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The Body as a Cognitive Artifact in Kinship Representations

Hand Gesture Diagrams by Speakers of Lao[1]

by N. J. Enfield

Central to cultural, social, and conceptual life are *cognitive artifacts*, the perceptible structures which populate our world and mediate our navigation of it, complementing, enhancing, and altering available affordances for the problem-solving challenges of everyday life. Much work in this domain has concentrated on technological artifacts, especially manual tools and devices and the conceptual and communicative tools of literacy and diagrams. Recent research on hand gestures and other bodily movements which occur during speech shows that the human body serves a number of the functions of "cognitive technologies," affording the special cognitive advantages claimed to be associated exclusively with enduring (e.g., printed or drawn) diagrammatic representations. The issue is explored with reference to extensive data from video-recorded interviews with speakers of Lao in Vientiane, Laos, which show integration of verbal descriptions with complex spatial representations akin to diagrams. The study has implications both for research on cognitive artifacts (namely, that the body is a visuospatial representational resource not to be overlooked) and for research on ethnogenealogical knowledge (namely, that hand gestures reveal speakers' conceptualizations of kinship structure which are of a different nature to and not necessarily retrievable from the accompanying linguistic code).

N. J. Enfield is a member of the scientific staff of the Max Planck Institute for Psycholinguistics (PB 310, 6500 AH Nijmegen, The Netherlands [nick.enfield@mpi.nl]). Born in 1966, he was educated at the Australian National University (B.A., 1994) and the University of Melbourne (Ph.D., 2000). His publications include *Ethnosyntax: Explorations in Grammar and Culture* (Oxford: Oxford University Press, 2002) and *Linguistic Epidemiology: Semantics and Grammar of Language Contact in Mainland Southeast Asia* (New York: Routledge, 2003). The present paper was submitted 20 VI 03 and accepted 29 IV 04.

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Co-speech hand gesture is of profound importance as a culturally imbued and conceptually powerful medium for diagramming thought. It is one of the most ubiquitous means of visually representing ideas. With hand gestures, the ordinary speaker routinely creates complex visual illustrations. These representations are visible and vivid during production and then, like speech, gone from the perceptual field. What is the link between the evanescent diagrammatic practices of gesture and visual representations of the historically enduring kind, such as iconographies, written texts, or printed diagrams? This question can be approached using the visual anthropologist's methods for capturing and inspecting the real-time flow of nonverbal behavior, but it is outside of mainstream anthropology that the bulk of the work on gesture is currently being conducted.[2] Intensive research over the past two decades has seen a psychologizing of research in the domain of co-speech hand gesture (and nonverbal behavior more generally). This explosion of activity is apparently due to a new scientific respectability of the topic within psychology and psycholinguistics (notably to the credit of McNeill 1985, 1992, 2000; cf. Goldin-Meadow 1999, 2003*a*). In this article I pursue an issue which deserves if not demands serious attention in current anthropology. The essential claim is that the human body is a cognitive artifact both for those who inhabit it and for those who view it. This is most vividly illustrated by focusing on hand movements, perhaps the most salient contribution to the rich "geography of cognition" (Goodwin 2000*a*) constituted by bodily positioning, gaze, talk, and orientation to both the physical environment and the attentions of co-present others. The study of diagrammatic visual representations must not exclude the ubiquitous and structured practices of co-speech hand gesture, among other features of bodily behavior.

A more specific point arises for the domain in which I explore this broader issue, namely, kinship and kin terminology. It is known that the study of kinship stands to be enriched by study of the visual representations produced by members of the group being studied. But hand gestures and other bodily actions have been overlooked in this context. Speakers' gestures during interviews on kinship and kin terminology are ethnogenealogical diagrams which have been in front of our eyes all along. Different forms of iconographic or diagrammatic repre-

2. Historically, scholarly attention to gesture has come under a broad array of disciplinary rubrics (see, among many others, Jorio 2000 [1832]; Efron 1972 [1940]; Goffman 1963; Condon and Ogston 1967; Ekman and Friesen 1969; Birdwhistell 1970; Kendon 1972, 1980; McNeill 1985; Calbris 1990; Haviland 1993, 2000; Streeck 1993, 1994, 2002; Goodwin 1994, 2000*b*, 2002; Goldin-Meadow 2003; Liddell 2003; Levinson 2003; Wilkins 2002; and journals such as *Semiotica, Research on Language and Social Interaction,* and *Gesture*).

sentation can have different cognitive consequences in problem-solving (Larkin and Simon 1987, Zhang 1997, Oestermeier and Hesse 2000). While this suggests implications for the broader study of culturally situated forms of visual representation, research on the role of external artifacts in cognition (e.g., Norman 1991, Hutchins 1995) has yet to connect with the ethnographic study of visual representations in non-literate and/or non-technological settings (but cf., e.g., Wassmann 1997, Wilkins 1997, among other works on representation of spatial information). At the same time, the wealth of research on iconographic and other depictive visual representations (e.g., Marshack 1972, Munn 1986 [1973], Dubinskas and Traweek 1984, Layton 1991) has not explored implications for cognitive processing. Certain other types of visual representation—specifically those enduring visual representations which are capable of directly representing speech—have led some to argue for profound cognitive consequences on a *historical* level (Goody 1977, Ong 1982, Donald 1991, Olson 1994; cf. Street 1984). But despite a mass of research on the written word, we still know little of the role of nonverbal visual forms (such as iconographic depictions or diagrams) in the online cognitive processes of those who produce and interpret them (Scaife and Rogers 1996). Existing work on the relation between diagrams and thought has concentrated on graphs, tables, and charts, which represent only a fraction of the range of culture's visual products. We have yet to recognize the extent to which indigenous visual representations, both enduring and non-enduring, may constitute "technologies of the intellect" (Goody 1968).

I will explore these themes with reference to the spontaneous visual representation of abstract kinship relations in ethnogenealogical interviews (cf. Conklin 1969 [1964]). Diagrammatic representation of kinship relations is not only a technical practice within the culture of social science but a revealing cultural and cognitive practice among lay people. While kinship research—a giant among topics in the history of anthropology—has always relied on diagrams, little scholarly attention has been paid to kinship's visual depiction itself as a topic for empirical ethnography (Bouquet 1996; cf. Conklin 1969 [1964]). To what extent are our technical kinship diagrams modern products of the "domesticated mind" (Goody 1977)? Could their spatial properties just as well emerge from "savage" conceptions? We lack a broad ethnographic view of the visual representation of abstract kinship relations, whether it be in culturally conventional practices or in spontaneous displays.

In this article I present a study of bodily movements made by semi-urban speakers of Lao during informal ethnogenealogical interviews. Video-recorded segments show speakers faced with the communicative challenge of defining features of their own system of kinship and kin terminology. This challenge elicits spontaneous use of semiotically composite representations—sequences of speech signals in concert with sequences of hand gestures, eye-gaze movements, torso orientations, and other meaningful physical actions. These efforts are visibly designed to be viewed by recipients and, further, are recognized by onlookers as part of what the speakers are saying. The examples show speakers using gestures and other bodily movements as tools for diagramming thoughts on a rich three-dimensional virtual sketch space anchored in the body.

Co-speech Gesture as a Means of External Representation

Universally, when people speak, they convey a wealth of information with bodily movements. Much of this information, especially in movements of the hands, is tightly and systematically integrated with the timing and content of speech (Kendon 1972, 1986; McNeill 1985; Morrel-Samuels and Krauss 1992). Gesture and speech are far from being "fundamentally different forms of communication" (*pace* Burling 1993:25; cf. Stokoe 1993, McNeill 2000), but they do display different semiotic properties. Speech is for the most part highly codified, linearized, discrete, and conventional. Visual semiotic representations which accompany speech differ from it not only with respect to modality (visuospatial rather than vocal/aural) but also with respect to semiotic ground (more iconic and indexical than symbolic [Peirce 1965 (1932)]). Consider facial expression, hand gesture, and graphic diagrams of various kinds: While different semiotic modalities can be employed to convey similar information—compare the sound of the word *up* with the graphic displays UP and ↑—these different modalities have different semiotic affordances (cf. Peirce 1965 [1932], Norman 1991, Zhang 1997).[3] These different signifiers convey apparently identical information, yet the employment of one rather than the other can imply different kinds of thinking, including different effects on memory, reasoning, and imagination (Goody 1977; Ong 1982; Larkin and Simon 1987; Glenberg and Langston 1992; Zhang 1997; Goldin-Meadow 1999, 2003*a*; Kita 2000; Oestermeier and Hesse 2000; Emmorey 2001).

Actions which tightly orchestrate the simultaneous display of complementary pieces of information in different channels or modalities are *composite signals* (Engle 1998; cf. Slama-Cazucu 1976, Bavelas 1994, Clark 1996). In such orchestrated acts, various types and sources of information are not only complementary but co-constitutive of a larger whole message. The composite signal performance par excellence involves simultaneous integration of (symbolic) speech, (indexical) gesture, and (iconic/indexical) visual representations or artifacts. The weather reporter gives verbal commentary while using a pointer to link his or her speech with marks and symbols on a two-dimensional graphic display. In a less formal setting, I explain to you how to find my house, using my index finger as a link between my verbal commentary and the lines and symbols on a city map. A diagram such as this drawn or printed on paper and

3. I use the term "affordance" in the sense of Gibson (1979: chap. 8).

an analogous diagram "drawn" by hand movements in mid-air (Enfield 2003) have in common the property of being visually accessible externalized communicative representations. Both are produced by people for the purpose of organizing and conveying information. They can be seen and therefore have spatial properties. A fundamental difference between drawn or printed diagrams and diagrams sketched by hand movements in mid-air is that the latter are evanescent.[4] One advantage of adding hand movements to speech is that one becomes able to use absolute coordinates in space to track referents through a spoken discourse (Marslen-Wilson, Levy, and Tyler 1982:356; McNeill, Cassell, and Levy 1993; Liddell 1995, 2000; McNeill 2003). In the absence of visible artifactual diagrams, hand gestures are often used *as if* perceptually accessible artifacts were in view. Indeed, this is how pointing and tracing gestures are usually employed to construct virtual diagrams indexically (Enfield 2003). One can point to chunks of thin air, assigning referents to stable points in space and inviting one's interlocutor to imagine that such a diagram is "hanging there." (Recent work on sign language also explores this phenomenon [Liddell 2000, 2002, 2003; Emmorey 2001, 2002].)

Certain types of conceptual problem are particularly amenable to diagrammatic representation, for example, where one is required simultaneously to maintain reference to multiple individuals and refer to multiple (abstract) relationships between them. The kinship domain provides a good example.

Diagramming Kinship

Anthropology's obsession with kinship has seen it follow many avenues of investigation through decades of research, and the dimensions of interest are far from exhausted (cf. e.g., Parkin 1997, Godelier, Trautmann, and Tjon Sie Fat 1998, Bloch and Sperber 2002). One intriguing domain which has received little scientific attention is the practice—*qua* cultural practice—of visually representing kinship not only by anthropologists but also by lay people. As Bouquet (1996:43) writes, the theoretical status of the genealogical diagram is "rarely considered." Can a genealogical diagram tell us about the conceptualization of kinship in the imagination of the person who produces it? We occasionally see in anthropological work a non-standard representation offered by the ethnographer (e.g., Rosaldo 1980:12) or, less often, a representation produced by the people whose kinship system is under investigation. Conklin's (1969 [1964]:97) "ethnogenealogical method" is a "highly instructive" technique of "examin[ing] the explicit models constructed by the informants themselves." Some of the kinship models Conklin elicited from Hanunóo-speakers have visuospatial features. For instance, the Hanunóo talk about degrees of "proximity" (a spatial metaphor) of interconnectedness of kin with reference to *kāway* 'flowering branchlets of certain plants': "The Hanunóo refer to relations between such adjacent plant structures when discussing the boundaries of their maximal kin groupings" and when reckoning permissible marriages (p. 101). This in itself is perhaps no different from English-speakers' talking of "branches" of a family or organization. More interesting in the present context is a diagram which Hanunóo men spontaneously produced during Conklin's questioning (fig. 1). Conklin says that drawings such as this did much to clarify his thinking about Hanunóo principles for reckoning kinship. Similarly, Munn (1986 [1973]) reports that during fieldwork on Walbiri iconography she made drawing materials available to Walbiri consultants, eliciting "visual texts" for her research. She says of these representations: "I gained not only information on Walbiri iconography, but also a different perspective on the way Walbiri men conceive of their myth and cosmology than I gained from verbal texts" (p. xviii). These observations of the special effects of visual sources of information are consistent with the known cognitive effects of diagrammatic representations discussed earlier. I argue that such benefits are also to be gained from analyzing hand gestures and other spontaneous bodily movements.

Familiar traditions of kinship diagramming (e.g., standard genealogical "trees") furnish enduring external representations designed for display and for physical/spatial and temporal portability across communicative contexts. Like iconographic and semasiographic representations (Gelb 1952, Salomon 2001), they are part of culture's "external symbolic store" (Donald 1991). Co-speech gesture is, by contrast, an evanescent and apparently less conscious means of diagramming kinship. It does not add to a historically enduring external store but nevertheless does yield a cultural product which forms a focus of joint attention in transitory congregations of interactants (Goodwin 2000*a*), functioning as a kind of external working memory (cf. Baddeley 1986; Donald 1991; Goldin-Meadow 1999; Roth 2000; Roth and Lawless 2002*a*, *b*; Clark 2002; Emmorey 2002; Emmorey and Casey 2002).

Kinship is a complex structured conceptual domain that is relatively abstract in spatial content. It has, however, at least two concrete spatial properties, namely, (1) an analogic correspondence between relative height and relative age among kin in childhood and (2) the tendency for greater spatial proximity of certain kin in daily life. "Proximity" is one-dimensional and therefore spatially highly abstract. Furthermore, it is neither a necessary nor an inherent property of kinship. Therefore there would seem to be few intrinsic constraints on the way kinship is to be diagrammed. This makes it a useful domain in which to examine the relationship between abstract cognitive structures and concrete spatial/external representations, since the chosen mode of spatial representation will not be pre-empted by direct visual/

4. Evanescence is a matter of degree. Sand drawings or drawings on a chalkboard are "permanent" as long as they are not rubbed out. Only rarely do these types of representation stand the test of time. An example is the glass encasing of a chalk board at the School of Physics and Astronomy, University of Nottingham, upon which Einstein wrote lecture notes during a visit in June 1930.

