Mycological Society of America
NEWSLETTER

Gloiocephala caricis (Karst.) Bas

Volume 39 No. 1 June 1988
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MYCOLOGICAL SOCIETY OF AMERICA NEWSLETTER
Volume 39, No. 1, June 1988

Iris Charvat, Editor

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St. Paul, Minnesota 55108
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SOCIETY ORGANIZATION, 1987-1988

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Past President, 1986-1987 James M. Trappe
June, 1988

Letter from the Editor,

In order to save funds, the questionnaire has been placed in the center of the recent issues of the Newsletter. Since it is least expensive to use a double sheet, the questionnaire in the December, 1987 issues was extra large. If members aren't bothered by this, we will continue to have the questionnaire inserted by the printer. A smaller size has to be inserted by hand, not machine. Please note that added information concerning "Fungi Wanted" is requested on the questionnaire. If members will indicate the class of the fungi wanted, the MSA secretary can type the information directly without passing the sheets to the Editor.

Again, as with Volume 38, No. 2, there is an insert for International Members. The announcement is for the 1989 MSA Meetings to be held in Toronto, Canada, August 6-10. Please return this form to Dr. Sandra Anagnostakis if you want to receive additional information for these meetings.

The new Directory will be sent to you this month. This is the first revision of the Directory since 1984, so the address changes listed in each Newsletter are of value to MSA members. It would be most helpful if members would keep these sheets with their new directory.

Attention Associate members: If you are an associate member and have not received past issues of the Newsletter, please write me. I apologize for this oversight.

At the suggestion of Dr. Paul Szaniszlo, Program Chairman, I have included a synopsis program for our 1988 Meetings in Davis. The abstracts of papers to be presented at these meetings are located in the center of this Newsletter.

A time consuming task associated with the publication of the Newsletter is the cutting and mounting of all the abstracts. This was done by the excellent office staff of the Botany Department, University of Minnesota; so I want to thank Carolyn Ferrell, Diane Peters, Anne Caton, Ellen Harnisch, and Lori Nicol for their help. A special thanks to Michele Watrin, the MSA Newsletter Secretary for the past year, who has made my job possible.

Dr. Harold Burdsall Jr., President-Elect, has asked me to remain as editor of the MSA Newsletter for another year and I have agreed to do so. I am looking forward to receiving your questionnaires and other communications.

Iris Charvat, Editor of MSA Newsletter

FRONT COVER - NOTE

Gloiocephala caricis (Karst.) Bas (syn. Marasmius caricis Karst.) was collected at Schaefer Prairie TNC, McLeod Co., Oct. 19, 1987 by David J. McLaughlin and Patrick R. Leacock as part of an inventory of the higher fungi of Minnesota supported by The Nature Conservancy. This pale agaric is a common inhabitant of the lower stems of Carex sp. in wet unburned prairie. It is readily identified by its microscopic features. Although it has been reported over a wide range in Canada, it appears to be little known in the United States. Drawing by D. J. McLaughlin. Specimens in MIN.
GENERAL ANNOUNCEMENTS

Airfares: Discounts on some airfares to MSA meetings, Sacramento, California, for Mycological Society of America members. American Airlines has been selected as the official carrier for the Mycological Society of America meeting in Davis, California. **Their special staff will confirm reservations for you at the lowest rate available, providing normal qualifications are met.** Savings of 35-40% may apply to full day coach rate for USA passengers. American Airlines may also offer 5% off any published roundtrip applicable airfare including First Class. **Canadian passengers may benefit by a 35% saving in fares.** Fare reductions are available to MSA members 5-26 August 1988. Because there are some restrictions call the toll free number for complete information. American has created a special Star File in their computer containing information on our meeting to better serve you. It also permits the creation of an arrival and departure report on each attendee who reserves through their Meeting Service Desk.

Call the toll free number below. **If you normally use the service of a travel agency, please have them make your reservations through this number to obtain the same advantages for our organization.**

CALL TOLL FREE...ASK FOR STAR FILE #S 83085, 1-800-433-1790, 7:00 AM - 12:00 midnight central time, seven days a week, spring announcement from Meredith Blackwell, MSA Secretary.

