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More Kin: An Effect of the Tradition of Marriage

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Introduction

Kinship has often been referred to as the heart of anthropology, by virtue of its fundamental and universal nature (Brown 1991), since the very origins of the field. Parent/child relationships may be conceptualized as claims rather than as biological outcomes, as genealogists and ethnographers are well aware. Other genealogical ties are also created putatively by foster, adoptive, emotive, and other recognitions of quasi-parental roles. But, despite the putative element in the identification of kin, genealogical ties assume great importance because they last not only until death but well beyond insofar as recognized ancestors are involved in linking living relatives. Kin ties are not only a basis for altruism but for broader solidarities based on networks that have the unusual feature of compositional ramification. Unlike a friend of a friend of a friend, who is not automatically taken as a friend, many kin of kin of kin, given links composed of primary relations like child of brother of mother, are recognized in a genealogical space as kin.

A genealogical space is here defined as a representation of social relations based on parentage. A genealogical space mirrors biological parentage in that a given individual or entity has one or more previously existing parents relative to the offspring they engender; hence, genealogical parentage constitutes an order relation in time (White and Jorion 1992). Biologically, for nonsexual species, a genealogical space has a single generative parent, while for sexual species a genealogical space has elementary dual engendering with double parentage. In the latter space, a {female, male} parent P and a {female, male} child C may be reciprocally defined by one of four parent/child pairs— M/D, M/S, F/D, F/S—from the reciprocals of the core relations between {mother M, father F} and {son S, daughter D}. Relatives in such a genealogical space may be designated as pairs of individuals connected by these primary or parent/child genealogical relations. Relatives by descent are those that trace back to a common ancestor.

A given species may or may not have abilities to recognize living biological relatives at various removes. Significantly, in the ability to name social relationships in ways that utilize a computational logic of genealogical spaces, humans are unique. This ability includes an associative logic for relative products (Wallace 1970) such as Father's Brother being equivalent to Brother of Father (FB = B°F = brother of F). Logics of genealogical spaces are associative when order of composition, such as ((B of F) of F) = (B of (F of F)), does not introduce ambiguity as to genealogical position.

Social identifications of relatives among mammals, such as they exist, typically center around the observability of birth events and thus relatedness in female lines. These identifications affect groupings of relatives because of the way that pair bondings form connectivities and clustering in networks. They do not rely on associative genealogics. Simian group composition, for example, tends to reflect strong pair-bonding between M-D pairs, with sons tending to shift group membership as they seek mates from outside their natal group. Ape group composition reflect pair-bonding and avoidance patterns that tend to result in daughters shifting group membership as they seek mates from outside their natal group. That males remain within their natal group does not automatically entail recognition of paternity. The evolutionary shift between simians and apes entails only a circumstantial change that heightens the potentiality for double recognition of mother- and father-child pairs. In general, there is no intrinsic connection between patricentric or matricentric group membership after mating and an associative logic of genealogical relationships.

How associative logics evolve among humans is of considerable interest. Read (2003, 2004), Bennardo and Read (2005) and Read et al. (2006) trace the evolutionary steps from categorical concepts to concepts of self, the self/other relation, and other/other relations based on observed similarities in behavior to those of self/other relations, other/other relations attributed without the associated behavior, and composition or transitivity in deduced relations and the property of associativity. It is out of such cumulative cognitive steps that the evolution of an associative logic of genealogical relations might occur, leading to the human cognitive ability to mobilize a logic of genealogical spaces. Read goes on to show how such an abstract logic can also be extended to metaphoric kinship, such as the extension of terms associated with genealogical ties to broader sets, such as name-relations among the !Kung (Marshall 1976).[1]

Our interest in this paper is in the evolutionary implications of the possible lines of development, cognitively and behaviorally, of an associative logic of genealogical relationships that leads to the expansion of kinship networks. We explore, in the simplest terms, how evolution of the human ability to mobilize associative logics in the domain of kinship might interact with development of an institution of marriage that entails recognition of both maternal and paternal relationships, thereby expanding the size of the network of potential kin. This expansion of networks of potential kin is important for human evolution. One hypothesis concerns intergroup relations. So long as matings occur within a local group, for example, the enlargement of kinship networks might offer little advantage since localization of interactions of all sorts within a single interacting group already entails broad network integration within that local community. But when matings occur between different local groups and these groups are multiple, the tendency for interaction frequency and solidarity to decay with intergroup distance might be offset by an associative kinship logic that enables an expansion of the recognition of different kinds of kin relations between communities. Extended kinship relations, then, offer for increased population sizes a kind of scalability of integration at these larger sizes. This view of marriage, exogamy, and social integration is not unlike that of Lévi-Strauss (1949).

Our goal here, however, is simply to show that while the exact amount of increase in the number of genealogical kin-types within the range of living kin, from unilineal to bilateral, depends on demographic variables, it will always be greater than the mere doubling of kin that might at first be assumed. Our basic questions are: As the ability to mobilize an associative logic of genealogical spaces evolves, what are the evolutionary implications of its deployment in tracing not just lines of relatedness through a single gender, but through both genders? Does development of the institution of marriage affect the numbers of identifiable kin regardless of kinship type?

