New England Botanical Club - Minutes of the 1010th Meeting
30 September 2005

Karen Searcy, Recording Secretary *pro tempore*

The 783rd meeting of the New England Botanical Club, being the 1010th since its original organization, was held on Friday, September 30, 2005, in the auditorium of the Peabody Museum of Natural History, New Haven, CT. There were 12 members and guests in attendance.

The evening speaker was Dr. Michael Donoghue, Director of the Peabody Museum of Natural History, and G. Evelyn Hutchinson Professor of Ecology and Evolutionary Biology at Yale University. Mike spoke on "Radiation of the Dipsacales, including Caprifoliaceae, with special reference to eastern North America." The Dipsacales includes the Adoxaceae, Morinaceae, Caprifoliaceae, Dipsacaeae, and Valerianaceae and is most closely related to the Apiales among the Euasterids. Twenty years of research in the group using morphological and genetic markers has shown that the Dipsacales consists of several clearly defined groups, but not necessarily the traditional ones. For example, the familiar genera *Viburnum* and *Sambucus*, traditionally classified in the Caprifoliaceae, are more closely related to *Adoxa*. The Adoxaceae is the sister group of the rest of the Dipsacales.

Using the current understanding of phylogeny of the Dipsacales, Mike went on to discuss trends in character evolution in the group. He started with examples of floral characters, pointing out that the Dipsacales includes members with both radially symmetrical, rotate corollas and bilaterally symmetrical, tubular ones. The basal split of the Adoxaceae from the rest of the group is well-supported by many characters, and coincides with the derivation of zygomorphic, tubular corollas. Further mapping of this character in the phylogeny of the Asteridae revealed that there have been eight origins and nine losses of zygomorphy in the larger group. As part of a study of *Antirrhinum*, it was found that one gene, named cycloidea, is responsible for zygomorphy, and that multiple copies of the gene exist in members of the Dipsacales. Three copies of the gene are found in the Adoxaceae, and other families in the group have five copies. In the Morinaceae, seven copies may result in a zygomorphic calyx as well as corolla. The gene is also associated with reduction in stamen number.

Another trend Mike discussed in the Dipsacales was the evolution of fruit characters. The basal Adoxaceae has drupes or berries, while many other members have achenes. Associated with the flowers and fruits in most of the achene-bearing families are a series of bracts, which are variously modified. In the more basal *Dipelta* and *Linnaea*, the bracts are enlarged and closely associated with the fruits. In members of the Dipsacaceae, the upper series of bracts is fused into an epicalyx and is directly involved in fruit dispersal. This may provide an interesting example of "transference of function." The range of dispersal functions carried out by the calyx in Valerianaceae is mimicked by a corresponding set of functions carried out by the epicalyx in the Dipsacaceae. Mike then asked: how is character evolution of the type he described related to diversification? To answer the question, he examined time and rate of diversification within the Dipsacales. He found that the increase in rate of diversity didn't correlate with any particular character, but that a rate shift was associated with biogeography. Specifically, he showed that the movement into South America about 8 million years ago by the Valerianaceae resulted in adaptive radiation that produced about 150 species.

The last part of the talk was spent discussing trends in character evolution in *Viburnum*, now in the Adoxaceae. This is a genus comprising 12 clades and about 168 species. Members are found primarily in temperate forests throughout the world. Within this genus, large sterile flowers have evolved independently four times. The center of diversity for the genus is Asia; eastern North America has 6 clades with 13 species, China 9 clades with 84 species, and South America 2 clades with 39 species, again suggesting that diversity is driven by movement into new geographic areas and subsequent adaptive radiation. For South America and Mexico, Mike hypothesized that birds dispersing the fruits across steep mountain ranges allows for populations that are reproductively isolated but in areas with similar ecology. Thus, instead of finding one species in a particular habitat across a geographic area, he finds sister species. In North America, the species are not closely related, having arrived from different areas at different points in time. For example *V. acerifolium* is more closely related to the Asian *V. kansuense* than to North American *V. dentatum*. Molecular analysis in which there was incongruence between information from nuclear and chloroplast markers resulted in identification of several probable hybrid species. One of these is *V. prunifolium*, which may be a hybrid between *V. lentago* and *V. rufidulum.*

Mike concluded with two important thoughts resulting from the work he described. First, he noted that he used to think that diversification was driven by character evolution (that the evolution of new characteristics allowed for diversification into new habitats), but now he believes that the movement into new biogeographic provinces drives diversification. Second, he pointed out that the progress made in understanding evolution in the Dipsacales demonstrates the importance of studying the same group of organisms for a long period of time.

