Genomics: Whither Next for the Plant Kingdom?

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What can we do now?

- **Gene discovery: easy (ESTs, genome sequence, annotation)**
- **Crude but comprehensive expression analysis: easy**

- **Mutagenesis: somewhat easy**
- **Mapping: slowish, species-specific biology, robust markers**
- **Reverse genetics (including transformation): limited number of species, non-trivial**
- **Phenotyping: some easy, most important stuff is difficult, slow, expensive and inconsistent**

- **Physiology: challenging, disappearing somewhat at the whole plant level**
- **Metabolomics, biochemistry, cell biology, development: rate limiting**

What genomics approaches are getting better, fast?

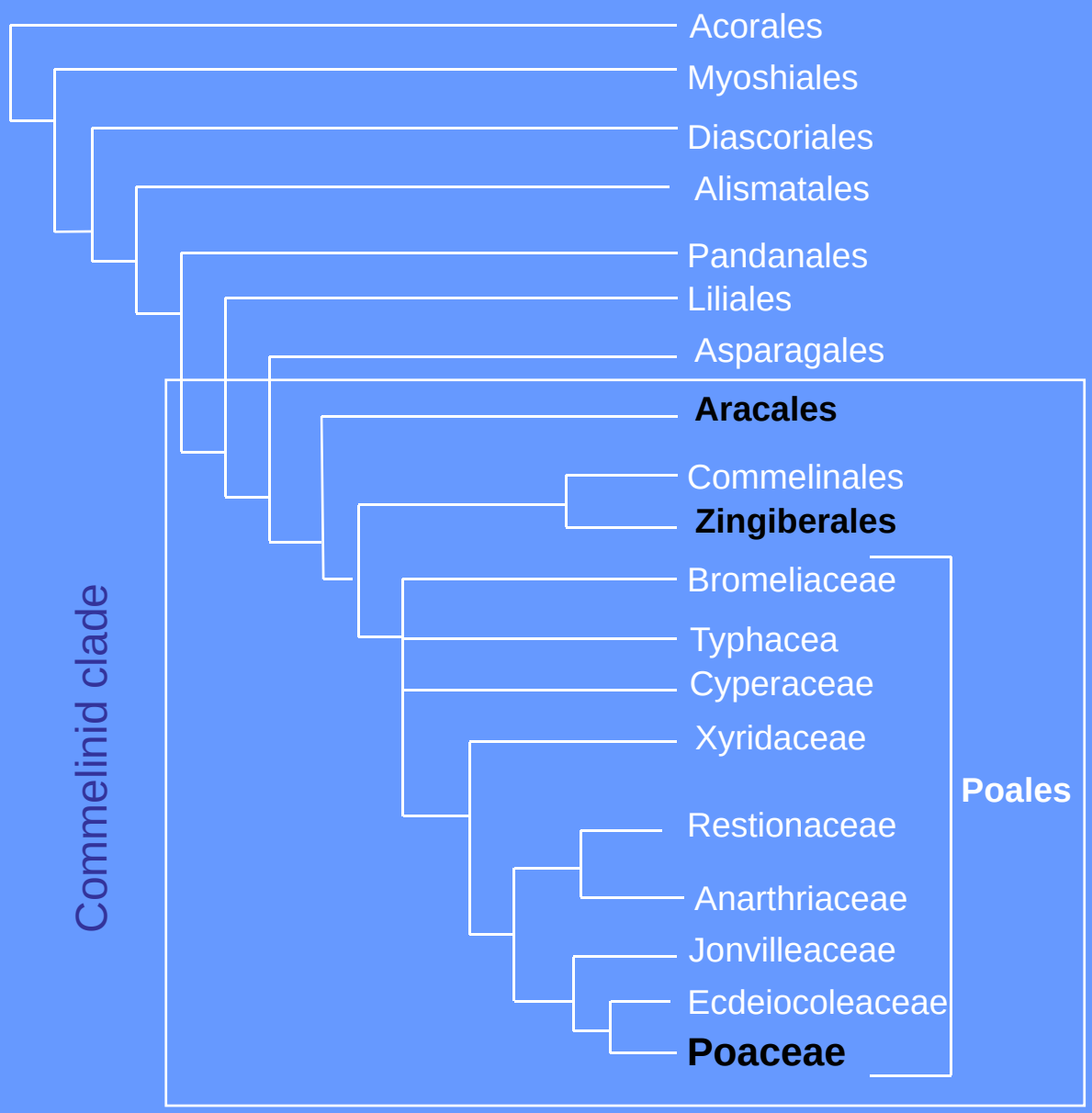
- **Sequencing, expression**
- **Mapping, association mapping**

- **Some reverse genetics (site directed, TILLing, ?)**
- **Some levels of annotation**

What genomics approaches aren't improving apace?

- **Some reverse genetics (e.g., types of tagging)**
- **Transgenics**
- **Phenotyping**
- **Some levels of annotation**
- **Phylogenomics: comparative genomics**

A Monocot Phylogenetic Tree



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- **Access, retrieve and analyze data across platforms**

What is really worth doing?

- **Basic research: black boxes, blue sky**
  - **Plant-associated microbial metagenomics**
  - **Agronomic QTL**
  - **Comprehensive gene discovery**
  - **Genetic basis of similarity and difference**
  - **Epigenetic connections**
  - **Systems biology: pathways and connections**

- **Applied (translational) research**
  - **Crop improvement**
  - **Sustainability**
  - **Diversity preservation and use**
  - **Bioenergy and carbon capture**

Structural Problems to Overcome?

- **Megascience and megamanagers**
  - **A great way to do incremental research, no great history of transformational discovery**
  - **Necessary, but what is the right balance**
  - **Small projects empower broadest community, especially young researchers, and increase competition**
  - **Orphans (crops and questions) not as likely to be lost in the mix**

- **Loss of blue sky, risky and long term research**
  - **Limited funds lead to conservative choices**
  - **Five year plans run the show (welcome to the USSR, 1957)**
  - **How about a venture capital model for some portion of public sector funding?**