We present a general model of the effect of the tradition of marriage on the potential number of individuals that can be identified as kin. The model is compatible with various hypotheses concerning the proximate causation of kinship cooperation, including various forms of social learning and the role of genes (see Alexander 1979; van den Berghe 1979; Boyd and Richerson 1985; Palmer and Steadman 1997; Coe 2003). Separate from the question of how altruistic acts are distributed across the distribution of biological kin,[2] it is our hope that this model will stimulate discussions over whether or not such an increase in identified kin (whether or not parent/child links composing the genealogical ties correspond to putative or biological links) might have been important in human evolution, and if so, in what way and under what circumstances.

Why the Number of Identified Kin may be Important

Despite the variability and complexity of human kinship, "sentimental attachments that distinguish kin from nonkin . . . are thoroughly familiar features in world ethnography" (Brown 1991:105). Several anthropologists have put forth their own labels for this general phenomenon as, for example, Fortes' "axiom of kinship amity," which is based on his observation that kinship predicates "prescriptive altruism exhibited in the ethic of generosity" (1969:232). However, not all anthropologists are in agreement with such positions; universal kinship amity, in particular, remains a point of contention. This paper, focused as it is on a model, is not the place to explore the huge amount of ethnographic data needed to settle these issues.[3] But we hope this paper will help focus and reinvigorate the study of these questions and other controversial aspects of kinship.

Our model is dependent neither on an avowed universality of kinship amity, nor on the assumption that all those identified kin will be altruistic. "Amity" certainly does not cover all interactions among kin. Competition among kin is often intense, and many kinship relationships fit the kind of description given in the title of Firestone's 1967 book "Brothers and Rivals." We mention the observations of anthropologists about the general tendency toward amity only to suggest that altruism among kin might be a possible benefit of an increased number of identified kin (for a discussion of the benefits of altruism, see Ridley 1996). The benefits of kinship altruism, whether through biological or putative kinship ties, and whether these ties are local or translocal, may thus be one of many possible evolutionary explanations for why an expanded kinship network became so widespread among humans.

We will focus first on the biological roots for the recognition of parentage. Once biological parentage comes to be recognized, we can consider the imputation of parentage. Given recognition and imputation of parentage as a possibility, it becomes a potentiality that more distant relatives might be recognized, so we ignore the difference here for purposes of simplicity.

Mother-Offspring: The Defining Relationship of Mammals

In all mammals, birth to females gives rise to identifications between relatives centered upon particular women in birthlines. All living organisms are born from other living organisms that in turn were born from other organisms and, hence, have a potential—rarely realized—to identify innumerable ancestors and relatives. Not all organisms are capable of recognizing kin or exhibiting kinship behavior (i.e., cooperation with individuals because they are identified as kin; see Palmer and Steadman 1997:39), such as behaving in ways that create enduring social relationships between kin. The nursing behavior that defines mammals, however, regularly establishes social learning that creates enduring and important social relationships between a female and her offspring. Hence, mammalian kinship behavior is matrilineal in the specific sense that kin are easily identified through the social relationships established by birth to females. This observation does not entail any priority of matricentric over patricentric tendencies in localization of groups in human evolution or in principles of common descent reckoned through an associative logic of genealogical space.

The observation, then, is simply that matriline relationships are normally recognizable by the fact of birth, granted that nonmaternal females may also provide lactation and display many kinds of maternal behavior toward those who are not their offspring. But if it is mammalian females that care for their own offspring, among the focal pairwise kin relationships will be those between a mother and her offspring (diagram 1a).

Diagram 1

1a

1b

1c

1d
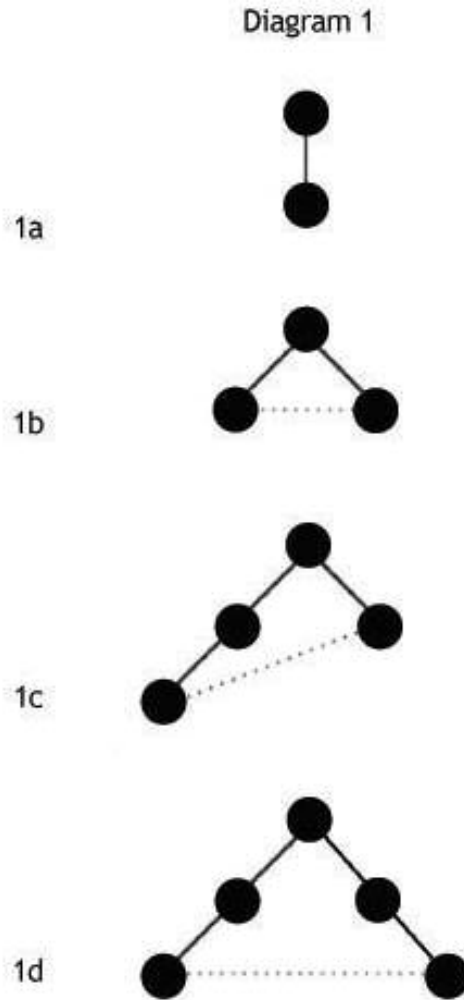
Further, if offspring are raised together, kinship relationships between siblings may develop (see diagram 1b). Because of the proximities of sibling bondings to the same mother for similar-age children, these bonds are often considered as primary, acquired in early childhood, and not necessarily dependent on an associative logic for genealogical spaces such as typifies adult humans. At further remove, and more likely to be dependent on such a logic, if regular contact between siblings continues after the siblings and their children reproduce, aunt/niece-nephew relationships (see diagram 1c) are possible. Once this happens, first cousin relationships may occur (see diagram 1d). These are even more likely to be dependent on a logic of genealogy. As Evans-Pritchard pointed out, any recognized blood kinship relationship "must have a point of reference on a line of ascent, namely a common ancestor" (1940:106). Additionally, kin are identified as individuals linked by one

or more birth links through a common ancestor who forms "the apex of a triangle of descent" (1940:200). As Radcliffe-Brown stated, "two persons are kin when one is descended from the other . . . or when they are both descended from a common ancestor" (1950:4).