Directory: The 1988 **MSA DIRECTORY** is at the printers now. It will include lists of past officers, Corresponding Members, award winners, prize nomination guidelines, **MSA By-Laws**, and membership directory. As soon as the printing is receiving the directory, it will result in great postage savings for MSA. Spring announcement from Meredith Blackwell, Secretary.

Foray lists are needed for completion of the Foray reports for the Florida, 1985 the Massachusetts, 1986, and more recent Forays. Any length of list is acceptable from one species to 100 or more. Please submit lists to Wm. Bridge Cooke, 1135 Wilshire Ct., Cincinnati, Ohio 45230.

International Commission on the Taxonomy of Fungi: The **International Commission on the Taxonomy of Fungi (ICTF)** was established in 1982 as a Commission of the Mycology Division of the **International Union of Microbiological Societies (IUMS)**. The Commission's primary aim is to improve, and to promote improvement in, any or all aspects of fungal systematics. **The Commission further aims to extend understanding of fungal systematics in the scientific community, by publishing its findings, and by sponsoring meetings, workshops and sessions dealing with aspects of its work. Particular emphasis is given to keeping scientists in applied fields aware of recent advances and changes in taxonomic mycology.**

Current members are Chairman D. L. Hawksworth (U.K.), Secretary J. I. Pitt (Australia), O. Constantinescu (Sweden), J. Ginns (Canada), S. C. Jong (U.S.A.), D. W. R. Mackenzie (U.K.), M. R. McGinnis (U.S.A.), A. Y. Rossman (U.S.A.), R.A. Samson (Netherlands), Lynne Sigler (Canada) and Shun-ichi Udagawa (Japan).
Several articles reflecting the philosophy and work of the Commission are:


J. Ginns, Biosystematics Research Center, Ottawa
and
Amy Rossman, Systematic Botany Institute, Beltsville

CALENDAR OF MEETINGS, FORAYS, COURSES AND WORKSHOPS

June 1988

5-10 MARINE BIOTECHNOLOGY WORKSHOP Information: Dr. V. Cuomo c/o Ciba-Geigy, Via Prov.le Schito 131, 80058 Torre Annunziata (NA) Italy

11 1988 THEMES IN MARINE BIOTECHNOLOGY: Dr. V. Cuomo c/o Ciba-Geigy, Via Prov.le Schito 131, 80058 Torre Annunziata (NA) Italy

July 1988

17-22 8TH EUROPEAN PHYSARUM WORKSHOP, Fakultät Biologie und Vorklinikum, Universität Regensburg, Universitätsstrasse 31, D-8400 Regensburg. Sessions will cover all aspects of scientific activity in the field of molecular biology of Physarum polycephalum and related myxomycetes, in particularly cell cycle, differentiation, genetics, motility and cytoskeleton. Oral presentations of 30 min are preferred (including discussion), but posters are acceptable, and are encouraged as illustrations in support of oral presentations. In case that the number of talks will exceed the time schedule only selected papers will be presented. The remainder will be given as posters. In such a case, participants will be noted in advance. Date for Receipt of Abstracts and Registration: 1st May, 1988. Contact: Dr. Eggehard Holler, Institut für Biophysik u. Physikalische Biochemie der Universität, Universitätsstrasse 31, D-8400 Regensburg, FRG.
August 1988

1-3 The Northeastern Mycological Pre-Foray Courses at the University of Rhode Island in Kingston on August 1-3. Dr. Roy Watling from the Royal Botanic Garden, Edinburgh, Scotland will be our 1988 senior foray mycologist. Dr. Watling has also agreed to teach a pre-foray course. A second pre-foray course offering will be on seashore ecology taught by experts from the URI oceanography faculty. Both pre-foray courses (to be held August 1st to 3rd) are limited in the number of participants and will be available on a 1st come, 1st serve basis.

4-7 Foray: Full package includes room and meals and all activities, $150/person, double occupancy. Registration must be paid in full at time of application. Checks payable to NORTHEASTERN MYCOLOGICAL FORAY. Information: Northeastern Mycological Foray. Barbara Peabody, R.D. 1, Box 250, Milford, NJ 08848. (201) 995-9110.

IV Workshop on Identification of Macromycetes (Gasteromycetes). Details from Dr. Jorge E. Wright.

August 1989

6-10 MSA meeting at the University of Toronto, Ontario, Canada. Program Chair, Sandra Anagnostakis.

