more horizontal view of kinship ties, with the idea of co-affinal *relinking* and more specific *renchaînement* between pairs of families, was invented and studied by Jolas et al. (1970) as a form of social integration in peasant villages in France and elsewhere in Europe. This has been found to be common in European, Christian, and

many other societies where intermarried ancestral lines are relinked by marriage but not by marriage to blood kin. Across many studies, we find that relinkings go beyond local alliances through overlapping ancestries to also form horizontal cycles of intermarriages that repeatedly overlap to form larger cohesive units. When they are large and cohesive social formations, they may be entwined with community, social class, or ethnicity.

Genealogy and pedigree

Many studies of kinship are concerned with pedigree and lineage or lines of vertical descent. This is also a social concern of many elites in establishing boundaries and social identities. Lloyd Warner's Yankee elite ethnographies (1941–1959, 1949) echoed this obsession. Descent group corporations were then the dominant concern of the descent theory school of British anthropology. Warner, one of the foremost ethnographers of an American city, viewed church and voluntary associations as the two great institutional organizations of the United States, one religiously divisive, the other integrative through special interests. In his "beautiful, static, organized community" description, however (as John Phillips Marquand in the novel *Point of No Return* [1949] describes the work of Warner's character, Malcolm Bryant), he neglected not only social change and disorganization but also the organizational role of kinship and marriage in the formation of social class and social strata.

Social class

Max Weber, like most theorists of social class, was not blind to marital relinking: his two basic characteristics of class were endogamy (*social* class; often conflated with prestige hierarchies) and differential access to life chances or access to productive wealth (*economic* class, acquired through inheritance, or achievement indexed by income distinctions).

Some large cohesive formations based on marital relinkings are generationally shallow, with large multiply connected sets of siblings or cousins and no need to go back more than two generations in finding the multiconnected ties among overlapping cycles of affines.

Ethnographic examples for social class

Brudner and White (1997) used P-graph and P-systems analysis (Harary and White, 2001) to move from Jolas et al.'s (1970) more local view of relinking to a network analysis of how those couples who relinked with one another in an Austrian farmer village formed a giant bicomponent that constituted most (about half) of the community. Further, they showed it was within the bicomponent, whose members inherited land, "in which propertied marriages were an instrument of class formation" (1997: 175), citing Rebel's (1983) distinction between economic and social class in Austrian farming villages. Thus marital relinking at the scale of the entire community was a core feature of the social construction of class as constituted in part by cohesively overlapping relinking marriage cycles. Following White (1997), who coined the term *structural endogamy* for the boundaries of network cohesion created by marriages, Brudner and White showed that the coefficient of covariation between bicomponent membership and "stayers" in the community who inherited parental land and property was highly significant statistically even if underestimated (R^2 = .29) because a minority of the community who were "stayers" were not interviewed. Interviewing more of the permanent residents in the community could only have had the effect of magnifying the size estimate for the structurally endogamous group since the exceptions to the hypothesis were almost all those of heirs with missing endogamous links, including the uninterviewed. Simulation analysis (White, 1999) supported the conclusion that marriage relinking among sets of siblings and cousins occurred far more than expected by chance. The Turkish nomads study by White and Johansen (2005), with more complete data, found a higher "structural endogamy-stayers" correlation coefficient R^2, of .90. Here the "stayer" category includes the *larger* families who are more successful in competition for resources. This suggests that a Brudner-White type of "structural endogamy-stayers" correlation at the community level could be very widespread and include many non-European cases.

Analyzing systemic relinking among Guatemalan colonial elites, Casasola Vargas and Alcántara Valverde (Casasola Vargas, 2001; Casasola Vargas and Alcántara Valverde, 2002) showed that both aspects of class elites, social and economic, were recognized family by family by experts in this historical period and as identified concomitantly through network analyses of relinking. Like Brudner and White (1997), these studies showed conformity between the social (endogamously bounded) and economic (wealth and property transmission) aspects of Weberian class. In a direct test of the cohesion/class hypothesis for a society with co-affinal relinking, White (2009) reexamined the San Juan Sur (Turrialba, Costa Rica) farmer village data of Loomis and

Powell (1949) and found that higher levels of structural cohesion (Moody and White, 2003) in kinship visiting patterns among family households correlated with villager judgments of higher social class.