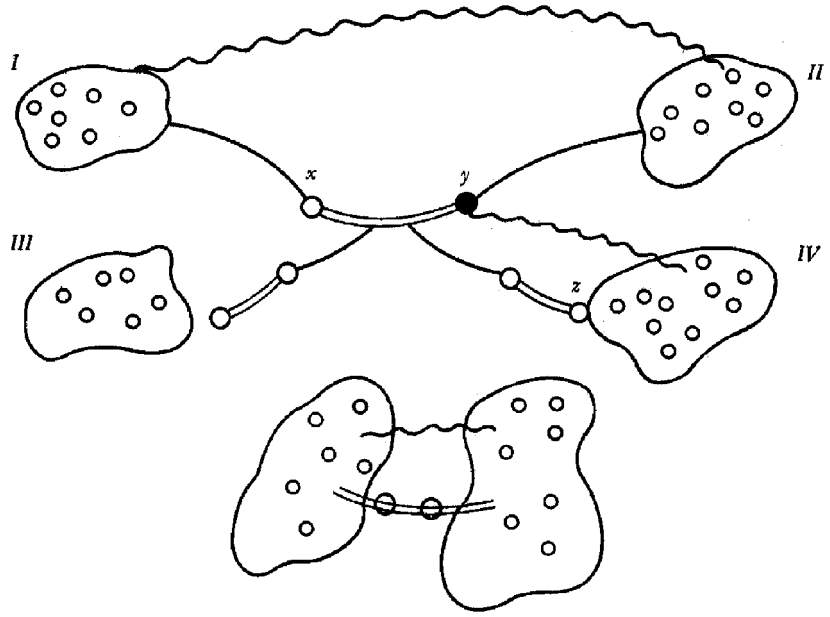


FIG. 1. *Hanunóo diagram of "abstract principles" of Hanunóo kinship proffered to Conklin during his application of the "ethnogeneaological method" (1969* [*1964*]*:109). In these drawings, large enclosures were sketched to indicate* kāway, *or maximal consanguineal categories. Small circles stand for individual kinsmen. As indicated by the informant's use of a wavy line, any member of* I (x*'s* kāway*; I have added only the letter and number symbols) is a* balāyih *of any member of* II (y*'s* kāway*), and vice versa. This relationship exists because* I *and* II *were linked by the marriage of* x *and* y. *Similarly,* y *and* x*, together with the combined membership of* I *and* II*, are reciprocally* balāyih *of all members of* IV (z*'s* kāway*), because of z's marriage to a child of* x *and* y*" (p.113).*

iconic principles. Another reason the kinship domain is valuable for the current investigation is that in contrast to the situation with other complex conceptual domains, extensive knowledge of kinship systems is not restricted to certain expert individuals in a community. Many facts of kin terminology and kinship-related pre- and proscriptions are common ground in an adult community and are central to social organization and daily life. Much of kinship constitutes lay knowledge, fundamental cultural common ground assumed and accessed in all social interactions.

In order to represent kinship structure visually, one has to map it onto spatial structure. While there are few if any stable, direct correspondences of kinship relations onto two- or three-dimensional space, the currently prevailing metaphorical principles of spatial mapping seem well motivated. In a typical family tree, greater height corresponds to greater age (an appropriate mapping at least with reference to non-adults). But not all age differences between individuals are made explicit in standard kinship diagrams. Siblings, for example, are often set out at a single level along the lateral axis.

Below I examine some ways in which four semi-urban speakers of Lao externalize their conceptualization of Lao kinship and kinship terminology in informal explanations. Before presenting the data I will establish the background to Lao kinship and kin terminology.

Lao Kinship and Kin Terminology

Lao is a Southwestern Tai language spoken in Laos and in some areas of Thailand and Cambodia (Enfield 1999). Lao kin terms are used as terms of address, as pronouns, and as descriptive terms.[5] Linguistic items used in these three general functions are drawn from a single set, and the selection of a specific term is based not just on the identity of the referent but on the type of referential function being performed. As terms of address, kinship terms are used either alone or as a prefix to the referent's name (Enfield 2004*a*). Thus, if my mother's older sister's name is Seng, I could call her *paa4* 'elder aunt' or *paa4-sèèng3* 'elder aunt Seng'. As pronouns, kin terms are used with reference to people higher than oneself.[6]

5. On kinship and kin terminology in closely related systems of Thai-speakers, see Keyes (1975), Potter (1976), and Kemp (1984). Writing on Thai, Haas (1978[1969]:40) recognizes three ways in which kinship terms may be used: as nouns, as pronouns, and as titles preceding a given name. These are distinctions of grammatical function which crosscut the distinctions I focus on here.

6. Transcription of Lao here follows International Phonetic Association convention, except for *q* (glottal stop), *ñ* (palatal nasal), *ng* (velar nasal), *ê* (mid front vowel), *è* (low front vowel), *ù* (high back unrounded vowel), *ò* (low back vowel). There is no standard romanization of Lao. Lexical tones are marked by numerals at end of each syllable: *1* (mid level), *2* (high rising), *3* (low rising), *4* (high falling), *5* (low falling), ∅ (unstressed). Glosses of examples observe

(1) *paa4 siØ phaa2 khòòj5 paj3 talaat5 bòò3*
aunt IRR take ISG go market question
"Will aunt ("you"/"she") take me to market?"

The individual referred to by the kin term *paa4* 'aunt' in this example could be the addressee or a third person. The specific construal would depend on context. It is necessary to distinguish between "informal" and "official" descriptive uses of kin terms. A Lao-speaking man may informally describe his father's older brother's son as his *qaaj4* 'older brother' ("Hawaiian"-style), but he will acknowledge that the "proper" or official description is *luung2* 'parent's elder brother' ("Crow-Omaha"-style) because of a skewing rule which renders cousin and elder uncle in this case terminologically equivalent (see below).[7] In this article I focus exclusively on the "official" descriptive use of Lao kin terms—the terms speakers use when they are explicitly and formally defining a kinship relationship (as in "That person is my [brother, father, cousin, etc.]"). The basic kinship terminology of Lao begins with three terms for immediate filial relations (table 1).[8] The term *luuk4* 'child' is not specified for sex. Specification of sex for this term (and some others) is by suffixation of *saaj2* 'male' or *saaw3* 'female' (as in *luuk4-saaj2* 'son' and *luuk4-saaw3* 'daughter').

There are three terms for siblings, each specifying age relative to speaker, with two older-sibling terms distinguished by sex (table 2). It is impossible to refer in Lao to a sibling without explicitly stating whether he or she is older or younger than oneself. The dotted line in table 2 is of fundamental importance in the descriptive kin terminology of Lao and indeed has a range of consequences in the social life of Lao-speakers. It represents the notion of *lun1*, often (inaccurately) translated as "generation." If two people are of the same *lun1*, it means that they are of the very same age. In English, one is of the same generation as one's siblings, while in Lao, one's older sibling is in a *lun1* above and one's younger sibling is in a *lun1* below. The dotted line divides *lun1 qaaj4/qùaj4* 'older sibling *lun1*' from *lun1 nòòng4* 'younger sibling *lun1*'.

Relative age status has a number of consequences for linguistic and other behavior of siblings toward each other. When referring to an older sibling one typically uses his or her name with the appropriate kin term as a prefix—for example, *qaaj4-phêt1* 'Phet (older brother)', *qùaj4-kham2* 'Kham (older sister)'. When referring to a younger sibling one typically uses his or her name with one of two sex-specific "non-respect" prefixes, *bak2-* (male) and *qii1-* (female)—for example, *bak2-phêt1* 'Phet (younger brother or other familiar "lower" male)', *qii1-kham2* 'Kham (younger sister or other familiar "lower" female)'. These terms are classificatory in informal address and reference; collateral kin (and also familiar non-kin) will be referred to using these terms, with strict reference to status as older or younger than the speaker. Another linguistic practice which makes reference to age differences of siblings is the selection from among a large number of socially marked pronouns (Enfield 2004*b*). The bare pronouns *kuu3* 'I' and *mùng2* 'you' are maximally informal and are typically used reciprocally between age-mates who have been friends since childhood or youth (cf. Cooke 1968 on related terms in Thai). They are also common as reciprocal terms of reference between adjacent siblings. They are used *non*-reciprocally by older siblings when speaking to younger siblings. Younger siblings do not use them in return when addressing non-adjacent older siblings unless they intend serious offense. A younger sibling is likely to use polite pronouns *khòòj5* 'I' and *caw4* 'you' when talking to an older sibling. Use of the bare pronouns *kuu3* 'I' and *mùng2* 'you' also extends to interactions with cousins and familiar same-generation social associates as long as the relationship is forged in childhood or youth and has remained continuous since then. As these observations illustrate, the line between younger and older *lun1* is of significant consequence for social and linguistic practice among Lao-speakers.

We now turn to descriptive kin terms which denote collateral relations, namely, parents' siblings and their offspring (cousins). Table 3 show the six terms for siblings of one's parents. Each is specified for sex and for age relative to ego's parent, with an added distinction among parents' younger siblings (specifying whether they are on the mother's or father's side). The dotted line separates them into higher or lower *lun1* with respect

TABLE 1
Lao Terms for Immediate Filial Relations

Term	Definition
phòò1	F
mèè1	M
luuk4	C

TABLE 2
Lao Terms for Siblings

Term	Definition
qaaj4	eB
qùaj4	eZ
nòòng4	yG

the following conventions: 1/2/3 (first/second/third person), COMP (complementizer), EXP (experiential), FOC (focus), HES (hesitation), HON (honorific), IRR (irrealis), NEG (negation), PCL (particle), PL (plural), POL (polite), RCP (reciprocal), RDP (reduplication), SG (singular), TPC (topic).

7. The issue of informal versus official uses of kin terms among Lao-speakers is worthy of closer attention. Practices of kinship description, as well as members' knowledge of such practices, are rapidly changing in Lao society and also betray class and regional differences. I hope that an investigation of the broader dynamics of the discourse of Lao kinship will be undertaken elsewhere.

8. The notation I use follows Parkin (1997:9): F (father), M (mother), B (brother), Z (sister), S (son), D (daughter), H (husband), W (wife), P (parent), G (sibling), E (spouse), C (child), e (elder), y (younger). In the genealogical diagrams, siblings are placed at different heights to signify relative age (where higher is older).

TABLE 3
Lao Terms for Parents' Siblings

Term	Definition
luung2	PeB
paa4	PeZ
qaaw3	FyB
qaa3	FyZ
naØ-baaw1	MyB
naØ-saaw3	MyZ

to ego's parents. One is described in return by all of one's parent's siblings with the term *laan3* (for which sex may be specified by suffixation of *saaj2* 'male' or *saaw3* 'female', as described above for *luuk4* 'child'). The term *laan3*, however, does not simply refer to one's "nibling." In its official descriptive use it shows a skewing of three generations, referring to any grandchild (G^{-2}), any child of any of one's own siblings (G^{-1}), or any child of any of one's parents' younger siblings (G^{0}) (table 4).

Skewing in the system also occurs in certain extended descriptive uses of the "aunt/uncle" terms described in table 3. Official descriptive kin terminology used between cousins is the same as that used between niece/nephews and aunt/uncles (table 5). If you describe your father's older brother as *luung2* 'older uncle', then officially you describe his son as *luung2* 'older uncle' also. While your father's older brother's son is in the same generation as you ("first cousin" in English), he is on a different side of the "dotted line," as calculated by the relevant sibling relationship (i.e., the one between his father and yours). In return, both your father's older brother and your father's older brother's son officially describe you as *laan3* 'nephew'.

A further type of skewing arises from descriptive uses of "aunt/uncle" terms (collateral, G^{+1}) with reference to spouse's siblings. One describes one's spouse's siblings using the same terms one's own child would use, that is, by terminologically identifying one's spouse with one's opposite-sex parent (table 6).

While use of "aunt/uncle" terms for cousins "above the line" entails being called *laan3* 'nibling' by them in return, the descriptive relationship between one's spouse and one's sibling is not precisely analogous. For example, a woman officially describes her husband's older sister as *paa4* 'older aunt', while the husband's older sister describes the woman as *qaa3* 'younger maternal aunt' (and not as *laan3* 'niece') in return.

TABLE 4
Lao Term laan3, *Skewing across Three Generations*

Term	Definition
laan3	PyGC
	GC
	CC

TABLE 5
Extension of "Older Aunt/Uncle" Terms to "Higher" Cousins

Term	Definition	Extended Reference, via Parents' Older Sibling
luung2	PeB	PeGS
paa4	PeZ	PeGD

To summarize: There is a horizontal line separating one from one's older siblings and younger siblings, respectively. This is observed in the semantics of sibling terms with obligatory specification of age relative to speaker. The three terms are *qaaj4* 'elder brother', *qùaj4* 'elder sister', and *nòòng4* 'younger sibling'. Terms for parents' siblings also obligatorily mark age of the referent individual relative to ego's parents. Cousins are informally referred to by the same terms used for siblings, but officially one has an aunt/uncle-nibling relationship with one's cousins. I describe my parents' older siblings in the same way I describe my parents' older siblings' *children* ('older uncle', 'older aunt'), and they describe me as *laan3* ('grandchild', 'nibling') in return. There is skewing of reference via siblings' marriage as well. One's siblings' spouses are officially described by the same terms as one's *parents'* siblings' spouses. Thus, my older sister's husband is my 'older uncle', while my younger brother's wife is my 'younger aunt'. (Informally, however, my wife's younger sister is simply *nòòng4 mia2* 'younger sibling [of] wife'.) A sibling exchange which "crosses" this line creates a terminological conflict. When a man A marries a woman B, B describes A's older sister C as 'older aunt', and A describes B's younger brother D as 'younger uncle'. If C and D were to marry, the descriptive terminology would clash. One of the two would have to cross the line in order for the terminology to be put right (see below for explication of this point).

In discussing these and other issues, Lao-speakers make repeated reference to the status of individuals as "high/big" or "low/small" in the system and use a metaphor of "crossing" the line between one *lun1* and another.