October 1989


November 1989

6-10 ISMS-JSTEC International Symposium on Mushroom Biotechnology, Jiangsu Province People's Republic of China. Jiangsu Province Science and Technology Centre with Foreign Countries (JSTEC) in cooperation with the International Society of Mushroom Science (ISMS). The registration fee will be approximately $250 for full members, $150 for students and accompanying persons, which includes admissions, reception, refreshments, conference materials. Info: Associate Prof. N. X. Bu, Secretary ISMS Symposium on Mushroom Biotechnology, Jiangsu Province Science & Technology, Exchange Centre with Foreign Countries, 39 East Beijing Road, Nanjing, China.
GENERAL

Masood, Ahrmadunisa: Cellulose destroying fungi.

ASCOMYCETES

Boehm, Eric: Any *Leptosphaeria* spp.

Wingfield, Michael: *Ceratocystis, Ophiostoma*.

BASIDIOMYCETES

Ammirati, J. F.: The genus *Cortinarius* with notes and/or color photo.

Chase, Thomas: Cultures or spore prints of *Heterobasidion annosum* (*Fomes annosus*)

Desjardin, Dennis: Dried specimens and cultures of Marasmioid Fungi (*Marasmius, Marasmiellus, Micromphale*), especially from the atlantic coastal and gulf coastal states. Notes on fresh basidiomata coloration and substrate preferred but not essential.

Hutchison, Leonard: Cultures of secatoid fungi other than *Rhizopogon* spp. Will pay for postage and handling. Leonard Hutchinson, Department of Botany, University of Toronto, Toronto, Ontario M5S 1A1, CANADA.

Rhoades, Fred: Cultures of *Mycena* species, especially *Mycena plumbea* M. leptocephala and M. atroalboides.

Ross, Ian K.: *Coprinus congregatus* - cultures or spore prints.

DEUTEROMYCETES

Boehm, Eric: Living cultures of graminicolous *Septoria* spp.

Siefert, Keith: Synnematous hyphomycetes, specimens or cultures. Please write before sending cultures.

Vincent, Michael A.: Specimens and/or cultures of *Rhinotrichum* sensu lato, *Oidium* sensu Linder, *Alysidium, Olpitrichium, Acladium, Sporotrichium, Basifimbria, Rhinocladium*, etc.

Wingfield, Michael: *Leptographium, Phialocephala*.

MYXOMYCETES

Braun, Karl L., Jr.: Specimens from Ohio

Keller, Harold W.: Specimens from Arkansas

Stephenson, Steve: Especially collections from western North America or areas of the world other than North America.
PUBLICATIONS, COMPUTER SOFTWARE AND SLIDES AVAILABLE--FOR
GIVE-AWAY, SALE, OR EXCHANGE

ATKINSON, R. G.: Complete sets (unbound) of *Mycologia* from Vol. 53 (1961) to Vol. 74 (1982). He would like to sell all 22 volumes for $250 or $12 per volume. 3890 Ansell Road, Victoria, B.C., Canada V80P 4W2.

ELLIS, DAVID H: Dr. David H. Ellis has completed a collection of 540 35mm colour teaching slides on medical mycology as a memorial to the late Geraldine Kaminski OAM, a very well known and respected Australian medical mycologist. The aim of this collection is to provide a set of teaching slides showing the clinical and mycological features of the pathogenic fungi likely to be encountered in Australasia, South East Asia and Oceania. Although several fungi such as *Microsporum audouinii*, *Microsporum ferrugineum*, *Trichophyton schoenleinii*, *Trichophyton soudanense* and *Coccidioides immitis* are not endemic to the region, they are included in the collection because they have been isolated from immigrants or travellers from other regions. This collection entitled "Kaminski’s teaching slides on medical mycology" will be marketed as a non-profit venture in memory of Gerry by the Adelaide Children’s Hospital. Gerry worked at the ACH for 46 years and is the longest serving staff member on record. Price (including postage & handling): Australia and New Zealand, A$425, Other countries, A$600. Make check payable to the Adelaide Children’s Hospital, to: Linda Stack, Coordinator, Educational Resource Centre, Adelaide Children’s Hospital, North Adelaide, SA 5006.

FARR, M. L.: BOOKS FOR SALE, mostly mycology and botany. If interested please send self addressed stamped envelope for list.