Marriage and the Identification of Fathers

Humans are distinguished from most other mammals by the regular occurrence of kinship behavior between a male and offspring. Human mammals, thus, not only have an extremely long and important relationship with their mother, one that regularly endures for life, they also often have such a relationship with a male identified as their father through the male's social relationship with the mother (although the male so identified may or may not be the genitor). Even in societies in which the mother's brother's role is particularly important, fathers are identified and known to have at least some significance for offspring. This remains true even in such extreme father-absent cases as the Nayar (Schlegel 1972).

In this paper, we are not concerned with the exact definition of marriage, but only with marriage as a means of identifying kinship ties with fathers. While it may seem obvious at the rudimentary level, we shall demonstrate the extent to which ties with fathers facilitate the accumulation of a great many more kin than is possible without such identification. Although our interest in the effects of marriage was driven by the obviously frequent occurrence of marriage in the ethnographic record, our model does not depend on the universality of marriage. Studies of the few societies in which segments of the population do not engage in marriage, such as the Nayar (Gough 1959) and the Na (Cai Hua 2001; Shih 2001), are certainly of great interest to the study of any aspect of marriage, and are of obvious relevance, as the negative case, to our demonstration of the role of greater or lesser fathering to the extension of kinship network. The Na, for example, provide an interesting case study to observe the effects of a much lowered frequency of identifying kin through fathers.

More Kin

We suggest that the importance of identifying fathers through marriage provides far more than the possibility of additional care and protection from the father. The identification of fathers also entails the possibility that *humans at birth and during the life cycle have far more recognizable relatives than any other mammal.* The regular and systematic recognition of a kinship relationship between males and their offspring increases tremendously the number of genealogically recognizable relatives for every individual.

Part of the reason for this increase is that marriage enables humans to identify kin *bilaterally*, that is, through both their mother and their father *and* through male and female links on both sides. There is, of course, no guarantee that a man identified as a father will act altruistically toward his offspring, as previously mentioned. Further, there is no guarantee that one or both of the reciprocal relative pairs identified through the father or through both male and female genealogical links will act altruistically. However, altruism does tend to flow along the "sentimental ties between kin." Therefore, a person's ability to identify these relatives will add to whatever benefits they receive from altruistic behavior on the part of these relatives.

To begin to appreciate the extreme difference in number of identified relatives between individuals who identify relationships bilaterally (i.e., through both males and females), like most humans, in contrast to those who identify relationships unilineally, like most other mammals, consider diagrams two through nine. Identification of fathers makes possible tracing many additional paths in the network that would not otherwise be identifiable.

If we take an individual (Ego) and his parents and grandparents, give each of these ancestors a sibling of the opposite sex and allow each of these individuals to have a son and a daughter, who in turn have a son and a daughter, etc., down to Ego's generation, we can approximate a number of those living kin that an individual would be likely to have at birth in a steady population with an equal sex-ratio (see key and diagram 2). Without marriage, a first born Ego would only be able to identify the 4 matrilineally-related types of relatives indicated in diagram 2. A non-first born Ego would, of course, also be able to identify previously born siblings. However, once the tradition of identifying fathers through marriage develops, a first born Ego is able to identify 40 genealogical types of individuals as kin (see diagram 3).

We argue, then, that marriage coevolves with an extensively cognized network that is entailed by marital recognition of fatherhood. This is an evolutionary argument, of course, not one posited on a *motivation* for people to get married expressly so that their children can have more kin. This coevolution is held to occur due to the benefits of extended support networks, however they are organized, and largely independently of the variation in specific details of relationships among kin.
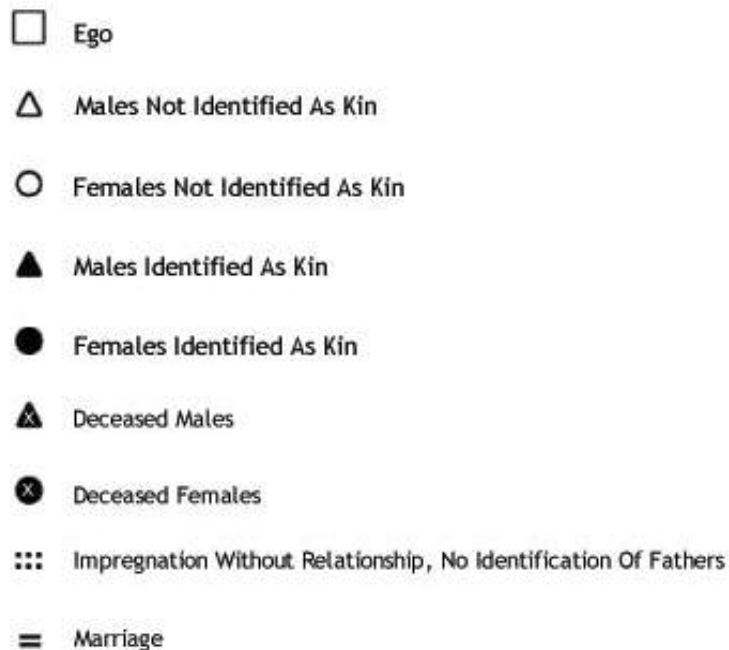
Figure 1
KEY

