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REPLY TO: F.K.L. CHIT HLAING, "ON G. BENNARDO AND D. READ'S 'THE TONGAN KINSHIP TERMINOLOGY' (MACT 2005): ON ASSOCIATIVITY", IN MACT JANUARY 15, 2006

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In his letter, F.K.L. Chit Hlaing has identified some of the most salient issues regarding the relationship between PGS (Primary Genealogical Space) and KTS (Kinship Terminology Space).

His observation that PGS is an associative space, coupled with Greechie's comment that the Tongan KTS is not associative, highlights the problem with the Lounsbury/Scheffler assumption that one can productively (read: homomorphically) construct a mapping from PGS to KTS (see Read 1984, 2000 for a rebuttal of the premises underlying the rewrite formalism introduced by Lounsbury as a means to explicate the logic of kinship systems expressed through kinship terminologies). There can be no homomorphic mapping since a homomorphic mapping preserves associativity. With respect to KTS and kin term maps, however, the matter is different as the algebraic model must be structurally isomorphic to the kin term map, hence if the kin term map is non-associative the algebraic model must also be non-associative.

That the Tongan terminology is non-associative can be seen from comparing the kin term product (*Ta'okete*-M of *Tehina*-M) of *Tuofefine* = *Tuanga'ane* of *Tuofefine* = *Tuanga'ane* (ws) with the kin term product *Ta'okete*-M of (*Tehina*-M of *Tuofefine*) = *Ta'okete* of 0 = 0 (products computed from Table 3 in Bennardo and Read 2005). Since these two products are not the same, associativity does not hold.

The algebraic account of the Tongan terminology takes non-associativity into account through the manner in which the algebraic model for the kin term map of the terminology is constructed. The beginning point of the algebraic model (what I call the base algebra), namely the algebraic representation of a simplified kin term map, is associative since it is a semigroup. Correspondingly, all kin term products in the simplified kin term map are associative. Non-associativity in the algebraic model of the complete Tongan terminology arises when sex marking of kin terms is introduced in the algebraic model by "joining together" two isomorphic but non-overlapping algebraic structures, one "labeled" as male elements and the other as female elements (see Figure 14 in Bennardo and Read 2005).

To see this, let B+ be the algebraic element with transliteration "Older Brother" (ms), B- the algebraic element with transliteration "Younger Brother" (ms), and I_m the identity element for the structure of male elements. Then B+B- = B-B+ = I_m. These are the equations that make the algebraic elements B+ and B- into reciprocal elements in the structure of male elements, as discussed in Bennardo and Read (2005).

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Now consider what happens with a product involving male elements and female elements when the male structure and the female structure are joined together to form a structure with sex marked elements. Specifically, consider the product of B+B- with the identity element I_f for the structure of female elements. The product (B+B-)I_f = $I_m I_f$ maps to the kin term with transliteration "Brother" (ws). But what about B+(B-I_f)? Since there is no kin term corresponding to B- from a female's perspective (i.e., a Tongan female has a "Brother" but not an "Older Brother" or a "Younger Brother"), we have the equation B- I_f = 0 = B+I_f . Hence (B+B-)I_f = $I_m I_f \neq 0$ = B+(0) = (B+(B- I_f) and so we do not have associativity.

Lack of associativity makes sense from the viewpoint of kin term products. The algebraic product B+B- corresponds to the kin term "Brother" (ws) and so the product (B+B-)I_f corresponds to the kin term that is computed when ego refers to one's self as a female (i.e., we have a female ego) and then refers to alter as "Brother." Validating associativity requires us to decompose the kin term "Brother" (ws) into its constituent parts and then to compute the kin term a female ego uses for a "Younger Brother". But this does not make sense in terms of kin term usage. If ego uses a kin term K for alter and alter uses a kin term L for alter$_1$, then by the kin term product L of K we mean the kin term ego uses for alter$_1$. We do not mean: decompose K into its constituent parts, say X and Y (K = X of Y), then compute K of X and lastly apply the result to the kin term Y. From a usage viewpoint a compound such as K = X of Y "loses" its compound status when taking a kin term product with another kin term in the sense that the kin term product, X of Y, becomes "unified" into the kin term K and it's constituent parts are "hidden" when taking a kin term product of L with K.

From an algebraic viewpoint, associativity would not recognize this "unification" process as it allows us to first take products with the constituent elements in a "unified" compound element rather than just with the "unified" compound element as a whole. Consequently, equations must be introduced at this stage in the algebraic modeling to implement the "unification" process. These equations make the algebra non-associative.

In the mapping of KTS into PGS, lack of associativity in KTS is not incompatible with the associativity of PGS since each of (B+B-)I_f and B+(B-I_f) are mapped into PGS as follows. For (B+B-)I_f, begin with a female ego (I_f), then trace from her to a brother (B+B-). For B+(B-I_f) begin with a female ego, then trace from her to her younger brother. Now notice the problem that arises from the Scheffler/Lounsbury perspective of trying to use an idealized universal genealogical space. There is no younger brother in the idealized space. So we have to augment the genealogical space with younger/older sibling positions. But tracing from a female ego to a younger brother position and then to an older brother of that younger brother is ambiguous. Hence it makes sense that B+(B-)I_f is not a kin term as it is ambiguous as to the genealogical position, even in the augmented PGS, to which it should be mapped. Asymmetrically, the same problem does not arise with a male ego. B+(B-I_m) says: start with a male ego, trace to a younger brother, then trace back to the older brother of the younger brother, namely trace back to male ego. For this product associativity holds in the algebra: $I_m = I_m I_m = (B+B-)I_m = B+(B-I_m) = B+B- = I_m$.

The lack of associativity in KTS is thus resolved in PGS by the fact that one side of the equation demonstrating non-associativity maps to a position in PGS whereas the other side of the equation does not map to anything. The latter side of the equation (i.e. $B+(B-I_f)$) is 0 in the algebra, hence it cannot map to anything in PGS and that makes sense since there is nothing in PGS to which it could map unambiguously.

Bennardo, Giovanni and Dwight Read. (2005). Tongan Kinship Terminology: Insights from an Algebraic Analysis. *MACT* 2(1).

Read, Dwight. (2000). Formal Analysis of Kinship Terminologies and Its Relationship To What Constitutes Kinship. *MACT* 1(1).

Read, Dwight. 1984. An Algebraic Account of the American Kinship Terminology. Current Anthropology 25(4):417-449.