

**SAG Culture Collection of Algae:**  
a platform for *ex situ* conservation of  
algal biodiversity and research



Maike Lorenz & T. Friedl

SAG - Culture Collection of Algae at  
University of Göttingen, Germany



# SAG: Biological Resource Centre for Algae

- *Ex situ*-maintenance of living cyanobacterial and algal strains
- provision of quality source material for research, teaching, ecotoxtesting and biotechnology
- isolation and deposition of new strains
- research
- teaching



The **SAG** originates from the collection started by

***E. G. Pringsheim***

in Prague in the early 1920's



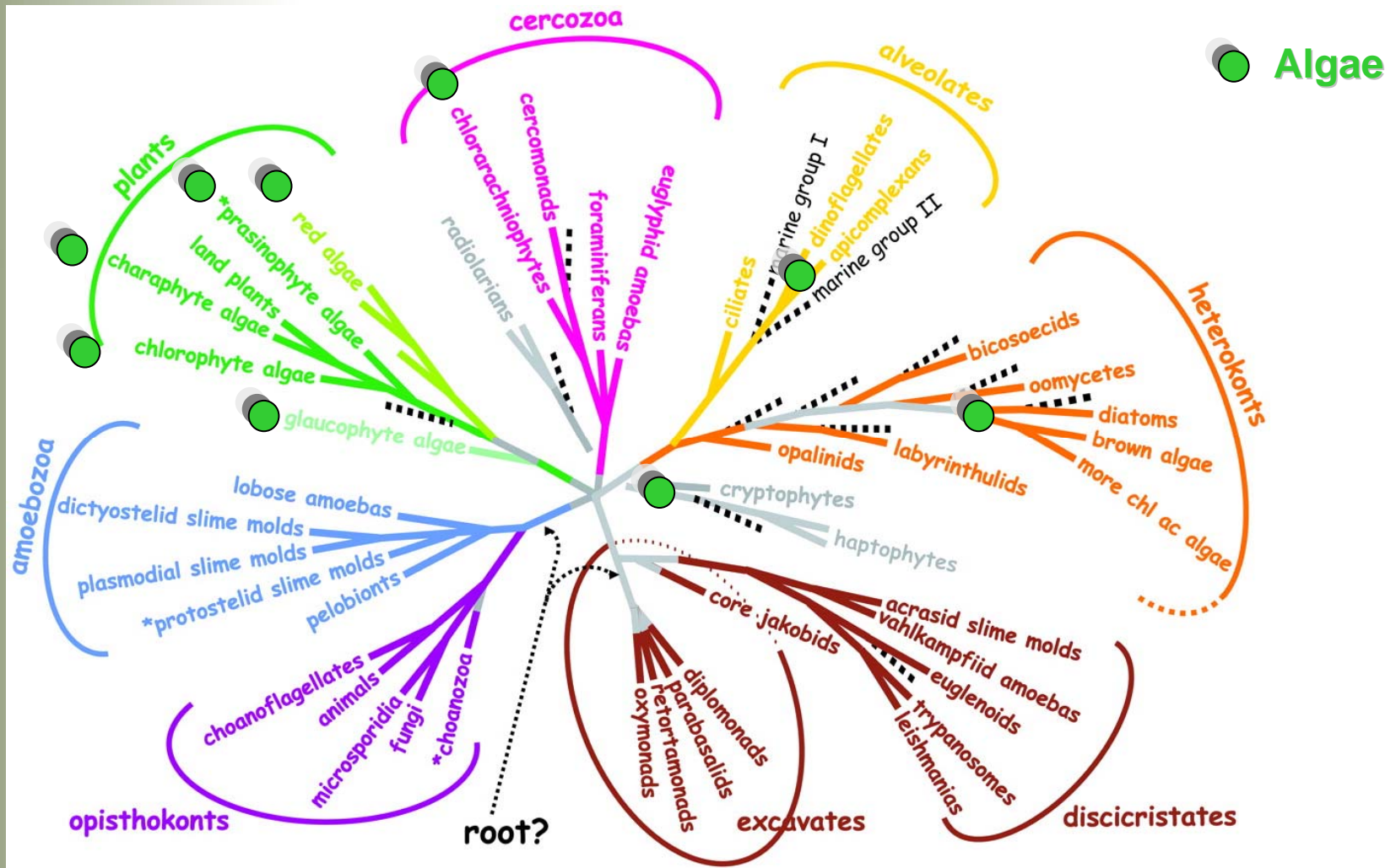
E. G. Pringsheim  
(1881 - 1970)