Further examination of structural endogamy and social class (Fitzgerald, 2004) found distinct strata of structural endogamies within the Bevis Marks (Sephardim) Synagogue in London at the levels of crafts people and office workers (horizontal adjacent generation relinking) and elites (generationally deeper relinking), as Berkowitz (1975, 1980), his teacher, had suspected. In contrast, Widmer et al. (1999) found deep ancestral (vertical) relinking and relinking between family lines in among the Geneva Scientists of the seventeenth to nineteenth centuries.

Challenges to pluralism

Once relinkings are analyzed to show the extent of interfamily cohesion at different class levels, the pluralistic theory of interest groups can be challenged by ones that explore how interfamily ties intersect to cohesively integrate a social class with interest groups and diverse political office holding, directorships, and other leadership roles. Systematic use of kinship network data, in the manner of analyzing horizontal social cohesion, can provide a basis for the study of power elites, as Berkowitz suggested (1975, 1980). Here, the identification of cohesive groups provides a basis for causal modeling of historical contingencies. For comparative politics, Doyle (2005: 1) finds the White and Johansen (2005) P-graph framework to provide for "detailed assessment of highly decentralized self-organizing local governance structures" in Central Asia and "unparalleled examination of sub-national political behavior," and European politologists have since begun to do so. Studies of Mexican power elites by Alcántara Valverde (2001) and Gil and Schmidt (1996, 2005) show the interlocking of political power and kinship/marriage networks. Kuper's (2006) P-system study of the families of Bloomsbury found maritally cohesive groups that supported the great English scientific families (e.g., the Darwin-Wedgewood families) and mounted some of the great English scientific, political, and literary projects of the nineteenth and early twentieth centuries.

SIDEDNESS AND SECTIONS

Moieties are a form of matrimonial dual organization that divides a maritally cohesive group into two sides that exchange spouses: that is, into sides that are mutually exogamous but more globally endogamous.

Dual organization, divides, sides, and cognatic sides

The view that exogamous exchanges between marital moieties must be based on principles of residence or descent (e.g., Fox, 1977: 175–207) needed to create clear-cut named oppositions of local groups (e.g., patrilocal) or (patri- or matri-) lineages assumes that other peoples lack the relational logics for understanding their own networks. This view correlates with the insistence that that "egocentric" kinship terminologies consistent with dual organization – kinterms that systematically distinguish one side, "lines of relatives I can marry," from the other side of unmarriageable relatives – do not entail "sociocentric" organization. The balance theorem of signed graphs (Harary, 1953, 1969), however, applied as a principle of network organization, explains the conditions under which cognition and behavior do converge in this way for egocentric and sociocentric relational classes. It shows for a context of structural endogamy how the consistent individual *practice* of marital sidedness is coterminous with marital sidedness as a network outcome. Four new theorems relating egocentric sidedness in kinship terminology to sociocentric sidedness among consangineally married couples, in relation to their common ancestors, are given by White (2010). The study of empirical kinship networks in the following examples shows that the predicted cognitive-behavioral-network convergence is very common.

Empirical examples for dual organization, divides, sides, and cognatic sides

Divides and sides were defined for P-graphs by White and Jorion (1996: 287–88) solely in terms of principles of balance in signed networks and independently of rules of descent or named moieties. In a P-graph, if links of opposite gender are signed + and –, then *divides* exist in a single generation connected by sibling and sibling-in-law links if the product of signs in marriage cycles is positive. Divides were found to be statistically significant[1] for the Anuta of Polynesia (Houseman and White, 1996). *Sides* extend the principle of balance to marriage cycles across all generations in the network and were found to be statistically significant ($p < .0001$) by Houseman and White (1998b) for all nine societies in "Dravidian

Amazonia," a region where most societies have sided egocentric categories in their kin terms with published genealogies but no named moieties or dual descent group organization and four other cases from elsewhere with Dravidian kin terms but no moieties. In these 13 cases, "imperfect" sidedness error rates of 1 to 7 percent matched "imperfect" locally sided behavior. Structural cohesion, dual opposition in local and global "balance," and local marriage cycles or "types" of marriage come together in a single package (in a way that is easily tested with empirical kinship networks) where egocentric kin terms and marriage behavior are linked to more global network structures.

