Newsletter of the FRIENDS OF THE FARLOW

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From Roland Thaxter to PCR: A Century of Work on the Laboulbeniales

Alex Weir

For those very few mycologists in every generation who specialize in the biology of entomogenous fungi the Farlow Herbarium remains a constant source of inspiration, as well as a repository for type material. Particularly well-represented are members of the order Laboulbeniales, a bizarre group of ascomycete fungi found growing only on the integument of living arthropods, primarily insects.

The major contribution to our knowledge of the taxonomy and biology of this diverse group came from Professor Roland Thaxter here at the Farlow between 1891 and 1931. Prior to Thaxter's pioneering studies, only a few species of these fungi were known worldwide and there was still debate regarding whether or not they could be considered fungi at all.

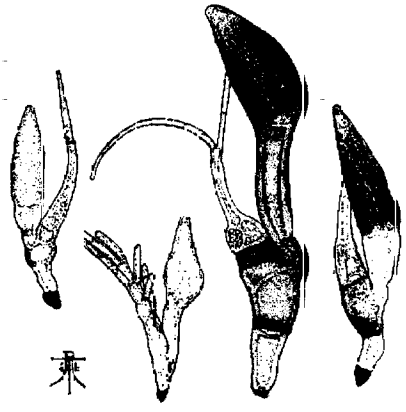
This skepticism was quite understandable given the morphologies of the Laboulbeniales. Each consists of a distinct thallus composed of a more or less ordered array of cells within a precisely arranged axis — quite different from the hyphal and mycelial growth of other fungi. Early on, however, Thaxter firmly established their ascomycetous nature and began accumulating and describing new taxa from all corners of the world. Precise descriptions were accompanied by amazingly detailed and accurate illustrations. Thaxter's monograph of the order was published over more than 30 years in 5 parts in the *Memoirs of the American Academy of Arts and Sciences*. The fifth part was issued just months before Thaxter's death and brought the total number of new genera and species described to 1358. Holotypes of these taxa are still preserved in the Farlow.

Since Thaxter's death an additional 500 or so species have been described bringing the known world total to around 2000. Thus, even today, almost 70 years after his death, two-thirds of the known taxa can be attributed directly to Thaxter, and his monograph remains the taxonomic framework on which current investigations are based.

The post-Thaxter period has been dominated by continued descriptive work by a few specialists (Balazuc, Benjamin, Majewski, Rossi, Tavares) with few new approaches to the study of these fungi emerging. Despite Thaxter's meticulous

FOF Annual Meeting
Saturday, November 6. See page 4.

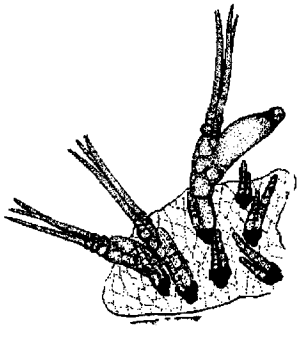
descriptions, many questions regarding aspects of the biology of these organisms remain. The resistance of these fungi to attempts to bring them into culture have foiled efforts to gain greater insights into phenomena such as their pathogenicity.



Up until a few years ago questions regarding phylogeny were also difficult to resolve, since only limited morphological characters were available for comparison. Recent success in extracting and amplifying ribosomal DNA from a number of Laboulbeniales using the polymerase chain reaction (PCR) technique now provides the key for future studies aimed at elucidation of the phylogeny of this group (Weir and Blackwell, unpublished). In addition, use of highly variable regions of the rDNA could help resolve intriguing questions regarding the specificity of Laboulbeniales fungi.

For many years, in fact even preceding Thaxter's studies, biologists had noticed that some of the Laboulbeniales were not only specific to a given species of insect host but sometimes were found only on one portion of the integument of the host (sex-of-host specificity). At its most astounding level this specificity, as described by Thaxter, reached its peak with 18 species parasitic on a single species of African water beetle, each found on limited regions of the host integument. Although involving fewer taxa, many other examples of the partitioning of multiple species on a single host have since been reported.

Our on-going molecular investigations are beginning to unravel this picture, at least for one of these host-parasite interactions. We have concentrated on the large fungus genus *Stigmatomyces* known to parasitize flies (Diptera). Ribosomal DNA sequences of the fungi obtained to date are giving us some interesting results. It appears, for instance, that some thalli exhibiting different morphologies on the same host fly and traditionally distinguished as two distinct species could be genetically identical, thus making it unlikely that "position specificity" could be supported in this case. Current attempts to improve our extraction and amplification methods should provide more consistent results and more definitive answers. The rediscovery of many of Thaxter's host insects in the Museum of Comparative Zoology (MCZ) at Harvard during my visit last November may also provide an unique opportunity to reassess host-parasite interactions.