TABLE 6
Extension of "Aunt/Uncle" Terms to Spouse's Siblings

Term	Definition	Extended Reference, via Spouse = Parent Rule
luung2	PeB	EeB
paa4	PeZ	EeZ
qaaw3	FyB	HyB
qaa3	FyZ	HyZ
naØ-baawl	MyB	WyB
naØ-saaw3	MyZ	WyZ

Interviews on Kinship with Speakers of Lao

The empirical data to be presented here are excerpts from videotaped interviews concerning principles of kinship and kin terminology in Lao. Consultants were asked to give the meanings and uses of a number of kin terms and to comment on a number of marriage rules and preferences (including sibling exchange and second-cousin marriage). The speakers consulted were residents of the city of Vientiane, but all originated in more rural areas of Laos. They were not asked to gesture (indeed, gesture was not mentioned), and therefore the gestures they used in response constitute spontaneous and to some degree unreflective spatial mapping of kinship relations.

EXAMPLE 1: "FIRST COUSIN"

Consider one instantiation of the "first cousin" relationship, father's elder brother's daughter. In one videorecorded segment, a speaker explains that she officially categorizes her first cousin as *paa4* 'father's elder sister', while the speaker herself is officially categorized as *qaa3* 'father's younger sister' in return.[9] Here we see a collapsing of the two generations such that the direct descendent of a parent's sibling is described using the same term as would be used for the parent's sibling. The speaker's explanation steps through a full chain of relations in linear fashion. She proceeds along direct filial and sibling relations, first from herself to her father, second from her father to his brother, and third from her father's brother to her father's brother's son (figs. 2–4).[10]

(2) *khòòj5* *niØ* . . . *pên3* *[luuk4* *phòò1]*—
1SG TPC.PCL be child father
"I'm the [child (of my) father]—"

(3) *laØ* *phòò1* *phen1* *mii2* *[qaaj4]*—
PCL father 3SG have eB
"and (my) father has an [older brother]—"

(4) *phòò1* *hanØ* *mii2* *qaaj4* *lèkaØ*
father TPC.PCL have eB PCL
mii2 *[luuk4]* *qiik5*
have child more
"(my) father has an older brother and (he) has a [child] too."

The speaker has constructed a mid-air diagram of the form of figure 5. This spatially structured virtual diagram remains available as a target for pointing gestures in the next part of the speaker's explanation. She says, "We have to refer to his child as ['older aunt'], and she has to call us ['younger aunt']."

9. Speakers are not in complete agreement here. Some say that the official description of FyBD is *laan3* 'nibling'.
10. The illustrations are captured from digital video recordings. Most cases show a gesture at the peak or apex of its *stroke* phase (Kendon 1972, McNeill 1992), the point of greatest articulatory effort and the one at which the focal meaning of the gesture is most clearly expressed. In the linguistic examples, the stretch of speech with which the pictured gesture coincides is in square brackets.

FIG. 2. *"I'm the [child (of my) father]—."*

FIG. 3. *"and (my) father has an [older brother]—."*

FIG. 4. *"(my) father has an older brother and (he) has a [child] too."*

This segment illustrates a number of important features of the spontaneous diagrammatic use of co-speech gesture for depicting kinship. The speaker frames her explanation in terms of four individuals: herself, her father, her father's brother, and her cousin (the target referent). Her purpose in mentioning her father and uncle is to reach the cousin in a linear stepwise series of relationships. She uses pointing gestures to assign the individual referents to distinct "chunks of space" (Enfield 2003), and these spatially anchored reference points remain in place as if drawn on a board. Unlike the speech produced with it, the gesture diagram is multidimensional. The representational nodes are established in linear fashion, but once in place each maintains an intrinsic and direct locational relation to every other node. Because they are not literally drawn anywhere, to persist as they do they must be mentally represented by the participants in a stable way. As long as the explanation at hand remains the focus of attention in the discourse, the diagram does not evaporate. Eventually, when it is no longer needed, it is erased in the progression to something new. But while not permanent like a printed diagram, this temporary persistence makes the gestured diagram more than evanescent.

The diagrammatic properties displayed in this example reveal aspects of structure in one fragment of the kinship network which are not available in the linguistic commentary.[11] The two siblings in the structure are both depicted spatially as *higher* than the speaker while being equal in height with respect to each other. They are in addition laterally distinguished, one on the left, one on the right. The father-daughter relation between father's brother and father's brother's daughter is represented as directly vertical, with daughter below.

EXAMPLE 2: EXPLAINING THE TERM *LAAN3*

The term *laan3* provides a representational challenge for the speaker trying to explain its meaning in the abstract. As described above (table 4), the category of *laan3* merges not only lineal and collateral kin but also individuals of three different generations (G^0, G^{-1}, G^{-2}). The extensional range of *laan3* in a traditional scientific kinship diagram is a diagonal line, extending laterally to capture both lineal and collateral relations and vertically to capture multiple generations. How are such skewed categories thought of by speakers? In the type of explanatory discourse elicited in this study, speakers do not represent such categories as diagrammatically unitary. When calculating series of relations, speakers follow a linear stepwise path of kin relations as in the previous example and

FIG. 5. *Diagram of speaker's relation with her father's elder brother's daughter.*

enumerate possible referents of a given term.[12] Figure 6 shows a fragment of a kinship network, with arrows leading from an individual to those whom he may refer to as *laan3*.

I have elsewhere (2003) described in detail how one speaker explicates the information depicted in figure 6 using composite signals of hand gestures and speech.[13] To make reference to the set of relationships depicted by dotted-line arrows in figure 6 the speaker first sets up a kind of diagram with multiple referential "nodes" at which he can direct gaze and finger-pointing gestures. The first sequence in this video-recorded segment involves the use of pointing gestures to set up a virtual diagram which is as if suspended in mid-air (fig. 7).

Consider the semiotics of how the non-spatial relations of abstract kinship are mapped in this example onto spatial relations in a publicly shared diagrammatic sketch pad: The diagram depicted graphically in figure 7 has a number of spatial properties. First, descent leading from the speaker to his child and to his child's child is mapped onto a straight line beginning at the speaker's body and proceeding outwards on a sagittal (away-going) axis (although shifted across to the right half—from the speaker's point of view—of the gesture space projected by the speaker's body). As in the previous example, filiation is mapped onto a non-lateral axis, although this time sagittal rather than vertical. Two lines of descent are presented side-by-side as parallel lines running forward on a sagittal plane, symmetrically occupying left and right halves of the speaker's projected gesture space.

11. By this I do not mean that these aspects of structure cannot be expressed in the language at all. I mean that in this case they are not expressed in speech and are retrievable only from the gesturally expressed information.

12. This could be taken to mean that terms with skewed reference such as *laan3* are not thought of by speakers as denoting a unitary extension and that the class is instead thought of as defined by the set of different types of individuals in it. At the same time, it may be the nature of the discourse genre reported on here that elicits this kind of representation.

13. Illustrations in this example and the following three examples also appear in Enfield (2003). That article concentrates on description of technical properties of the performance of diagrammatic gesture sequences rather than on the iconic and indexical properties of the diagrams themselves.

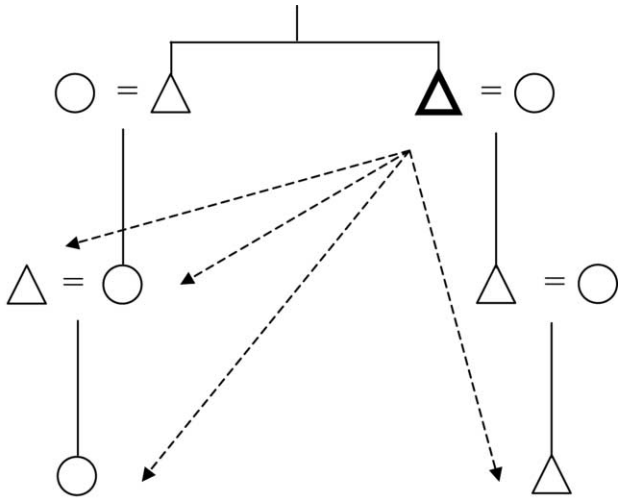


FIG. 6. *Partial extension of the Lao term* laan3, *indicated by arrows.*

As in example 1, this symmetrical use of left and right space is appropriate for representation of two comparable but contrasting entities. It is not that the two must be represented in this way, but for purposes of what is being said about them at this point in the discourse they are being lined up side-by-side. Here, two brothers are placed symmetrically on a lateral axis (just like the father and uncle pair in the previous example), and the collateral lines of descent are correspondingly symmetrical. Thus, the spatial properties of this spontaneous representation directly preserve certain logical properties of the set of relationships being described. These spatially represented properties are not directly represented in the accompanying verbal message and are not available in this case without access to the manual/visuospatial channel. Here we see hand gestures doing for us what Conklin's ethnogenealogical diagram (fig. 1) may have done for him.

Once this diagram is set up, it has some degree of persistence (despite its lacking real visibility) and is used like a drawing on a board. The speaker is able to use deictic gestures (pointing) to link the diagram with the verbal exposition. In the following example, the speaker states that he describes his brother's son as *laan3* (the brother's name is Naak).

(5) *khòòj5* *hòòng4* *[luuk4]* *qajØ-naak4* *kaØ*
1SG call child eB-N. FOC.PCL
ñang2 *pên3* *laan3* *juu2*
still be *laan3* PCL
"I still call Naak's [children] *laan3,* nevertheless."

Next, the speaker states that his own child is described by his brother as *laan3* also.

(6) *qajØ-naak4* *hòòng4* *[luuk4* *khòòj5]* *kaØ*
eB-N. call child 1SG PCL
pên3 *laan3* *khúú2* *kan3*
be *laan3* like RCP
"(and) Naak calls [my children] *laan3,* too."

Despite being literally invisible, the diagrammatic structure established in this sequence (depicted graphically in fig. 7) functions like a real diagram, an artifact in the perceptual common ground. It enables sustained reference to multiple individuals during a stretch of talk, functioning as an external working memory. The structure provides targets for pointing gestures which pick out individuals in the network. As noted above, the term *laan3* (child's child, sibling's child, parent's younger sibling's child) poses significant referential complexities, requiring the speaker to link two individuals by five relationships with four intervening individuals (fig. 7). With the representational aid of co-speech gestures, gaze, and other mechanisms of non-verbal behavior, this speaker manages well.

EXAMPLE 3: MARRIAGE BETWEEN FIRST COUSINS VERSUS BETWEEN SECOND COUSINS

The next segment continues directly from the previous one, with the speaker moving on to a new sub-topic in the discourse. Once the diagram in figure 7 is established in collectively accessible space and, indeed, in the collective discourse record, the speaker is able to exploit it in making further comments about kinship relations between the individuals depicted. He now wants to say that second cousins may marry as long as the male of the pair is descended from the *older* of the two sibling ancestors. The male second cousin should be descended from the "higher" side if the two are to marry (regardless of the relative age of the pair to marry). The parents will be first cousins, such that the girl's parent classifies the

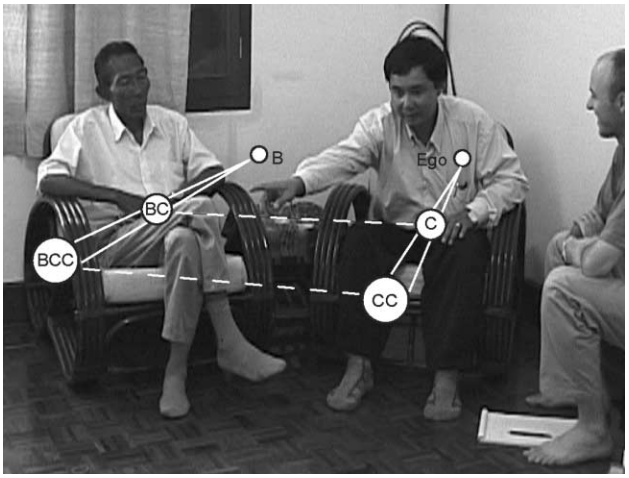


FIG. 7. *Diagram in place for pointing in exposition (Enfield 2003).*

boy's parent as *luung2* 'older uncle' or *paa4* 'older aunt' (because of the girl's parent's parent's being younger than boy's parent's parent). In the following example, the speaker states that his own grandchild can marry his brother's grandchild (the two being second cousins), since they are sufficiently "far apart." He points to the distant nodes which stand for the second-cousin pair (BCC and CC in figure 7), saying, "(They) get married, those ones—being yonder, they can marry, since it's far." Next, the speaker refers to the "closer" pair, that is, the first-cousin pair, his own child and the child of his brother. As he does so, he draws his arms in closer to himself and gestures as if pinching the two nodes for the first generation below (BC and C in fig. 7), saying, "If they're close together, like so, they're not allowed to marry."

This example provides important support for the contention that gesture-generated diagrams are cognitive artifacts. The key observation here is that interpretation of the indexical expressions "those ones" and "like so" would be impossible without access to the spatial diagram and the referential value of each of its nodes. The speaker's utterance design accords critical responsibility to the virtual diagram for correct interpretation of the linguistic component. As the speaker refers verbally to "those ones," he points to pieces of space which, while having been accorded reference earlier, were, just prior to the relevant moment, literally empty. The speaker makes no check for comprehension of this reference and shows no evidence that he expects any problem in understanding. He is treating the (in fact invisible) diagram as an unproblematic source of information to his addressees. This indicates that he assumes that his addressees are cognitively maintaining the diagram through time, across segments in which there is no pointer to the space, no physical realization of a referent in that space, and no referring speech. The same is true in example 2; the speaker points to something which at the preceding moment had no corporeal form, no pointer oriented to it, and no verbal reference. That this passes without comment indicates that the virtual diagram, as a cognitive artifact required for the representational and interpretive task at hand, is assumed by participants to be being collectively entertained.

EXAMPLE 4: ONE DESCENDING GENERATION ON A VERTICAL LINE

In the data set from which the present examples are drawn, Lao-speakers are never observed to map a relation of filiation onto the lateral axis when using gesture for spatial representation. In examples 2 and 3, the speaker uses the sagittal axis as a line of descent, mapping the parent-child-grandchild line onto a vector going forward from the center of the body. In the following segment, filiation is similarly mapped onto a non-lateral axis but this time on a vertical line (cf. example 1).