LUBRECHT, HARRY: has the book by Dr. Funder requested in the MSA Newsletter (Vol. 37, No. 2, December 1986) by Dr. O. O. Adebowale. MSA has no address for Dr. Adebowale. Contact, Dr. Harry Lubrecht, Lubrecht and Cramer LTD, R.D. 1, Box 244, Forestburgh, NY 12777, USA.

RHOADES, FRED: *ASKATAKA* synoptic key driver plus keys to mushrooms, lichens, simple key to molds. $5 for IBM-PC compatible disk.

SEIFERT, KEITH A.: *Mr. Jackson’s Mushrooms* by H.A.C. Jackson, originally sold for $35, is now remaindered. Unused copies are available for $6.95, plus $3.50/book for postage with Canada, or $5.00/book for postage to the US, from the Nature Canada Bookshop, 453 Sussex Drive, Ottawa, Ont. K1N 6Z4 CANADA.


Catalogue of the University of Alberta Microfungus Collection. 2nd Edition. 1986, 166 pp. Cost $10.00 + $2.00 for postage for North America and International surface mail, + $5.00 for international airmail. Payment in advance not required and update will be included for all new orders.
The University of Alberta Microfungus Collection data bases may be searched on-line through the U. of A. Computing Systems operating system. Outside users must obtain an account. Documentation describing access is available from Lynne Sigler and entitled "Introduction to searching the UAMH SPIRES data bases." This mimeographed publication is free.


Unbound, PHYTOPATHOLOGY, V. 21, 1931; V. 22, (2-12); V. 23, (2,9); V. 24, (3-12); V. 25, 26; V. 27, (1,3-12); V. 28 thru 31; V. 32, (1-3,5-12); V. 33, thru 37; V. 38, (2-12); V. 39, (1-11); V. 40 thru 44; V. 45, (1-6, 8-12); V. 46 thru 51; V. 52, (1-5, 7-12); V. 53; V. 54, (1-6.8-12); V. 55; V. 56, (1,.3.4.5,7-12); V. 57, (4,6,10,11); V. 58, 59; V. 60, (1-11); V. 61 thru V. 77. $400.00 or best offer.

Ellis and Everhart, 1892. The North American Pyrenomycetes. 793p. Added pages, 41 pages (plates) of drawings of fungi and 41 pages of legends, $100.00.

PHYTOPATHOLOGY, Thirty Year Index, Vols. 1-30, 1911-1940, and PHYTOPATHOLOGY, Ten Year Index, Vols. 31-40, 1941-1950. Make Offer.


List of books and publications available, free. Note. Please, transportation costs (postage, UPS, express) is paid by buyer.


VINCENT, MICHAEL A.: Duplicate sets of the publications of Dr. Marion L. Lohman were given to Miami University herbarium shortly before Dr. Lohman's death. Complete and partial sets are available, preferably on an exchange basis, from Michael A. Vincent. The publications deal mainly with the Hysteriaceae.
PUBLICATIONS NEEDED

AMMIRATI, J. F. is looking for two copies (or at least one) of *The Lichen Flora of the United States* by Bruce Fink. University of Michigan Press, Ann Arbor (1935 or 1960 editions).


HENDRICK, JOHN would like a copy of *Advance of the Fungi* by E. C. Large.

MASOODY, AHMADUNISA wants publications on Biodegradation.

MCGINNIS, MICHAEL is looking for old medical mycology books and reprints.

STEPHENSON, STEVE is looking for reprints on myxomycetes.

KWAN YOON needs a color chart for the identification of mushrooms.

NEW BOOKS BY MSA MEMBERS

The following announcements were received in response to the MSA Newsletter questionnaire:


Rolf Singer with appendix by Bob Harris. *MUSHROOMS & TRUFFLES*. Hardback $75.00 ppd from Mushroompeople. (415) 663-8504. P.O. Box 159, Inverness, CA 94937.

Harris, Bob. *GROWING SHIITAKE COMMERCIALY*. $11.50 ppd from Mushroompeople. (415) 663-8504. P.O. Box 159, Inverness, CA 94937.


LIST OF OPENINGS FOR MYCOLOGISTS ON SABBATICAL

University of Texas at Arlington: Interested person who may want to make a short term visit to work on the systematics of Myxomycetes. Excellent facilities and collections available for use including light microscopy with a fully automated camera system, SEM, TEM, and darkroom facilities. Please inquire for more details. Contact: Harold W. Keller.

