

## **Supplement F from Aureli et al., “Fission-Fusion Dynamics” (Current Anthropology, vol. 49, no. 4, p. 627)**

### **A Third Dimension**

We propose a third dimension along which social systems may vary and affect communication. A Z-axis, representing an individual's range of social opportunities (measured as the number of conspecifics typically encountered per unit time), could be added to figure 4. The range of social opportunities is determined by group/community size, population density, the mobility of the animals (e.g., dispersing versus philopatric sex, large versus small bodied, arboreal versus terrestrial), and the extent of fission-fusion dynamics (depending especially on the temporal variation in party size and composition; see supplement C).

Tamarins, which live in extended-family groups that rarely exceed more than ten individuals (Lottker, Huck, and Heymann 2004), and Costa Rican squirrel monkeys, which live in multimale/multifemale groups of 45–60 individuals (Boinski 1996), would both be considered lower-FF groups because they spend close to 100% of their time within communication range of group members, but they have very different numbers of potential companions. We predict that, holding position on the X- and Y-axes constant, species or populations with higher values of Z will employ more complex or more specialized forms of social signaling because of the greater number of relationships they may need to monitor. These effects should be similar in both lower-FF and higher-FF groups, although whether the social signals solve problems posed by permanent association (e.g., reconciliation when fission is rarely an option) or problems posed by frequent or prolonged separation (e.g., reaffirming alliances during reunions) depends on their positions within the multidimensional fission-fusion space and the evolutionary route by which they arrived there.

Considerations of the potential influence of group size on social signaling do not assume that individuals distribute their social interactions among all potential partners evenly. Indeed, it is the uneven distribution of affiliative interactions, including proximity, within the range of potential options that defines differentiated relationships. Individual squirrel monkeys may concentrate their social interactions on a subset of group members that may be comparable to or even smaller than the number of individuals with which tamarins interact despite the greater array of social options that the larger groups of squirrel monkeys can provide. Identifying qualitative and quantitative differences in the distribution of social signals among potential social partners provides an additional way of distinguishing variation within the multidimensional fission-fusion space.