**Pringsheim´s living legacy:**

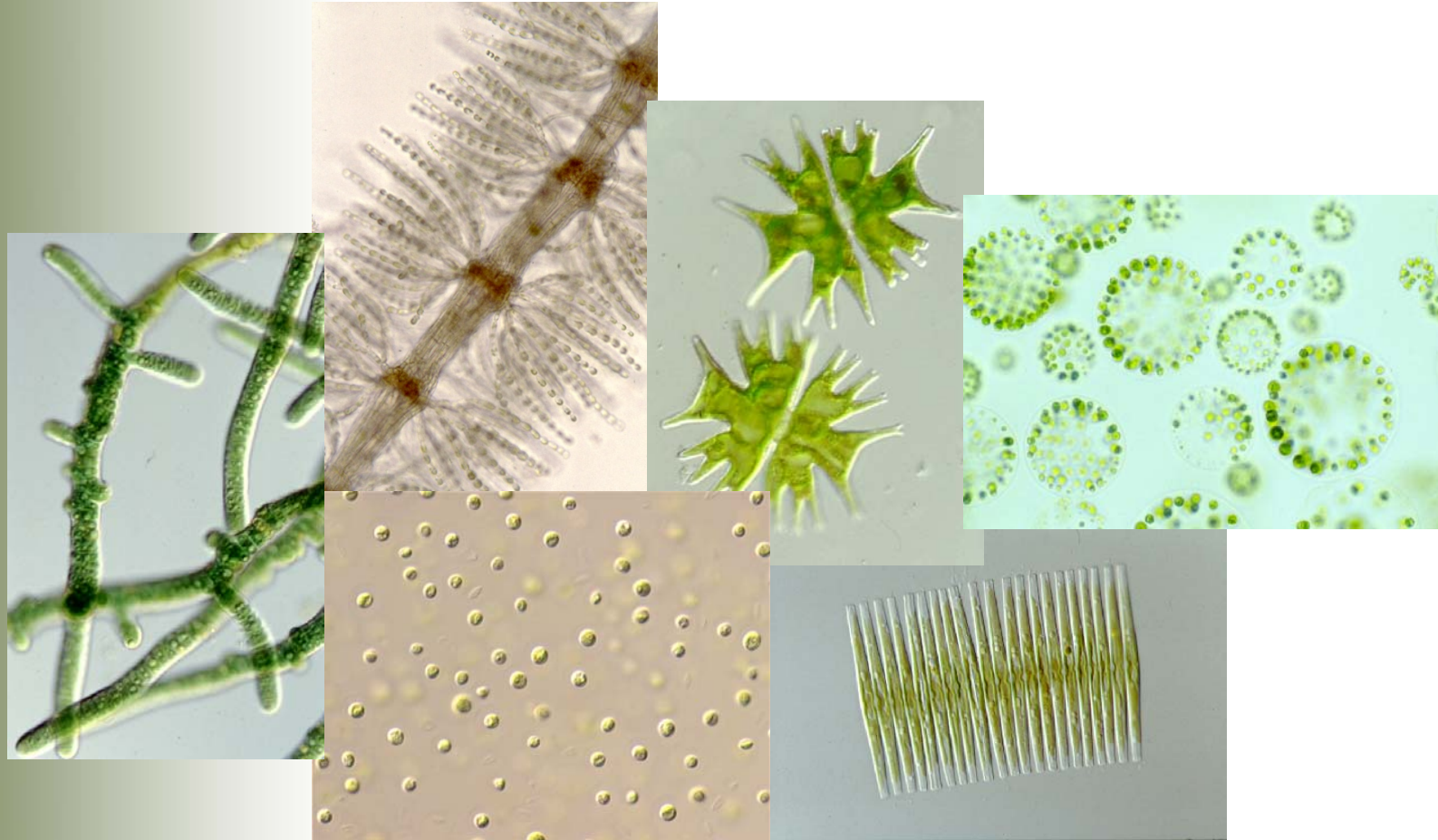
313 strains still available (56 authentic)



