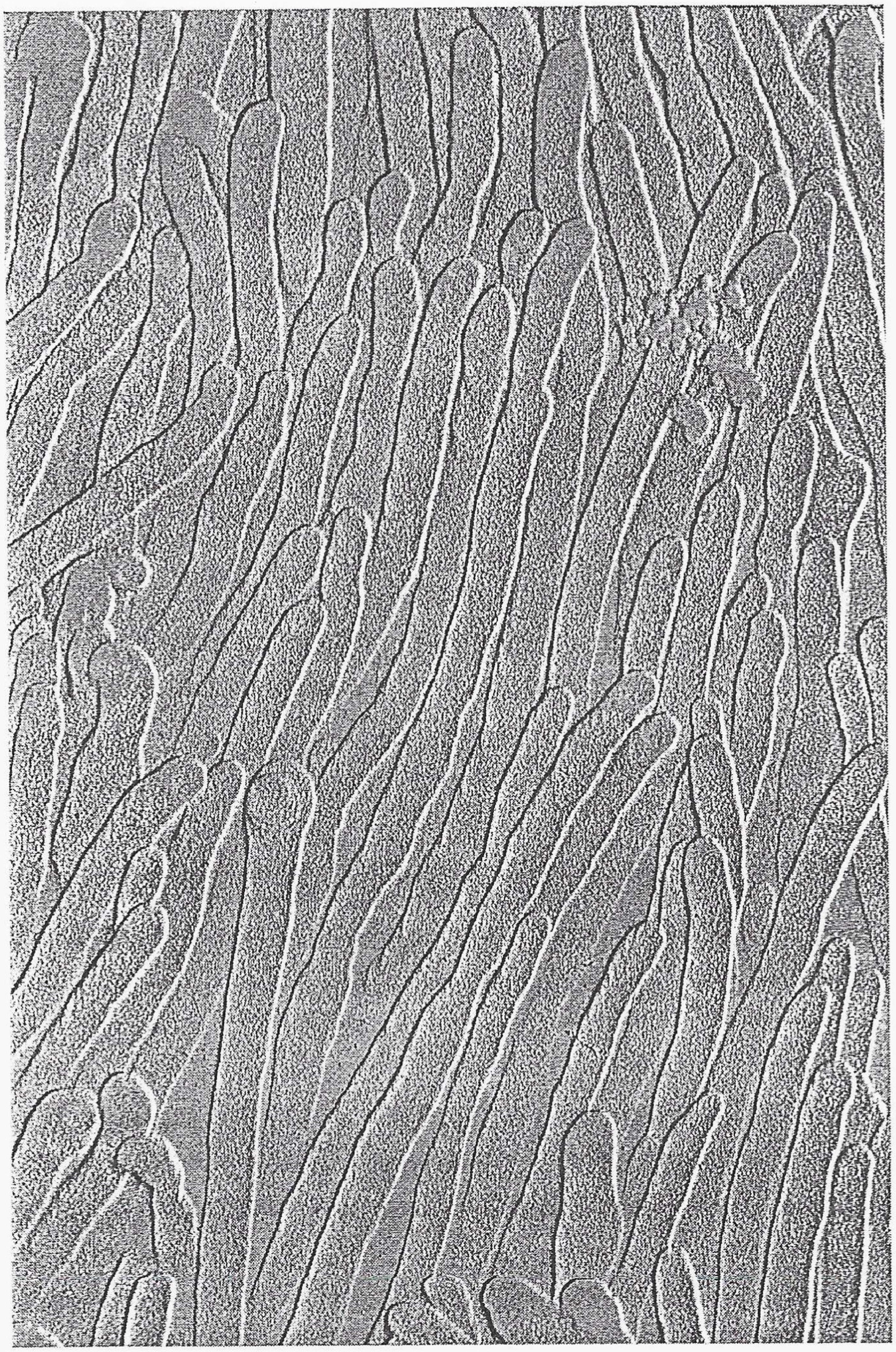
CBS SYMPOSIUM

Mycology in the 21st Century - Morphology, DNA and the phylogeny and taxonomy of the fungi



11-12 May 2000 -
Amsterdam - The
Netherlands

organized by the

Centraalbureau voor
Schimmelcultures, Baarn,
The Netherlands

Program and abstracts

belonging to different families. Preliminary studies showed, however, that different genotypes occur on different fly species. *E. muscae* isolated from the same host species (in Denmark) all have the same genotype, suggesting that co-evolution is an essential factor in the development of these fungi.

Fungi and the conquest of emerged land by phototrophs - **M.-A. Sélosse** - Muséum National d'Histoire Naturelle, Engref, 75005 Paris, France

Most terrestrial phototrophs are facing ecological problems (such as fluctuating water and mineral nutrition, strong irradiance and temperature fluctuations) with the help of fungal symbioses. Plants form mycorrhizae that improve their access to soil resources and protect roots against soil pathogens and toxic compounds. Vesicular-arbuscular mycorrhizae formed by the Glomales, that are widespread among extant plants (and some Bryophyta), may represent an ancestral adaptation, as suggested by molecular data and Silurian fossils. Other mycorrhizal types involve higher fungi and appeared many times, later in plant evolution: e.g. the ectomycorrhizae, common under temperate climates, probably spread during the Eocene/Oligocene transition, when such climates arose. Multicellular algae of the tidal zone also associate with fungi to form the so-called mycophycobioses, that enhance tolerance to water stress. Filamentous and unicellular algae (Chlorophyta, such as Trentepohliaceae, and Cyanobacteria) can survive aposymbiotically, but are often lichenized by higher fungi. Those algae probably conquested land without symbionts, since the earliest known fossil lichens do not predate their terrestrialization. However, lichenization, that appeared several times in their evolution, probably allowed them to diversify in harder ecological niches and to survive on land after the rise of multicellular plants. The success of phototroph/fungus symbioses is partly due to the combination of the partners' properties: soil exploitation by the fungus, gas and photon collection by the phototroph. Symbiosis-induced changes also enhance stress tolerance, such as morphological innovations (lichen stroma), physiological modifications (e.g. protecting against water stress, as for mycophycobiosis or grasses with *Neotyphodium* endophytes) or induction of protective compounds (lichen products or plants phenylpropanoids, acting against excessive light and herbivory). The conquest of land by phototrophs is therefore a matter of coevolution with fungi. In turn, this coevolution provided new ecological niches for fungi and contribute to their radiation on emerged land.

