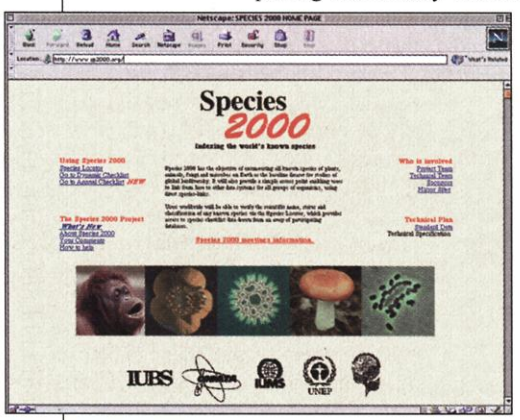
Diversity Digitized

Bioinformatics and biodiversity are terms so recently added to the scientific lexicon that they feature in none but the very latest dictionaries. "Bioinformatics" gained common currency in the early 1990s to describe the tools and techniques for storing, handling, and communicating the massive and ever-increasing amounts of biological data emerging principally from genomics research. Made possible by dramatic improvements in computational power and accessibility, bioinformatics has become a major growth industry almost in its own right. Edward O. Wilson, whose guest Editorial appears on page 2279, coined the term "biodiversity" in the 1980s, to encompass the taxonomic and functional diversity of living organisms. Although not a new field in itself, it represented the realignment and closer relationships between the existing sciences of systematics, ecology, and evolution; it also provided a unified rallying cry for conservation.

In a sense, bioinformatics and biodiversity were made for each other. Even before the possibility of gene sequencing was on the horizon, data storage and retrieval were the stuff—and the nightmare—of systematics research. Data were held as card indexes and taxonomic monographs as well as physical specimens in museums and herbaria. Knowledge of specific taxonomic groups was the privilege of handfuls of experts scattered in institutions on different continents. The bioinformatics revolution is finally enabling biodiversity researchers to communicate efficiently with one another, providing a springboard and a common language for progress. Such progress is badly needed, as Wilson points out, if we are to attempt a catalog of life on Earth that is even vaguely complete. This effort has the broader advantage of at last putting biodiversity information into the public domain in accessible forms on the Internet.



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In this special issue, we portray the emerging synergies between bioinformatics and biodiversity. In his Viewpoint on page 2309, Frank Bisby describes Species 2000, an Internet-based global research program that aims to create an index of the world's (known) species. He also discusses the taxonomic and bioinformatic background to this and other related efforts. James Edwards *et al.*, in a second Viewpoint on page 2312, discuss the Global Biodiversity Information Facility, which aims to ensure interoperability among the various databases now emerging from biodiversity studies. We also provide links to a large number of relevant Web sites at www.sciencemag.org/feature/data/biodiversity2000.shl.

These Web resources will be of greatest use if they can be put into a historical context and if the species included are correctly identified. That's where the world's museums and institutions that do systematics research come in. A News story on page 2306 looks at the resurgence of systematics and efforts to put research collections online. Some of those collections date back centuries, providing a historical context for studies of the world's organisms. A second story on page 2307 looks at efforts to put online paleontologic databases that can help researchers assess biodiversity on the scale of millions of years.

The application of bioinformatics techniques to biodiversity studies does not, of course, obviate the need for the more traditional methods and tools of systematics, especially field exploration and the management of large collections of specimens. Wilson stresses that these activities, and the training of new generations of systematists, are just as critical as ever. Rather than mere millennial buzzwords, bioinformatics and biodiversity studies represent a robust continuation of the science of Linnaeus and Humboldt, the foundation of so much modern biology, and provide the practical means of assessing human impact on the rest of the living world. **–ANDREW SUGDEN AND ELIZABETH PENNISI**

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