# Algae are extremely diverse



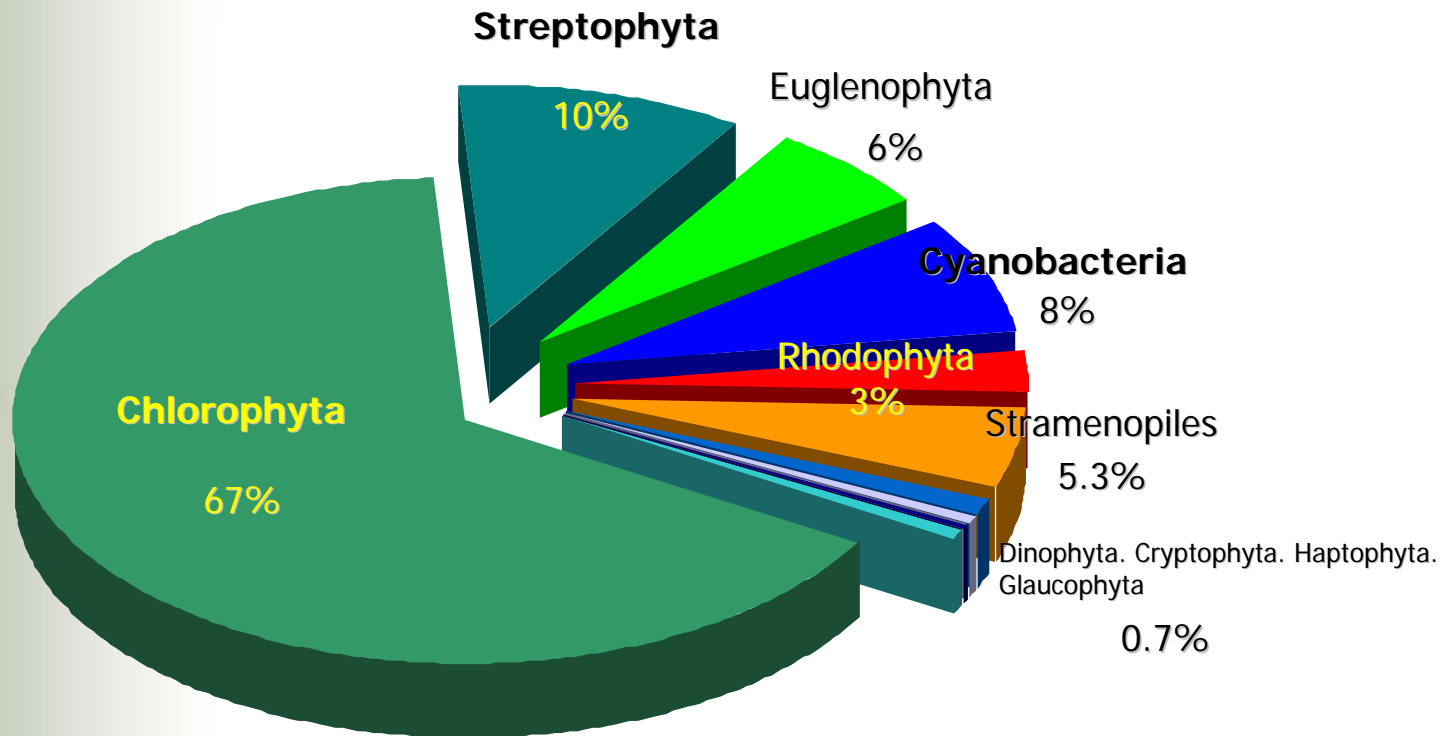
# Enormous diversity of organization and life stages



# SAG culture collection

the challenge: phylogenetic diversity of microalgae:

about 1,500 species (530 genera) with 2,400 strains



# biological diversity

> diversity of culture maintenance



## Maintenance of culture strains

- routine serial subculture of ~2400 strains
- a broad range of different media is applied
- cultures are stored in three culture rooms at 16/18/20 °C and in culture chambers at 10 and 25 °C





# Cryopreservation of Microalgae at SAG



to prevent

- genotypic and phenotypic changes
- the risk of contaminations
- loss of important attributes
- loss of strain

to reduce costs of maintenance

to increase capacities of collection's holdings

at present: about 600 strains cryopreserved

# **SAG: a non-commercial institution**

University of Göttingen covers staff costs and  
provides culture facilities and laboratories

