

# Pitt Professor's Theory of Evolution Gets Boost From Cell Research

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An article by University of Pittsburgh Professor of Anthropology Jeffrey H. Schwartz and University of Salerno Professor of Biochemistry Bruno Maresca, to be published Jan. 30 in the *New Anatomist* journal, shows that the emerging understanding of cell structure lends strong support to Schwartz's theory of evolution, originally explained in his seminal work, *Sudden Origins: Fossils, Genes, and the Emergence of Species* (John Wiley & Sons, 2000).

In that book, Schwartz hearkens back to earlier theories that suggest that the Darwinian model of evolution as continual and gradual adaptation to the environment glosses over gaps in the fossil record by assuming the intervening fossils simply have not been found yet. Rather, Schwartz argues, they have not been found because they don't exist, since evolution is not necessarily gradual but often sudden, dramatic expressions of change that began on the cellular level because of radical environmental stressors-like extreme heat, cold, or crowding-years earlier.

Determining the mechanism that causes those delayed expressions of change is Schwartz's major contribution to the evolution of the theory of evolution. The mechanism, the authors explain, is this: Environmental upheaval causes genes to mutate, and those altered genes remain in a recessive state, spreading silently through the population until offspring appear with two copies of the new mutation and change suddenly, seemingly appearing out of thin air. Those changes may be significant and beneficial (like teeth or limbs) or, more likely, kill the organism.

Why does it take an environmental drama to cause mutations? Why don't cells subtly and constantly change in small ways over time, as Darwin suggests?

Cell biologists know the answer: Cells don't like to change and don't do so easily. As Schwartz and

Maresca explain: Cells in their ordinary states have suites of molecules- various kinds of proteins- whose jobs are to eliminate error that might get introduced and derail the functioning of their cell. For instance, some proteins work to keep the cell membrane intact. Other proteins act as chaperones, bringing molecules to their proper locations in the cell, and so on. In short, with that kind of protection from change, it is very difficult for mutations, of whatever kind, to gain a foothold. But extreme stress pushes cells beyond their capacity to produce protective proteins, and then mutation can occur.

This revelation has enormous implications for the notion that organisms routinely change to adapt to the environment. Actually, Schwartz argues, it is the environment that knocks them off their equilibrium and as likely ultimately kills them as changes them. And so they are being rocked by the environment, not adapting to it.

The article's conclusions also have important implications for the notion of "fixing" the environment to protect endangered species. While it is indeed the environment causing the mutation, the resulting organism is in an altogether different environment by the time the novelty finally escapes its recessive state and expresses itself.

"You just can't do a quick fix on the environment to prevent extinction because the cause of the mutation occurred some time in the past, and you don't know what the cause of the stress was at that time," Schwartz said.

"This new understanding of how organisms change provides us with an opportunity to forestall the damage we might cause by unthinking disruption of the environment," added Schwartz. "The Sudden Origins theory, buttressed by modern cell biology, underscores the need to preserve the environment- not only to enhance life today, but to protect life generations from now."

Schwartz, with his colleague Ian Tattersall, curator of anthropology at the American Museum of Natural History in New York, also authored the four-volume *The Human Fossil Record* (Wiley-Liss, 2002-05). Together, the volumes represent the first study of the entire human fossil record. Volume 1 was recognized by the Association of American Publishers with its Professional Scholarly Publishing Award. In 1987, Schwartz's *The Red Ape: Orang-utans and Human Origin* (Houghton Mifflin Company) was met with critical acclaim.

Schwartz, who also is a Pitt professor of the history and philosophy of science, was named a fellow in Pitt's Center for the Philosophy of Science and a fellow of the prestigious World Academy of Arts and Science.

Source: University of Pittsburgh

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