Genetic analysis and diversity of primary biogenic aerosol particles

Viviane Després

Biogeochemistry Department, MPI for Chemistry, Mainz, Germany
General Botany, Mainz University, Germany

Identification of Biological Aerosol Particles and Characterization of their Abundance

MPIC

...with molecular genetic methods...

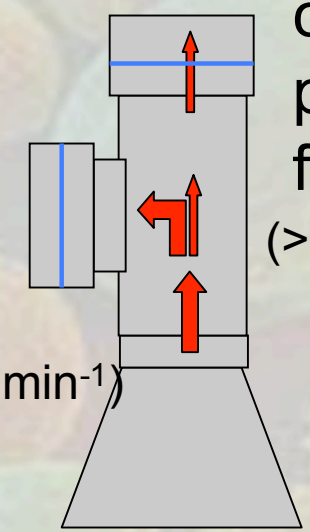
- Bioaerosols - important fraction of the aerosols in the atmosphere

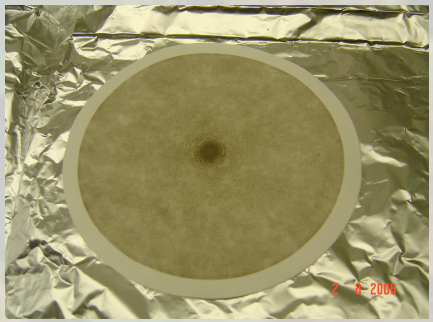
- Effects on climate

- Human, animal and plant diseases
- Not well characterized (traditional detection methods have many limitations)

Sampling Method

High-Volume Filter Sampler (HVFS)





Sampling Locations

Mt. Zugspitze:
high alpine
(autumn, 2003)

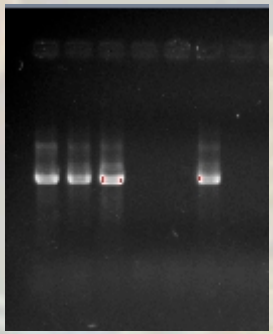
Mainz: urban
(all year 2006)

Hohenpeissenberg:
rural (sommer, 2004)

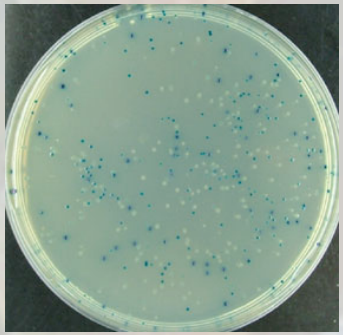
Munich: urban
(spring, 2005)

Laboratory Methods

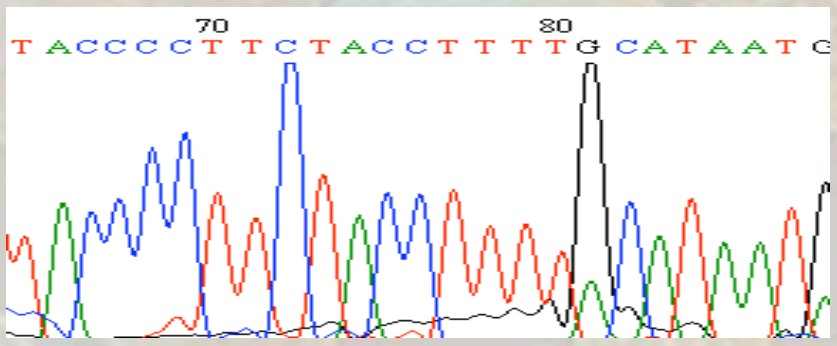
DNA Extraction and Amplification



PCR



Cloning



Sequencing

T-RFLP

Controls

glass fiber filter

- baked at 300°C for 12h
- not sampled = blank

polypropylen filter

- directly from industry
- not sampled

polypropylen filter

- not sampled
- pressed into tablet

no DNA

bacterial DNA

bacterial DNA

Control improvement

All filters need to be decontaminated prior to sampling!