□ Ego

△ Males Not Identified As Kin

○ Females Not Identified As Kin

▲ Males Identified As Kin

● Females Identified As Kin

▲ Deceased Males

⊗ Deceased Females

⋮⋮⋮ Impregnation Without Relationship, No Identification Of Fathers
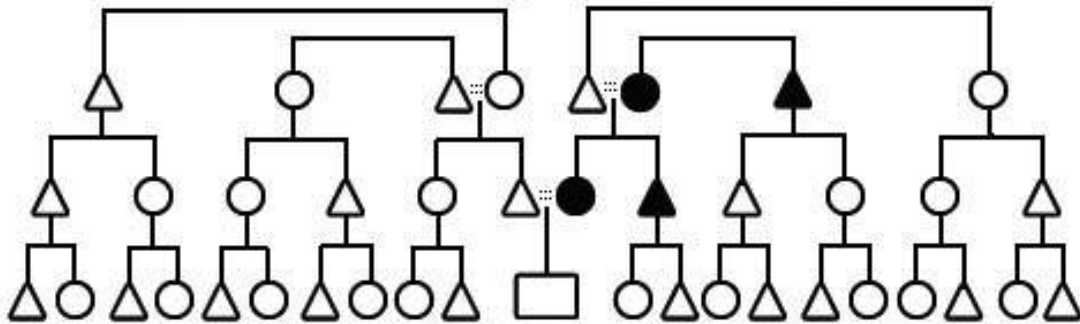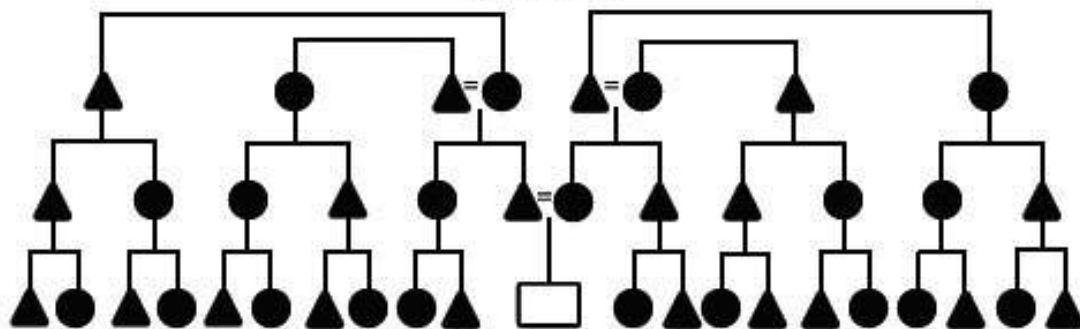
= Marriage

Diagram 2

Diagram 3

Anthropologists often divide human cultures into those with bilateral kinship and those with unilineal kinship. In the latter case, non-lineage kin are not only identified but "the sentimental ties between kin are always to some degree effectively bilateral" (Brown 1991:105; see also van den Berghe 1979:146-147 see also Chagnon 1979; Hames 1979; Evans-Pritchard 1940). Major kinship classification systems nominally distinguish bilateral and unilineal kin but fail to capture the permeable affective boundary between the two. Bilateral kin are recognized in virtually all societies.

In modern societies, many of our important social relationships are with individuals not identified as kin. In such a society it is difficult to see any advantage in such a large increase in the number of identified kin (but see Brudner and White 1997 for advantages of kinship networks for class formations). However, in traditional societies in which "kinship and society were co-extensive" (Keen 2004:174), an increase in the number of identified kin corresponded more clearly to an increase in valuable altruistic relationships. Thus, as Turke pointed out, "In traditional societies, extended kinship networks are likely to be broadly advantageous to individuals . . ." (1989:66). Further, "the extent of advantage probably varies with age, status, and sex" (Turke 1989:66). Hence, it is important to trace the impact of the tradition of marriage on the number of kin identified by both males and females as they progress through the life cycle.

