**The inner life of earthworms: Darwin's argument and its implications**
**Eileen Crist**

I am a student of the life sciences, not a natural scientist. I have been interested both in the scientific knowledge of animal life, and in how presuppositions, structures of argumentation, and language-use are expressed in and shape that knowledge. Ways of knowing animals have varied in behavioral science according to the interconnected play of underlying assumptions, theoretical frameworks, and what kind of language has been deemed permissible for portraying their lives. Mind is unavoidably implicated in different ways of knowing animal life, because how behavior is understood and described always speaks to the "question of animal mind," whether deliberately, implicitly, or by omission. This is the major theme of my work *Images of Animals: Anthropomorphism and Animal Mind* (2000). In this essay, I address such connections between assumptions, forms of scientific inquiry, language-use, and animal mind by discussing Darwin's argument for the inner life of earthworms.

In his last work, *The Formation of Vegetable Mould, through the Action of Worms with Observations on Their Habits* (1881), Charles Darwin investigated the impact of earthworms on the geological and biotic environment, and devoted part of his study to worm behavior and intelligence. He introduced the latter topic by expressing his wish "to learn how far the worms acted consciously and how much mental power they displayed" (1881/1985:3) -- a formulation that turned out to be incongruent with most ensuing twentieth century behavioral science. The question of whether animals "act consciously" has been regarded as problematic: ontologically problematic, in that the existence of conscious action has been subject to doubt regarding many (and sometimes all) animals; epistemologically problematic, in that conscious action has been regarded as intractable to scientific inquiry; and semantically problematic, in that "conscious action" has warranted the pejorative and dismissive label of anthropomorphism. That Darwin researched conscious action in animals so distant genealogically from human beings was an anomalous move for the trends that came to govern behavioral research. And the fact that he argued that earthworms exhibit intelligence was apparently discomfiting; the notable silence of behavioral science regarding Darwin's argument for worm intelligence speaks volumes.[1]

Darwin made a bold argument about the inner life of earthworms. I use "inner life" to capture something more comprehensive than "mental life" or "cognitive ability." These latter ideas tend to allude to processes like thinking, deliberating, or judging, whereas inner life includes a subjective viewpoint. On Darwin's portrayal, the inner life of worms is indeed a cognitive world -- a world about which worms form judgments. But the inner life of worms also includes their subjective world -- a world of perception and work that they experience, rather than vacantly sleepwalk through. Darwin delivered both aspects of inner life, cognition and subjective experience. I discuss the former aspect of Darwin's portrayal in the section "The intelligence of worms," and the latter in the section "A world of experience." After examining Darwin's depiction of the behaviors, intelligence, and experience of worms, I draw some implications that are pertinent about the question of animal mind in science today.

**The intelligence of worms**

Earthworms plug the openings of their burrows with leaves and petioles. This behavior was Darwin's main interest, and he began by asking why worms plug their burrows, surmising several adaptive purposes: to keep them free of water and dirt, provide protection from predators, and block cold air currents. He then undertook observations and experiments to examine how earthworms handle leaves and other objects. He found that the pattern of plugging was too regular to be random; yet he also recognized that the pattern was too variable to be strictly instinctive. Darwin was ultimately compelled to admit that earthworms use judgment about the best way to pull leaves into their burrows -- that they feel the shape of the leaves prior to grasping them. This capacity of judgment based on the tactile sense, Darwin