It seems that after all these years, we may now be on the threshold of finally bringing our knowledge of the Laboulbeniales up to that of other ascomycetous fungi. We can now endeavor to incorporate them, as a major component of ascomycete species richness throughout the world, in broader studies of ascomycete evolution and phylogeny. I do hope Thaxter would approve!

Alex Weir is an Assistant Professor in the Faculty of Environmental and Forest Biology at the State University of New York at Syracuse.

Renovation of the Bryophyte Collections

Scott LaGreca

The Farlow's holdings of non-vascular autotrophs and fungi amount to about 1,325,800 specimens, of which about 440,800 are mosses and liverworts. These include many exsiccatae, type specimens, and historically significant collections. Until recently the cabinets housing these bryophytes were filled to capacity, and there was no space for the addition of new cabinets.

A recent National Science Foundation-funded renovation of the bryophyte collections (basement, room H-1) has increased the available space by more than 60%. This increase is made possible primarily by the installation of moveable compact storage units, similar to those used to house the fern and gymnosperm collections in the Herbaria building.

Additional space has been provided by remodeling a basement storage area into a room which now houses the liverworts. Increasing space in the basement has allowed for expansion of the crowded lichen and fungus collections, since some of these collections have been moved to the renovated

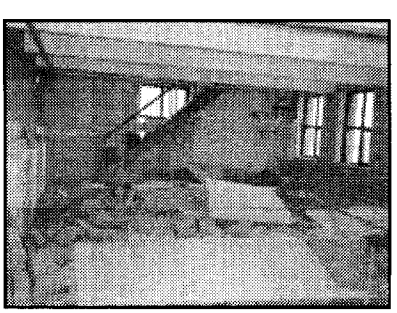


Photo courtesy of E. Wood

Room H-1 during renovation.

area. At the same time we are reorganizing the collections so the systematic treatments better reflect modern generic concepts.

A second part of this renovation has been the integration of the E.B. Bartram Moss Collection, the largest separate moss collection in the Farlow, with the general moss herbarium. Combining these two

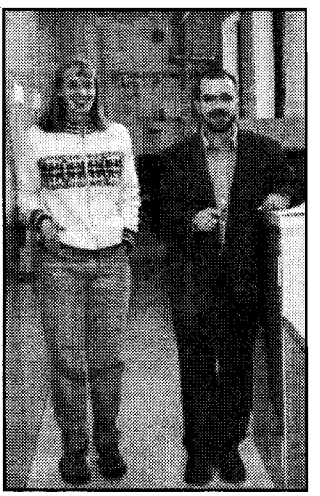


Photo courtesy of E. Kneiper

Chris Liebson and Scott LaGreca in the newly renovated H-1 seen above.

large, frequently consulted moss collections will not only improve their internal curation, but will also make them more readily accessible to the botanical community including the FOF membership.

Moving over 400,000 specimens is not trivial! The following details some of the necessary planning and organization:

1. Bryophyte specimens in room H-1 were boxed, moved, and relocated in-house.
2. Old herbarium cabinets were disassembled and removed.
3. Room H-1 was renovated including a new floor to support weight of cabinetry.
4. New compact storage was installed.
5. Bryophyte specimens were moved into the new storage units. Bartram and general mosses are now integrated.
6. Selected lichen and fungus collections from rooms H-2 and H-3 were moved into the space remaining in H-1.

This extensive renovation is resulting in improved work stations for users of the herbarium, better cared for specimens, and will allow for the addition of material in the future.

FOF Annual Meeting

The Annual Meeting will be held on **Saturday, November 6** at **3:30 PM** in the seminar room of the herbaria.

Dr. Norton Miller, Principal Scientist of the Biological Survey at the New York State Museum, will speak on "Bryophytes in Times of Change: Recent Data from New York and New England".

A reception and sale of book remainders will follow in the Farlow Reading Room.

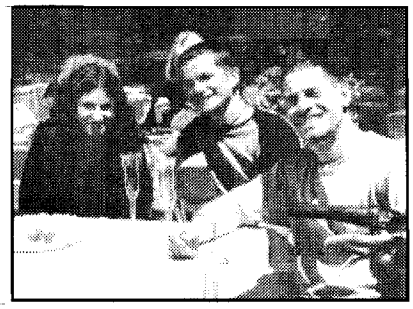


Photo courtesy of E. Kneiper

Kris Peterson, Thorsten Lumbsch, and Sam Hammer enjoy a non-workshop moment.

TLC at the *Lecanora* Workshop

Joann Hoy

Whipping the Farlow's collection of *Lecanora*, a lichen genus of about 350 species, into shape takes more than a weekend. But as part of that effort, Scott LaGreca organized a workshop on *Lecanora*, led by Thorsten Lumbsch of the University of Essen, during the weekend of June 5-6. Thorsten gave the eight attendees a lecture about the latest systematic work on the genus. Then his expertise (and unflagging patience) plus several keys, thin-layer chromatography (TLC), and reference specimens helped us identify dozens of *Lecanora* specimens in the Farlow's and our own collections. In the Farlow's collection, Thorsten found three previously misidentified or unidentified specimens that are new to North America. Many thanks to everyone who contributed to a productive and very enjoyable workshop.

