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Vocalizations are ideal identity signals

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Abstract

If human societies are understood as identity groups, then our psychology should include design for the production and detection of credible identity signals. We argue that vocalizations are ideal identity signals because the human auditory system is sensitive to subtle acoustic features; vocal signals are efficient; and speech and song are highly complex, enabling the embedding therein of identity signals.

Moffett argues "Societies should be understood fundamentally as *identity groups*…." If so, then social organisms require evolved mechanisms for detecting identity and advertising it by credibly signaling information concerning group membership.

Humans and other organisms form societies to obtain and maintain benefits, such as food and protection. These benefits create a selection pressure that threatens society members: They lead to social parasites, who mimic cues of society membership to exploit the resources of a society. For example, ant colonies are often exploited by species of spiders, beetles, and other ants that mimic the chemical and behavioral signals and cues of colony membership (Mclver & Stonedahl, 1993). Similarly, cuckoos exploit other bird species by tricking them into raising their young: cuckoo eggs mimic the appearance of the target host species' eggs, and cuckoo chicks mimic host chick behaviors (Davies, 2011; Yang et al., 2012).

Humans have culturally evolved similar mimicking strategies, such as duck decoys, whose analogues date to octopus lures in the Mariana Islands, from at least 1500 B.C.E. (Carson & Hung, 2021; Moser, Buckner, Sarian, & Winking, 2023). Mimicry also enables humans to pass as members of social groups to which they do not belong. Although there is cross-cultural evidence for visual and other markers of ethnic identity (McElreath, Boyd, & Richerson, 2003), these are vulnerable to parasitism. For example, hairstyle influences perceived race, such that changing one's hairstyle can change how they are grouped by others (Sims, Pirtle, & Johnson-Arnold, 2020).

Given the threat of social parasitism, reliably signaling identity to conspecifics in a society is essential, especially in large societies where individuals may not be known to all other members (Przepiorka and Diekmann, 2021).[1] Here, we argue that *vocalizations* are a widespread form of honest identity signaling – and are ideally suited to delineating societal units of the type Moffett argues for. Vocal signals, including cues present in language, music, and other, non-linguistic utterances, play an essential role in displaying shared identity in humans, because (1) human auditory perception is sensitive to subtle acoustic features that can uniquely characterize a vocal signal; (2) vocal signals are efficient, requiring minimal energy to produce; and (3) vocal signals can be complex, as in coordinated vocalizations in music, providing a rich medium in which to embed identity signals.

First, human auditory perception is specialized for the processing of speech and music (Singh & Mehr, 2023; Zatorre, Belin, & Penhune, 2002), with a high degree of sensitivity to subtle differences in the acoustic content of speech and music tokens. This makes it possible for vocalizations to function as identity signals. For example, infants and adults exhibit social preferences for unfamiliar adults whose accents are familiar (Giles & Billings, 2004; Kinzler, Dupoux, & Spelke, 2007) or who sing songs that previously have been produced by a social partner (Mehr & Spelke, 2018; Mehr, Song, & Spelke, 2016). Social inferences can also be drawn from other, non-linguistic and non-musical utterances: Listeners can

reliably detect friendship/affiliation from the sounds of co-laughter, and can reliably detect if laughs are "real" or faked, whether or not the listeners had the same native language as the vocalizers (Bryant et al., 2016; Bryant et al., 2018).

Such effects evoke similar patterns in non-human species, where vocal identity signals are common, especially in the domain of territorial signaling (Mehr, Krasnow, Bryant, & Hagen, 2021). Such vocalizations are omnipresent across species, from whales, who use group-specific vocalizations (target article); to chimpanzees, who produce individual-specific and arguably group-specific calls (Crockford, Herbinger, Vigilant, & Boesch, 2004; Desai, Fedurek, Slocombe, & Wilson, 2022); to red-winged blackbirds, where experimentally removing singing ability reduces their ability to control territory (Catchpole & Slater, 1995).

Second, the energy costs of vocal production in humans are small (Titze, 2021), certainly smaller than some other signals, such as those involving movement or physical identifiers such as elaborate clothing. The human vocal tract, including the low position of the larynx compared to other species, efficiently produces a wide range of sounds (Fitch, 2018), and humans demonstrate their proclivity for vocalization from birth, spontaneously vocalizing regularly, often in the first seconds or minutes of life (Soltis, 2004). In addition to distress signals, neonates produce protophones (non-cry, speech-like vocalizations) that may signal developmental progress to caregivers (Oller, Ramsay, Bene, Long, & Griebel, 2021).

Last, human vocalizations are highly complex, providing a broad palette with which identity signals could be painted. For example, approximately 6000 languages are presently used, far surpassing the range of vocalization in any other species – yet linguistic diversity today likely accounts for only a small fraction of linguistic diversity across human history (Fitch, 2011). Concurrently, music varies along tonal, metrical, harmonic, instrumental, and contextual dimensions, among many others (Lomax, 1968; Mehr et al., 2019), with links between its acoustical forms and behavioral functions (Hilton, Crowley-de Thierry, Yan, Martin, & Mehr, 2023; Mehr, Singh, York, Glowacki, & Krasnow, 2018; Yurdum et al., 2023), indicating that it too can function as a signal.