- baking for 12h at 300°C
- autoclaving

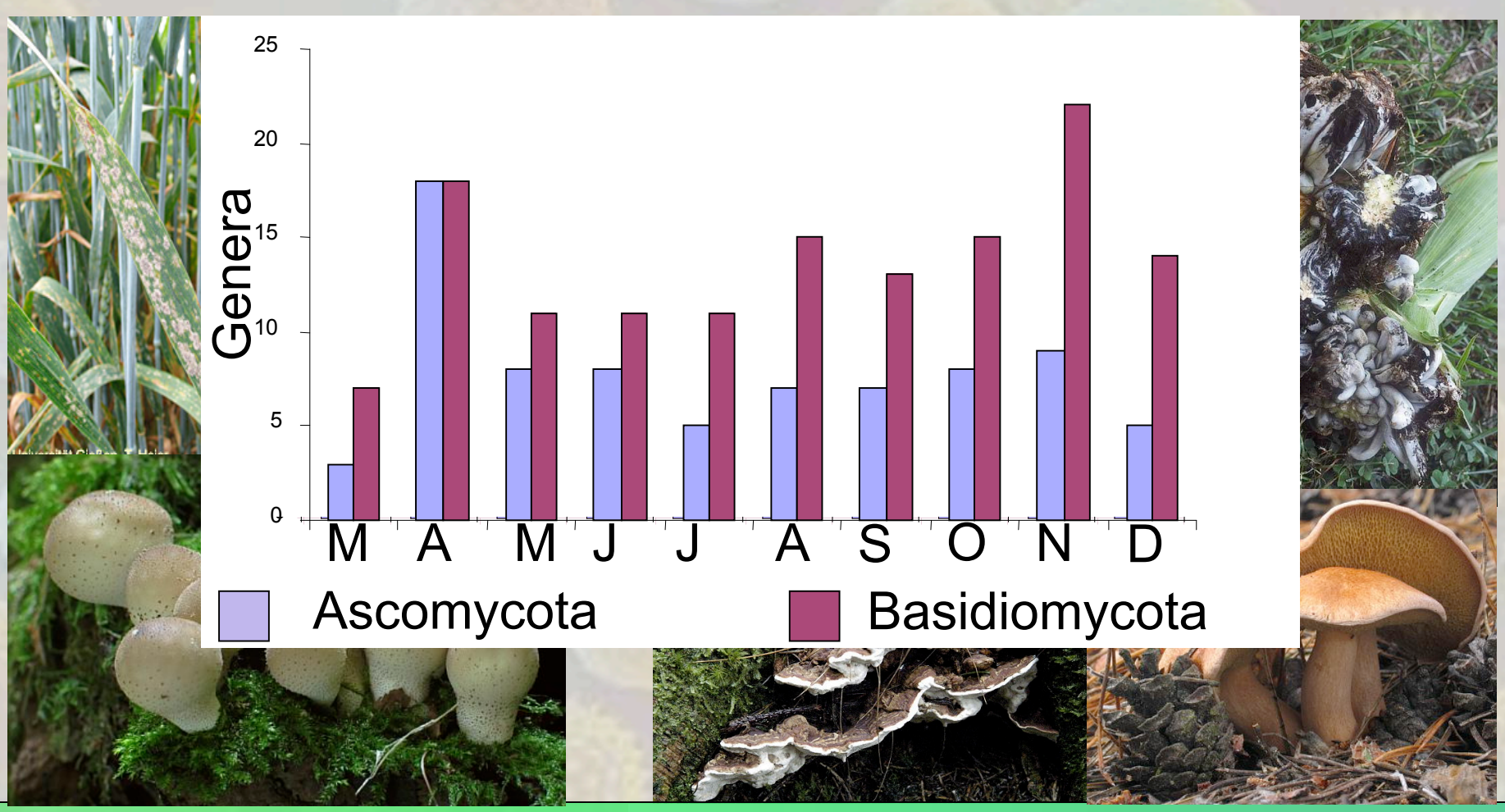
1. Handling blank: controls possible contamination during installing the filter into the High Vol