University of Texas at Austin: Molecular biology of dematiaceae or other fungi pathogenic for humans. Contact: Paul J. Szaniszlo.
ASSISTANTSHIPS AND FELLOWSHIPS AVAILABLE

Duke University: Teaching assistantships and competitive University Fellowships are available to study evolutionary genetics and molecular systematics of fungi. Contact Rytas Vilgalys, Department of Botany, Duke University, Durham, NC 27706.

Iowa State University: Assistantship MS or Ph.D., 2 years. In Mycology to curate materials in mycological collections within the herbarium. An extensive reworking is underway following acquisition of a large number of specimens of historical significance. Contact Lois H. Tiffany.

Farlow Visiting Fellowship: Friends of the Farlow provide travel support and subsistence for work related to a dissertation using the Farlow collections at Harvard University.

Southern Illinois University: Doctoral Fellowship, for 1987-1988, with $10,000 stipend plus tuition waiver for each of 3 years (University-wide competition, 5 available). Also Teaching Assistantship (available on Departmental competitive basis) for M.A. or Ph.D. aspirant in SYSTEMATIC MYCOLOGY. Duties in General Biology, General Botany and/or Forest Pathology. Write W. J. Sundberg, Dept. of Botany, SIU, Carbondale, IL 62901.

State University of New York: College of Environmental Science and Forestry: Research and teaching assistantships available to graduate students interested in systematics, physiology, ultrastructure, and ecology of fungi; forest pathology; wood products pathology; mycorrhizae. Contact: C.J.K. Wang, D.H. Griffin, on J.J. Worrall, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210.

University of Florida: Graduate Research Assistantship (M.S. or Ph.D.) available to study VA MYCORRHIZAL FUNGI. Contact David Sylvia, Soil Science Department, University of Florida, Gainesville, FL 32611. Telephone (904) 392-1951.

University of Iowa: FOUNDER'S FELLOWSHIP in field studies for predoctoral students -- a summer at The Iowa Lakeside Laboratory. The stipend is $2,000, tuition free; fellows pay modest fees for room/board and lab space. The fellowships honor our founder, Thomas H. Macbride. Applicants will be doctoral candidates whose work has a field component for which a summer at the Iowa station would be especially profitable. Applicants should be at the level of independent investigator. Applicants should write the director about the area and facilities. An application will contain a cover letter, vitae, and a one or two page synopsis of the proposed project. Specific reasons why our station is so suitable are critical to the application. Two letters are requested, including one from the research sponsor. Applications will be considered up to April 1st 1988. Contact: Richard V. Bovbjerg, Director, Professor of Biology, The University of Iowa, Iowa City, IA 52242.

University of Minnesota: Teaching Assistantships and Fellowships from the Botany Graduate Program. Contact Director of Graduate Studies, 220 BioScience Center, University of Minnesota, St. Paul, MN 55108.
University of Texas: Research Assistantships in MEDICAL MYCOLOGY and BOTANY/MYCOLOGY. Contact G. T. Cole, Department of Botany, University of Texas, Austin, TX 78713 immediately. Telephone: (512) 471-4866.

University of Texas: Graduate Research and Teaching assistantships available in the Department of Microbiology to carry out grant related research with Paul Szaniszlooon.

University of Vermont: Graduate assistantships and fellowships are available in CLASSICAL and/or MOLECULAR GENETICS OF BASIDIOMYCETES. Support includes stipend and tuition remission. Obtain more information from Robert C. Ullrich, Department of Botany, Life Science Building, University of Vermont, Burlington, VT 05405.

VACANCIES FOR MYCOLOGISTS

Cornell University: Four post-doctoral assistantships available 7/1/88 to participate in an ongoing research project concerned with cell differentiation (infection structure formation) in the fungus, Uromyces. Specific areas of research are directed toward determining (1) structural changes in the plasma membrane during cell differentiation; (2) the role of extracellular ion and electrical currents as well as stretch-activated ion channels in the plasma membrane during the signaling process; and (3) Isolation and characterization of thigmotropically triggered post-transcriptionally expressed proteins involved in the differentiation process. These proteins will be isolated using Mab derived via neonatal tolerization. Another area of study (4) concerns elucidating the mechanisms involved in race non-specific resistance due to host morphologies, such as stomatal lip architecture and leaf pubescence, will be emphasized. Areas (1) and (4) require expertise in LM, but also in TEM (freeze-fracture) and SEM, respectively. Area (2) involves LM and electrophysiology. Area (3) requires experience and/or adequate knowledge of cell and molecular biology, and be able to perform studies using such techniques as protein purification, PAGE, immunization, LM, Western blotting, etc. Send CV, three letters, and transcripts or contact: H. C. Hoch, Department of Plant Pathology, New York State Agricultural Experiment Station, Geneva, New York 14456. Telephone: (315) 787-2332.