The speaker begins an explanation of sibling terms. He will eventually concentrate on the kin terms used between four brothers, but first he establishes the relation

FIG. 8. *Speaker points (and gazes) as he refers to "father."*

FIG. 9. *Speaker points as he refers to "first son of father."*

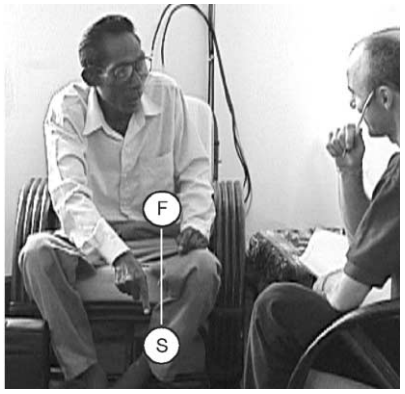


FIG. 10. *Relation of filiation represented on a vertical line in gesture space.*

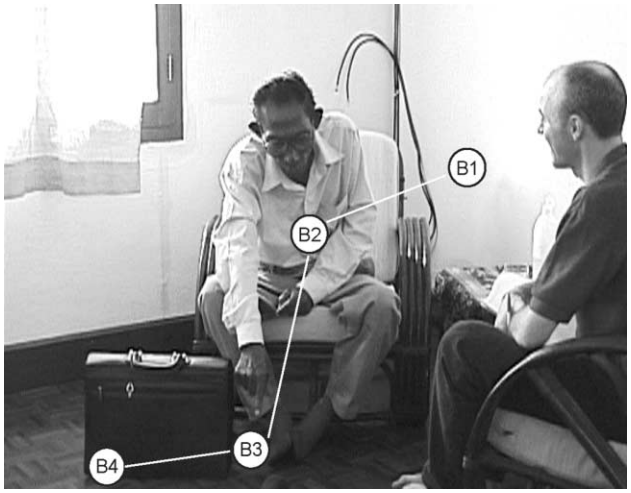


FIG. 11. *Relation between four brothers represented on a diagonal line in gesture space.*

of the father to the first son, the speaker's own older brother (see Enfield 2003 for detailed description of the entire sequence). We begin here at a point where the speaker has introduced his own father as a discourse topic. Figure 8 shows the speaker representing his father (as he mentions him in speech) by finger-pointing to a space at belly height, directly in front of his body. Having introduced his father into the discourse and established a point in space to refer to him, the speaker then refers to the father's first son (i.e., the speaker's own older brother), pointing to a space vertically beneath the point on which he had mapped the father. He says, "This one here (i.e., the father [cf. fig. 8])—is the one who brings about the creation—is the one who brings about the creation (of) the—this [*qaaj4*] (the oldest brother)."

It would not be possible to resolve reference of the indexical "this one here" (*phuu5 nii4 nii4*) without reference to a conceptual representation of the gesture-generated virtual diagram. That neither speaker nor addressee shows any evidence of a real or expected problem indicates that the diagram is being cognitively attended to for both utterance production and comprehension and the joint attention that unite these. Figures 8 and 9 show the relation of filiation represented on a vertical line, depicted graphically as in figure 10. And again, certain information about the structural properties of kinship relations is depicted in the spatial construction of the hand gesture sequence and not in the accompanying talk (e.g., the relation of vertical placement of father over son is not encoded in speech; see below for further discussion).

EXAMPLE 5: SIBLING RELATIONS: FOUR BROTHERS ON A DIAGONAL LINE

Lao kinship terminology represents kinship relations as inherently hierarchical, based on sibling birth order. Unsurprisingly, Lao-speakers in these interviews employ differences in height in spatially representing sibling relations. Figure 11 depicts a virtual diagram illustrating four brothers, of whom the speaker is second-oldest (Enfield 2003:32). The speaker uses nodes of the diagram as targets for pointing gestures while referring to the individuals who are mapped onto those locations. As in the previous example, these pointing gestures are distributed over time, with nodes on the virtual diagram being temporarily left unattended and the speaker apparently assuming no problem in their interpretation. The speaker differentiates visually between siblings by combining lateral and vertical dimensions in space. The result is a diagonal line. The vertical dimension represents relative age (i.e., the older individual is higher), and the spacing of siblings along the lateral dimension represents their "side-by-side" status as heads of new collateral lines of descent (see discussion of examples 1–3). The conceptual relations manifest as a diagonal axis are directly represented in the spatial structure of the hand gesture diagram and are not directly available in the coded linguistic structure supplied.

EXAMPLE 6: SIBLING EXCHANGE AND RELATIVE "HEIGHT," 1

A constraint on sibling exchange described by Lao-speakers can be explained with reference to the diagram of figure 12. A woman's sibling may marry her husband's sibling only if they are both older siblings or both younger siblings of the woman and her husband, respectively (regardless of the relative ages of the pair to wed). In figure 12, the permitted marriages are 1 = 4 and 3 = 6. In the following excerpt, the speaker uses co-speech gesture to accompany his spoken explanation of the principle depicted. He says that older siblings of a husband and wife can marry, since they are both on the same side of (i.e., above versus below) the line defined by sibling birth order:

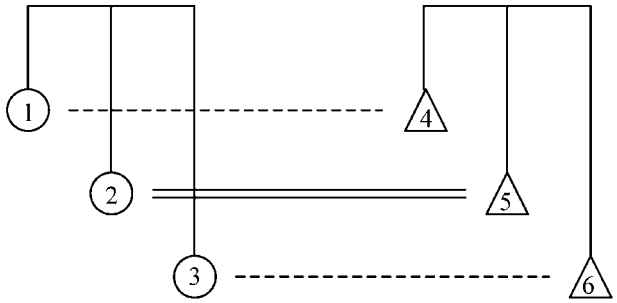


FIG. 12. *Some possible sibling exchanges among Lao-speakers (*dotted lines*); it is permitted for two older or two younger siblings of a married couple to wed.*

(7) *[phen1 pên3 qùaj4 — pên3 qaaj4*
3 POL be eZ be eB
khòòng3 phuak4 haw2 laØ
of group 1PL PCL
mèèn1 qaw3 daj4]
be marry can
"They are older sister—(and) are older brother of us, and so they can get married."

Figure 13 shows the speaker using an accompanying gesture in which height is employed to represent the status of the two siblings as "above" the level of the speaker and his wife (i.e., as older siblings or equivalent). Further, the equivalence in height of the two hands iconically portrays the equivalent status of the two siblings (as both at the same level). These notions can be taken as assertions about Lao kinship structure but are not encoded in the accompanying speech.

FIG. 13. *"They are older sister—(and) are older brother of us, and so they can get married."*

EXAMPLE 7: SIBLING EXCHANGE AND RELATIVE "HEIGHT," 2

Soon after the segment described in example 6, the same speaker elaborates on possible sibling exchange marriages, stating the two logical possibilities—two older siblings' marrying and two younger siblings' marrying:

(8) *khan2 vaa1 [ñaj1] kaØ ñaj1 bet2—*
if COMP big PCL big all
khan2 vaa1 [nòòj4] kaØ nòòj4 bet2
if COMP small PCL small all
"If (one is) big, (they should) both (be) big, if (one is) small, (they should) both (be) small."

Again, the speaker uses equivalence in height of the two hands to represent equivalence in "height" of the two suitors and also directly represents spatially the status of the pair as above or below the speaker himself (taking his upper chest as a reference center point). In addition, in this sequence the lateral dimension is also exploited. The high gesture in figure 14 is to the speaker's left; the low gesture in figure 15 is to the speaker's right. This use of laterality is a typical way of representing a contrast or comparison of two situations (see above). The information conveyed by this placement of referents on the left and right of gesture space is not provided in the concurrent speech.

FIG. 14. *"If (one is) big, (they should) both (be) big,"*

EXAMPLE 8: SIBLING EXCHANGE AND RELATIVE "HEIGHT," 3

We now turn to the proscribed sibling exchanges, in which "the line" is crossed (i.e., a person's younger sibling marries the older sibling of the person's spouse [cf. fig. 12]). The various rules outlined above may be consulted to elucidate the problem here (fig. 16). If 3 and 4 marry, 2 has a problem with respect to her relationship with 4. As husband of 2's younger sister, 4 would be 2's *naa2-baaw1* 'younger uncle', but as older brother of 2's husband, 4 would be 2's *luung2* 'older uncle' (see table

FIG. 15. *" if (one is) small, (they should) both (be) small."*

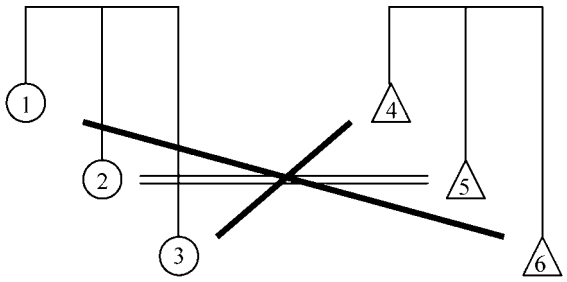


FIG. 16. *Constraints on sibling exchange among Lao-speakers; it is not permitted for an older and a younger sibling of a married couple to wed. The proscribed marriages are indicated by bold lines.*

6). The next data excerpt focuses on a specific instance of the type of problem illustrated in figure 16, namely, a man's younger brother's marrying the man's wife's older sister (fig. 17). The speaker begins with a reference to his own wife, finger-pointing to the front as he refers to her in his speech (fig. 18), and then refers to her sister, his own sister-in-law, raising his index finger (fig. 19) and locating her at a point higher in space than her sister (his wife):[14]

(9) *tèè1* *vaa1* *[—]* *phuu5*
but COMP person
qanØ — *mia2* *[khòòng3*
HES.PCL wife of
khòòj5] *hanØ* *laØ* *laaw2*
1SG TPC.PCL PCL 3SG
mii2 *qúaj4* — *nòq1*
have eZ PCL
"But—the one who is—my wife, she has an older sister—right?"

He now refers to his own younger brother, whom he locates in space at a point *lower* than the level of himself and his wife, pointing down close to his side (fig. 20):

(10) *tèè1* *vaa1* *[khòòj5]* *phat1* *mii2* *nòòng4*
but COMP 1SG PCL have yG
"But [I] have a younger sibling—"

Now entertaining the idea of his younger brother's marrying his wife's older sister, the speaker once again refers to the wife's older sister. In doing so, he finger-points (fig. 21) to the already established point on his hovering virtual diagram, to the front and higher in space than the point reserved for his wife:

(11) *siØ* *paj3* *[qaw3]* *hanØ* *naØ* — *bòØ* *daj4*
IRR go marry PCL PCL NEG can
"(for him) to marry (her) —is not possible."

The speaker refers by finger-pointing to a referent which is not mentioned in the accompanying speech and not visible. The gesture in figure 21 is directed toward the same point in space as that in figure 19. There has been a break between these two moments during which no reference, verbal or gestural, was made to the relevant point in space (fig. 20). In figure 21, the speaker points to the temporarily unattended node without showing any sign of expecting trouble in interpretation, and no such trouble arises. The information in the gesture is not only *for* the addressee but is being treated by the speaker as *usable by* the addressee.

The speaker elaborates further, now clarifying that if his younger brother were to marry any sister of his wife, it would have to be the younger sister (cf. fig. 12). He first points to the younger brother, established in figure 20 and being returned to now (fig. 22). In first mentioning the wife's younger sister, he makes a new pointing gesture (accompanied by gaze [fig. 23]), not just pointing to but *creating* the diagrammatic node corresponding to the wife's younger sister:[15]

(12) *khan2* *[nòòng4* *khoòng3* *khòòj5]*
if yG of 1SG
siØ *[qaw3* *nòòng4]*
IRR marry yG
khòòng3 *mia2* *hanØ. . .* *daj4*
of wife TPC.PCL can
"If my younger sibling would marry the younger sibling of my wife . . . (that's) possible."

The diagram this speaker has now produced can be made explicit as in figure 24.

The semiotic use of space in this sequence is rich, achieved not only by hand movements but also by gaze. Height is again used to represent status as to individuals' being above or below the line established by sibling birth order. This and other spatial features of the display are not encoded in the speaker's verbal descriptions. The speaker neither expects nor creates problems of interpretation in gesturally referring to referential points in space which have been temporarily left empty.

14. This is a clear example of gesture's running well ahead of speech in time of production (McNeill 1992:25). The pointing gesture referring to the wife's older sister comes well before its lexical affiliate *qùaj4 'older sister'*.

15. Such "creating" gestures are described as "baptismal" by Haviland (2000:20).

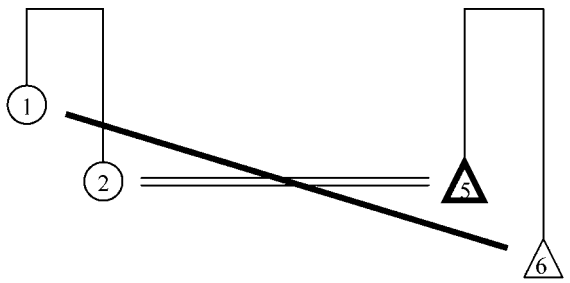


FIG. 17. *Example of non-permitted marriage: younger brother = wife's elder sister. Speaker takes the perspective of 5.*

FIG. 18. *"But—the one who is—my wife,"*

FIG. 19. *"she has an older sister—right?"*

FIG. 20. *"But [I] have a younger sibling—."*

FIG. 21. *"(for him) to marry (her)—is not possible."*

FIG. 22. *"If my younger sibling"*

FIG. 23. *"would marry the younger sibling of my wife . . . (that's) possible."*

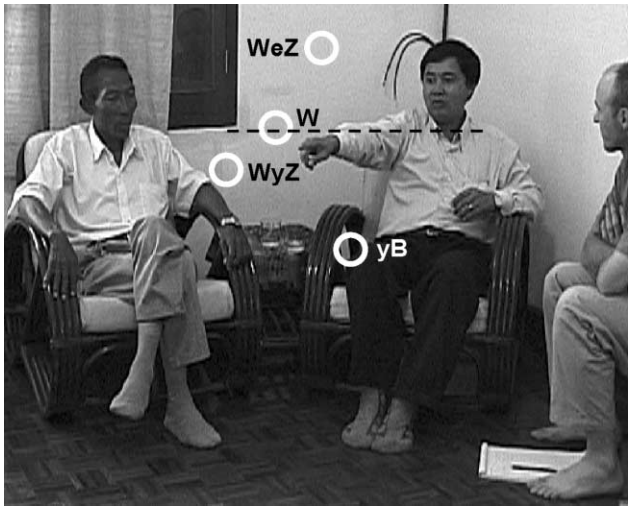


FIG. 24. *Proscribed marriage between wife's elder sister and younger brother would cross "the line" implicit in the gesture diagram (represented explicitly here as a dotted horizontal line). Permissible marriage between wife's younger sister and younger brother does not.*

EXAMPLE 9: SIBLING EXCHANGE AND RELATIVE "HEIGHT," 4

In a further example, a different speaker is discussing a situation similar to that in figure 17, depicted as in figure 25. Here, the speaker (taking the perspective of 5) is talking about the hypothetical possibility of his wife's older brother (1)'s marrying his younger sister (6). He begins with pronominal reference to his wife's older brother (using the polite third person singular form *phen1*), accompanying the speech with a pointing gesture high and far to his right (fig. 26).