Especially troubling to ethnographers is the occurrence of "sidedness" (supposedly based on descent) in complex Eurasian state societies that are cognatic, lacking descent groups, and with monogamy or limited polygyny and inheritance divided between sons and daughters. Leach's (1961) Sinhalese village ethnography put an end to British descent-based theory of kinship corporations by showing that Pul Eliyan productive systems were egocentrically organized and based on marriage alliances. He could not find the coda, however, as to how conflicts and alliances were organized. Houseman and White (1998a) coded his detailed genealogies into P-graphs to test whether Sinhalese two-sided (Dravidian) egocentric kin terms were associated with maritally sided networks in the absence of unilineal descent groups, and found that couples linked through common ancestries included women marrying between opposing sides formed by male succession to ownership. Without a male heir in a family, however, daughters could receive through cognatic inheritance the normally male-transmitted residential compound, fields, and irrigation ditches. The exceptions to male-sidedness were all "diga" marriages (residence with the wife), in which the device to reconcile the contradictions with sidedness was to choose the husband in these cases from a distant village whose sidedness was discounted. Rather than marrying from the "side" of the father, children took their side from the mother's inherited compound.

Generations

Generations in a kinship network are often thought of, alternatively, as relative to ego, as roughly contemporaries of the ego (assuming men and women marry as close to the same age), or as having a different average time span for males and females depending, for example, on how early females marry or have children relative to men, and on how late men begin (because of male initiations, for example) and go on having children relative to women. The Alyawarra of the central Australian desert (Denham and White, 2005), as a result of two years' fieldwork by Denham, have one of the most complete data sets on kinship networks, actual ages, and use of kinship terminology. Women's average age at childbirth is only two-thirds that of men's paternity so that men's generational time span is 50 percent longer and slower than women. In any society where a large spousal-age difference is present, this will create chains of wives' brothers that move forward in time in augmented-generational increments (and backward in diminished generational increments for sisters' husbands).

Empirical examples for generations

The Alyawarra take siblings and siblings-in-law to define their *generations*, so that generations are most definitely not contemporaries. In Figure 10.4 the two diagonal dash-dotted lines connect marriages in the age-slanted generations of WB (wife's brother) chains (WBWBWB . . .), with vertical solid lines for the patridescent lines of sons and dotted lines veering from the vertical, diagonally down and left, following a recurrent pattern of MBD- or MMBDD-type marriages, and those veering to the right breaking this pattern with other kinds of marriage. The age slant entails that a WF averages a female half-generation older than his DH and a WB averages a female half-generation younger than his ZH.

The brother/sister age-to-marriage variations in vertical heights of lines in Figure 10.4 closely approximate true age, so age differences can be read off the figure. When arranged by classificatory descent lines (1–6 for men), it is possible in this P-graph to see patterns of marriages, all of which are consistent with the marriageable-category memberships of the kinship terminology. In some marriages the wife is older than the husband (e.g., widow marriage), or much younger (e.g., alternating generation, like MBDDD).

Sections

A section system like the marriage classes of the Alyawarra is a matrimonial organization that gives different members of the nuclear family and their spouses – father, mother, children, and children's spouses – four "section" names that govern their marriages and marital sections of their offspring. Governing pairs of names create a permutation group where each parental pair creates children's and their spouses' pairs (Weil, 1949). The naming

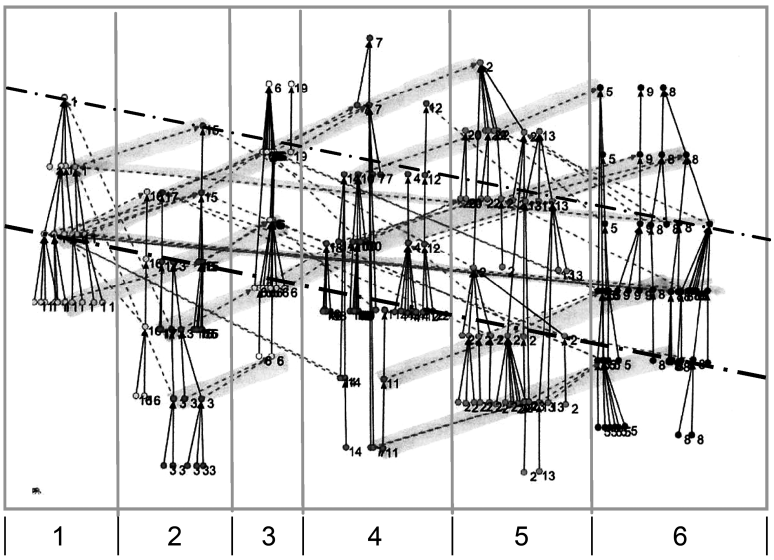

Figure 10.4 Alyawarra age-slanted alternating sibling and sibling-in law generations *(main female lines shaded and two)* in P-graph format

pairs are doubly *sided*, with intersecting male and female sides, and marriages only with their opposites. Sides are not *descent groups*, considering that the section names in both male and female names alternate between generations. This creates an equivalence of alternating generations wherein one can only marry *within the generation* (normally composed of sibling and sibling-in-law chains) or a generation twice removed.

