Barcode of Life Initiative Comes to Life

A consortium of major natural history museums and herbaria is launching the Barcode of Life Initiative, an emerging collaborative effort to promote a process enabling the rapid and inexpensive identification of the estimated 10 million species of Earth’s fauna and flora. The Smithsonian’s National Museum of Natural History will host the Secretariat for the Consortium. Preliminary groundwork for the Initiative was carried out at two Banbury conferences on the use of DNA characters in taxonomy (classification of life) at the Cold Spring Harbor Laboratory, Long Island, New York. These consultations favored the formation of the Consortium and basing its Secretariat during its foundational period at one of the world’s largest and strongest taxonomic institutions, the National Museum of Natural History (NMNH) of the Smithsonian Institution in Washington, D.C.

The Barcode of Life Initiative will create a valuable public resource in the form of a rapidly growing electronic database that contains DNA barcodes linked to voucher specimens, images, and collateral information maintained by museums and related research institutions worldwide, including taxonomy, geographic distributions, natural history, and relevant medical and economic concerns. The Initiative is made possible by a $669,000, 30-month award from the Alfred P. Sloan Foundation of New York City. Scott Miller, Senior Biodiversity Advisor to the Director, is coordinating the project for NMNH.

DNA barcoding is a diagnostic technique in which the sequence of a portion of a single gene is used for species identification. It is intended to promote the rapid and inexpensive identification of the estimated 10 million species of eucaryotic life on Earth. Scientific benefits of DNA barcoding include 1) facilitating species recognition, including flagging specimens that may represent species new to a geographic area or new to science; 2) enabling rapid, inexpensive, on-site identifications where traditional methods are inappropriate or impractical; 3) promoting development of portable technology for DNA barcode analysis that can be applied in the field; and 4) providing insight into the natural and evolutionary history of life via quick and reliable species-level identifications. Single-gene sequence data obtained also will contribute to multi-gene efforts to determine both deep and shallow evolutionary relationships.

Potential practical applications lie in many areas, including environmental genomics, biomedicine (identification of pathogens and disease vectors), agriculture (recognition of pest species), environment (identification of species that are endangered or whose trade or exploitation is restricted), national security (remote monitoring for bio-warfare agents), and enhanced bio-literacy among the general public. Initial efforts to apply DNA barcoding to animals have focused on a 645 base-pair fragment of the ubiquitous mitochondrial gene, cytochrome c oxidase subunit I (COI). COI-based identification systems cannot be applied with plants due to low sequence variation and the peculiarities of sequence evolution in plant mitochondria (i.e. RNA editing). Efforts to apply DNA barcoding to plants is in the preliminary stages, and is being coordinated by the Department of Botany at NMNH.

DNA barcoding is not intended to supplant or otherwise invalidate existing taxonomic practice; it is not “DNA-based taxonomy” but is an extension of the existing taxonomic system. Moreover, DNA barcoding should adhere to established professional standards for specimen and data management, including the routine deposition of voucher specimens in institutional collections, and freely accessible electronic databases and specimen images (see <http://www.barcodinglife.com>). By providing a simple and convenient molecular diagnostic tool, DNA barcoding is intended to enhance both the identification of existing species and the discovery of new ones, as well as provide other applied benefits to science and society.

The Consortium’s purpose is the speedy completion of DNA barcoding for millions of species. The Secretariat at NMNH will help organize and expand the emerging
Consortium of biodiversity institutions (museums, herbaria, molecular systematics laboratories, and conservation sites) galvanized by the two meetings of the community at Cold Spring Harbor last year. DNA barcoding activities will be done in collaboration with major related initiatives such as the Global Biodiversity Information Facility, GenBank, and the Census of Marine Life. Some of the American organizations participating in the new Consortium include the Academy of Natural Sciences (Philadelphia), Missouri Botanical Garden (St. Louis), Museum of Comparative Zoology (Cambridge, Massachusetts), and Scripps Marine Science Institute (San Diego). International organizations include the Canadian Museum of Nature, CSIRO Marine Research (Australia), Instituto Nacional de Biodiversidad (INBio, Costa Rica), Natural History Museum (London), the International Society for Biological and Environmental Repositories (ISBER), as well as institutions in France, Japan, and many other countries.

**Current Literature**