(13) *phen1* *pên3* *sùa4* *[suung3]*
3POL be bloodline high
haw2 *kheej2* *phen1* *hòòng4* *naØ-baaw1*
3PL EXP 3POL call MyB
"They are of a high bloodline; we're accustomed to their calling us 'younger uncle.'"

Then, he refers to his younger sister, tapping on the floor, low and far to his left (fig. 27):

(14) *laØ* *phen1* *maa2* *qaw3*
PCL 3POL come marry
kap2 *phuu5* *[tamØ-tam1]*
with person low-RDP
phuak4 *haw2* *niØ*
group 1PL PCL
"And then they come and marry 'us' low ones here."

In this sequence we again see height of hand gestures (in relation to the speaker's torso level) being employed to indicate position of kin as above or below the line established by sibling birth order. In this case, "height" is encoded in the speech, but the separation of the two related individuals on a lateral axis is not.

EXAMPLE 10: SIBLING EXCHANGE AND RELATIVE "HEIGHT," 5

A final excerpt on sibling exchange illustrates a striking use of the hands in a speech-gesture composite signal. After having explained the problem of marriages such as that depicted in figure 17, the speaker wants to articulate further the nature of the problem. He used the word *khuaj3* 'crossed' to describe his assessment of the proscribed sibling exchange, while exploring this notion manually, circling one hand around the other, as if searching for the right representation.

(15) *man2-* *man2* *[khuaj3]* *[kan3]* —
3SG 3SG crossed RCP
"It's—it's crossed together—".

He concludes as follows, settling on the striking posture depicted in figure 28, vividly evoking the idea of the illicit couple's having "crossed the line."

(16) *[man2* *siØ]* *pên3* — *khuaj3* *bèèp5* *sii4*
3SG IRR be crossed like thus
"It would be—crossed like this."

Representational and Conceptual Properties of Gesture Diagrams

Communicating is one of the fundamental cognitive and practical tasks human beings face. In the absence of telepathy, communicating an idea to another person involves both internal (cognitive) and external (perceptible) processes. In order to make our inner states known, we must produce external representations which are perceptually available to others (Miller 1951:3). And in order to know the inner states of others, we must perceptually access external representations and transform them into corresponding internal representations (Reddy 1979, Hutchins and Hazlehurst 1995). These processes of con-

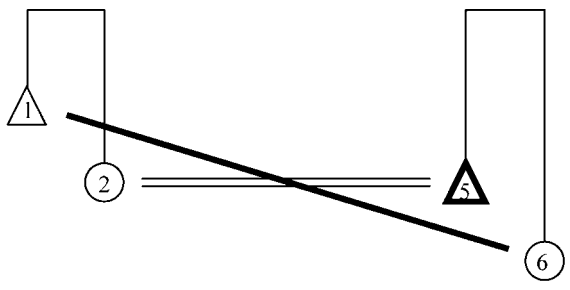


FIG. 25. *Example of non-permitted marriage: younger sister = wife's elder brother. Speaker takes the perspective of 5.*

FIG. 26. *"They are of a high bloodline; we're accustomed to their calling us 'younger uncle.' "*

ceptualization, articulation, perception, and comprehension are tightly intertwined in the "interactional achievements" of discourse (Schegloff 1982, Goodwin 2000*a*). Bodily movements and specifically co-speech hand gestures are resources for solving these conceptual problems of both production and comprehension in communicating complex ideas. External representations feature not just in the range of cognitive and practical tasks (Goody 1977, Larkin and Simon 1987, Button 1990, Norman 1991, Zhang 1997, Heath and Luff 2000, Roth 2000, Roth and Lawless 2002*a*) but also in the "technology of conversation" (Sacks 1984:413). In the Lao kinship examples, speakers not only choose to accompany their speech with visual representations but also choose, with some consistency, specific *forms* of visual representation. What are the implications of these representational choices?

The same piece of information may be externally rep-

FIG. 27. *"And then they come and marry 'us' low ones here."*

FIG. 28. *"It would be—crossed like this."*

resented in different forms, and the given form of an external representation can have a significant effect on how it is perceived and, in turn, on how the information it conveys is cognitively processed. A number of taxonomies of types of representation have been proposed (cf., e.g., Kosslyn 1978, Palmer 1978, Larkin and Simon 1987). Examining types of "paper-and-pencil" external representations, Larkin and Simon (1987) distinguish between *sentential* and *diagrammatic* modes. Sentential representations are data structures "in which elements appear in a single sequence" (p. 68). These sequences are either natural-language sentences or formal translations of them. Diagrammatic representations, by contrast, convey information via data structures "in which information is indexed by two-dimensional location." Pieces of information are given specific spatial locations with respect to each other and can be searched via the "computationally easy process" of change of attention to adjacent locations, that is, by direct visual inspection (p. 80; cf. Goody 1977:134; Harris 1986:139). Spoken and visual representations have significantly different affordances for fundamental problem-solving cognitive operations such as search, recognition, and inference (Larkin and Simon 1987:69; cf. Glenberg and Langston 1992, Zhang 1997). Visual representations have a number of cognitive advantages.

The "external memory" function of diagrams arising from simultaneous perceptual availability of multiple items of information can be considerably enhanced if the mapping between a form of representation and its value is a *natural* one. The naturalness of a mapping is related to its "directness," which in turn "can be measured by the complexity of the relationship between representation

and value, measured by the length of the description of that mapping" (Norman 1991:28; cf. also Palmer 1978: 270–71). *Intrinsic representations* (Palmer 1978) are natural ones, allowing representational relations to be "efficiently read off from the display" without the need for them to be "inferred from symbolic descriptions and coordinates" (Oestermeier and Hesse 2000:93; cf. Norman 1991:30–31). What types of information are intrinsic to the diagrammatic hand gesture sequences described above? Three representational properties of gesture sequences are of special importance for understanding the nature of hand gestures and other bodily movements in their role as cognitive artifacts: virtual reality, temporal structure, and a bodily origo for three-dimensional spatialization.

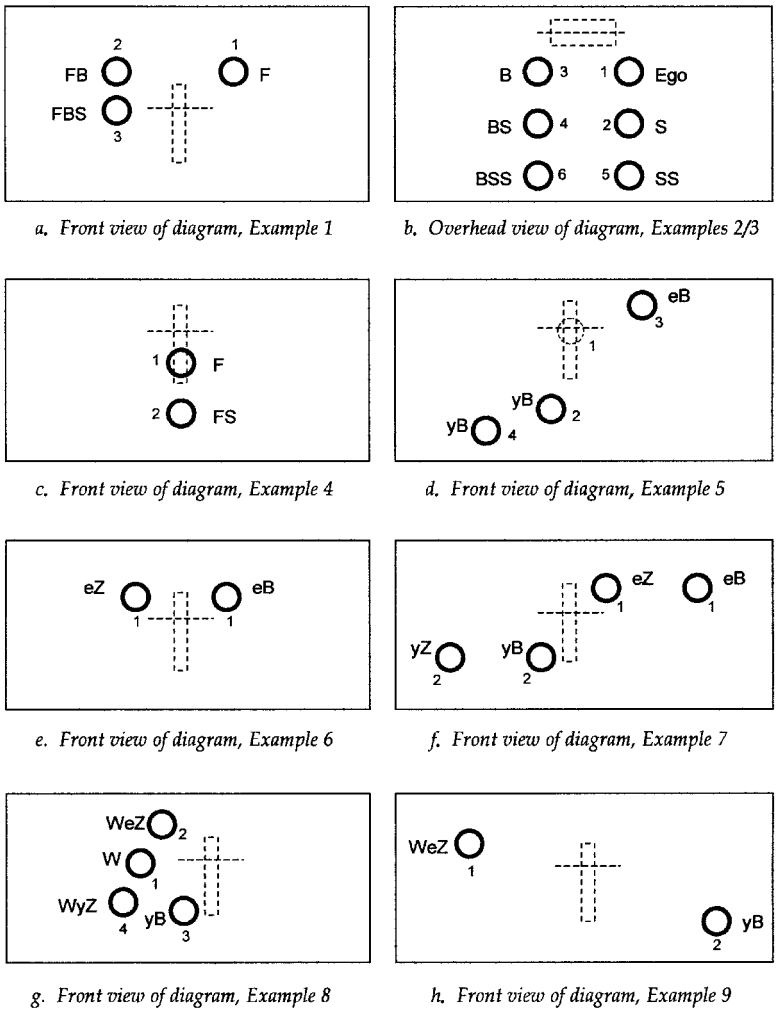
Hand gesture sequences have an extraordinary ability to give rise to "virtual" structures. The illustrations in figure 29 do not depict the gestures themselves; they represent what the speakers may be conceived to have *pointed to* in the sequences described. The gestures themselves are analogous not to the weather map but to the stick which indexically *connects* the weather reporter's map with his symbolic (linguistic) commentary. And, most of the time, the initial setting up of the gesture diagram is performed by "baptismally" pointing as if the referent were already there (Haviland 2000). A weather map is a persistent physical object, while gesture diagrams are transient and virtual. In the contexts in which they occur they are almost entirely imagined. Nevertheless, hand gestures have the properties of cognitive artifacts. They are "designed to maintain, display, or operate upon information in order to serve a representational function" (Norman 1991:17). But the diagrams they create are cognitive artifacts of a special type, context-bound and interactionally achieved. The gesture diagrams depicting Lao kinship arise from ordinary speakers' resourceful attempts to articulate abstract and complex sets of relations. With speech as an attentional and symbolic anchor, these speakers introduce visually signifying material into the environment of their interlocutors, a prime position for entry of information into the conceptual common ground (Clark 1996). The result is the maintenance of virtual diagrams in the collaborative and co-present imagination, grounded by passing indications in the common perceptual field.

Zhang (1997) defines external representations as "the shapes and positions of the symbols, the spatial relations of partial products, etc., *which can be perceptually inspected from the environment*" (p. 180, emphasis added). Where in the environment is the gesturer's diagram? With the assistance of hand gestures and gaze, speakers bestow representational values on transparent chunks of space (Liddell 1995, 2000, 2003; Enfield 2003, 2004*c*). Those collectively imagined chunks maintain their absolute positions, creating an impression of a cohesive spatial structure *as if* actually present and perceptually available. Like enduring structures such as printed diagrams, gesture diagrams are externally anchored and simultaneously available to more than one (perceiving, thinking) person, thereby enabling distributed representation (Norman 1991, Hutchins 1995). This kind of simultaneity and reciprocity of production and comprehension is the essence of distributed cognition in everyday interaction (Goodwin 2000*a*).

In the Lao kinship examples, referential values are mapped onto spatial locations without being continuously available for perceptual inspection. On repeated occasions, speakers leave points and later go back to them, yet show no evidence that they expect trouble in interlocutors' understanding due to the momentary lack of physical form accorded to that element in the structure. They apparently presume that the diagram is being maintained in their interlocutors' imagination. While a conceptual mapping between signifiers and signifieds is generously supported by having the relevant signifying material simultaneously available in perception, the gesture examples show that this persistent artifactual material is in fact not even necessary. This is of some consequence for those who have insisted on the direct perceptual effects of external representations.

A second intrinsic representational property of gesture sequences is the inescapable temporality of their production and comprehension (Goodwin 2002). While drawn or printed diagrams are often accessed at a time and place other than the time and place they are produced, gestures seldom have context-free form (but cf. their portrayal in art and in scientific work such as this). While the information in a drawn or printed diagram can be scanned in any order (despite certain orders suggested by symbols such as arrows) and indeed can be perceived all at once, a sequence of gestures is perceived as a series of movements supplied in the order of their production through time. (Figure 29 specifies the order of appearance of each node on each diagram.) Gesture, like language, is forced to linearize when it reaches its representational limits (Enfield 2004*c*).

What is the function of a speaker's choice of relative ordering in the supply of information? First, as for speech, temporal succession in the delivery of informational chunks affords (indeed forces) asymmetries in the global structuring of information in discourse. What comes first can be assumed to be conceptually active for some period while new pieces of information are added to the discourse record (Chafe 1994). A speaker's decision to express p before q may be due to his or her foreseeing that p is a prerequisite for comprehending q. This principle is likely to have applied in a number of the above examples (e.g., example 1, fig. 29, *a*). Alternatively, a speaker's decision to express p before q may simply be a reflection of his or her having thought of p first. As Efron puts it, one function of co-speech gesture is to provide a "chart" of the course of talk, "outlining the logical itineraries of the corresponding ideational processes" (1972 [1941]:122). In a detailed study of the sequences summarized above as examples 2 and 3 (Enfield 2003), I describe speakers' encounters with technical problems in representation arising from their having not foreseen the need to incorporate certain features into the diagram at a stage when its general structure had already been established. Speakers employ systematic mechanisms for editing gesture diagrams during the



a. Front view of diagram, Example 1

b. Overhead view of diagram, Examples 2/3

c. Front view of diagram, Example 4

d. Front view of diagram, Example 5

e. Front view of diagram, Example 6

f. Front view of diagram, Example 7

g. Front view of diagram, Example 8

h. Front view of diagram, Example 9

FIG. 29. *Abstract representations derived from hand gesture diagrams described in examples 1–9. The dotted-line figure represents the torso of the speaker (with line crossing at upper chest height); circles represent chunks assigned reference to individuals in the discourse. Numerals represent the order of appearance of nodes in the series of gestures.*

course of production. A second function of choices in ordering the supply of information in gesture sequences is (again) also observed in speech. The temporal order of *expression* of events may directly correspond to the temporal order of the *occurrence* of those events (Haiman 1985). In figure 29, *c* (example 4), for example, the speaker introduces higher generation before lower, directly representing their order of appearance in the world. The order of introduction of individuals in figure 29, *a* (example 1), in contrast, appears to reflect the speaker's path of calculation, linearly from A (self) to B (A's father), then to C (B's brother), then to D (C's child).

