New England Botanical Club – Minutes of the 1017th Meeting
5 May 2006
Karen Lombard, Recording Secretary

The 790th meeting of the New England Botanical Club, being the 1017th since its original organization, was held on Friday, May 5, 2006 at Garden-in-the-Woods in Framingham, MA. There were 42 members and guests in attendance. The winners of the 2006 Fernald Award were announced by Robert Bertin, and Julie Richburg announced the two winners of the NEBC Graduate Student Award (see website for details). Two members, who recently passed away, Fred Taylor and LeBaron "Barry" Colt, were remembered by other club members who knew them. Announcements included: the winning of a Fulbright Scholarship by Melanie Schori to study botany in the Philippines, Julie Richburg's new position as ecologist at The Trustees of Reservations Western Management Region, and Mary Walker's new book, *A Guide to Common Plants of Anguilla*. It was also announced that Ernie Steinauer of Massachusetts Audubon Society is looking for volunteers to help with a plant survey on Nantucket in the fall.

President Karen Searcy introduced the evening's speaker, Dr. Joan Edwards of Williams College. Her talk was entitled "Botanical Explosions: Ultra-fast Movements in Plants." Dr. Edward's current research is focused on the evolution of plant and animal interactions, as well as long-term population dynamics in garlic mustard and Great Lakes-Arctic disjuncts. Dr. Edwards began her talk by pointing out that most people think that plants do not move. However, there are many examples of stored mechanical energy producing rapid movements in plants. Examples of plant species with rapid movements include *Cornus canadensis* (the subject of this talk), as well as *Peraxilla tetrapetala*, *Polygala paucifolia*, *Sphagnum* spp., and *Impatiens pallida*. Dr. Edward's research focuses on two aspects of this plant behavior: how does it work, and why does the plant do it? These questions have led to molecular, as well as evolutionary and ecological research. Most of her fieldwork takes place in Isle Royale National Park, an archipelago in Lake Superior, Michigan.

Cornus canadensis, or bunchberry, is a widespread and common northern plant (along with its sister species the Swedish cornel) that has four showy white bracts around an inflorescence of about thirty flowers. One summer on Isle Royale, a student felt a "poof" when sticking her face into one of the inflorescences. Closer examination revealed that the four tiny petals of each flower are held together at their tips. Any pressure on a "trigger hair" coming off one of the petals causes the flower to open instantaneously and release its pollen into the air. This phenomenon was originally reported by John Lovell in 1898 in the *Journal of the Torrey Botanical Club*.

Early efforts by Edwards and colleagues to photograph the rapid movement were stymied by too-slow cameras, but finally with the use of an ultra high-speed camera, they showed that the opening of the flower, recorded at 10,000 fps, occurred in less than 0.5 milliseconds! Dr. Edwards then played several impressive videos of the movement for the audience. The petals are fastest, moving at 15 mph (acceleration 22,000 m/sec^2) with the anthers recorded at 7 mph (acceleration 24,000 m/sec^2). Research into the morphology and physics of the mechanism has demonstrated that the "boat-shaped" anthers, angled at 45^o with sacs of adjacent anthers facing each other, hold the pollen until the last second. The anthers are also hinged; pectinase activity softens the tip of the filament to create a hinged catapult, or trebuchet, which greatly increases the ability of the stamens to accelerate the pollen and allows it to be propelled a long distance. Pollen heights were measured at 2.7 cm, and air currents then can help keep the pollen aloft. Dr. Edwards and others recorded pollen to move distances of up to 21 cm from the plant with few air currents, and distances over 1m with moderate wind.

Insects usually trigger the explosive pollen release in *Cornus canadensis*, but unvisited flowers eventually explode on their own. Edwards hypothesizes that the mechanism is a back-up when pollinators are scarce. However, explosive flowering can also enhance insect pollination. Bunchberry grows in large clones and in order to travel to separate individuals, pollen needs to travel fairly far. Many different types of insects, from ants to bumblebees, visit the species, and pollen tends to be sprayed all over the body of larger pollinators after a visit. This ensures that, despite insect attempts at cleaning off the pollen, some pollen is likely to make it to another clone. Smaller pollinators do not trigger the explosion, limiting pollen-carrying to more efficient pollinators (the insect has to weigh at least 0.01g to trigger).

Work on rapid movements in *Cornus canadensis* has also led to similar work on the male flower of the stinging nettle. This species also uses a catapult mechanism, but is probably wind pollinated, and the explosive anther dehiscence may serve to deter herbivores. Videos on *Impatiens pallida* movement demonstrated a complicated slingshot dehiscence of the fruit, which peels like a banana. Another video showed dry capsules of *Sphagnum* moss spiraling spores greater than 15 cm into the air like an air gun at 29 mph!