

## Lichen Symbiosis Workshop 2013

**An outreach activity organized by the Lutzoni lab, Duke University, for the North Carolina School of Science and Mathematics (NCSSM) as part of the NSF funded project “REVSYS: Phylogenetic revision of the lichen-forming genus *Peltigera* (Ascomycota): Disentangling cryptic speciation, phenotypic plasticity, and hybridization”**

**Duke University:** Francois Lutzoni, Jolanta Miadlikowska, and Camille Truong (workshop instructors).

**NCSSM:** Linda Schmalbeck and Myra Halpin (Biology Instructors), and 17 students.

**The workshop includes two Saturday sessions: March 2 and March 9.**

### **Saturday March 2, laboratory session at Duke University:**

**10:00 AM – noon:** Introduction to lichen symbiosis

#### **Useful books:**

Brodo, I. M., Sharnoff, S. D., and Sharnoff S. 2001. Lichens of North America. Yale University Press.

Nash, T. H. N. 2008. Lichen Biology (second edition). Cambridge University Press.

**1:00 – 2:30 PM:** Laboratory session – Introduction to lichen morphological structures.

Define “**thallus**” and compare lichens with bryophytes. (*Pleurozium schreberi* versus *Parmotrema* spp. and *Usnea* spp.)

Thallus growth forms part I: **crustose (microlichens), foliose, and fruticose (macrolichens)** (*Porpidia albocaerulescens*, *Parmotrema* spp., *Usnea* spp., *Dibaeis baeomyces*, and *Xanthoria elegans*)

Thallus growth forms part II : **umbilicate, squamulose, and leprose** thalli (*Umbilicaria mammulata*, *Cladonia apodocarpa*, *Lepraria* spp.)

Thallus growth forms part III: **prothallus, areolate thallus, effigurate thallus** (*Rhizocarpon geographicum*, *Dimealena* spp., *Cryptothecia striata*)

Thallus structure part 1: **upper cortex, photobiont layer, medulla, and lower cortex** (*Parmotrema* spp.)

**Cyanolichens versus chlorolichens** (*Peltigera* sp. versus *Parmotrema* sp.)

**Bimembered** versus **trimembered** lichens (*Peltigera canina* group versus *Peltigera aphthosa* and *Nephroma arcticum*), including introduction to the term cephalodia

Thallus structure part 2: **heteromerous** versus **homoimerous** thalli (*Peltigera canina* group versus *Collema* sp.)

**Rhizines: simple, squarrose** (*Punctelia rudecta*, *Parmelia saxatilis*)

**Cilia:** (*Parmotrema perforatum*)

**Fibrils and Papillae:** *Usnea*

Thallus upper surface: **pruinose, tomentose, reticulate, maculate** (*Physconia*, *Peltigera canina* group, *Lobaria pulmonaria*, *Parmelia sulcata*)

Thallus undersurface: **tomentum, cyphellae, pseudocyphellae, veins** (*Lobaria pulmonaria*, *Sticta* spp., *Pseudocyphelaria* sp., *Peltigera* sp.)

**2:30-2:40:** break

**2:40 – 4:00 PM:** Laboratory session continued

Sexual reproductive structure: **apothecia** and **perithecia** (*Porpidia albocaerulescens*, *Lecanora* sp., *Parmotrema* spp., *Verrucaria* sp., *Dermatocarpon* sp., and *Trypethelium* sp.), including the introduction of the terms **lecanorine** versus **lecideine apothecia**, and **stroma**.

Radial cross section of an apothecium: **Exciple, thalline margine, hymenium, epihymenium, subhymenium, hypothecium, ascus, ascospore, paraphysis** (*Porpidia alboscaerulescens*, *Lecanora* sp.)

**Pycnidia and pycnidiospores.**

Asexual reproductive structures: **Isidia, lobules, soredia, laminal and marginal soralia** (*Parmotrema tinctorum*, *Parmotrema hypotropum*, *Sticta*, *Lobaria scrobiculata*).

**Saturday March 9, field trip and laboratory session at Duke University:**

**10:00 AM – 1:00 PM:** Field trip at the Eno River State Park, Cole Mill, Durham, NC

**10:00 AM:** Meet at NCSSM.

**10:05 AM:** Departure for field trip.

**12:30 PM:** Lunch at Eno River.

**1:00 PM:** Departure for Duke University

**1:30-4:00 PM:** Lichen identification workshop.