

New England Botanical Club - Minutes of the 995th Meeting 5 March 2004

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The 768th meeting of the New England Botanical Club, being the 995th since its original organization, was held on Friday, March 5, 2004, in the Lecture Room of the Fairchild Biochemistry Building, Divinity Avenue, Cambridge MA. There were 46 members and guests in attendance.

President Paul Somers called the annual meeting to order, presiding over his last event as NEBC President. Following introduction of guests and several announcements, the club heard summary reports from the Chairs of the Library, Vascular and Non-Vascular Herbaria, and Graduate Student Award Committees. The new slate of officers was submitted by the Nomination Committee and unanimously approved by the members. Paul then turned the NEBC gavel over to the new President, Art Gilman.

Les Mehrhoff introduced the night's speaker, Dr. Bernard Goffinet from the University of Connecticut. His talk was entitled "When a phenotype belongs to multiple genotypes: Phylogenetic affinities of North American species in the lichen genus *Dendroscopula*." Lichens are a symbiotic association between a fungus (the mycobiont) and populations of unicellular or filamentous algae or cyanobacteria (the photobiont). This association tends to be stable, and also obligatory for the fungus, while some species of photobionts can be free-living. Dr. Goffinet compared the fungus-algae association to that of an agricultural system, with the fungus depending on the output of the algal "crops." The morphology of fungus species that lichenize is very different when the fungus is grown alone in culture and resembles callus tissue.

There has been much research focused on species specificity in lichen relationships. Some fungus species have a high degree of specificity, such as *Diploschistes muscorum*, which will appropriate *Trebouxia showmanii*, the photobiont of the lichen *Cladonia*, to establish independent thalli. Yet in some cases, two or more species of algae have been isolated from a single lichen, indicating that if there is specificity, it is not narrow. Researchers in Finland coined the term "lichen guilds" to refer to groups of fungi that share related photobionts. For example, many epiphytic lichens form a guild that shares the same cyanobacterial strain. The photobionts differ from those of terrestrial lichens, even when the mycobionts of the epiphytic and terrestrial lichens are congeners.

About 90% of lichens are associations between fungi and green algae, while 10% are fungi and cyanobacteria (blue-green algae). Some fungi have a primary association with a green algae as well as internal or external warts of cyanobacterial colonies known as cephalodia. These tripartite relationships can change, as occurs with *Peltigera leucophlebia*, which first adopts cyanobacteria following reproduction via fungal spores, then forms a macrothallus with green algae, and finally forms cephalodia. *Sticta felix* lichenizes with cyanobacteria in some locations, but forms a morph with green algae in drier, high-light habitats. Recent molecular research has revealed several cases where what appeared to be two different lichen species were actually the same fungus associating with two different photobionts. *Lobaria amplissima*, for example, forms a foliose (flat) lichen when associating with a green algae, and a fruticose (branched, tree-like) lichen with a cyanobacterium. The lichen once identified as *Nephroma silvae-veteris* was discovered through molecular and chemical testing to be a foliose cyanomorph of *Lobaria oregana*.

Bernard then spoke about his research, asking the question: have the many fungi that lichenize into "Dendroscopuloid" growth forms (lichens in the genus *Dendroscopula*) evolved from a single ancestor, or do they represent a polyphyletic group? In North America two species of *Dendroscopula* have been identified. These species likely represent cyanomorphs of lichens involving a green algae. The question is which species? Using the ribosomal DNA sequences of the ITS, he compared 110 lichen samples (about 25 haplotypes) assigned to several different genera. When the sequences were aligned, there were some conserved regions, but also significant amounts of variation. Looking at only the conserved regions of the DNA, he could separate the samples of North American *Dendroscopula* into at least four fungal lineages, indicating that these *Dendroscopula* thalli share their fungus with either 1) *Sticta wrightii*, 2) *Lobaria quercizans*, 3) *L. amplissima*, or 4) some yet unidentified lineage.

Dr. Goffinet then turned to an examination of the photobiont genus *Nostoc*, a strain of cyanobacteria. Only one strain of *Nostoc* is found per lichen, with some fungus species like *Peltigera aphthosa* exhibiting a high degree of specificity. The *Nostoc* found in the cephalodia of a lichen formed with green algae is different from that found in a free-living cyanomorph (simple fungus-cyanobacteria association). Sequencing of *Nostoc* of Dendroscopuloid lichens has yet to show a taxonomic or geographic pattern.

The evening concluded with a variety of questions from the audience, which included several members of Friends of the Farlow, a group of cryptogam enthusiasts.