2. 5s blank: controls contamination within the HighVol (e.g. Bacterial/ fungal colonies)

3. PCR blanks: control PCR without DNA

Fungal Results

(Coarse particle from Mainz/2006)



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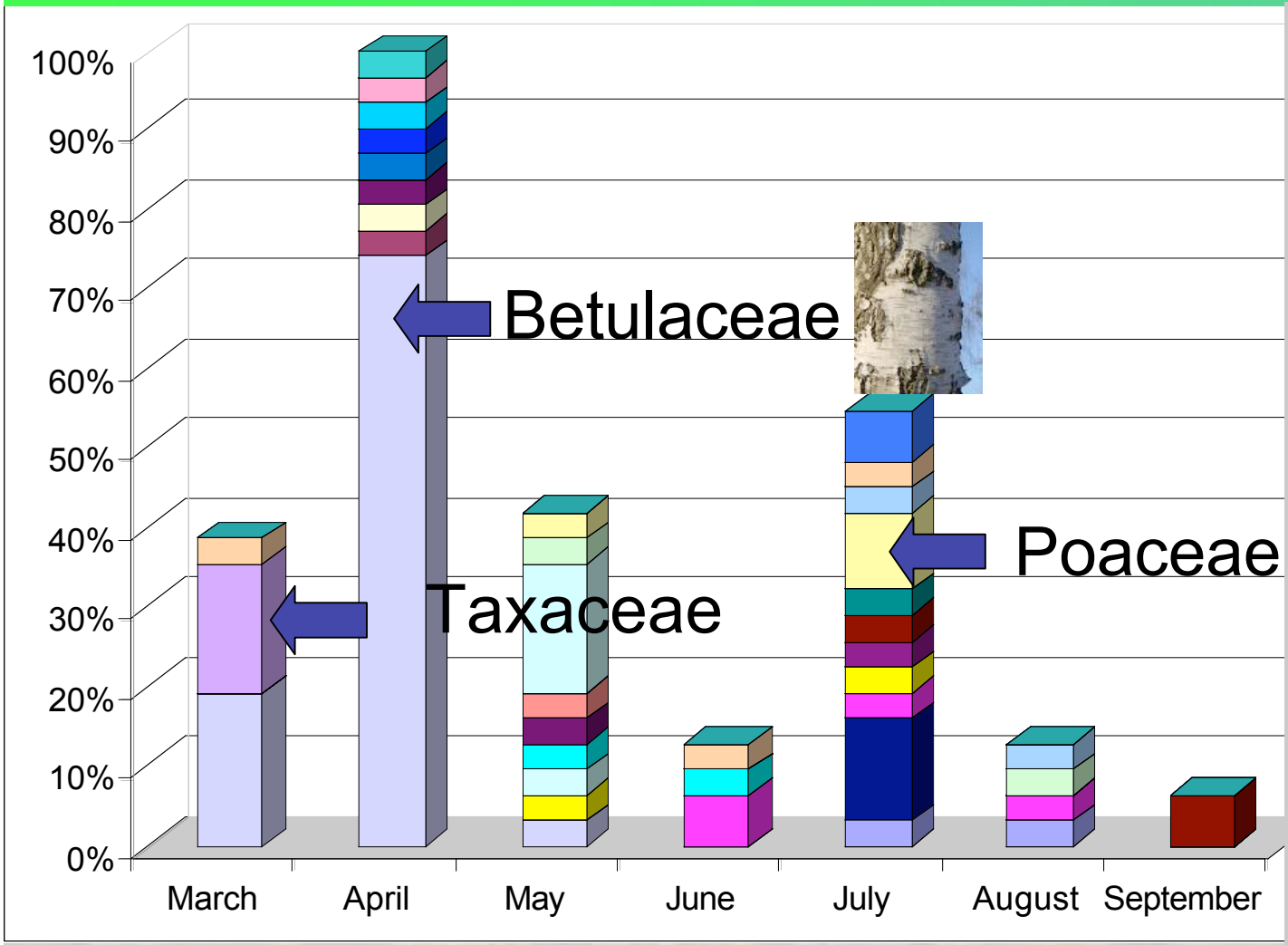
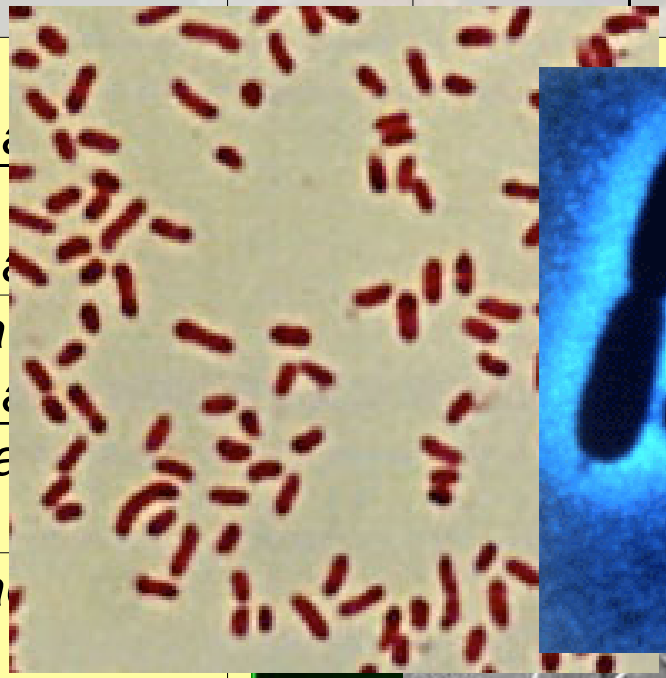
Plant results
(Coarse particle from Mainz/2006)