A third intrinsic representational property of hand gesture sequences arises from the status of the human body as a visual and proprioceptive center for anchoring meaningful oppositions. Our expressive signs, whether performed by voice or by arms and hands, are projected from a spatiotemporal origo (Bühler 1982 [1934], Hanks 1990), a deictic zero for the I/here/now, and a grid center for spatial oppositions including high/low, left/right, and forward/back. This perspective affords an analysis of the semiotic mappings illustrated in figure 29. For example, speakers consistently use height not only to mark relations between different nodes on their diagrams but also to mark relations between those nodes and the speakers themselves. Apart from 29, *b*, all the examples feature the use of height to distinguish older individuals from younger individuals. None of the linguistic items which express these kin relations make explicit reference to height (although height is sometimes referred to in accompanying speech; cf. examples 13 and 14). In figure 29, *b*, the relation of relative age is mapped onto distance away from the speaker. When two individuals are of the same age-rank for the purpose of what is being said, this is conspicuously

represented by mapping them onto points at identical height. This is illustrated in figure 29, *a* (FB and F), *e* (eZ and eB), and *f* (the pair eZ and eB and the pair yZ and yB).

Now consider the use of laterality: In figure 29, *a*, the speaker places two siblings—her own father (F) and his brother (FB)—in symmetrically opposed positions on each side of her body. The lateral axis is used in this case to situate two entities which are of the same kind but in some relevant sense different, just as we might make a two-handed laterally symmetrical gesture to express a "paradigmatic contrast" (Kita, Danziger, and Stolz 2001: 131–34), as if weighing up two comparable but distinct entities. Siblings are repeatedly distinguished by lateral opposition (figure 29, *a*, *b*, *d*), a strategy accentuated in figure 29, *b*, by the representation of lines of collateral descent running forward in parallel from their source in two siblings. And when direct filiation is represented, in none of the cases examined here is it depicted using a lateral opposition in space. In figure 29, *a* and *c*, the relation of direct descent in kinship is mapped onto a spatially vertical relation. In figure 29, *b*, it is mapped onto the sagittal axis. Perhaps the reason speakers avoid mapping filiation laterally is that, as noted already, a representation anchored in the lateral divide across the center of the body—an archetypal symmetrical object—would suggest some near-equivalence or comparability between the two referents which could be inappropriate in the context.

These three properties of gesture diagrams—virtual reality, temporal structure, and a bodily origo for three-dimensional spatialization—set them apart from garden-variety conceptual tools such as light switches, dashboards, and balance sheets. We now consider more directly their status as cognitive artifacts.

Gestures and Gesture Diagrams as Cognitive Artifacts

While research on cognitive artifacts acknowledges the role of the body in determining affordances of cultural and technological artifacts (e.g., door handles should be at about the right height to be comfortably reached by a lowered hand when standing [Norman 1988]), the idea of the body itself as a cognitive artifact has seldom been made explicit. Current research on gesture has proposed and established that speakers can use gesture to spatialize abstract concepts (e.g., McNeill 1992, 2000; McNeill, Cassell, and Levy 1993), to assign reference to seemingly empty space (e.g., McNeill, Cassell, and Levy 1993), and to express information not encoded in speech (e.g., Goldin-Meadow 1999, 2003). But the specific link to research on cognitive artifacts and, in particular, on the special semiotic affordances of gesture diagrams has been relatively unexplored (but see Emmorey 2001, Liddell 2003 on sign language, Roth 2000, Roth and Lawless 2002*a*, *b*, on gesture in educational contexts).

The connection is a fruitful one for a number of reasons. As traditionally described, cognitive artifacts not only assist in solving cognitive tasks but also change the nature of those tasks (Norman 1991). Visual representations in the task of communication (both for producers and for interpreters) are an important example. Scholars such as Goody (1977), Donald (1991), and Olson (1994) suggest that certain types of enduring external representation have historically transformed the way humans think. These developments did not simply involve writing down speech. They are claimed to have taken advantage of properties of the written medium which speech itself could never have afforded. But prior to the profound historical developments which writers such as Goody describe, language had already altered the way we think as a species (Noble and Davidson 1996, Deacon 1997). And further to this, we must be reminded that language is not speech alone (Kendon 1972, 1980; McNeill 1985, 1992; Engle 1998). Linguistic utterances routinely take semiotically composite form, combining speech with visible bodily behavior in holistic utterances. Human gesture is far from the primitive "call system" that some writers suggest (e.g., Burling 1993).

Evidence and arguments in support of the "cognitive artifact" claim for co-speech bodily actions in the Lao kinship interviews draw upon a number of sources. The three main lines of argument and evidence arise from (1) recipient orientation, (2) referential dependency, and (3) compositeness of signals.

Speakers' diagrammatic gesture sequences are studiously and deliberately *presented to* recipients. As Goodwin forcefully contends, "participants don't produce talk or build action into the air, but instead actively work to secure the orientation of a hearer . . . and design the current action and utterance in fine detail for the particularities of the current addressee" (2000*a*:1499; cf. Bavelas et al. 1992, Özyürek 2000). That speakers do this "extra semiotic work" to direct their representational bodily actions to addressee/recipients suggests that they assume their addressees' ability to interpret and make use of those particular actions for the at-hand task of interpretation. Gestures do more than simply make information *available to* onlookers, since speakers are visibly *working to make it available* by their efforts to orient to addressees (Goodwin 2000*a*). Speakers in the Lao kinship examples orient their bodies and their gestures to their interlocutors. They consistently place gestures in the ideal location for joint attention. Their deployment of gesture is closely coordinated temporally with associated expressions in the accompanying speech. They make extensive use of gaze both for directing attention to the representational structures being established and for checking receipt of the information so far supplied. There is evidence that speakers' gaze fixations on their own gestures play an important role in recipient uptake of gesturally expressed information. When a speaker looks at his or her own gestures, recipients are more likely to show evidence of having taken on board the information expressed in those gestures (Gullberg 2003).

Recipients can accordingly be observed on occasion to orient physically to the gestural contributions of speakers. The data discussed here do not yield clear examples

(mainly because I, the primary addressee, am dutifully inhibiting recipient behavior during the interviews). An illustration of the way in which multiple individuals can physically orient to a single gestural representation comes from an interview in which two speakers are describing different kinds of fish-trapping gear used in rural Laos (Enfield 2004*c*). The topic in the section of interest is the *lòòp4*, a horizontal cylinder trap (Claridge, Sorangkhoun, and Baird 1997:27). One way of using this trap is to set up a means of channeling flowing water into the trap's opening so that fish will go down into it and get stuck. The younger man on the right of the image in figure 30 is describing the placement of the channeling walls which serve this purpose:

(17) *pên3* *cang1* *sii4* *dêj2* *faa3-maaj3*
be like so PCL channeling-wall
"(They're) like this, the channeling walls."

The speaker has his arms and hands placed on the table in front of him as an explicit means of illustrating the concept he is trying to convey. His arms depict the channeling walls. His splayed hands represent the channel opening up again on the downstream side. As he talks, his gaze is fixed on the space between his arms, which corresponds to the spot where the *lòòp4* trap would be placed. He is making an indexical gesture with his gaze in the absence of a third hand.[16] While this "channeling walls" representation differs from the above kinship diagrams in directly depicting the shape and spatial layout of *concrete objects*, the two types of representation are the same in one important respect. Their interpretation involves sustained conceptual projection of structure onto an unstructured space. In figure 30, the speaker's arms are doing the representational work. The table provides a backdrop of empty space, but like the pieces of air in which the kin diagrams are inscribed, it inherits representational structure from the speech and gesture to which it is linked.

It is in this "empty space" that the *lòòp4* fish trap is placed. This remains implicit at the segment of discourse depicted in figure 30, since the current speaker has not yet explicitly mentioned the trap. The second speaker now chimes in and makes this point explicit, providing the "third arm" that the first speaker is lacking. The second speaker's left hand comes forward and taps the space on the table which the first speaker has assigned referential correspondence to the space in the water where the trap should go (fig. 31).

(18) *qaw3* *lòòp4* *saj1* *nii4*
take lòòp4 put here
"The *lòòp4 is put here.*"

This is a typical but nevertheless extraordinary case of distributed representation and, indeed, of distributed cognition. The two men collaborate in physically and

16. Here the speaker's most versatile representational resources, his two arms and hands, are tied up. Gaze becomes especially useful here (cf. Enfield 2001). See Enfield (2004*c*) for a description of further techniques for dealing with these representational limitations.

FIG. 30. *"(They're) like this, the channeling walls."*

cognitively orienting to as well as *constituting* the diagram as a unitary representation. The normal situation is for representation to be distributed across sub-systems *within* a single speaker's suite of available representational resources, including verbal and constructional linguistic categories, speech prosody, timing, and the myriad of visible signals including bodily orientation, gaze, and gestural tools for representing information. Distribution of information across these modes of representation lowers the overall load on any one of them (Goldin-Meadow 2003*a*). This becomes especially visible when constraints are imposed on one or other mode of representation. When others step in to compensate for those constraints, as in figure 31, both cognition and representation are distributed *across* individuals.

The phenomenon of distributed cognition is best known from cases in which the relevant representational constraints arise from the presence of a technology which operates on a larger scale than a single human

FIG. 31. *"The* lòòp4 *is put here."*

being can handle (Hutchins 1995, Goodwin 1996). Such constraints do, however, routinely occur at the smaller scale of face-to-face interaction. And when an individual's resources for representation are heavily constrained, the problem is naturally dealt with by distributing the component representational tasks across interlocutors. This is dramatically visible in Goodwin's research on day-to-day family interaction with Chil, a man with severe nonfluent aphasia (Goodwin 2000*b*, 2003; Goodwin, Goodwin, and Olsher 2002). Goodwin writes of Chil, "His gestures do not stand alone, but instead count as meaningful actions by functioning as components of a distributed process in which he creatively makes use of the language of others" (2000*b*:84). This is possible because of the public orientation to communicative bodily movements and their meanings. The example illustrated in figures 30 and 31 shows clearly the sense in which these diagrams are both made public and publicly made for the cognitive task of articulating something. This makes them cognitive artifacts to the extent that they provide the mediating artifactual structure that enables distributed cognition (Hutchins and Hazlehurst 1995).

A second main source of evidence that the communicative body is a cognitive artifact comes from cases in which speakers oblige addressees to rely on the virtual diagram for successful interpretation of the accompanying spoken utterance. This is most notable when the linguistic code features indexical expressions, which depend on something external to the expression itself for their interpretation. The simplest type of example is the use of the body as a measure. Figures 32 and 33 show a speaker drawing attention to a part of his body (with gaze fixed on the relevant part) to exemplify some analogue feature of what he is saying. The speaker is treating parts of his body like objects linked to speech by indexical signals. But in the kinship gesture diagrams, in contrast, the body is the *pointer*, not the thing *pointed at*. The structure of the target "object" itself is manifest in empty space. There are multiple cases in the Lao kinship examples in which speakers use indexical elements to refer to points in space whose reference had previously been established but which have been temporarily abandoned and unattended (e.g., examples 3 and 8). In these cases, there is no perceptual evidence available to participants of any link between signifier and signified. The only way to recover reference is to have maintained a conceptually accessible representation of the set of relations established in the (invisible!) diagram. That this is actually the case is supported by participants' apparent *assumption* that it is the case in certain sequences in which speakers oblige their recipients to make reference to the virtual diagrams for interpretation of their utterances. None of these speakers act as if they had any trouble or expected their addressees to have any trouble in keeping track of reference. This referential dependence on gesture diagrams reveals their role as cognitive artifacts—externally anchored representations which figure critically in the cognitive maintenance of and operation upon information.

FIG. 32. *Speaker (*center*) showing the size of a species of fish with indexical reference to his pinkie.*

A third basis for maintaining that the body is a cognitive artifact is an outcome of the contention that communicative bodily movements occur as elements of composite signals. Cognitive artifacts are devices which semiotically facilitate tasks including the solving of mathematics problems, the derivation of logical inferences, the opening of doors, the operation of video cassette recorders, and so on (Norman 1988). If, in the course of solving a problem, a person carries out some operations on perceptible structures and these operations are unequivocally part of the attempt to solve that problem, then those perceptible structures are cognitive artifacts—in Norman's terms, devices "designed to maintain, display, or operate upon information in order to serve a representational function." Speech is a cognitive artifact in this sense. Now, if speech occurs within composite utterances in which it supports gesture and is supported by it (Hutchins and Palen 1993:38), then gestures are cognitive artifacts for the same reason that speech

FIG. 33. *Speaker (*left*) showing the length of a species of fish indexically, with reference to a point along his left arm (as indicated by the right hand gesture).*

is. This does not mean that just any visually accessible bodily movement made during speech is a cognitive artifact. What counts is determined by people's "differential attention" to bodily movements with respect to their interpretation of the tasks a speaker is engaged in (Kendon 1978, Goodwin 1986). People are seldom in doubt as to whether a particular hand movement is intended to be part of an accompanying utterance (e.g., pointing or making an iconic gesture) or has nothing to do with it (e.g., scratching one's nose). I investigated this in follow-up interviews conducted in Laos in which I showed the kinship interviews to a number of Lao-speakers and discussed with them the gesture diagram sequences. Without exception, viewers identified the diagramming hand movements as being part of what the speaker was saying. A typical description of the gestures was *sanñaa2 bong1 bòòk5* 'informing signals'. One consultant explained that the speakers in these examples were "not just speaking with the mouth" (*bòò1 phiang2 tèè1 vaw4 kap2 paak5*). This is a crucial point. The speakers are mobilizing everything at their disposal in order to solve a cognitive and representational problem. They are working to make sure that their performance is attended to and understood by their addressees. And their bodily movements, specifically their hand movements, are recognized by viewers as *part of what they are saying*.

Both speech and hand gesture in these sequences are uncontroversially taken by observers to be part of the speakers' efforts to solve the problem of articulation-for-comprehension. This is the third sense in which hand gestures and communicative bodily movements more generally are cognitive artifacts: they are recognizably functioning as tools for expression of what a person is saying and are thereby, again, serving as externally anchored representations which figure critically in the cognitive maintenance of and operation upon information.