Cornell University: Technician, GR-22. Employee will assist in conducting research in a modern well equipped cell biology laboratory. The research is concerned with growth of fungal cells and with the development of infection structures, especially in Uromyces. Cell organelles and other cellular components are studied by biochemical methods and by TEM, SEM, and LM using immunocytochemistry, computerized video image analysis, etc. B. S. or M. S. in biology or biochemical techniques are preferred. Immediate opening. $14,500-19,732. Contact: H. C. Hoch, Department of Plant Pathology, New York State Agricultural Experiment Station, Geneva, New York 14456. Telephone: (315) 787-2332.
University of California, Santa Barbara: Post-Doctoral position available in the area of molecular biology and biochemistry of differentiation in filamentous fungi. Experience in recombinant DNA, membrane protein isolation and analysis, and/or immunocytochemistry most desirable. The research is on mechanisms of signal transduction leading to terminal differentiation in filamentous fungi. Applicants should have had some experience with the cultivation and biology of filamentous fungi. Please send resume and names of 3 references to Dr. Ian K. Ross, Dept. of Biological Sciences, University of California, Santa Barbara, CA 93106 by July 30, 1988.

University of Texas, Austin: Post-doctoral position available in the Department of Microbiology to carry out grant related research with Paul Szaniszlo on "Identification of antimycotic targets among pathogenic dematiaceous fungi" and on "Enhanced plant-iron nutrition through biotechnology." Prior training in molecular biology required.

Washington State University: Assistant Professor of Plant Pathology to conduct research in the area of fungal taxonomy and fungal diseases of crop plants and to teach basic and advanced courses in mycology. Rank-Salary: Permanent Full-time (12 months). Assistant Professor-Assistant Plant Pathologist (tenure-track). 70% research-30% teaching appointment. Salary commensurate with qualifications and experience. Responsibilities: This is a full-time, tenure-track position at the Assistant Professor-Assistant Plant Pathologist rank in the Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430. The person filing this position will be expected to conduct research in the area of fungal taxonomy and fungal diseases of crop plants. The person will be expected to devote a portion of time to problems involving smut fungi. The person will be expected to teach basic and advanced courses in mycology and to contribute to other graduate or undergraduate courses and to direct M.S. and Ph.D. degree candidates. The person will be expected to seek grant funding from national, regional, and state sources. Qualifications: An earned doctorate is required. Training in plant pathology is preferred. Only persons with expertise in the taxonomy of any group of fungi (excluding slime molds) are eligible. A competence with, or a desire to become competent with, smut fungi (Ustilaginales) is required. Additional expertise in cladistics, isozyme analyses, nucleic acid technology, genetics, or cytology as applied to fungal systematics is desirable. Evidence of ability to perform imaginative and sustained research in an academic environment, potential to attract extramural sources of funds, and capacity to teach in both formal and informal settings will be sought and evaluated. Submit a resume, copies of publications, and three letters of reference to: Professor Timothy D. Murray, Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430. Phone: (509) 335-7515. Application Deadline: September 30, 1988.

POSITIONS WANTED

STEPHENSON, S. L. seeks a teaching position in plant ecology/mycology/botany at an institution at which it would be possible to develop a research program involving graduate students.

MSA PLACEMENT SERVICE

Forms for the use of the MSA Placement Service— for both those seeking jobs and prospective employers—are included on the following pages.
EMPLOYER DATA FORM
MYCOLOGICAL SOCIETY OF AMERICA PLACEMENT SERVICE

Please type or print all entries clearly.