Application to the Ascomycetes of a new approach to parsimony analysis of large sequence data sets - **G. Castillo, V. Cornet and V. Demoulin** - Institut de Botanique, B.22, Université de Liège, B-4000 Liege, Belgium

A new program for parsimony analysis that we are developing has been applied to 260 18S rRNA sequences in the data bank of the University of Antwerp. To address the NP complete problem of parsimony analysis of large data sets, we have devised a strategy for dividing the set in groups to which branch-and-bound (B&B) can be applied (9 is the usual maximum) and recombining the results. In a first step we apply neighbour-joining (NJ) and select on the resulting tree the deepest branch that is taxonomically uncontroversial. All subtrees that are not as deep are then submitted to branch-and-bound or decomposed in smaller groups if too large. Subtrees are replaced by their ancestral sequence for further rounds of branch-and-bound. If several equally parsimonious trees exist a strict consensus is introduced. We have the options to treat gaps as missing characters, each missing base as a character and each gap as a single character. The programs written in C are inspired of J. Felsenstein's Phyllip for the classical parts (neighbour-joining, branch-and-bound) and are original for new developments like the integration of consensus subtrees in a bigger one. Examples will be presented of the results obtained by NJ and our parsimony approach, as well as of the influence of treating the gaps in the three possible ways. Our results are in line with many recent analysis but the comparison of the various treatments and the visualisation of the equally parsimonious trees give good indications of the caution to exercise in using sequence comparisons in reconstructing phylogenies.

POSTER PRESENTATIONS

- *A monograph of Amphisphaeria* - **You-Zhi Wang and Kevin D. Hyde** - Center for Research in Fungal Diversity, Department of Ecology and Biodiversity, The University of Hong Kong, Pokfulam Road, Hong Kong.

Amphisphaeria was introduced by Cesati & De Notaris in 1863 and *A. umbrina* was since designated the lectotype of the genus. About 254 taxa have been described in *Amphisphaeria*, however the species are often confused with other genera whose ascospores are bicellular and brown. Some species have been excluded from *Amphisphaeria* by A. Sivanesan, M. E. Barr, D. L. Hawksworth, K. D. Hyde, A. Aptroot and T. E. Umali, while others have yet to be reexamined. In this thesis a world monograph of *Amphisphaeria* is presented based on a slightly revised generic concept. *Amphisphaeria* species have unitunicate asci with an J+ or J- ascal ring and 1-septate, brown ascospores without striations or germ slits. *Arecophila, Atrotorquata, Cainia, Collodiscula, Ommatomyces* and *Seynesia* share similarities with *Amphisphaeria*, but differ in various aspects. Examination of 140 available type species indicates that only 12 species can be accepted in *Amphisphaeria*: *A. arizonica, A. cavata, A. depressa, A. fallax, A. feveata, A. gauge, A. lusitanica, A. multipunctata, A. pseudoumbrina, A. seriata, A. umbrina* and *A. vibratis*. The remaining species were found to belong in other genera, most of them having bitunicate asci. Descriptions and plates are provided for all accepted species and most of excluded species. A modern key to the accepted *Amphisphaeria* species is provided.

- *Biological and molecular characterization of root endophytic sterile associates of mediterranean plants* - **Mariangela Girlanda, Stefano Ghignone, Isabelle Lacourt, Silvia Perotto and Anna Maria Luppi** - Dipartimento di Biologia Vegetale and CSMT-CNR, Viale P.A. Mattioli 25, 109125, Torino, Italy

Dark sterile mycelia (DSM) are omnipresent associates of the roots of plants with different mycorrhizal *status* from a wide range of ecosystems. Although the sterile phenotype may reflect some ecological adaptation to the root habitat, it certainly conceals a heterogeneous group of taxa, whose exact identity and number remain uncertain. Recognition of taxonomic affinities of these fungi will help to reach a better understanding of their ecological functions.DSM were common colonizers of mycorrhizal roots of different hosts in a Mediterranean forest. The obtained isolates, recognized to be of ascomycetous affinity based on septal ultrastructure, remained sterile in spite of extended sporulation induction trials, and were therefore ascribed to different morphotypes. Consistency of the main morphotypes was assessed by means of molecular analyses and somatic compatibility assays. Sequencing and phylogenetic analyses of rDNA regions were carried out to elucidate relationships to known ascomycetous taxa. *In vitro* interactions with other root-colonizing saprotrophic and ECM fungi were investigated.

- *Temporal persistence of ericoid fungi in late-successional Q. ilex stands* - **Roberta Bergero[2], Federica Bello[1], Silvia Perotto[2] & Anna Maria Luppi[1,2]** [1]Dipartimento di Biologia Vegetale, University of Torino and [2]Centro di Studio sulla Micologia del Terreno-CNR, V.le Mattioli 25, 10125-Torino, Italy

Inoculum potential and diversity of ericoid fungi were analysed in a secondary plant succession determined by cutting. Axenic *Erica arborea* seedlings were used as bait plants on soils collected from early and late successional stands of a *Q. ilex* forest, respectively with or without the same ericaceous host. After six months, roots from these plants were examined for