Representational Determinism

We currently lack much sense of the extent of cultural variation in spatial representation of abstract relations in kinship. Nor do we know much about culture-specific conventions of the use of hand gestures and other bodily movements in the spatial representation of abstract ideas (but cf. Efron 1972 [1941], Calbris 1990, Wilkins 1997, Kita, Danziger, and Stolz 2001, inter alia). There is much at stake if patterns turn out to be significantly different across ethnographic settings. Zhang (1997:213) proposes a *representational determinism* based on the observation that "different representations of a common abstract structure can cause dramatically different cognitive behaviors" (cf. Norman 1991:34; Wilkins 2002). Recent neo-Whorfian approaches to the language-cognition interface (Lucy 1992*a*; *b*; Gumperz and Levinson 1996; Lee 1996; Bowerman and Levinson 2001; Levinson 2003; Gentner and Goldin-Meadow 2003) suggest ways in which this broader notion of representational determinism (or *representational relativity principle*) could be rigorously investigated. Effects may be expected not only in the cognitive behavior of the person producing the representation but also in that of the person perceiving and interpreting it. In all but one of the different spatial mappings of sibling relations in the examples summarized in figure 29, for example, siblings are separated laterally. The exception is *g* (example 8), where the issue at hand is not collateral lineage or equivalent status of siblings but the relative age of the two siblings concerned (the speaker's wife and her sister). When relative age is the only thing that matters in a relationship being represented, it becomes possible to use height alone as a basis for differentiation in the spatial mapping. This difference in representation arises in the performance of a single speaker. What if distinctions like this were to define the habitual behavior of a whole cultural group? Kita, Danziger, and Stolz (2001) document a striking difference in the use of gesture space in a comparison of hand gesture in narrative by individuals from two Mayan cultures, Mopan in Belize and Yucatec in Mexico. They write: "For Yucatec Mayans, but not for Mopan Mayans, conceptually distinct entities can be located at different points along the projected lateral axis. Consequently, the 'shape' of abstract thought is different in the two cultures: time flows and a plot develops along different axes, and contrasted entities are localized differently" (p. 137). Such studies suggest directions for the empirical ethnography of gesture and its cognitive implications.

Conclusion

Bouquet (1996:62) asks about "the fate of the genealogical diagram" in kinship research. I have tried to sketch some issues that I think deserve to be on the agenda. The modern anthropological study of kinship is a pursuit of the "domesticated mind" (Goody 1977). A graphic representation like a scientific kinship diagram is a tool for thinking, "a facilitating device" (e.g., Goody 1977:109; cf. Norman 1991:17; Hutchins 1995; Clark 2002). So, too, are the wealth of other types of perceptually accessible representation, not all of which endure the way print does. I have investigated one genre of genealogical diagram which has no intrinsic or necessary relation to conventions of literate culture. It comes in the form of fleeting, evanescent sketches which speakers produce online using co-speech hand gestures. How much do we know about the visual representation of abstract kinship relationships in societies whose members are not (diagram-) literate? What is the cognitive status of the ethnogenealogical diagram?

For daily puzzles of expressing meaning, the body is an abacus, a sextant, a pencil and paper. Hand gestures and the human body more generally afford the special cognitive advantages claimed to inhere in the enduring visuospatial modalities of iconography, semasiography, and print. As Hutchins and Hazlehurst (1995:64) remind us, "no individual can influence the internal processing of another except by putting mediating artifactual structure in the environment of the other." The *requirement*

to externalize ideas may be what is behind our propensity to use space in thinking wherever we can (witness the ubiquity of spatial metaphor in language). Even without visual diagrams, we are still using "internal imaging processes" in order to access the inferential affordances of visuospatial representation (Larkin and Simon 1987:92). Larkin and Simon (p. 97) speculate "that mental images play a role in problem solving quite analogous to the role played by external diagrams (and that this role is also played in the two memories, internal and external, in concert)." Is the task of verbalization a matter of constructing a linear version of our two- and three-dimensional thoughts? Or, in producing gestures, are we transforming our one-dimensional thoughts by giving them visuospatial properties? Larkin and Simon (p. 72) describe what happens when they give their experimental subjects a complex physics problem. "Everyone we've observed reaches for pencil and paper, and draws a sketch of the situation." Ordinary people trying to communicate their thoughts do much the same thing, not reaching for pencil and paper but sketching with bare hands in mid-air. As Efron wrote in his classic work *Gesture, Race, and Culture,* gestural behavior during speech is "an intrinsic part of the thinking process" (1972 [1941]: 105). Gestures provide a primordial sketch pad for organizing thoughts and displaying them to others, a technology of both the intellect and the body, that supreme tool kit for overcoming our lack of telepathy.

Being context-bound and evanescent, sequences of gestures do not allow the "reflection" that Goody (1977: 109) has identified as such a special affordance of written language and its relatives, but the case for a unique influence of representations in the *printed* modality may have been overstated. Oestermeier and Hesse (2000) show that with diagrammatic/graphical externalizations we can "transform abstract relationships into visible spatial ones, and thereby inspect and control argumentative and causal relationships" (p. 81). But they claim in addition that we can "thereby inspect and control argumentative and causal relationships *in a way completely unknown to illiterate societies*" (p. 81, emphasis added). The Lao data discussed here show that hand gestures can and do transform abstract relationships into visible spatial ones and, indeed, allow us to thereby inspect and control argumentative and causal relationships (cf. esp. Enfield 2003:17–30). Members of all societies, literate or not, make hand gestures while they speak. Do they all produce the kinds of diagrams these Lao-speakers produce when talking about kinship? The domain of kinship is just one among many which will yield fertile data in exploration of this little-charted territory: the body as cognitive artifact.

It is possible to view *all* of culture's visual products as cognitive artifacts, tools at the perceptual interface between individual cognizing minds and the social world they collectively construct and inhabit. Our bodies are not only loci of enculturation. They are important sources of information both for ourselves and for our social associates. With more detailed empirical ethnographic description of how the body reveals and conveys information in concert with speech, we stand to gain a deeper understanding of naturally occurring practices of multimodal representation. Hand gestures and other visible bodily signals provide rich resources for spatial representation of complex and abstract ideas in up to four dimensions (including that of time). They both facilitate and publicize the very organization of thought.

Comments

SUSAN GOLDIN-MEADOW
Committee on Human Development, University of Chicago, 5730 S. Woodlawn, Chicago, IL 60637, U.S.A. (sgm@uchicago.edu). 7 IX 04

If you give people a complex physics problem to solve, they instinctively reach for pencil and paper (Larkin and Simon 1987). What Enfield elegantly shows is that if you give people the task of describing their family relations—and don't offer them paper—they use their hands to sketch diagrams in the air. Gesture thus serves the same purpose as pencil and paper and, in this sense, constitutes a cognitive artifact. One speaker, for example, pointed at a location in front of him when talking about his wife, at a location above that point when referring to her older sister, and at a location below that point when referring to his own younger sibling and then used the grid established by his pointing gestures to explain that older siblings (above his wife on the grid) are not permitted to marry younger siblings (below his wife on the grid) but that two older siblings (both above) and two younger siblings (both below) can marry. The striking aspect of this example is that the grid isn't there. As listeners, we infer a diagram from the speaker's points at a series of locations, but, as with the emperor's new clothes, the diagram is only there because we believe it is—a compelling illustration of Enfield's thesis that gesture is a social communicative process, that gesture is "made public and publicly made." Gesture works well for communication because it allows speaker and listener to exploit the advantages of visual representation. For example, speech is good at giving the listener the sequential steps in an argument, and static diagram is good at displaying a map of the argument. But gesture facilitates both—it allows the speaker to place the steps in the argument on a spatial map and to walk the listener through those steps.

Gesture is useful not only for transferring information to a communication partner but also for easing the speaker's own cognitive burden. It would not be surprising if Enfield's consultants were to create kinship diagrams in the air with their hands even if asked to describe family relations to someone behind a screen or in another room—that is, to a nonvisible listener. Indeed, people often gesture when on the telephone, and even individuals who are blind from birth gesture when talking to both sighted and blind listeners (Iverson and Gol-

din-Meadow 1998). Gesture thus seems to be useful to speakers as well as listeners. In fact, if asked to remember a list of unrelated items while explaining their solutions to a math problem, speakers remember more items when they gesture along with their explanations than when they do not (Goldin-Meadow et al. 2001, Wagner, Nusbaum, and Goldin-Meadow 2004). Gesturing eases the cognitive burden of explanation.

Gesture is also of value to scientists. It offers an additional view of a speaker's thoughts, and, as many of Enfield's examples illustrate, those thoughts are often not conveyed in the speaker's words. In other words, gesture can provide a *unique* picture of a speaker's thoughts. Moreover, gesture may convey beliefs that are so deeply entrenched within a culture that they do not need to be expressed. For example, deaf children whose hearing losses prevent them from acquiring spoken language and whose hearing parents have not exposed them to a sign language create gestures to communicate with the hearing individuals in their worlds. Many of the properties of these gestures turn out to be the same across cultures (Goldin-Meadow and Mylander 1998), but the stories that the deaf children tell with them differ in culturally appropriate ways. Chinese deaf children of hearing parents produce gestural stories that have an evaluative tone comparable to the moralistic tone in verbal stories told in Chinese cultures (Miller, Fung, and Mintz 1996, Miller et al. 1997); no such tone is evident in the gestural stories that American deaf children of hearing parents produce (Phillips, Goldin-Meadow, and Miller 2001). The Chinese deaf children cannot hear the stories that their parents tell, but they are able to learn the evaluative tone from their parents' gestures—from emblems, gestures that can substitute for words and that vary across cultures (Ekman and Friesen 1969); for example, *shame* (index finger drawn diagonally down the cheek or forehead) and *bad* (pinkie shaken in the air). The moral message is instantiated in nonverbal as well as verbal practices in Chinese cultures. Some aspects of culture may be so important that they cannot be entrusted to a single medium.

As Enfield so beautifully illustrates, gesture is a window through which culture can be viewed. It is a tool that is there for the taking to facilitate not only communication but also everyday thinking and scientific discovery.

SPENCER KELLY
Psychology Department/Neuroscience Program, Colgate University, 13 Oak Dr., Hamilton, NY 13346, U.S.A. (skelly@mail.colgate.edu). 8 IX 04

Enfield's research takes an embodied perspective on the role that hand gestures play in linguistic representations of sociocultural knowledge. The work advances two hypotheses: (1) that gestures affect the way communicators conceptualize their own knowledge of kinship structures and (2) that gestures influence the way interlocutors understand those structures. My commentary will provide empirical psychological and neuroscience evidence for these claims.

Enfield uses McNeill's (1992) gesture-speech theory to argue that hand gestures are crucial to the verbal expression of kinship relationships. Although he touches upon experimental support for this claim, I will elaborate. Enfield briefly explains research demonstrating that gesture plays a special role in spatial memory processes when people verbally explain their understanding of conceptual problems (Goldin-Meadow et al. 2001). The study asked people to explain answers to math problems under conditions in which they were, and were not, allowed to gesture. The main finding was that when participants did gesture, they performed better on a secondary cognitive task (remembering lists of letters/words) than when they did not. One interpretation of these findings is that gesture freed up cognitive resources that people needed to explain their understanding of the problems. In much the same way, Enfield's participants may have used gesture to externalize information about kinship structures, thereby "offloading" the cognitive resources needed to conceptualize and verbally express that knowledge.

In addition to this psychological evidence, neuroscience researchers have argued that the brain is optimally designed to communicate with gesture and speech (for a review, see Kelly et al. 2002). For example, Binkofski and Buccino (2004) have demonstrated that Broca's area (located in the left posterior frontal lobe) is involved not only in language production but also in the production and comprehension of hand movements. This speech-gesture relationship has been observed in brain-damaged patients with language deficits. Hanlon, Brown, and Gerstman (1990) noted that patients with Broca's aphasia—a deficit involving problems with language production—performed better in a word-naming task when they produced hand gestures during the test. Gesture and speech are psychologically and neurologically linked, and therefore it may be their combination that allowed Enfield's participants to represent their complex knowledge about kinship relationships so eloquently.

In addition to language production, Enfield suggests that gestures help interlocutors *comprehend* kinship information. Although he provides no empirical evidence for it, this hypothesis is supported by several experiments in psychology and neuroscience. My research has demonstrated that interlocutors not only pay attention to gestures that naturally accompany speech (Kelly et al. 2002) but combine gesture and speech in a *synergistic fashion* when comprehending language (Kelly 2001, Kelly et al. 1999). For example, when someone says, "It's getting loud in here" while pointing to an open door to a noisy hall, most interlocutors integrate speech and gesture to understand the intended meaning: "Please close the door." Interestingly, interlocutors do not understand the intended meaning when they hear only speech or see only gesture. In this way, speech and gesture may *mutually disambiguate* one another. It would be interesting to investigate this phenomenon in people interacting with Enfield's participants. I wonder how much inter-

locutors would understand about kinship structures by attending to either speech or gesture alone, compared with how much they would comprehend from the combination of the two.

As with language production, there is evidence that the brain may be designed to comprehend multimodal messages conveyed through speech and gesture. In a recent study of event-related potential, Kelly, Kravitz, and Hopkins (2004) have demonstrated that hand gestures affect the brain's comprehension of language during not only semantic stages of processing but phonological ones as well. This suggests that gestures have a powerful relationship with speech during multiple stages of comprehension. There is substantial neuroanatomical evidence to support this claim. For example, the superior temporal region in the left hemisphere is implicated not only in early stages of language comprehension (Hickok and Poeppel 2000) but also in the brain's processing of goal-directed hand movements (Bonda, Petrides, and Ostry 1996). In addition, recent evidence from transcranial magnetic stimulation demonstrates that when an experimenter magnetically disrupts parts of the brain involved in controlling hand movements (e.g., the primary motor cortex), language comprehension suffers (Floel, Ellger, and Breitenstein 2003). This neural overlap of language and hand processing regions strongly suggests that the brain is wired to comprehend speech and gestures in an integrated fashion.

To conclude, I believe that Enfield's break from traditional ethnogenealogical research is a move in the right direction. The body is more than just a vessel that passively contains and carries information about the world. Rather, diverse lines of research from psychology, neuroscience, and anthropology all suggest that the body is a tool that enables us to conceptualize, communicate, and comprehend information.