Empirical example for sections

Alyawarra have four sections, each divided into two subsections, and the data show a nearly perfect correspondence between marriage behavior and sections/subsection memberships. In indigenous Australia, where four-, six-, and eight-section systems (or simple sidedness) are nearly universal, ethnographers have tried to model kinship networks as if they had symmetries and regularities beyond the permutation group governance of marital sections. Nearly every mathematical model of Australian kinship networks (e.g., H. White, 1963) has exaggerated symmetries. Kinship network analysis (e.g., with P-graphs) allows networks to be considered as complex relational systems rather than marriage prescriptions for categorical descent lines of men and women. Figure 10.4 is perhaps the only actual-age marriage pattern diagram of an Australian society in existence. Denham et al. (1979) explored the puzzle of how the age difference between spouses would affect marriage within one's (or an alternating) generation and proposed an idealized double helix model where classificatory lines of females in the MBD diagonal would pass through six classificatory male descent groupings and then cycle over back to the first of these groups, continuing indefinitely while only coded for a finite number of generations in the kinship terminology. Yet, in this small-scale society the possibilities for continuity, like a generation that wraps around from the right side to the left in the next *alternating* generation, are not filled in. There are too few people. In Figure 10.4 there are many breaks where WB links are missing and the WB link pattern does not recur for all the patrilines. Rather than "fill in" imaginary links, as in a double helix model, it is better to consider how such a system works on the ground: when residence is virilocal, with men in the male line living together, then a MBD marriage, within a *parallelogram of female shaded lines bounded left and right by adjacent classificatory male lines*, will link to another group in which one's MB is resident and one's wife was born. In the struggle for survival, this MB group will be a potential place to visit, and an obvious source for exchange and balancing out of resources. The neighboring group in turn may have a similar MB group, to which the ego could be redundantly linked through a wife as an MMBDD relative. In life on the ground, these two-step linkages to a neighbor's and a neighbor's neighbor's groups are sufficient

for survival and correspond to the short chains of single or double MBD links in the diagram, where empirical pulses of one or two successive MBD marriages sum to 18 in all in Figure 10.4.

Having temporally ordered time series data is of enormous value in social network analysis, even using heuristic placement of generations (a standard option in Pajek: White, 2008a) and age-difference adjustment that can be done in the absence of known dates of births, marriages, deaths, and other events. (Temporal marriage-date adjustments can be made for FZD marriages, for example, which entail same-age for husband and wife, while MBD does not; MBDDD entails wives' average marriage at half or less the ages of their husbands.) Knowing approximate generations, age differences between individuals, and rough temporal intervals of contemporaneity is a major advantage to kinship network analysis because we can permute marriages randomly or with rules of prohibition (e.g., against marrying prohibited relatives) or with probabilistic biases for *contemporaneous* men and women whose marriages could have been different, like within games of musical chairs. Valid estimates of marriage *preferences or aversions/prohibitions* can be made with the statistical controls explained below (White, 1999), as deviations against this random "musical chair" baseline of controlled "random rewirings".

SIMULATIONS: STRUCTURE AND AGENCY

Permuting only the element of who women marry (alternately, the men) in each generation or contemporaneous period limits the permuted choices to only those marriage opportunities indexed by actual marriages in that generation. This holds constant the demographic composition of descent groups in the male (or alternately, female) lines, the numbers of sons and daughters in each nuclear family, and thus all other structural and demographic features of the observed marriages. The resulting frequencies for each type of marriage (those resulting from the permutated marriages, all else constant), compared with the actual marriage-type frequencies, give appropriate measures of preference or aversion (prohibition) for each type of marriage (White, 1999, 2008b). These can be *departures from the controlled simulation frequencies*, either for sizes of bicomponents or for or against specific types of marriage. This allows a separation of structure and agency by means of empirical criteria. Such measures can also include inferential statistics that improve and refine these results by positing a probabilistic model of choices over the target set of marriage types, using bootstrap simulation to generate probability distributions evaluated against the data.