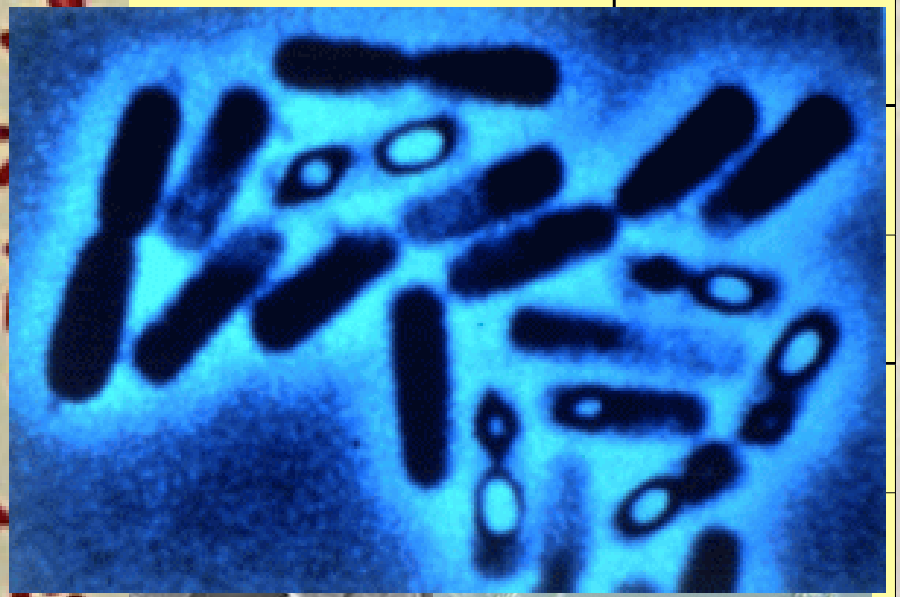


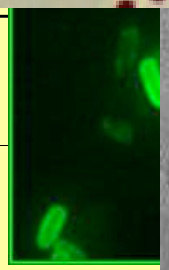
- Bryophyta (mosses)
- Chlorophyta (green algae)
- Pteridophyta (ferns)
- Magnoliophyta (flowering plants)
- Coniferophyta (conifers)
- Ginkgophyta (ginkgo)