Without a way of identifying fathers, the generation after Ego would only be able to identify 5 types of living relatives. Diagram 4 illustrates the 5 types of living relatives a female Ego could identify. A female Ego could identify her own offspring, but not her brother's offspring. A male Ego with a female sibling could also identify only 5 types of

living relatives because he could identify his sister's offspring, but not his own. With the tradition of marriage identifying fathers, however, Ego would be able to identify 77 types of living relatives (see diagram 5).
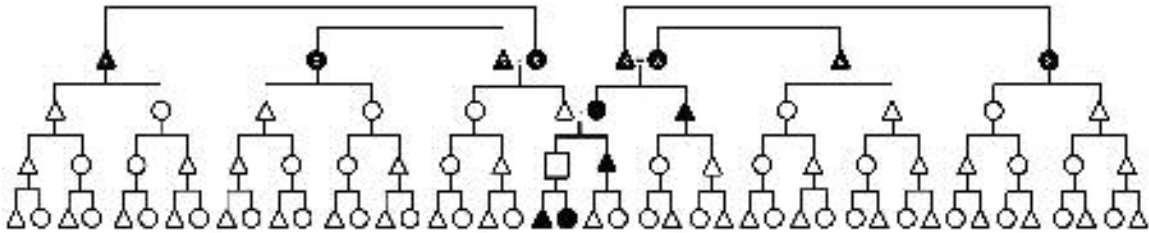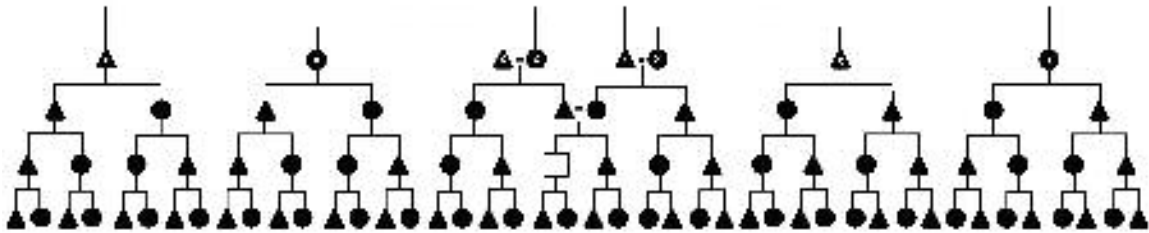
Diagram 4

Diagram 5

Without a way of identifying fathers, during the generation in which Ego becomes a grandparent, a female Ego would still be able to identify only 5 types of living relatives (see diagram 6). A male Ego could also identify only 5 types of living relatives because he could identify his sister's children and his sister's daughter's children, but he could not identify any of his own descendants. The tradition of marriage, however, would enable 153 types of living relatives to be identified (see diagram 7).
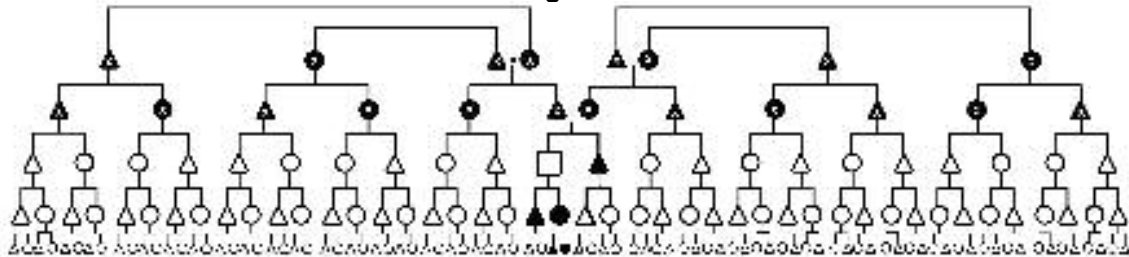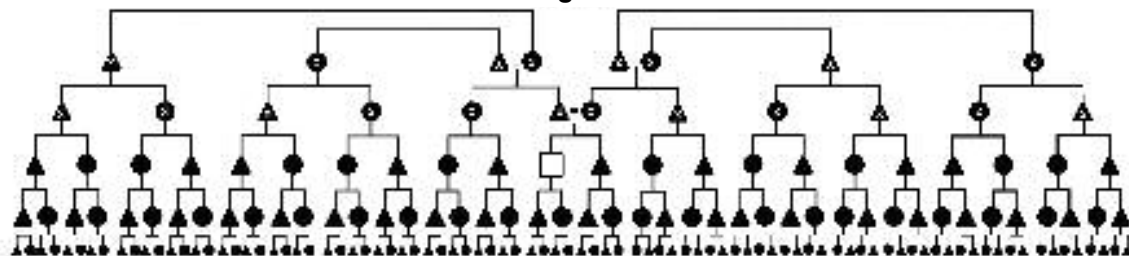
Diagram 6