running costs are exclusively financed by  
distribution of culture strains



# Strain distribution: SAG online



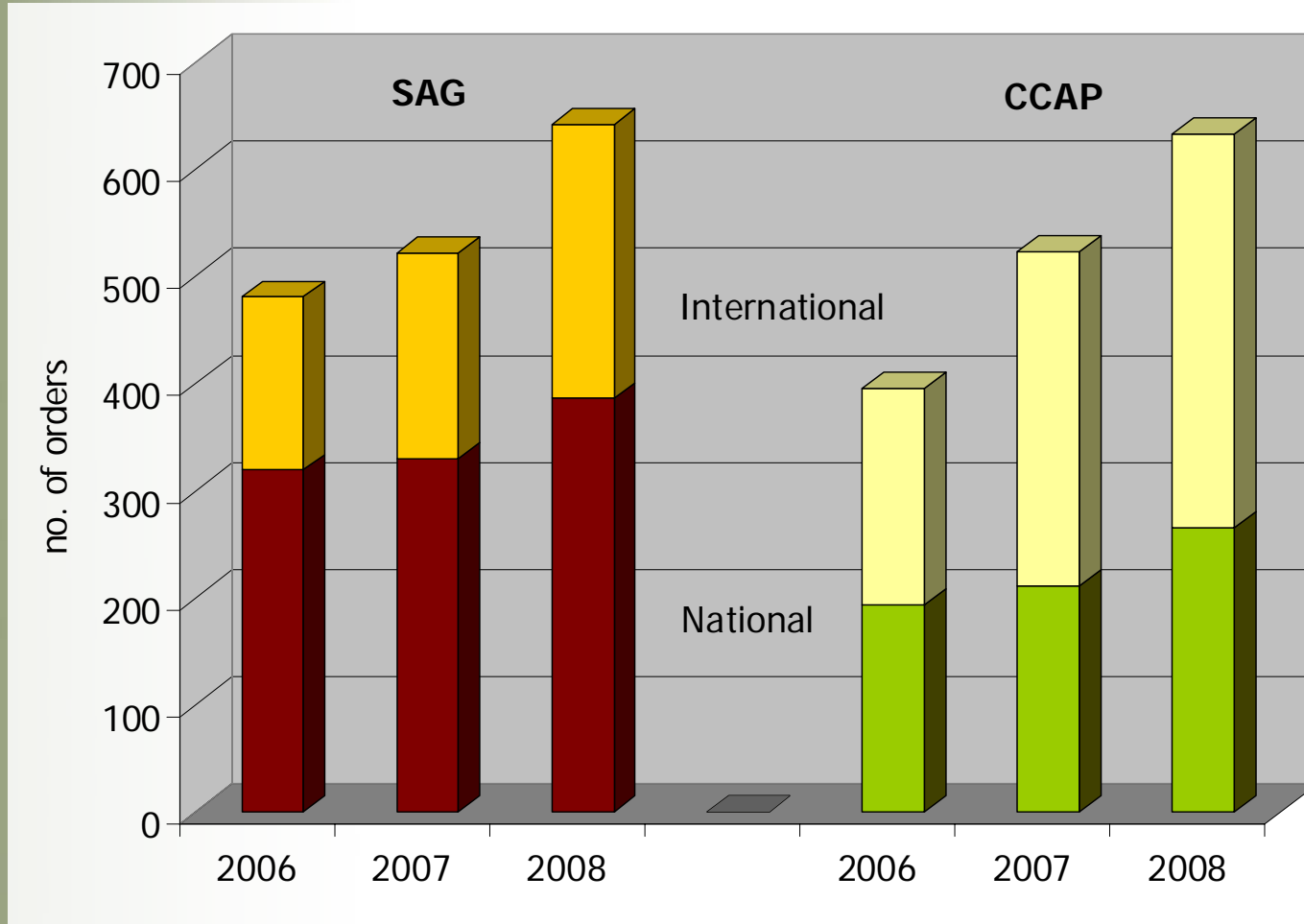
The screenshot shows a web browser window with the URL [http://epsag.uni-goettingen.de/cgi-bin/epsag/website/cgi/show\\_page.cgi?id=3](http://epsag.uni-goettingen.de/cgi-bin/epsag/website/cgi/show_page.cgi?id=3). The browser tab is labeled "Stud.IP - Göttingen". The website header features the SAG logo and the text "Sammlung von Algenkulturen Göttingen". A navigation menu on the left lists: Home, EPSAG Department, About SAG, Order Cultures (highlighted), General Terms, Non-Commercial, Commercial, Catalogue of Strains, Culture Media, Contact, Algae Links, and Depositing Strains. The main content area is titled "How to order" and contains the following instructions:

- ◆ Before placing your order, please review **General Terms and Conditions**
- ◆ Select a strain from the SAG searchable **Catalogue of Strains**
- ◆ Place your order:
  - ◇ **Order for Non-Commercial Research and Teaching**
  - ◇ **Order for Applied Research and Commercial Use**
  - ◇ **Request**



# Dispatch of algal cultures

( ~ 600 orders for 2000 cultures per year)



# Culture distribution: non-commercial orders

> highly subsidized rate

Academia, government and other non-profit making institutions/ individuals :

- teaching
- basic & non-commercial research



# Strain distribution: commercial users

Specific material transfer agreement (MTA)  
with advanced prices



# Strain distribution: commercial users

The screenshot shows a web browser window with the URL <http://www.mbm.med.uni-goettingen.de/indexENG.html>. The page features a header with the MBM ScienceBridge logo and navigation links for MEDIZINTECHNIK, BIOTECHNOLOGIE, MESSTECHNIK, CHEMIE, PHYSIK, and AGRAR. A sidebar on the left lists business activities and technology offers. The main content area includes a welcome message and a news article dated Friday, April 3, 2009, regarding protein substitution therapy for neurodegenerative diseases.

**Business activities**

- Science and Business
- Technology Offers
- Cooperations

**Technology Offers**

- Biotechnology
- Medical technology
- Chemistry
- Physics
- Agriculture/Forestry
- IT

**Welcome to MBM ScienceBridge**

**- Where science meets business -**

MBM ScienceBridge is the technology transfer organization for different Universities and Universities for Applied Sciences and Research facilities in Lower Saxony.