Ethnographic example for simulations: structure and agency

For separating structure and agency, structural "signals" that come from limitations of context need not be interpreted in terms of decision-making agency. Table 10.1 gives an example. Here, the ethnographer (Schweizer) recorded four types of cohesive marriage (using the notation here and in Table 10.1 of F = Father, B = Brother, D = Daughter, M = Mother, and Z = Sister: FBD, MBD, FZDD, ZD) among the 19 marriages of Muslim elites in a Javanese village (Sawahan), compared to commoners who had only one such marriage (White and Schweizer, 1998). Is this a difference in marriage preferences or cultural rules or strategies for the two groups? Each group was partitioned into generations, and marriages in each group and generation were randomly rewired using controlled simulation (White, 1999). No marriage frequency was found to significantly differ in frequency from those of random marital rewirings, that is, controlling for difference in the sizes of the groups and thus noting the smaller size of the elite group. In marrying within its status group, each such group will require a proportionate number of spouses, but in a smaller group descended from a common ancestor there will be more co-descendant marriages among the marriages if marriage choices are random. The result would have been different if the elites chose to avoid co-descendant marriages, but they did not. Nor did they prefer them, similar to the commoners, assuming that they followed a preference for *status endogamy*, each preferring to choose spouses from their own groups.

The Austrian village case (analysis of social class, above) studied by Brudner and White (1997) provides an example where controlled ("musical chairs") simulation answered the question: In the competition for heirships how do we know whether some farm family children *choose* to relink or whether relinking occurred by chance? Couldn't the relinking be the product of a random assortment of marriages, relative to inheriting, some persons relinking by chance in a giant component and others not? Permuting women's marriage in each generation, in the latest and prior historical generations surveyed, showed that relinking occurred far more frequently than by chance at single, double, and triple generational depths (i.e., relinking among sets of siblings or cousins in the village) but far less frequently than

Table 10.1 Marriage-type comparisons between Javanese Muslim elites (MusElite) in Dukah Hamlet versus Dukah commoners (DhC) (White, 1999: 13.2, Table 7)

Muslim Elite vs. Dukah Commoners	*Presence of the marriage for this kin type*		*Absence of the marriage for this kin type*		*Fisher Exact test*	*Marriage types*	*Three-way Fisher test*
	Actual	*Simul.*	*Actual*	*Simul.*	*p=*	*type*	*p=*
1:MusElite	1	0	4	3	.625	FBD	
* DhCom	0	1	9	12	.591	"	1.00
2:MusElite	1	2	2	3	.714	MBD	
* DhCom	1	0	11	16	.429	"	1.00
3:MusElite	2	1	3	2	.714	FZDD	
* DhCom	0	0	11	0	n.a.	"	1.00
4:MusElite	0	1	6	7	.571	ZD	
* DhCom	0	0	18	24	n.a.	"	1.00
Total MusElite	4	4	15	15	1.00	All	1.00
Total DhCom	1	1	49	52	1.00	"	1.00

* The three-way Fisher test compares the difference between entries within two 2 x 2 cross-tabs, controlling for the bivariate marginal totals of each pair of variables (White et al., 1983). Given the number of each type of marriage and the numbers in each group, none of these pairs of fourfold tables differ as between the two groups.

by chance for relinkings at greater generational depths. It is obvious that relatives at shallow depth sets would know each other, and could self-select and marry endogamously, excluding relinking with noninheriting members of their sets. Further, it is among the sibling and cousin sets that there is competition for parental inheritances that are not yet decided. Thus, we can conclude that the statistical evidence favors intentional or implicit and strategic decision making, while relinking fails the test for randomness.

INSTITUTIONAL AND COHESION ANALYSIS

Greif (1994, 2006) treats social networks in the context of embedded decision making and a historical context to derive analyses of economic institutions. The systems of co-descendant marriage preferences in the Matriarchs and Turkish nomads examples fall into his "collectivist belief system" societies (Grief, 1994), which are segregated (they individually, socially, and economically interact with members of specific groups), while the systems of co-affinal marriage preferences such as the Austrian farmers example fall into Grief's "individualistic belief system" societies, in which social structure is integrated, economic transactions are conducted among people of different groups, enforcement is achieved through specialized organizations (courts), and self-reliance is highly valued. The contrast suggests to Greif that the individualistic system may be more economically efficient in the long run. The networks he considers include family relationships, but not kinship networks writ large. He fails to take into account that European kinship networks have a marriage structure that facilitates stratified social classes and dominance by elites. That is very different from systems in which lineages and clans compete and each may have its elites that not only cooperate within groups but have broadcast strong ties for cooperation and exchange. Greif's conclusions may be premature.