Both types of vocalization also vary on features that make them difficult to mimic. A given language may have only a few phonemes (e.g., 11, in Rotokas, from Papua New Guinea) or many (e.g., 144, in !Xun, from Southern Africa; Evans & Levinson, 2009). Although infants have the ability to learn any language, human audition is shaped by experience and adults have difficulty distinguishing sounds not native to their language, let alone producing them (e.g., Werker & Tees, 1984). Moreover, the style of vocal music contains complex acoustic information that can be informative in signaling contexts, as in lullabies, which may signal a parent's attentional state to infants (Mehr & Krasnow, 2017).

Evidence for the attempted parasitization signals in humans also supports the role of vocalization in identity signaling: Criminals sometimes attempt to alter voice pitch or accent to disguise age, sex, nationality, or identity (Didla, 2020). That these alterations are difficult and rare to compellingly produce suggests ongoing selection for greater abilities to produce and discriminate complex vocalizations. Indeed, aspects of linguistic and musical diversity may have evolved as an anti-parasite strategy in an arms race with hominin social parasites, given the putative role of these vocalizations in identity signaling.

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Note

1. A complementary idea is that signaling could establish common knowledge of group identity, facilitating group coordination (Chwe, 2013).

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Why societies are important and grow so large: Tribes, nations, and teams

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Abstract

Moffett's definition of societies could be augmented by recognizing society's organizing systems that coordinate diverse individuals' behavior for collective good. Viewing humans as cultural animals indicates three reasons for ever larger societies: More shared information, bigger and better marketplace for exchange, and military superiority in numbers. Sports teams are societies offering a promising venue for empirical work.

Although many social scientists often refer vaguely to "society," such as in invoking its beneficial or oppressive aspects, few have taken as much trouble as Moffett (this issue) to ponder carefully what are a society's defining characteristics. Fewer still have his biological, interspecies perspective. We appreciate his effort and offer some suggestions for extending his analysis and collecting data. Regarding the definition itself, we tend to think of a human society as a cultural system plus the people living within it, and so we respectfully suggest that Moffett's definition could give more emphasis to the organizing system aspect. There are perhaps animal societies that have no organization at all, but many have one, from ant colonies to mammal dominance hierarchies.

Moffett asserts that societies are the "most salient level" of social life (see his sect. 3 title). Families are obviously important in human (and many animals') social life, but they are insufficient to ensure enough survival and reproduction to sustain the species. This is particularly true of humankind, given the long dependency of human children. Cultural animal theory (Baumeister, 2005) suggests some reasons for the life-sustaining benefits of large human societies. This theory proposes that culture is humankind's biological strategy, so that the distinctively human traits are mostly the result of evolutionary adaptations to make culture possible. By advanced cooperation, facilitated by communication and group planning, and by building a collectively validated stock of shared information, cultural societies can master the environment and thereby amass more resources to sustain life than simpler systems.

Moffett emphasizes that human societies have grown to be much larger than other kinds of mammal societies. We suggest three main advantages of larger populations for cultural societies (as a means to increase population flourishing). First, cultures rely on shared information, and larger groups can obviously acquire and share more information than small groups, thereby facilitating the collective mastery of the environment. Second, economic trade, which dates back far into prehistory (Ridley, 2020), is facilitated by larger groups, improving what economists call the efficiency of the social system. Larger marketplaces work better, thereby increasing overall benefits. (Hence the modern globalization of the economy.) Third, when intergroup conflict and competition took the form of primitive warfare, battles were generally won by the side having more guys with spears.

The first two of those directly invoke the system aspect of society. The third does indirectly: Even in recent centuries, wars are usually won by the side with the larger economy, which enables it to put more warriors and weapons on the battlefield (Bernstein, 2004).

Moffett's carefully crafted definition opens new avenues for research into societies. In that context, we suggest more study of professional sports teams. They fit most aspects of Moffett's definition. They are clearly more than families (though sometimes fond of "we are family" rhetoric). They endure for multiple generations. Everyone knows who is on the team and who is not. Like other instances of what Moffett calls "anonymous societies" they rely on strong identity markers, starting with matching team uniforms. They maintain control over territory, identified with their home playing field, which during the game is apportioned between them and their opponent du jour. The jewel of their territory is the goal they defend, often with elaborately planned cooperative strategies and intense collective exertion. (To be sure, they do not usually dwell in the stadium.) Most teams are part of a larger organization such as a league, but we strongly suspect that players identify much more with their team than with the league. Players do move among teams, sometimes not by their own choice, and the team roster is entirely replaced much more rapidly than in other kinds of societies – which offers advantages for empirical study of societal continuity amid membership turnover. The importance of the team identity was made especially salient during America's professional football strikes. In 1982, the players asserted that "we are the game" and arranged pickup games among themselves, so that fans might come and pay to watch the athletic display, but these were a flop. In contrast, in 1987, when the owners hired replacement athletes to play the officially scheduled games, fans did pay to attend, indicating that they cared more about the abstract society-team as an official entity than about the individuals belonging to it (e.g., Chicago Tribune, 1987). Comedian Jerry Seinfeld quipped that fans root for the uniforms, regardless of the individuals who wear them.

We note further that the push toward larger group sizes is evident in sports teams, even despite strict rules limiting the number of players who can take part in the game at any given time. Like the efficiency of economic markets, the effectiveness of sports teams increases with specialization. To illustrate, football games allow 11 players on each side, and early teams had about that many in total. But teams have grown larger. By 1960, most professional teams had separate 11-man rosters for offense and defense, and soon after there were others for so-called special