- ◆ Information about offered technologies, patents and patent applications
- ◆ We commercialize results of our university's the latest research. [\[Information Flyer\]](#)

**News ...**

**Freitag, 3. April 2009, Proteinsubstitutionstherapie für Neurologische Entwicklungskrankheit :**

Forscher der Georg-August-Universität Göttingen Stiftung Öffentlichen Rechts, Universitätsmedizin, haben ein modifiziertes MeCP2 Protein entwickelt. Dieses biotechnologisch hergestellte Protein, welches zur Substitutionstherapie bei der Behandlung des RETT-Syndroms eingesetzt werden könnte, kann die Blut-Hirn-Schranke passieren. Es ist somit in der Lage in das Gehirn als das therapeutische Zielorgan zu gelangen. Erste, noch sehr vorläufige Ergebnisse konnten einen Erfolg dieser Strategie in einem Mausmodell belegen. [\[more\]](#)

Sitemap | Impress

MBM Flyer english [\[more\]](#)

signo  
Hochschulen  
an der  
Georg-August-Universität  
Göttingen



# Research at SAG:

## Exploring Biodiversity and Phylogeny





# Research at SAG:

## Exploring Biodiversity

## and Phylogeny

using

different morphological

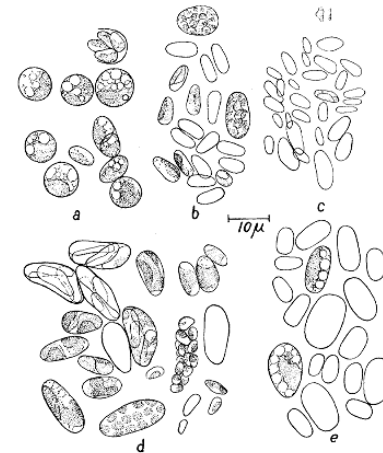
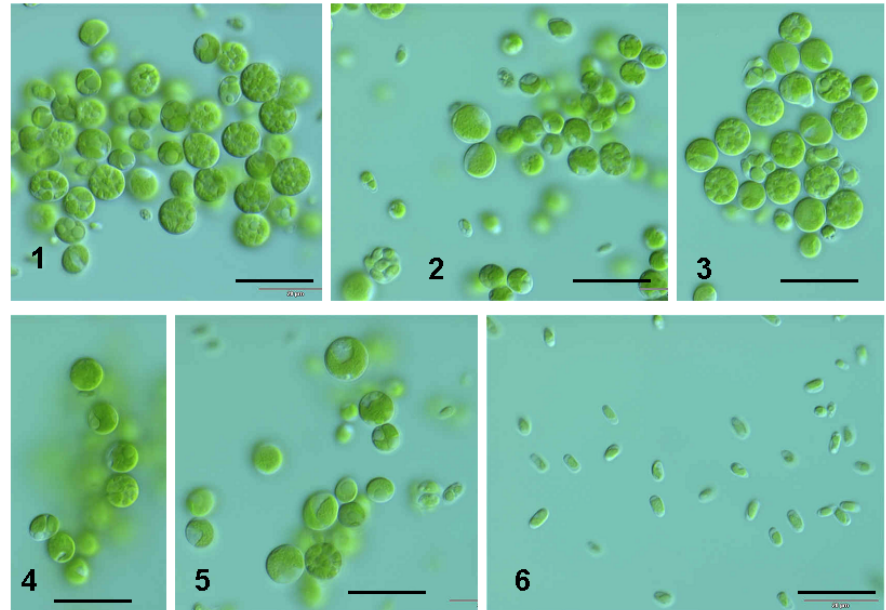