The endoconical clans examined here, in contrast, have very high marital relinking indices within their bicomponents (Aydınlı, 66 percent; Canaan, 64 percent) and a power-law spread of ties that balances intensive relinking for close relatives against broadcast links with distant ones. Up close, these look like segregative networks but in fact, in Greif's terms, the "social structure *is* integrated, economic transactions *are* conducted among people of different groups, enforcement *is* achieved through specialized organizations," the difference being that it is not only courts but kinship norms of reciprocity and punishment that are operative. The class-stratified Austrian farming village has a lower relinking index (48%), 60% among farmstead heirs. Counterintuitively, the "kin-based" Australian Alyawarra have the lowest index of relinking, 23 percent, in consequence of the fact that polygynous local family groups are large, but the precious kinship ties

between local groups are spread thin, as befits a low-density scarce-resource society, integrating the Aranda linguistic neighbors of the Alyawarra into their bicomponent as well as the Alyawarra themselves.

OVERVIEW AND CONCLUSIONS

Attention to the type of evidence presented here – on how class, political, and religious formations are related to the types and boundaries of marital cohesion and structurally endogamous groups in the kinship networks of different societies – was predicated on expectations from previous research about the effects of cohesive blocks in social formations. This research (motivated by findings *from* kinship studies) examined the effects of variable highest-levels of cohesion of individual, family, or firm for the cohesive blocks to which they belong within networks of various sorts. Moody and White (2003) showed (1) strong effects of levels of cohesion of individual students in their friendship blocks on their reports of attachment to high school and (2) how the cohesive strengths of co-memberships in the cohesive blocks of business alliances align with similarities in the choices of firms in their political party alliances of firms in party politics. The problem of structure and agency for this kind of research finding is disorienting to many social scientists. Does membership in a cohesive group "cause" an individual or firm to alter attitudes or choices? Do similar choices or attitudes "cause" homophilous affiliations? Is the causation circular? Powell et al. (2005), using the Moody-White measurement of structural cohesion, looked at time-lagged effects. They showed that choice of partners for strategic collaborations in the biotech industry was heavily predicated from year to year by level of cohesion in the cohesive blocks to which potential partners belonged the year before but decisions driven by cohesion may be matters of intent (which entails that actors perceive differences in cohesion). For kinship, in the most telling case where bicomponent (more cohesively integrated) members of a farming community tended to be those who inherit productive property, which came first? Knowledge that one is an heir, then the cohesively "local" marriage, or the "local" marriage first, disposing the parents to favor one child over another? In both the biotech and the farming examples, compared to a simulated baseline for "those eligible," convergences of structure (cohesion) and the decision to partner occurred empirically, but were they determined by agency, structural context, or both? A good example is the contrast within the Indonesian Muslim village (Sawahan) between the relatively few rich elites and the majority of poor commoners. There, the expectation was that *marriage choice* was within one's status group or class, but the simulation, controlling for status endogamy, showed no difference in marriage *structure* although marriage to a relative is far more probable by chance in a smaller group with common ancestry than in a larger group with more distributed ancestry. Context may mask as agency ("we marry X and Y relatives") although agency may operate at a higher level ("we marry our own", status-wise). Network studies need to attend to the multiple network levels at which agency engages.

What we find from kinship data is that preferences or proscriptions in monogamous Christian societies *not to marry a relative* creates horizontal co-affinal relinking at a sufficient spatial scale (given the Relinking theorem) and this *stratum* forms the basis of social class. This is no surprise in the Weberian view, where endogamy is the social tendency in class formation, while inheritance and consolidation of wealth through status endogamy is the economic tendency. This is true for the farming community at a scale of 500 people, half of whom on average, within each sibling group, inherit property and practice structural endogamy within the village, while the other half tend to marry outsiders and immigrate or take up a nonfarming occupation. This is also true for national societies with populations of millions, where subsets of elites (political, intellectual, scientific, occupational) not only practice structural endogamy within the social class they generate by these choices but as a corollary, as a maritally cohesive group, they also wield joint influence over political parties, governance, economic power, and industrial ownership. Similarly, for some countries, such as England, for the class strata of laborers, particularly those who wield particular skills, there is a hereditary component to social and economic class transmission. These two aspects weld together through *structural endogamy cum inheritance*, a combined engine of both structure *and* agency.