Field Trips
Summaries by Nancy M. Eyster-Smith, Betsy Corrigan, and Janet R. Sullivan

Dr. Les Mehrhoff, Director, Invasive Plant Atlas of New England, and Curator, G.S. Torrey Herbarium, volunteered to lead two field trips at the NEBC Fall 2005 "Away" Meeting at Yale University, New Haven, CT. On Friday afternoon, 30 September 2005, members were invited to meet Les near Wharton Brook State Park where remnants of North Haven sandplains were explored. The highlight of the site was a new stand of the imperiled Sickle-leaf Golden-aster *Pityopsis falcata (Chrysopsis falcata)*, a plant on the CT state endangered list. Also observed were lots of invading slender snakecotton *Froelichia gracilis* and aggressive buttonweed *Diodia teres*. Unfortunately a small stand of Japanese stilt-grass *Microstegium vimineum* was also found. Stilt-grass forms extensive patches that displace native species that are unable to compete with it. A sad discovery near the railroad tracks were 2 dead box turtles, another CT state endangered species.

On Saturday 1 October 2005, Les lead a joint NEBC/Connecticut Botanical Society field trip to the southern terminus of West Rock, a State Park in New Haven, CT. The warm, picture-perfect day and spectacular distant views of sister ridges and Long Island Sound were complemented by Les's enthusiasm and love of natural history. We were treated to the usual "mehrhoffian narratives," including one about a Mr. G. Van Ingen, who in 1892, while stuck between rocks on the cliff face waiting to be rescued, discovered a fern that he did not recognize. When he brought it to Daniel Cady Eaton, it was identified as *Cheilanthes lanosa*, the hairy lip fern, a plant with only two New England records, this being the first. The point of the story was that "it pays to look and to question." We learned how the thermoregulatory nature of basalt, its calcium content, and fire influence these ridgetop plant communities. The ridge is abundant in oaks, particularly *Quercis prinoides, Q. stellata, Q. illicifolia, Q. montana, and Q. veluntina.* Other botanical finds included *Selaginella rupestris, Triodea flava, Aristida dichotoma, Aster linariifolius, A. patens Bulbostylis capillaris, Celtis occidentalis Desmodium paniculatum, Lespedeza hirta, Helianthus divaricatus, Polygonum tenue,* and *Triosteum perfoliatum,* to name just a few. Naturally Les pointed out invasives, including Norway maple, oriental bittersweet, wine berry, barberry, and many others. Our last discovery was a colony of *Opuntia compressa* growing on a rocky bald in an opening in the woods, an exciting highlight at the end of a perfect day.

Herbarium Tour

On Friday afternoon, several members met for a tour of the Yale University Herbarium, led by Collections Manager Dr. Nico Cellinese. The herbarium was founded in 1864, and since 2002 has been housed in the new Environmental Science Center building. The collection comprises about 350,000 specimens, and because of its origins as the personal herbarium of Daniel Cady Eaton, is particularly rich in ferns and bryophytes. Specimens are arranged phylogenetically according to a modified APGII system, and maintained using rank-free phylogenetic nomenclature. The tour included the herbarium's imaging lab, where a lab technician demonstrated the process of capturing a digital image of an herbarium specimen, including the label information. The image is then processed through the Optical Character Recognition (OCR) web service, and both text and image are automatically imported into the HERBIS database. Eventually, researchers at other institutions will be able to access the images and label information for the entire collection. The tour culminated with Nico showing us two of the oldest personal herbaria in the US, both from the 19th century. We were able to see two of the volumes that had been restored and rebound. The first, Horatio Fenn's "Plants of New Haven" collection, is dated 1822 and is the oldest known collection of flora from Connecticut. The second, the herbarium of Amos Eaton, grandfather of Daniel Cady Eaton, is thought to date back to about 1815. Amos Eaton, a lawyer, is reported to have developed an interest in natural history while in prison, where he tutored a young John Torrey (John Torrey's father was a guard in the prison and he used to take his son to be mentored by Amos, which is probably how Torrey developed a passion for botany). More information about these collections, the databasing project, and activities at YU can be found at the herbarium's web site. http://www.peabody.yale.edu/collections/bot/