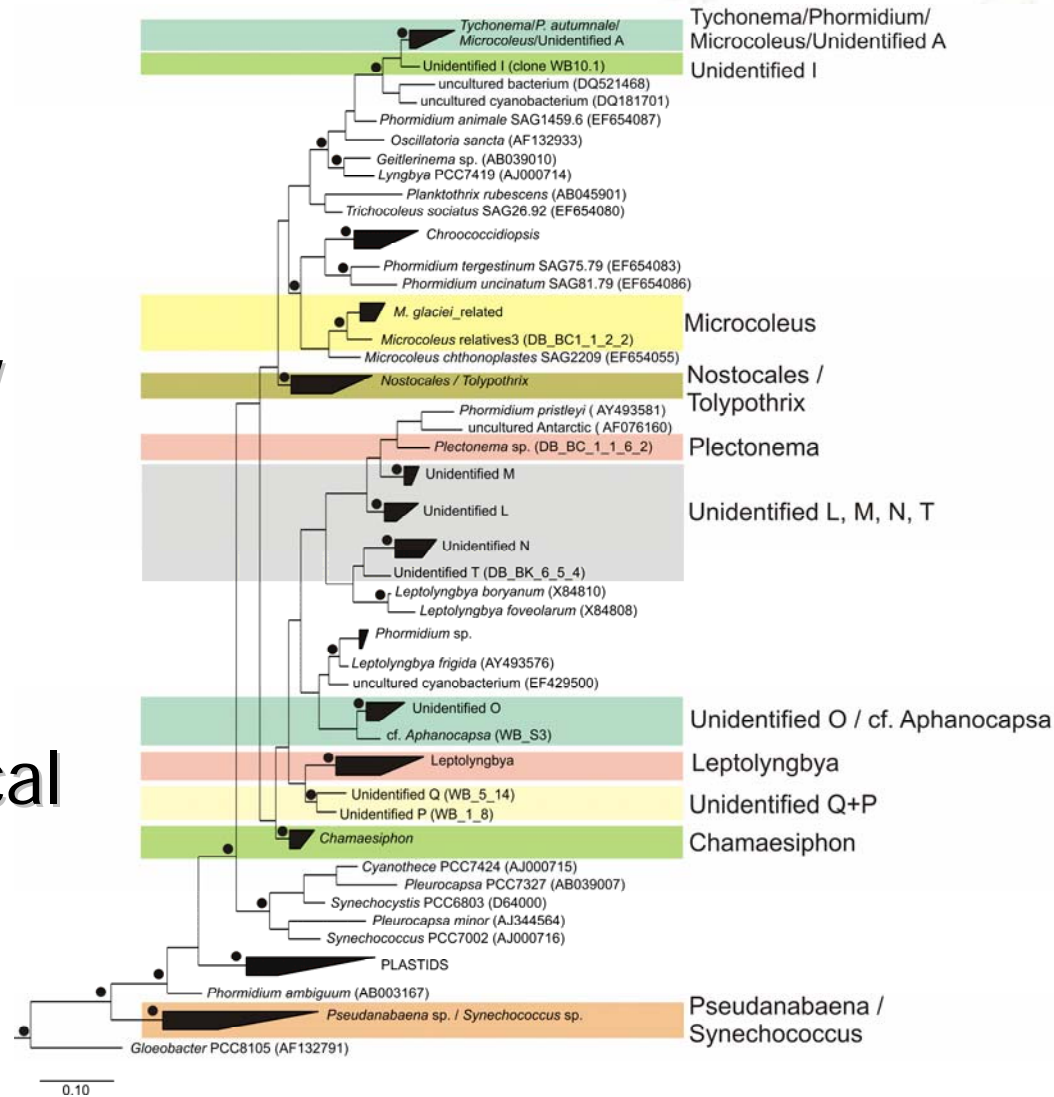
Abbildung 8. *Chlorocloster engadinensis* spec. nov., No. 252, auf Knop-Agar. a alte Kultur, mit Reservestoffen, rundlich. b junge Kultur. c drei Wochen alte Kultur mit wenigen Zoosporen. d vier Wochen alte Kultur. e ältere Kultur. (Vischer 1945) Chlorocloster\_812-1\_Abb8.JPG

*Chlorocloster engadinensis* SAG 812-1



# Research at SAG:

Exploring Biodiversity  
and Phylogeny  
using  
different morphological  
and molecular tools



# Green biofilms on artificial hard substrates



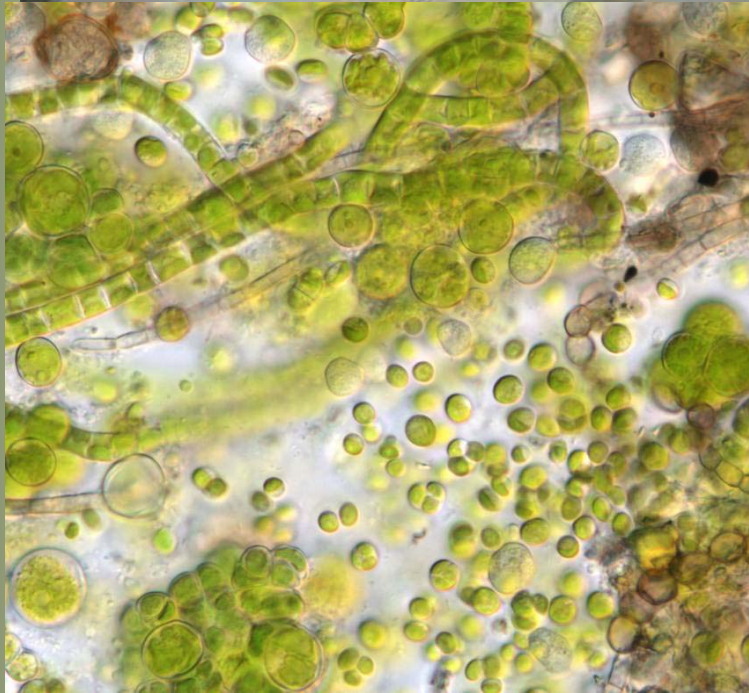
- extreme environment: strong fluctuations in humidity and light (UV-B, PAR)
- exploit new source of valuable compounds
  - discover new green algal lineages
  - treat biodeterioration in an environmentally safe way