Diagram 7

8

If we consider Ego's entire lifespan, we see that without marriage a female (or male) Ego would only be able to identify, and benefit from, a total of 9 types of relatives, but by identifying fathers, marriage increases this number to 173 (see diagrams 8 and 9). This demonstrates that the identification of fathers through marriage enabled humans to identify somewhere on the order of nineteen times as many types of relatives as could be identified by other mammals.
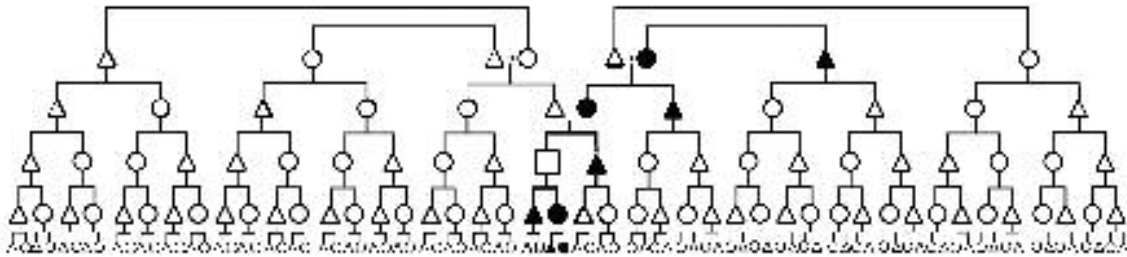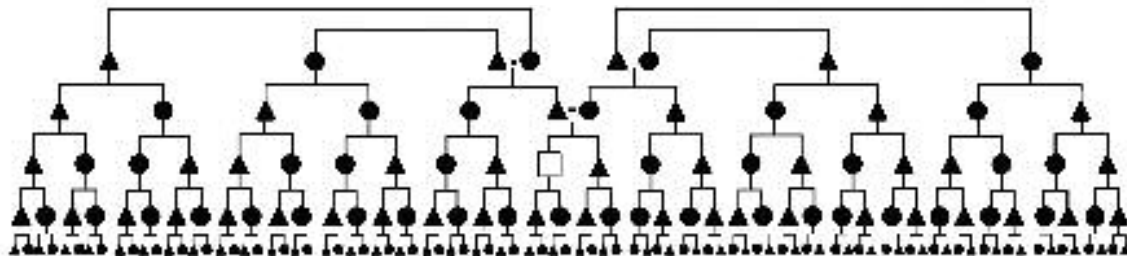
Diagram 8

Diagram 9

These diagrams have been drawn to show monogamous marriages. This is because both ethnographic data on human foragers and the amount of sexual dimorphism in our species indicate only a relatively small degree of polygamy. Hence, most marriages during early human evolutionary history were probably monogamous, with only a small number of polygamous marriages occurring. However, when polygamous marriages did occur, they increased the number of identified kin even *more* than these charts indicate because polygamous marriages would have enabled the identification *through fathers* of additional half-siblings, and other half-relatives.

Our argument about the effect of a tradition of marriage on the numbers of identified kin can be modeled more formally. The concepts in the modeling section below, as expressed by D. R. White, are particularly relevant to our argument.

Modeling Kin Ratios

The basic observation regarding the *network ratio of kinship*, i.e., the ratio of bilateral to unilineal kin (see equation (3) below), can be illuminated with a mathematical model. From this model we can draw further evolutionary implications. These implications exist whether or not we accept an explanation for the spread of a tradition of fatherhood that is based on learned behavior or some combination of learned behavior and other biological mechanisms such as Darwinian natural or sexual selection. And instead of dealing with number of genealogical kin types, the model deals with number of individual kin of different types, given some illustrative demographic assumptions about numbers of children.

The behavior of the *network ratio* can be observed even in a simplified model, and replicated in more general models, although I will not do the latter here. Assume that adults mate with a single partner and that each couple has *2n* children, exactly *n* sons and *n* daughters. Although artificial, these numbers will illustrate the point that when "fatherhood" ties are added to a kinship network initially defined as lacking them, the size of the bilateral network is multiplied exponentially in comparison to the size of a unilineage. What the model shows is not only how this occurs but that the exponentially increasing benefit of the network ratio (1) applies only when the size of sibling sets is sufficient to produce collaterals, (2) once achieved, is independent of the size of sibling sets, and (3) once achieved, the benefit increases with greater genealogical depth at which common ancestry is recognized, but in rapidly diminishing increments that fade with deeper generational kindred and lineage depth.

In this model, the numbers of persons regarded as "blood kin" in Ego's generation are compared as between bilateral and matrilineal relatives (results would be the same if we made the comparison with patrilineal relatives, although males having multiple wives versus females having multiple husbands will make a difference). The model does not depend on whether parentage is putative or biological, which is ignored in my use of the term "relative*"* or terms for type of relative. Given the simplified assumptions above regarding uniform number of siblings and sex ratios in sibling sets, simple computation shows that a matrilineal descendant of an ancestor, after *g* generations, belongs to a set of exactly $n^{g-1}(2n)$ matri-relatives in that generation. In other words, Ego will have 2n siblings by the same mother, $2n^2$ matrilineal siblings and cousins, $2n^3$ siblings and matrilineal first and second cousins, and so forth. (If *n* = 1, the population is at bare replacement, and Ego will have only one matri-collateral, the opposite-sex sibling, because the female ancestors will lack sisters.) Again, bear in mind I use terms for kinship here whether or not it is biological consanguinity or putative kinship that is recognized. Thus, letting *m* stand for the number of matrilineal relatives in Ego's generation:

$$m = n^{g-1}(2n) \qquad (1)$$

When paternity is recognized (once again: whether paternity is regarded as either genetic or social or both makes no difference to the model), and using the same simplified uniform assumptions about numbers of siblings, Ego will have precisely 2^g ancestors *g* generations back: 2 parents (*g* = 1), 2^2 grandparents (*g* = 2), 2^3 great-grandparents (*g* = 3), and so forth. Assuming that none of the descendants of the ancestors marry one another (recall that for purposes of illustration each has *2n* children, and that couples have the same children), this set of ancestors will have exactly $2^{g-1}(2n)^g$ descendants in Ego's generation. Letting *b* stand for the number of these bilateral relatives in Ego's generation:

$$b = 2^{g-1}(2n)^g \qquad (2)$$

Within Ego's generation, for *g* > 0, the ratio *r = b /m* of bilateral to matrilineal blood relatives will be

