Laboratories 4 & 5: Leptosporangiate Ferns

These two labs cover some of the major families of leptosporangiate ferns (see Lab #3 for a chart that distinguishes between eusporangiate and leptosporangiate ferns), sometimes called the “higher ferns” or “true ferns.” This is a group that contains 30-50 families and ~10,000 extant species. After the Leptosporangiate Fern labs you should be familiar with the common types of indusia (pellate, reniform, tubular, laterally attached, false), the two major categories of spores (trilete and monolete), annulus types (patch, apical, oblique, vertical), and other features that help distinguish the major groups of leptosporangiate ferns. (see p.87-92 in the Simpson text for more information)

PTERIDOPHYTES: Part II – Leptosporangiate Ferns

Osmundaceae – 3 genera, ~25 spp., temperate and tropical, terrestrial
Homosporous; fertile and sterile fronds present (dimorphic fronds) or frond divided into sterile and fertile regions, stipules often present at base of stipe; indusia lacking; no distinct or well-developed annulus; many spores per sporangium (>128), sporangia spherical; spores green, trilete

Osmunda
Todea

Hymenophyllaceae – 2-34 genera (depending on circumscription), ~600 spp., tropical, epiphytic or terrestrial
Homosporous; leaves only one or two cell layers thick; indusia present (cup-like or tubular); stomata lacking; sori located at the margin of the leaves; annulus oblique; spores green, trilete

Hymenophyllum
Trichomanes

Schizaeaceae – 4 genera, ~175 spp., tropical, terrestrial
Homosporous; leaves indeterminate and climbing in Lygodium, dichotomous branching and venation; sporangia occur singly, (i.e. not grouped into sori), marginal, on stalks at blade tips or on pinnae lobes; commonly climbing vines, indusia absent (except in Lygodium); annulus apical; spores monolete

Lygodium
Schizaea

Marsileaceae – 3 genera, ~80 spp., tropical and temperate
Heterosporous; sori are enclosed within a sporocarp (microsporangia and megasporangia within the same sporocarp), which is stalked and arises from the rhizome or petiole; rooted-aquatic (often with floating leaves) or terrestrial; spores trilete

Marsilea
Regnellidium
Pilularia
Salviniaceae – 2 genera, ~13 spp. tropical

**Heterosporous**; sori are enclosed within a **sporocarp** (microsporangia and megasporangia are in different sporocarps); in *Salvinia*, **leaves in whorls of three**, one of the three leaves resembles a submerged "root"; in *Azolla*, leaves divided into two lobes, one photosynthetic (with cavities that house the nitrogen-fixing cyanobacteria *Anabaena*), the other submerged and non-photosynthetic; all are **free-floating aquatic**, spores trilete

- *Salvinia*
- *Azolla*

• **Families below this point have 64 or fewer spores per sporangium**

Cyatheaceae – 4 genera, ~650 spp., tropical “Tree Ferns”

Homosporous; generally arborescent; numerous **scales** and sometimes hairs present at leaf bases; indusia various or lacking, but not as in Dicksoniaceae; spores trilete

- *Cyathea*
- *Alsophila*

Dicksoniaceae – 6 genera, ~20 spp., tropical “Tree Ferns”

Homosporous; arborescent; **lacking scales** but with hairs at leaf bases; **indusium present, bivalvate**, usually half composed by a reflexed portion of the margin (often colored differently), sometimes cup-shaped; spores trilete

- *Dicksonia*

Pteridaceae – ~40 genera, ~1000 spp., temperate to tropical, also in arid regions

Homosporous; sporangia typically aggregated in lines along the veins or near the leaf margin; **no indusium or a "false" indusium present**, formed by reflexed margin; scales or glandular hairs often present; annulus typically vertical, interrupted; trilete spores; few spores per sporangium (usu. >32 but <64); spores dark in color (*i.e.* black, brown or gray), not green, trilete

- *Adiantum*
- *Cheilanthes*
- *Pellaea*

Aspleniaceae – ~8 genera, ~700 spp., temperate and tropical

Homosporous; stems typically covered with scales; **sporangia located on veins and are covered by laterally-attached indusia**; sori usually linear, oblique to costa, typically open away from costa; spores **monolete**

- *Asplenium*

Blechnaceae – ~10 genera, ~300 spp., terrestrial or epipetric

Homosporous; blades often reddish in color when young; **sori linear or clustered so as to form "chains", parallel to rachis**; indusia present, opening inward (*i.e.* toward the costa); spores **monolete**

- *Blechnum*
- *Woodwardia*
Dryopteridaceae – ~40 genera, ~1500 spp., temperate and tropical
Homosporous; scales present on stems; indusia usually present, reniform
(kidney-shaped) or peltate, occasionally laterally attached (Diplazium),
sometimes lacking or “acrostichoid” (spread densely over abaxial surface);
sori generally not located along the leaf margin; leaves often highly dissected,
annulus vertical, spores monolete
  Athyrium
  Diplazium
  Dryopteris
  Polystichum

Polypodiaceae - homosporous; sori round (sometimes elongate or
acrostichoid) and lacking an indusium; annulus vertical and interrupted;
net-like venation pattern; leaves generally simple or pinnatifid; plants often
epiphytic, annulus vertical, spores monolete, usually yellow
  Lecanopteris
  Polypodium

<table>
<thead>
<tr>
<th>Family</th>
<th>Annulus</th>
<th>Indusium</th>
<th>Spore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Osmundaceae</td>
<td>Patch/Not Distinct</td>
<td>None</td>
<td>Trilete, Green</td>
</tr>
<tr>
<td>Hymenophyllaceae</td>
<td>Oblique</td>
<td>Cup-Shaped or Tubular</td>
<td>Trilete, Green</td>
</tr>
<tr>
<td>Schizaeaceae</td>
<td>Apical</td>
<td>None (except in Lygodium)</td>
<td>Monolete</td>
</tr>
<tr>
<td>Marsileaceae</td>
<td>N/A – In sporocarp</td>
<td>N/A</td>
<td>Trilete, Heterosporous</td>
</tr>
<tr>
<td>Salviniaeae</td>
<td>N/A – In sporocarp</td>
<td>N/A</td>
<td>Trilete, Heterosporous</td>
</tr>
<tr>
<td>Cyatheaceae</td>
<td>Oblique</td>
<td>Various (including lacking), but not as Dicksoniaceae</td>
<td>Trilete</td>
</tr>
<tr>
<td>Dicksoniaceae</td>
<td>Oblique</td>
<td>Bivalve or Cup-shaped</td>
<td>Trilete</td>
</tr>
<tr>
<td>Pteridaceae</td>
<td>Vertical</td>
<td>False or none, (some acrostichoid)</td>
<td>Trilete</td>
</tr>
<tr>
<td>Aspleniaceae</td>
<td>Vertical</td>
<td>Laterally-attached, usually linear, typically opening away from costa</td>
<td>Monolete</td>
</tr>
<tr>
<td>Blechnaceae</td>
<td>Vertical</td>
<td>Laterally-attached, linear, opening towards costa</td>
<td>Monolete</td>
</tr>
<tr>
<td>Dryopteridaceae</td>
<td>Vertical</td>
<td>Reniform or Peltate, occasionally laterally attached, (rarely lacking)</td>
<td>Monolete</td>
</tr>
<tr>
<td>Polypodiaceae</td>
<td>Vertical</td>
<td>None</td>
<td>Monolete</td>
</tr>
</tbody>
</table>