# Results from a combined approach



5 rDNA clone libraries, **214 clones**:  
(60% environmental samples,  
40% from raw cultures)



**23 phylotypes**

17 green algae (15 Trebouxiophyceae,  
2 Streptophyta)


6 Ascomycetes

# New Species: *Chloroidium ellipsoideum*



adhesive properties: "glue"

© T. Darienko



Diversity of cyanobacteria and eukaryotic algae  
in biofilms on tufa stromatolites of  
hard water creeks

Nicole Brinkmann, Kathrin I. Mohr, Ladislav Hodač, Regine Jahn, Thomas Friedl



Centre for Geobiology  
of Goettingen University



Centre for  
Environmental Research

Calcification  
processes  
( 'growing  
stones' )

Distribution  
of Organisms  
in biofilms  
(FISH)

Abiotic factors  
(Microsensor  
investigations)

AWI   
Stiftung Alfred-Wegener-  
Institut für Polar- und  
Meeresforschung

**GEO**biology of  
Organo- and  
Biofilms

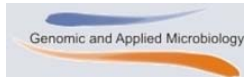
Bacteria

Diatoms /  
Eukaryotic  
algae

  
Botanic Garden and  
Botanical Museum Berlin



German Collection of  
Microorganisms and  
Cell Cultures



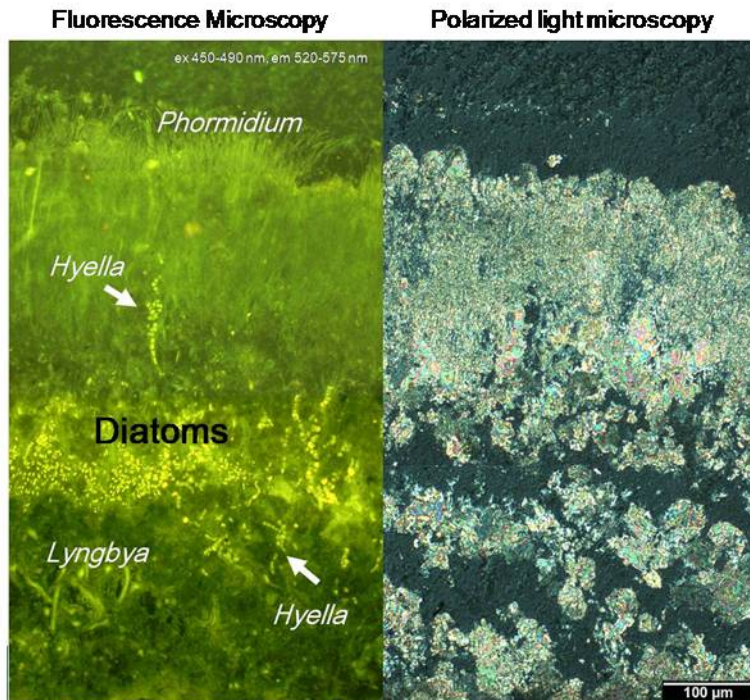
Department Genomic and  
Applied Microbiology of  
Goettingen University

