

For immediate release
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DNA Inventory of The New York Botanical Garden's Forest Demonstrates Effectiveness of DNA Barcoding as Identification Tool

With the support of the Alfred P. Sloan Foundation, The New York Botanical Garden has created a DNA-based inventory of all species of vascular plants in its 50-acre native forest. This pilot project, carried out in conjunction with the efforts of the Plant Working Group of the international Consortium for the Barcode of Life (CBOL), employed gene sequences to identify each species of plant in a defined area. The project took the idea of DNA barcoding out of the research laboratory and tested it in the field.

Results from DNA barcoding in the Garden's forest were presented at an intensive working session of 30 international scientists associated with CBOL at The New York Botanical Garden on January 7–9, 2007. The results attested to the viability of the barcoding concept as an effective tool for identification. They also contributed to the Consortium's ongoing efforts to determine which segment of genomic code—or, as may be more likely, a set of two or three different segments—might operate as a unique identifier of species across the plant kingdom.

Kenneth Cameron, Ph.D., Cullman Curator and Director of the Botanical Garden's Lewis B. and Dorothy Cullman Program for Molecular Systematics Studies, led the year-long project. Dr. Cameron comments, "The exciting part of this research was to test the effectiveness of applying a universal plant DNA barcode across a wide range of species in one habitat. Our results provided optimism that DNA barcoding can indeed work as tool for identification, especially in floristic studies."

Tests showed that identification based solely on DNA barcoding worked with a good degree of reliability. For example, 12 random plant samples were collected by third parties and tested "blind" by DNA barcoding, using two different methods of analysis on five sequences per sample. The results were able to identify accurately all of the flowering plants tested, although there was limited success with ferns and conifers.

CBOL's Plant Working Group is in the midst of a project to identify a universal DNA barcode for plants. The New York Botanical Garden's Forest DNA Barcoding project tested the same gene segments for sequencing as those being tested by the Plant Working Group; in this application, all five gene segments were successful. The CBOL project focuses on specific lineages within the plant kingdom, regardless of where they grow; the Botanical Garden's project, in contrast, looked at a specific geographic region, encompassing many unrelated species.

The familiar black-and-white "barcode" label that is present on virtually all commercial products was developed as the "universal product code" system. This pattern of varying black lines on a white background, with several possible line widths at each position, allows for billions of alternative products to be uniquely identified and tracked. In the same manner, a short segment of DNA sequence composed of varying patterns of A,C,G,T nucleotides should be able to identify different species of organisms from one another.

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Potential applications of DNA barcodes are numerous, from unmasking look-alike species and tracking alien invasive plants to identifying plant species just from small fragments of tissues for forensic applications. DNA barcodes could simplify a customs inspector's job, making it possible to sample a few cells of virtually any plant or plant fragment that came through the inspections station. With the use of a handheld DNA barcode scanner, the barcode could be submitted to a universal online database and assigned the correct name. This would help monitoring trade in endangered or threatened species, providing a way to identify imports and exports even when they are stripped of obvious identifying characteristics such as leaves or flowers. DNA barcodes could also provide a genetic test of the identity of food extracts or medicinal plants such as herbal supplements. And they could make it possible for more people to identify species; they could extend the reach of expertise, accelerate species identification, and make biological knowledge more accessible to everyone.

The species of vascular plants recorded from the Botanical Garden's forest represent eight percent of all species in the northeastern U.S., as recorded in the *Manual of Vascular Plants of Northeastern United States and Adjacent Canada* by Henry A. Gleason and Arthur Cronquist (The New York Botanical Garden Press, 1991). As such, this project represents a first step toward creating a DNA library and barcode database of the entire flora of the region. It also opens the way for a handheld molecular "Life Barcoder" that could be carried into the field in the future.

Results from the Forest DNA Barcoding project at The New York Botanical Garden, including data collection and analysis, are being posted at http://www.nybg.org/science/Ken_C/title%20page.htm

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The New York Botanical Garden is an advocate for the plant kingdom. The Garden pursues its mission through its role as a museum of living plant collections arranged in gardens and landscapes across its National Historic Landmark site; through its comprehensive education programs in horticulture and plant science; and through the wide-ranging research programs of the International Plant Science Center.

The New York Botanical Garden is a museum of plants located at Bronx River Parkway (Exit 7W) and Fordham Road in the Bronx. The Botanical Garden is open year-round, Tuesday through Sunday and Monday holidays, from 10 a.m.–6 p.m. April through October, and 10 a.m. – 5 p.m. November through March. For more information, visit www.nybg.org or call 718.817.8700.

The New York Botanical Garden is located on property owned in full by the City of New York, and its operation is made possible in part by public funds provided through the New York City Department of Cultural Affairs. A portion of the Garden's general operating funds is provided by The New York City Council and The New York State Office of Parks, Recreation and Historic Preservation. The Bronx Borough President and Bronx elected representatives in the City Council and State Legislature provide leadership funding.

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