$$r = 2^{g-1}(2n)^g/(2n)n^{g-1} = 2^{2(g-1)} \qquad (3)$$

This, the *network ratio r*, is not dependent on *n* but only on *g*, which acts as an exponent on the pairing number 2 for parents. Not only does Ego gain double the number of ancestors with each additional generation, but the same applies to every relative in Ego's generation and hence to either bilateral or unilineal network size. The growth of ratio *r* with number of generations (*g*) obeys exponential growth: If *g* = 1, then *r* = 1, that is, one's siblings are siblings regardless of lineality. For *g* = 2, there are *r* = 4 times as many bilateral than

matrilineal relatives; if $g = 4$, then $r = 16$; and for $g = 4$, $r = 64$. Thus, for each additional level of ancestry, the ratio r is multiplied by four, independently of the number of children. This qualitative type of result would also generalize probabilistically if we took the number of children to be generated uniformly by a stochastic instead of a deterministic distribution of sibling sets for successive couples.

Figure 2 is a semi-log graph that shows the relevant exponential growth curves in both the general case for ratio r and in the specific case of $n = 2$, for which population size doubles in every generation from an apical ancestor. The upper curve shows growth in the log of (b), the number of bilateral relatives, on the y axis, as a function of the log of the depth of ancestry (the x axis). The lower curve shows the lesser but still exponential growth of number of matrilineal relatives (m). The curve in the middle shows the ratio (r) of their magnitudes, which also grows exponentially with g. So long as $n > 1$, i.e., the population is not just replacing its numbers but growing so as to produce collaterals, this ratio and its growth is uniform and does not vary, in this model, with the size n of the sibling set. (Other models could be developed for the effects of multiple marriages and half-siblingship on the network ratio. Similarly for effects of many other elements such as sex ratios or consanguineal marriages, but the goal here is to illustrate the general problem, its structure, and its dimensions, and their link to dynamics.)
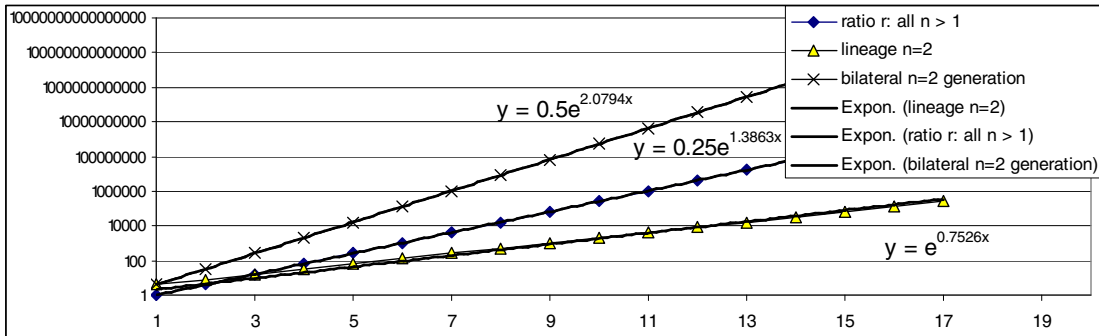

Figure 2: Exponential growth in the network ratio r and its unilineal and bilateral generational sizes as a function of depth of ancestries (x axis).

There are several implications of the results in this illustrative kinship-network model. One is that when paternal links are added to an existing set of matrilineal links, whatever the benefit of any resultant enlargement of a kinship network, the magnitude of benefit is not affected by the demographics of sibling set size, holding sex ratios constant.

The second implication is that this benefit *has a characteristic scale* within which generational depth creates a network ratio inverse $1/r$ —the unilineal proportion of the network—that approaches zero very quickly as g increases, as shown in Figure 3. After $g = 2$, the unilineal (and matrilineal) percentage of the bilateral network approaches 0% (and the non-unilineal percentage approaches 100%). Thus there are further benefits to increases in the network ratio r (decreases in $1/r$), which reflect increase the proportion of bilateral kin relative to g, only *in relation to shallow lineages* where $g < 5$. Figure 3 shows little further benefit in this proportion at a generational depth above $g = 2$ (grandparents), and that after $g = 5$ there is virtually no further gain to be had.
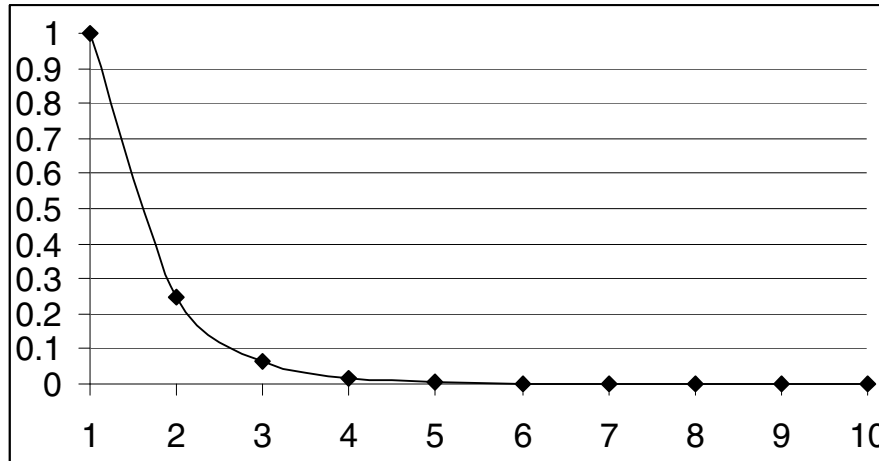
Figure 3: Network ratio 1/*r* quickly asymptotes to zero with moderate generational depth