BOIKE REHBEIN
Institute of Sociology, University of Freiburg, Rempartstr. 15, 79085 Freiburg, Germany (brehbein@gmx.de). 7 IX 04

There can be hardly any doubt that Enfield is the most ambitious and promising linguist of Lao. He is the first to combine a high level of linguistic theory with intimate knowledge of the Lao language. This paper is proof of this and a good example of his work. It identifies a very interesting problem and illustrates it with surprisingly evident empirical material. Enfield shows that Lao-speakers draw virtual diagrams in space that function as the referents of gestures that are intertwined with speech in talking about ethnogenealogy. This is an important contribution to linguistics and Lao studies but also to all cultural studies. It seems important to me for further research that Enfield interprets the combination of body action and speech as "holistic utterances" oriented towards a "recipient." With this thesis, linguistics departs from the model of a solitary speaker acting in an abstract universe of natural laws.

It is true that kinship plays an important role in Lao society. In everyday life, people are well aware of family ties. In face-to-face interaction, terms of address are chosen according to relative age (and position) and often expressed in kinship terms. It is also true, as Enfield notes, that two persons can be on an equal footing only if they are of exactly the same age. The line he draws between "above" and "below" is of fundamental importance. The term *lun*, however, refers not only to this exact same age but also to the age-group or "generation."

A critical remark might be that it is difficult to see the *theoretical point* of the paper. What does Enfield want to show? If it is the empirical material, the reader might ask for a more systematic evaluation of it. If it is the thesis concerning the relationship between speech and gesture or the contribution of linguistic description to ethnogenealogy, one might ask for a theoretical discussion of its relevance.

Furthermore, Enfield's *research method* seems problematic to me. He works alone and does research on topics that no one else is working on. Therefore, discussion with the scientific community and the empirical material are necessarily restricted. In this paper he cites no linguist of Lao except himself, and he does not mention the German pragmatic school that has done a lot of work on the relationship between gesture and speech (e.g., Konrad Ehlich, Jochen Rehbein). His solitary working style also means that the empirical basis is somewhat thin. I wonder if his two experiments would be easily reproduced in Laos, especially in remote areas. This problem has been discussed by Enfield elsewhere (2002) and is implied in his question about the cultural relativity of ethnogenealogical hand gestures.

This brings me to my last critical point. Human action is not only culturally but also *socially* relative. This means that in the Lao context the use of hand gestures may not be socially homogeneous. I suspect from the photographs that Enfield's study was confined to the urban middle class. I certainly hope that he will keep working on the relationship between hand gesture and speech in Laos, as the problem is very important.

DREW RENDALL
Laboratory of Comparative Communication and Cognition, Department of Psychology and Neuroscience, University of Lethbridge, Lethbridge, Alberta, Canada T1K 3M4 (d.rendall@uleth.ca).
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I wholly endorse Enfield's general point that the body in general and the hand movements that accompany speech (co-speech gestures) in particular might be productively viewed as cognitive artifacts in the sense that they could reveal details of a speaker's cognition. After all, any aspect of an organism's behavior could, in principle, index features of its underlying cognitive activity (Griffin 1992). However, I am far less convinced of the more specific point that the co-speech gestures of Lao-speakers reveal something substantive about the *content* of their

natural conceptualization of kinship structure. To begin with, it is not clear exactly what aspects of kinship structure Enfield thinks are revealed by the co-speech gestures, which appear to be largely iconic and completely redundant with the semantic content of their speech—involving simply pointing up or down (while describing older or younger relatives), pointing toward or away from oneself (while referring to ego or others), or reaching variably high or low (while describing a person's relative age). It is surely not the detail of the comparatively rich, formalized sketches of kinship that is superimposed on the still video images illustrating speakers' gestures, for the gestures shown capture only a fragment of the diagrammed structure and the rest has clearly been fleshed out by Enfield. I have to assume, then, that it is the simplest dimensions of these diagrams (e.g., up-down) that he feels the gestures capture. Although wholly intuitive, even this more modest result is not beyond question if the claim is that these represent the salient dimensions of Lao-speakers' native (i.e., nonlinguistically influenced) conception of kinship. The obvious problem is that the hand gestures are completely redundant with the corresponding speech descriptors and so may be simply tracking, reiterating, or emphasizing these. And, of course, the speech descriptors themselves represent the linguistic translation of any native conceptions and so may (or may not) significantly distort them.

Nevertheless, I applaud Enfield's work as a reflection of a growing appreciation of the many possible functions of nonverbal gestures and their *potential* utility in illuminating various aspects of cognitive functioning (Goldin-Meadow 1999). Further development of this field promises answers to long-standing questions such as the often debated but still enigmatic connections between gesture and language across multiple time scales from the developmental to the evolutionary. Proposals about the gestural evolutionary origins of language have been especially hotly debated (Hewes 1973, Armstrong, Stokoe, and Wilcox 1995, Corballis 1999) but until recently largely only speculatively because the ontological connections between gesture and language were poorly understood, the paleontological record of both was thin, and empirical evidence on gesture among nonhuman primates was equally scant. Work like Enfield's should help to inspire additional research on human gesture and perhaps also on its paleontological manifestations in early hominids as well as on the form, function, and cognitive implications of gesture in nonhuman primates.

With respect to the latter, two points are worth mentioning. The first is that the "co-vocal" gestures of primates, insofar as they are known, are similar to the human co-speech gestures studied in being largely iconic, or indexical, in nature. (I leave any implications of homology for others to consider.) Although primates do not make routine use of human-like hand-pointing gestures, their vocal signals are often accompanied by various other "gestures" that may be variably subtle (e.g., eyebrow raising and ear flattening) or flagrant (e.g., chest beating and branch shaking). While not even as systematically studied as those in humans and not wholly uncontroversial, these actions appear not to modify the content of the accompanying vocal message qualitatively but rather simply to reiterate, exaggerate, or just draw greater attention to it.

The second point concerns the intentional status of "co-vocal" gestures in the two groups. Enfield's descriptions of the co-speech gestures that Lao-speakers use to create invisible kinship diagrams imply that, while probably unconciously motivated in the lay sense, they are *intentional* in the formal sense (Dennett 1983)—requiring at least implicit modeling of listeners' attention to and understanding of the referential status of the diagram and its details. Is it possible, though, that these gestures instead reflect an externalization of the speakers' efforts to organize their own thoughts and communications and thus serve a homeostatic function? And might the answer have any bearing on the gestures of nonhuman primates, many of which appear designed to draw others' attention to their display? Does the latter imply at least a rudimentary awareness of the attentional state of others, reflecting an incipient intentionality heretofore presumed lacking in their communications (Cheney and Seyfarth 1996, Owren and Rendall 2001, Rendall and Owren 2002)? Or might many of these gestures also have an unintentional homoestatic function? Whatever the answers ultimately, there seems considerable fertile ground for comparative research on the cognitive implications of co-vocal gestures in human and nonhuman primates.

Reply

N. J. ENFIELD
Nijmegen, The Netherlands. 21 X 04

I thank the commentators for their engagement with the issues raised in my article and for raising a number of matters for further discussion.

One reason ethnographers ought to be producing empirical studies of composite signals such as the hand-gesture-plus-speech sequences on Lao kinship is the possibility of culture-specificity in their form, meaning, and/or use. Nevertheless, I have not attempted to generalize about specifics of co-speech gesture in "Lao culture." I cannot say whether the behavior of the individuals in my examples is typical of Lao-speakers. (We can presumably say, however, that certain details of what we observe in these examples are unlikely to arise in cultures in which relative "height" of siblings is of little or no consequence.) We can be more confident that conventional representations of kinship categories in the *linguistic* system are common to Lao-speakers. It is clear that gestures are "linguistic" (McNeill 1985), but to what extent are they part of "the language"? It may be that individuals differ significantly in the specifics of gesturing during speech. One reason for this, as Rehbein comments, is that there may be significant differences in

hand gesture practice *within* a culture. A variable sometimes noted is the degree to which self-expression by bodily gesticulation is suppressed in different contexts (associated, for example, with urban versus rural origin). Such social distinctions suggest a notion of "register" differences in co-speech gesture behavior (Enfield 2001: 205–6)—differences in the distribution of gestures according to social membership and context (cf. the distinctions of sociolinguistics). The extent to which gesture behavior is universal or specific to a given culture or sub-cultural group or to individual speakers is an empirical question.

Part of my argument is that an empirical cognitive anthropology should seriously consider the implications of gesture's role as a facilitator and mediator of individual and collaborative contributions to human face-to-face interaction (Goodwin 2004, Hutchins 2004). Like language, gesture is part of the very glue which bonds socially associating individuals, and therefore we must strive to understand it as a human phenomenon. But we cannot assume that it will or will not show cultural variation. On the one hand, Goldin-Meadow's work shows that gestures which emerge in communication where broad social convention is not a factor turn out to be the same across cultures. On the other hand, we see culture-specificity in more conventional settings—where gesture arises in the context of a common spoken language and an associated rich web of semiotic conventions with a long community history. Recent studies of pointing reveal distinct local conventions of both form and meaning (e.g., Sherzer 1973, Enfield 2001, Haviland 2003, Kendon and Versante 2003, Wilkins 2003).

Spoken languages differ radically in terms of conventional meaning-encoding symbolic structures such as words and grammatical constructions. Given that hand gesture has a structured and intimate relationship to speech, why shouldn't we expect to see corresponding and systematic difference in co-speech gesture across human groups? There are two problems. The first is that "gesture" is not a unitary category but a range of distinct semiotic phenomena (see Ekman and Friesen 1969; McNeill 1992; Enfield 2003:8–14; Kendon 2004). Thus, "emblems" (i.e., lexical gestures such as the OK sign) are fixed conventions specific to particular communities, like words, but they do not function to "sketch thoughts" in concert with linguistic expressions.

The second problem is that it is not possible to assess cultural variability until we have extensive field investigations of composite utterances in a variety of linguistic, cultural, and social settings. The tradition of research on hand gestures is still in relative infancy. In linguistics, after well over a century of broad cross-linguistic descriptive research, we know a lot (though still surprisingly little!) about how languages differ in structure and meaning. A long history of fieldwork-based grammatical description was a necessary precursor to the development of the comparative field of linguistic typology (Greenberg 1966, Croft 2003). Comparative work on co-speech gesture will require the construction of a significant descriptive tradition.

A point for clarification concerns the relative contributions of gesture and speech to the composite utterances investigated in my article. To reiterate, the gestures do provide information not given in the linguistic component of the utterances. The "mutual disambiguation" that Kelly says speech and gesture provide arises precisely from the fact that the two modalities supply different (though often overlapping) information. The gestures are not, as Rendall suggests, "completely redundant with the semantic content of their speech." Consider cases in which a relation of direct filiation is represented spatially: In none of the examples are the two referents placed at different points on the lateral axis. Yet we repeatedly see the lateral axis exploited in representation of sibling and collateral kin relations. No information relating to this distinction is encoded in the linguistic system. Gesture imparts rich information which speech does not (and cannot) provide, just as diagrams have affordances that spoken renditions of the same problems lack (see, e.g., Goody 1977, Larkin and Simon 1987, Zhang 1997). Populating the shared interactional space with multiple points of reference enables (virtual!) perceptual access to multiple direct relations between those referents which would not emerge in linear representations such as spoken sentences. A spatial/diagrammatic mode of representation (as opposed to a sentential mode [Larkin and Simon 1987]) not only affords but requires specification of values on multiple dimensions. "Added" specifications are not randomly made.

I have endeavored to establish that the relation between diagrams and gesture sequences is more than just an analogy. Demonstrating this experimentally is an important parallel mode of inquiry, and here we may turn to empirical offerings of the kind supplied by Kelly and Goldin-Meadow. Kelly's welcome sentiment that we must encourage "diverse lines of research" is right on the mark. Kelly and Rendall note that one role of work such as the present study is to inspire and inform further work in different research domains. This would be one good outcome.

The theoretical conclusions of my study remain. The general claim is that hand gestures act as cognitive artifacts by transforming the way in which conceptual and practical problems are approached and solved. The problems people are attempting to solve in the examples involve articulation-for-comprehension of sequences of communicative action by individuals in face-to-face interaction. What is at stake is the very means by which people think—and here we see thinking as externally coupled and inherently social (Goodwin 2000*a*). It is not just that gestures reveal, as Rendall puts it, but that they help *constitute* what and how people think. Following writers such as Goody (1995), I take it that people's primary cognitive orientation is as other-anticipating interactants rather than as stand-alone information processors (cf. Vygotsky 1962). This figures centrally in my discussion of the ways in which these kinship descriptions show studied recipient design. One lesson from this is that cognition is not only internal but also embodied

(i.e., linked to processes beyond the surface of the brain) and externally coupled (i.e., linked to processes beyond the skin of the person [Hutchins 1995, 2004; Goodwin 2000*a*, 2004]). The formulation of the gesture sequences is guided if not determined by their anticipated interpretation by an addressee. Thus, I am uncomfortable with Rendall's question whether these gestures are "intentional" (for the addressee) or "homeostatic" (for the speaker). Both functions are entailed as long as our unit of analysis is the speaker *in interaction*.

A final issue brought up by both Rendall and Kelly is that of the relation between gesture and language's origins. Two points arise from the fact that this study is about not just gesture but co-speech gesture. First, co-speech gesture is not a simple phenomenon. The hand movements produced by humans during speech are of qualitatively distinct types, relating in distinct ways to the meaning of the accompanying speech. Most types of human gesture are very un-apelike indeed. A telling example is pointing, which, as Tomasello (2004) argues, entails an ability for shared intentionality, a complex cognitive feat only humans can perform (Tomasello et al. n.d.). A second reason that care must be taken in considering what examples such as the Lao kinship diagrams may tell us about possible gestural origins of speech is that co-speech gestures occur together with speech in composite utterances (Kendon 2004). They are therefore not directly relatable to anything truly primordial. It is better to begin with cases in which gestures are not produced as elements of composite utterances with accompanying linguistic content. Good candidates are the pointing gestures of pre-linguistic infants (Liszkowski 2004) or the "home sign" systems of deaf children in hearing households (Goldin-Meadow 2003*b*). The critical difference between co-speech gestures and their possible primitive predecessors is that the former make up co-dependent composites with speech rather than just having speech added on. As I have argued here and elsewhere (Enfield 2004*c*), co-speech gestures show far more structure and semiotic sophistication than they are often given credit for.

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