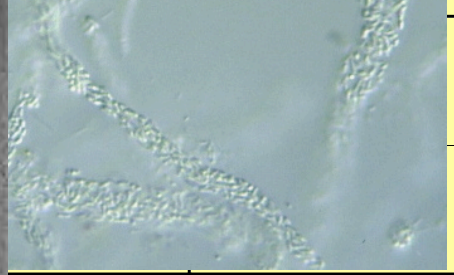
Bacterial results

	Mainz	Munich	Hohenpeissenberg	Mt. Zugspitze
Alpha - Proteoba				
Beta - Proteoba				
Gamma Proteoba				
Actinoba				
Acidoba				
Bacteroid es				
Firmicutes				





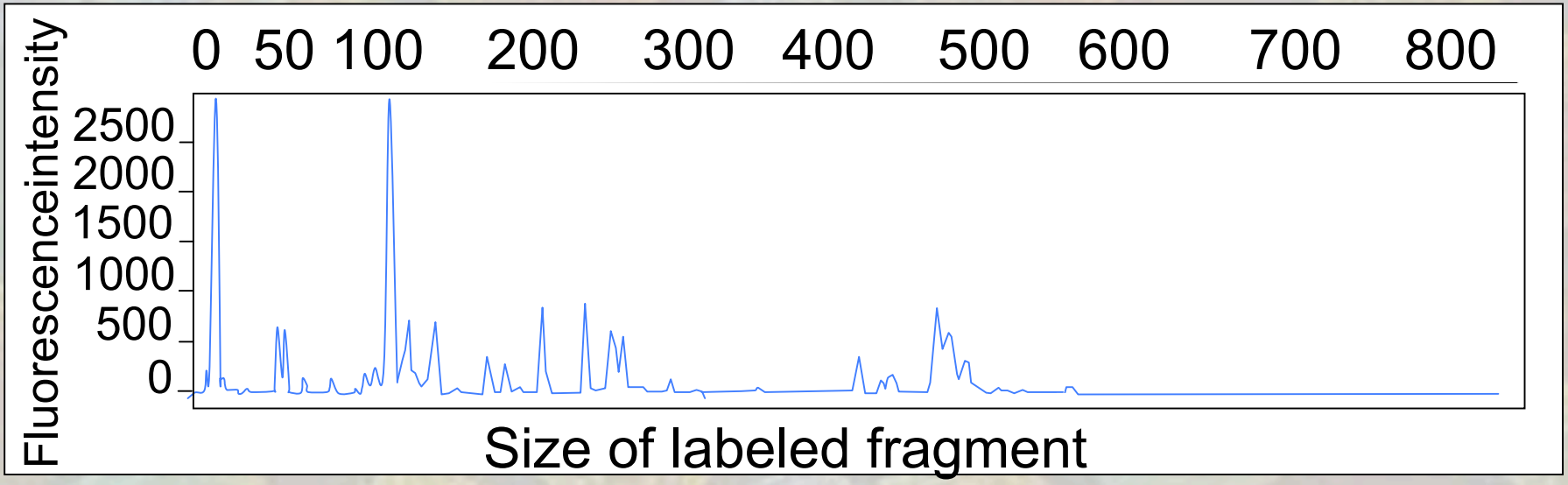




Terminal Restriction Fragment Length Polymorphism Analysis

Technique to quickly (and cheap) get information on

- diversity of e.g. bacteria or fungi
- relative abundance of e.g. bacterial groups



Summary

- It is possible to extract DNA from „old“ filters but much information is lost
- Blanks are very important and filters need to be decontaminated from biological particles prior to sampling
- fungi, plants and bacteria of 2006 have high diversity
- seasonal characteristics e.g. Pollen season can be seen in results

Thanks to

- U. Pöschl
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