Questions generated by Libkind et al. 2011 paper

- **Human selection**

Humans can actively act as a selective force in the evolution of some organisms (willingly or not). But in the selection of the actual yeast strains, do you really think that we could select for the ones that best served our interests (flavour, content, etc)?, or just allow the most effective user of the environment to overthrow the other less efficient strains. Sounds more like coincidence to me (we even don't know if we could have tastier beer with one of the other extinct hybrid strains!).

- **Source, transport and timing of the New World yeast introduction**

Besides *Nothofagus*, are there other genera and families in Fagales that should be considered when investigating possible wild populations of (cryotolerant) *Saccharomyces*? I know in the ESS this topic was mentioned with the subgenera of *Nothofagus* in Australia, New Zealand, and Papua New Guinea. Is this fungus associated with other orders?

As noted in the paper (page 5), I too was struck by the fact that a Patagonia species of yeast is one of the apparent parents of the domesticated hybrid Yeast, *Saccharomyces pastorianus*. It is interesting to note that the beginning of Lager-brewing in the 15th century does not correlate with the introduction of *Nothofagus* to European scientific literature, which occurred in 1850, though it does not automatically mean a Spanish explorer cut down a *Nothofagus* and transported it to a ship headed back for Europe. I wonder if it would be possible to isolate yeast from very old brewing houses (ie. wood beams) and if it is possible that *S. eubayans* has found a "niche" in such European environments.

Lager, cold bottom, brewing started in the early 1400s in Bavaria and requires fermentation with the cryotolerant "S. pastorianus" which the authors claim is a hybrid of" S. Cerevisiae" and New World "S. eubayanus". Yet significant trade between Europe and South America did not start for at least another 100 years. Was there a cryotolerant "S cerevisiae" or some hybrid with a European equivalent of "S. Eubayanus" that became displaced by a superior cryotolerant "S. pastorianus"?

I'm curious about how and when *S. eubayanus* was incorporated into brewing. Does lager brewing in Europe predate the domestication of *S. eubayanus*? And, how quickly would the events pictured in Figure 3 take place?

Has anyone tried brewing a lager with the unadulterated *S. eubayanus* yet?

- **Species concepts and delimitation**

The authors cited "clear differences in ecological background and in genomic constitution" (p2) to support their naming the Patagonian lineage as a new species, *S. eubayanus*. What species concept(s) do you think they used?

The authors noted that 6-8% of sequence divergence (between *S. eubayanus* and S. *uvarum*) is the lowest observed within the genus. Taking in account this and the Barret and Freudenstein paper in the first seminar (where genetic differences were not enough evidence for recognize species), it seems to be that sequence data are a secondary source of information and cannot used by themselves for resolving taxonomic problems. What do you think about the utility of the molecular data for in these cases?

It is interesting that this yeast species can only be distinguished from others via its genome sequence and not phenotypic characters. I wonder how practical of an approach this would be for future descriptions of new plant taxa. Should taxonomists be comparing genetic information of presumably new taxa with that of related, previously-named taxa so as to validate the naming and to avoid redundancy? It would be interesting to see how many taxa that have been "sunk" to synonymy should really be elevated, and vice versa, with this approach.

On the 2nd page the authors use the "meiotic sterility" test to examine the 2 South American (SA) isolates, populations A and B and declare that 7.3% viable spores is sufficient for them to be declared "two different biological species". What % of spore viability would be needed for them to be a single species?

In the end, they declare one new South American species, "*Saccharomyces eubayanus*". How do they have 2 species (populations A and B) on page 2 and one on page 5? Are they using the biological species concept on page 2 and a
different one on page 5?

- **Genomic techniques**

From page 2, they generated millions of 36-bp fragments. How does one keep track and align so many small pieces?