Cyano-  
bacteria

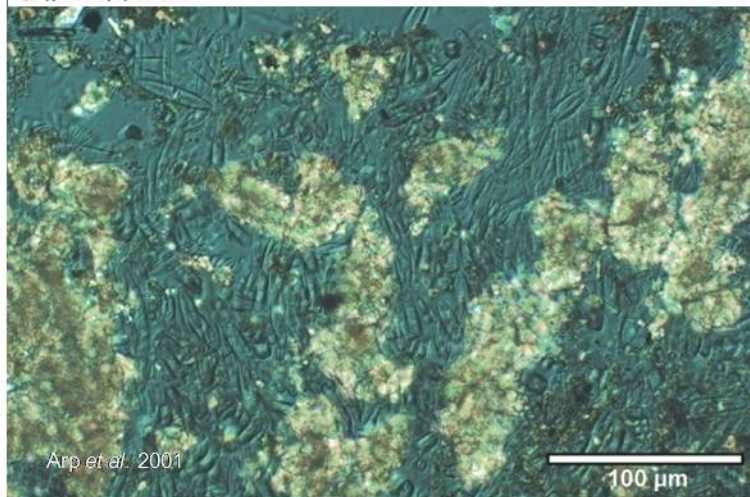


Experimental Phycology and  
Culture Collection of Algae

# INTRODUCTION



© Arp, Wedemayer, Reithner 2001

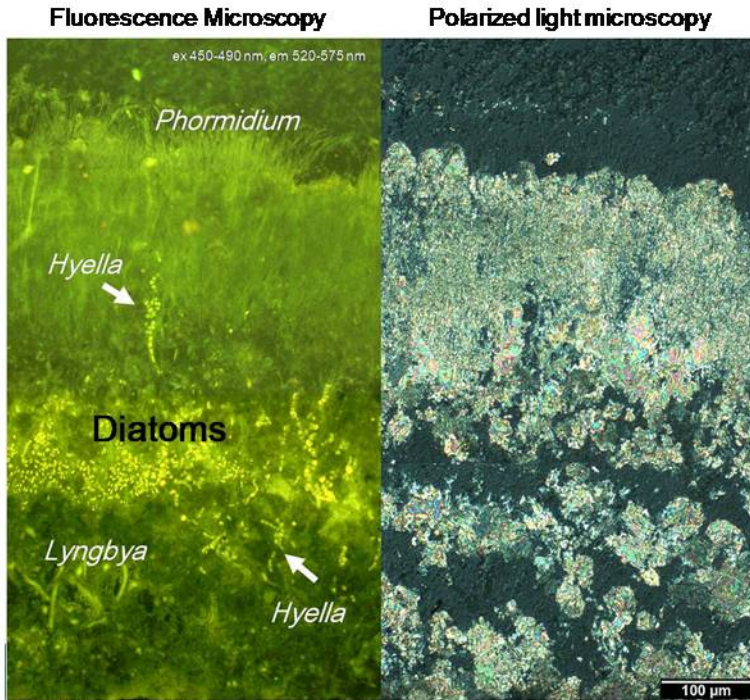


Arp et al. 2001

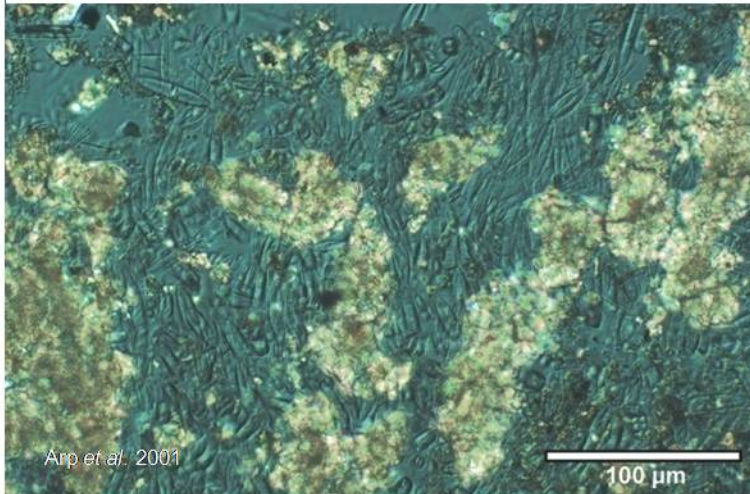
- Stratified biofilms with different morphotypes of cyanobacteria and diatoms
- CaCO<sub>3</sub> precipitation at cyanobacterial filaments
- No CaCO<sub>3</sub> precipitation at diatom cells



# dominance of cyanobacteria and diatoms



© Arp, Wedemayer, Reithner 2001



other

## SAG Research Projects on Microalgae from Biofilms

- Soil Algae and Algae from Bark along gradients of land use intensities (DFG Biodiversity Exploratories)
- Green Algae dominating Biological Soil Crusts in Southern Africa Deserts
- Algae from Biofilms under extended periods of darkness
- Soil Algae from Polar Regions

**→ new strains with new properties**

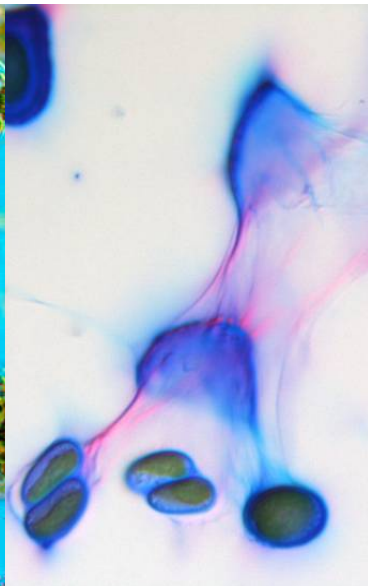
Algae from Bark at Hainich Exploratory



# Assessing algal biodiversity in biofilm habitats

## challenges for systematists:

- algal diversity still poorly represented in culture collections and sequence data bases
- taxonomic problems: more detailed studies based on reference and authentic strains needed
- revisit morphology !





Thank you !

