Self-Discrimination, a Life and Death Issue

Greek mythology tells of Narcissus, a young man punished by the gods for scorning the many women who fell in love with him. Coming across a pool of clear water, Narcissus saw his own reflection. Made to believe that a spirit lived in the pool, he admired the beauty of the face reflected back at him; unwittingly, Narcissus fell in love with himself and died in the futility of his obsession. Narcissus's downfall wrought by his inability to identify the reflection as his own can be viewed as a metaphor for the fundamental importance of distinguishing what is self from what is not, in many aspects of life. In this special issue, we consider self/nonself discrimination from a range of biological and evolutionary perspectives. Because the idea for this issue originated from concepts in immunology, this is where we start.

Immunity represents an evolutionary response to pathogens, and Medzhitov and Janeway (p. 298) discuss how the innate immune system has developed to distinguish infectious nonself from noninfectious self. Receptors identify molecular cues and activate immune responses. Resemblances to certain receptors in invertebrates suggest that elements of the innate immune system of mammals evolved from more primitive antimicrobial defenses. A Report by Choe *et al.* (p. 359; also see the accompanying Perspective by Khush, p. 273) describes a pathway in *Drosophila* for responding to pathogens. Matzinger (p. 301) presents the countersuggestion that the immune system has evolved not to discriminate self from nonself, but rather to recognize "danger" signals within the body, regardless of source.


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A different application of the ability to discriminate self from nonself is apparent in certain plant reproductive systems. As Nasrallah describes (p. 305), plants that carry perfect (hermaphroditic) flowers risk evolutionarily destructive inbreeding if self-fertilization isn't discouraged. Self-incompatibility systems of some plants identify, and discriminate against, pollen from the same plant. On the opposite tack from the immune system, action is taken against self rather than nonself.

The organism must also recognize self-identity on higher levels, to effectively manage its interactions with others of its community. The nervous system allows complex multicellular organisms to sense themselves as part of and as distinct from their environment. Churchland (p. 308) discusses how we are just starting to understand how the brain represents self-identity. She suggests that the capacity to distinguish between "inner" and "outer" depictions of self and nonself helps to build a representational model of their relation to one another and may start to explain consciousness itself.

Self may be described in terms of genes that an individual inherits, but distilling descriptions of self and nonself in this way is not easy. Queller and Strassmann (p. 311) discuss how social insects identify themselves both as individuals and as members of their community. Hierarchies of identity exist, and a type of conflict may arise in social insect systems in which genomic imprinting could lead to a fractured sense of communal self. Finally, Brock (p. 314) discusses the interplay between genome, environment, and identity that guides our perspective on the individuality of our human selves and other mammals in the context of new technologies that could enable reproductive cloning.

Whether facing a marauding bacterium or listening to the voices in our heads, we and many other organisms depend for survival, as the ill-fated Narcissus should have, on an ability to effectively distinguish self from nonself.

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VIEWPOINTS

***See also* Science's *STKE* on p. 211, the Perspective on p. 273, and the Report on p. 359.**

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