Composed within the kinship network, marriage choices (which include the universalistic aspect including the possibility of *leaving one's group*) in the context of structural endogamy are *particularistic* as to whom one marries (i.e., to someone at a particular distance or position within the social network). In societies where *it is commonly a relative who is married*, we Westerners are more apt to ascribe *prescription* or *normative preferences* in marriage. The use of tools for *marriage census* frequencies of different types of marriage (described as cycles or marriage motifs, such as MBD, but including many hundreds

of more remote relatives), however, reveals characteristic probability distributions (White and Houseman, 2002), ones that may tend to be Zipfian in equalizing the sums of close marriage types of higher individual frequency against the sums of lower individual frequencies more of the distant marriage types, thereby indicating overall either co-affinal or co-descendant marriage "preferences."

In many co-descendant marriage Middle Eastern clan structures (like the Aydınlı, the Old Testament Patriarchs and Matriarchs, or the mythical clan of Greek Gods), marital cohesion also distributes widely, as in co-affinal Christian marriage and class systems, but with an important difference: rather than "strength of weak ties," the broader networks are welded by "navigable strong ties" created through reciprocity between local and fractal kinship units with large size inequalities due to polygyny and fecundity. Here, too, as with the Aydınlı, those outside the structurally endogamous cores of communities are more likely to immigrate to cities (structure or agency?).

It is no surprise, then, that the embeddedness structure of kinship groups, integrated by marital cohesion at varying scales, marks out distinctive types of *social organizations* with different scalings of structure, and that these organizations are interlocked with large-scale class, clan and inter-clan, and caste and inter-caste formations (always linked by divisions of labor and occupations), and with political structure, religion, and religious organization. This also provides kinship frameworks, for politologists like Doyle (2005), for "examination of sub-national political behavior . . . the study of comparative politics . . . [and] of inter-governmental organizations, non-governmental organizations, or transnational advocacy networks with state government infrastructure." Korotayev (2003) and the regional case studies examined here show that multiple features of kinship, and network forms of marital cohesion, are closely interlocked with specific historical religions and regions.

For kinship, Weil (1949) was the first to understand that kinship structures are relations among marriages and groups and not just among people, and that even core relational structures, like sections, are easily transformed (e.g., to subsections, and back to sections). How cohesive units in kinship networks are connected to kin terms, norms, and prototypical role expectations is part of the views of social organization discussed by Firth (1951), H. White (1963), and Leaf (2007). Variant kinship networks not only serve as fundamental platforms for historically specific forms of social organization but exhibit general regularities that derive from how they engage with specific network principles (e.g., sidedness and balance principles, sections, class stratification through relinking, etc.). These support variant social processes, like the effect of horizontal stratification implied by co-affinal marriage relinking on a stratified mode of social class formation (Brudner and White, 1997) that channels wealth transmission, outmigration, and occupational mobility. By considering how selection processes affect changes in network structure in a population, rather than taking Firth's idealized approach to structure, we can study how network structures, organization, and agency interact dynamically at different scales. We now (see 2011: Chapter 35) have the tools, such as P-graphs, Ore-graphs, P-systems, Pajek (Batagelj and Mrvar, 1998, 2008), Puck (Hamberger et al., 2009a, 2009b), Tipp (Houseman and Granger, 2008), R programs (White, 2008a, 2008b) and statistical software (Butts, 2008; Handcock et al., 2008) to do so in a way that changes the landscape of our understanding of the "social" in the social sciences. Bank on the fact that with the global financial meltdown of the economy, kinship, like ecological sustainability, will be more important in people's lives than ever.

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NOTES

1 In a random graph, half the chromatic number $\gamma = m - n + 1$ of independent cycles are expected to have a negative product of signs, so an

appropriate test is given by the binomial theorem. The Par-side Program (White and Skyhorse, 1997) calculates statistical significance as a departure from randomness in the frequencies of balanced and unbalanced cycles.

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