Zhihong Zhong Wins Prize

Elizabeth Kneiper

A Graduate Poster Prize of the Mycological Society of American was awarded to student Zhihong Zhong at the St. Louis Botanical Congress August 1-7. Her winning poster, done with Scott LaGreca and Don Pfister, is:

"A Phylogenetic Study of *Geoglossum* and *Trichoglossum* Based on ITS and Group I Intron Sequence".

Conclusion: Analysis of rDNA sequences from the internal transcribed spacer (ITS) region and large subunit (LSU) gene show that *Geoglossum* and *Trichoglossum* together form a monophyletic group, but the species within this group are not grouped as we traditionally define the genera. Some species of *Geoglossum* group with some *Trichoglossum* species instead of with *Geoglossum* species. *Geoglossum* and *Trichoglossum*, therefore, might be treated as one genus. Phylogenetic trees derived from Group I intron sequences do not match the ITS and LSU trees, but a tree derived from all 3 data sets combined agrees with the ITS and LSU trees.

Additional posters taken to St. Louis from the Farlow are: "Resolving Color and Regional Differences within Species of *Cookeina* Using Molecular and Morphological Data." by T. Iturriago, R.M. Weinstein, and D.H. Pfister; "*Chorioactis geaster*: An Unusual Fungus with an Unusual Distribution" by K. R. Peterson, D.H. Pfister, and S. Kurogi; "Evolution of *Cyttaria* (Cyttariales, Ascomycota)" by K.R. Peterson, D.H. Pfister and M.J. Donoghue; and "Molecular and Morphological Phylogenetics in *Peziza* (Ascomycota)" by K. Hansen, D.H. Pfister and T. Laessoe.

News of the Farlow

Don Pfister

David Hibbett, a post doctoral fellow in the HUH for several years, has move to an Assistant Professorship at Clark University.

Thorsten Lumbsch (University of Essen, Germany) was a Geneva Sayre Fellow at the Farlow for one month. During his visit, he reorganized the *Lecanora* (lichen) specimens. In addition, he and **Scott LaGreca** began molecular systematic work on the Candelariaceae and on the genus *Diploschistes*. They also organized a weekend workshop on *Lecanora*. (See page 4 for a review of the workshop.)

Brian Perry joins the graduate student cohort in the Farlow. Brian comes to Harvard with a Master's from San Francisco State University where he worked on the basidiomycete genus *Mycena*.

Karen Hansen, graduate student at the University of Copenhagen, was at the Farlow working on the discomycetes genus *Peziza* from January to early September. She is now back in Copenhagen working on completing her Ph.D.

Don Pfister has become Interim Director of the Harvard University Herbaria.

With a grant from the Nature Conservancy a group of local amatuer mycologists have continued the survey of fungi at Devens Reserve Forces Training Area in Massachusetts. The goal of this survey is to collect widely in the area and provide a baseline for evaluating the fungal diversity of the area. Primary participants in this project are **Bill Neill**, **Kitty Griffith**, **George Riner** and **Wanda Metcalf**. They have recorded more than 500 species from the area.

Don Pfister was one of the organizers for the Latin American Mycological Congress which was held in Caracas, Venezuela from August 31 to September 3, 1999. Attending from the Farlow were graduate students **Karen Hansen** and **Kristen Peterson** and post doctoral fellow **Rick Weinstein**. Hansen and Weinstein presented papers in a Discomycete Symposium organized by Don and **Teresa Iturriago** from Venezuela. Pfister procured NSF funding for an Ascomycete Workshop for Latin American mycologists which was held the four days before the congress.

Jiang-chun Wei (Beijing, China) visited the Farlow for two weeks in August to study the *Umbilicaria* (lichen) collections.

Zhu-liang Yang (Kinming, China) worked at the Farlow from March until August. He identified and catalogued Agaricales specimens (mushrooms) which were collected as part of the herbaria's NSF-funded project, "Plant and Fungal Diversity of Western Sichuan and Eastern Xizang, China."

Annual Cabot Library Exhibit: Soil Crust Communities

Elizabeth Kneiper

Our 1999 exhibit at the Cabot Library describes the components of microbiotic soil crusts -- bacteria, cyanobacteria, algae, fungi, lichens, and bryophytes -- and outlines the vital ecological role played by these organisms. The exhibit will be on display from November 6, 1999 through January of 2000.

A big Friends of the Farlow thanks to both Larry St. Clair of Brigham Young University and to Rick Weinstein of the Farlow Herbarium for their invaluable help in the development of this exhibit.