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Douglas Erwin is a Senior Scientist in the Department of Paleobiology at the National Museum of Natural History. His research focuses on issues of evolutionary innovation, particularly major evolutionary events documented in the fossil record, but more recently on the similarities and differences between biological, technological and cultural evolution. He spent many years studying the largest mass extinction in the past 600 million years. Fieldwork has taken him to China, South Africa, Namibia and the western US.

He is the author of several books, most recently *The Cambrian Explosion: The Construction of Animal Biodiversity*, with Jim Valentine (2012) and *Extinction* (2005). He is a former Professor, Chair of Faculty and Chair of the Science Steering Committee at the Santa Fe Institute, has served on many committees for NASA, NSF and NRC, and on the Editorial Boards of numerous journals, including the Board of Reviewing Editors for *Science*.

Diversity and Repetition

Repetition without variation is sterile and uninteresting, but repetition coupled to variation has been a source of great diversity in fields as disparate as biology, music and transmission networks. Among animals, arthropods (insects, spiders and their kin) and annelids (earthworms and the like) both contain large numbers of species, and both have a modular architecture involving segmentation. Although some have argued that such repetition, seen both in the shape of organisms and in their underlying developmental systems, is the source of their taxic diversity, the diversity reflects patterns of interaction among genes during development, and among the various segments of an animal. In arthropods, for example, their morphologic diversity is built upon the extraordinary variety of limbs between different segments of the same animal, as well as between different groups of arthropods, much as classical music or jazz employ variations upon a theme. In any system it appears that interesting diversity arises from the opportunities which repetition opens up to produce diversity.