Features of the Basidiomycota

Evolutionary position - sister group to the Ascomycota,

Age - first fossils (clamp connections, 290 mya in fossil fern); Molecular estimates –400-700mya

numbers: 14,000 species described; second largest phylum of fungi

The **basidium** (means club)
formation: probasidium site of karyogamy;
metabasidium site of meiosis ,
formation of sterigmata (singular = sterigma),
spores usually asymetric with a hilar appendage

Mechanism of active discharge - unique to basidiomycota distance shot (.1-.2 mm), up to 1mm in "mirror yeasts"

Buller's droplet and observations (from 1922!) -
Components of active discharge: narrow, often curved sterigmata; asymmetric attachment of basidiospores (Hilar appendage); droplet formation
successive discharge with basidium retaining turgor.

Later observations – the droplet can be sectioned! – thin membrane covering

Chemical analysis of droplet shows very very dilute osmolyte ($5 X10^{-14}$ manitol, glucose, fructose)

Webster's 1989 model – the "surface tension catapult"

Movies by Pringle et al *Mycologia*, 97(4), 2005, pp. 866-871.
High speed video (100,000 frames/sec) - initial acceleration of > 10,000 g.
http://www.mycologia.org/cgi/content/full/97/4/866/DC1

Generalized lifecycle (e.g., *Coprinus*, or *Schizophyllum*)

haploid basidiospore, haploid mycelium ("**primary mycelium**") - may make haploid mitotic spores "oidia", - haploid mycelium usually short-lived in nature

Complex "dolipore" septa in many

dikaryotization by fusion of two haploid mycelia or on haploid mycelium and either oidia or basidiospore of proper mating type, new haploid nucleus migrates throughout mycelium.

dikaryotic mycelium ((N+N), "secondary mycelium") - often with clamp connections,

basidiocarp formed, karyogamy and meiosis in basidia, lack of differentiated gametangia (except in rusts)

Mitotic spores, mostly arthrocondia, when present almost always 1N, usually used for genetic exchange, not inoculum (exceptions: rust fungi, yeast states, insect vectored settings: *Peniophora* – Western pine beetle, *Amylostereum* - sawflies, *Lepiota* -ants)

Mating system

Tetrapolar versus bipolar mating systems - two multi-allelic loci

Example: dikaryon: $A_1A_2B_1B_2$ – four basidiospore types: A_1, B_1, A_1, B_2, A_2, B_1, A_2, B_2,

To be compatible haploid must differ at both loci, so only 1/4 of full sib pairings are compatible.

	A_1, B_1	A_1, B_2	A_2, B_1	A_2, B_2
A_1, B_1	-	-	-	+
A_1, B_2	-	-	+	-
A_2, B_1	-	+	-	-
A_2, B_2	+	-	-	-

Fusion first followed by compatible or incompatible reaction

A locus – (composed of Aα and Aβ)initial formation of clamps, nuclear pairing, conjugate nuclear division, septation of clamp,

heteromeric homodomain transcription factors (=B locus in Ustilago)

B locus (composes of Bα and Bβ) – nuclear migration, fusion of clamp tip

encodes lipo-peptide pheromone and pheromone receptors

Both loci highly multi-allelic (for Schizophyllum world wide, 288 A alleles, 81 B alleles. (predicts 23,328 combinations!)

Dimon mating (He/Ho mating) ("Buller phenomena") also possible.

Ecologies: Saprobes: **wood decay**; Mutualists**: ectomycorrhizae**, Plant pathogens (rusts, smuts, root decay fungi); mycoparasites (Tremellales)

Three main classes of Basidiomycota: Hymenomycetes, Ustilaginomycets, Uredinomycetes. –septal pore structure.

Reading:

Chapter 16 in Alexopolous

If you want more information on the molecular genetics of mating type"

Kothe, E. 1999. Mating types and pheromone recognition in the homobasidiomycete Schizophyllum commune. Fungal Genetics & Biology 27: 146-152.