The network ratio benefit, then, is not scalable beyond shallow lineages.[4] Further, the recognition of relatives at greater depth requires more cognitive, informational and other resources if the rate of altruistic behavior is held constant. A scalable benefit to larger networks would be one in which altruistic benefit and commitment thin out in relation to relatives at greater kinship distance even as the potential numbers of kin increase at that distance; hence there is an economy of altruistic scale. In that case (White and Houseman 2002) kinship organization can scale up to larger numbers of recognized kin without increasing costs but deriving benefits aggregated over many people with less benefit per average kinsperson. This type of kinship organization is observed with segmentary lineages in which segments at whatever scale are linked by marriage and bilateral kinship ties (see Sahlins 1961; Palmer and Steadman 1997). Conversely, a scalable network would allow scaling down to fewer numbers of recognized kin but increasing returns per linked kinperson.

A third implication of this model, in comparison to other aspects of kinship networks, is that the network ratio idea can be profitably investigated across different societies in terms of the distribution and differential intensities of altruism (which can also be either reciprocal or generalized or can take other forms).

Conclusion

Goodenough writes: "Fatherhood and kinship through males are derived from marriage . . . ." (1970:30). This, we suggest, is what allows the tradition of marriage to have profound genealogical consequences. It not only provides the conditions whereby children normally gain recognizable fathers but also the conditions whereby they gain a great number of additional relatives, both on their father's *and* on their mother's side, and ramifying on both sides through male as well as female genealogical links. Although the relative antiquity of marriage, or marriage-like relationships, is not known, this increase in the number of identified kin may have been an important factor in human biological evolution or cultural evolution or both. This increase depended on the development of the cognitive ability to mobilize a logic of genealogical space as explored by Read (2004) and,

as Jost (2005) notes, to "integrate an evaluation of the performance of other group members over long periods" as a basis for altruistic behavior. That such behavior has a learned cultural component, witnessed in the further generalization of "kinship amity" to include affines in some societies, is readily apparent.

By increasing the number of kin with whom an individual can engage in beneficial altruistic relationships throughout their lives, ancestors who married and transmitted the tradition of marriage to their descendants also transformed the environment of those descendants in fundamental ways. They increased the number of available kin who might behave altruistically toward their descendants. This might be especially important in times of great need as, for example, times of rapid fluctuations in the natural environment (see Ridley 1996). This effect is likely to be the crucial reason why marriage is very nearly universal and not restricted to societies with bilateral kinship. If this increase in identifiable kin does prove to be an important factor in human social organization, current evolutionary explanations of human kinship altruism may have to be expanded to incorporate such a wider category of kin (see Palmer and Steadman 1997).

The point of presenting such a general and abstract model of the effect of the tradition of marriage on the potential number of identified kin (whether or not such kin are actually biological kin) is not to direct attention away from the variability and complexity of human kinship. Instead, we hope our model will be seen as a springboard to fruitful discussions over when the increased number of identified kin might be important and when it is not. This, in turn, may advance debates over fundamental issues related to both kinship and marriage, including the possible evolutionary significance of these aspects of human behavior.

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Endnotes

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[1] Although not relevant to the importance of associative genea-logics to network expansion, Read (2001, 2005) also shows conclusively that relative product logics of kinship terms, which map the genealogical space of relatives, are so strongly organized internally across all the cases studied (e.g., Bennardo and Read 2005) that in order to investigate their structure it is unnecessary to collect kin-term data using the definitions of types of kin in egocentric terms. Instead, that is, terms collected from individuals in the form "If I use _____ to refer to X, and X uses _____ to refer to Y, then I should use _____ to refer to Y" will yield data sufficient to analyze the structure of the kin-term system. Further, the internal coherence of kin terms as relative products can be decomposed into generating relations whose composition consistently forms the entire structure of terms. There are such tight relational constraints on such relative product systems that they follow strictly path-dependent evolutionary tracks. While these structures presuppose logically consistent genealogical spaces (see Figure 3, Bennardo and Read 2005), however, all peoples studied tend to compute kinship in terms of their cultural lexicon of relative products, while able to point also at concrete people who stand to one another (often not uniquely because of multiple genealogical relations) as exemplars or "instantiations" (Read 2002) of these cultural relations.

[2] This also engages the question as to how different societies may slough off kin relations deemed to be unimportant.

[3] A research design to investigate the distribution of altruism ethnographically might begin with a sample of networks in which putative genealogical ties have been collected for communities and in which kinship roles are described. If it were possible to code aspects of altruistic behaviors that are present or absent in kinship roles, and the distribution of these roles could be mapped relative to each Ego in the network, the hypotheses in this paper could be tested. They could also be tested in relation to additional hypotheses about which features of social organization and other factors affect these distributions.

[4] Unlike, perhaps, the possible scalability of benefits of intercommunity marriages for integration mentioned earlier, but which is not investigated here.