1. Record Number: (leave blank)

2. Organization Name:_____________________________________________________

3. Position Title:__________________________________________________________

4. Interests. Circle letters from the following:
   A. Morphology    B. Taxonomy    C. Physiology
   D. Cytology     E. Biochemistry    F. Cell Biology
   G. Genetics    H. Ecology     I. Molecular Biology
   J. Pathology     K. Mycorrhizae    L. Medical
   M. Development    N. Computers
   O, P = other __________________________

5. Fungal Group. Circle one or more letters from list:
   A. Mycetozoa     B. Zoosporic Fungi    C. Zygomycetes
   D. Ascomycetes    E. Basidiomycetes    F. Deuteromycetes
   G. Trichomycetes    H. Pathogenic Fungi    I. General
   J, K, L, M, N, O = other __________________________

6. Degree or Training Desired:______________________________________________

7. Skills Desired. Circle one or more from list:
   A. Teaching    B. Research    C. Administration
   D. Public Service    E. Curatorial
   E-K = other. Please specify. ____________________________________________

8. Terms of Appointment:____________________________________________________

9. Closing Date:___________________________________________________________

10. Contact Person:__________________________________________________________

11. Dept. or Organization:___________________________________________________

12. University or Company:__________________________________________________

13. Street:________________________________________________________________

14. City:_________________________  15. State or Province:____________________

16. Zip or Postal:____________________  17. Country:___________________________

Return to: Dr. Gareth Morgan-Jones, MSA Placement. Dept. of Botany and Microbiology, Auburn University, Auburn, AL 36849.
EMPLOYEE DATA FORM
MYCOLOGICAL SOCIETY OF AMERICA PLACEMENT SERVICE

Please type or print all entries clearly.

1. Record Number: (leave blank)

2. Name: last__________________________
   first__________________________
   initial__________________________

3. Department or Organization:______________________________________

4. University or Street:_____________________________________________

5. City: __________________________________________________________

6. State or Province (abbrev.):_______________________________________

7. Zip or Postal Code:_____________________________________________

8. Country (abbrev. if >10 characters):______________________________

9. Phone Number:_________________________________________________

10. Degree 1 (M.S. or B.S./B.A.), Year, Professor, Institution:
    __________________________________________________________________

11. Degree 2 (Ph.D.), Year, Professor, Institution:
    __________________________________________________________________

12. Postdoctoral experience. Year, Professor, Institution:
    __________________________________________________________________

13. Interests. Circle letters from the following:

   A. Morphology                     B. Taxonomy                     C. Physiology
   D. Cytology                       E. Biochemistry                 F. Cell Biology
   G. Genetics                       H. Ecology                      I. Molecular Biology
   J. Pathology                     K. Mycorrhizae                  L. Medical
   M. Development                   N. Computers                    O, P = other

14. Organisms of interest. Circle one or more letters from list:

   A. Mycetozoa                     B. Zoosporic Fungi               C. Zygomycetes
   D. Ascomycetes                   E. Basidiomycetes                F. Deuteromycetes
   G. Trichomycetes                H. Pathogenic Fungi               I. General

   J, K, L, M, N, O = other ____________________________
15. Job preference. Circle one or more letters from list:

A. Industry  B. Univ. teaching  C. Univ. research
D. Both B and C  E. Government  F. Curatorial
G. Other than above

Order of preference in above by letter: ______________________

16-22. Narrative about job applicant. Use this space to write anything you would like to have submitted with our report to a potential employer. Write in the third person. It is unlikely that items listed under "other" in the above categories will appear on your printout. This is the only place where you can enter special experience. You have seven lines, each with 65 characters including spaces and punctuation. You may hyphenate at the end of a line if it saves you space. Count the number of characters per line or print on graph paper in a rectangle 7 squares by 65 squares. The print out will read as text if you follow these directions. Program will not underline.

Send completed form to:

Dr. Gareth Morgan-Jones, MSA Placement. Dept. of Botany and Microbiology, Auburn University, Auburn, AL 36849.

MYCOLOGICAL SERVICES AVAILABLE

HAROLD W. KELLER will identify Myxomycetes especially corticolous species from living trees and vines.

KEITH A. SEIFERT will identify Synnematous hyphomycetes.

NEW MYCOLOGICAL RESEARCH

Tom, Chase; Bill Otrosina; and John Taylor: Relationship of Host specificity and mtDNA variability to interterility in Heterobasidion annosum. Cooperative research project with Dr. Fields.

RESEARCH NOTES

ROY, ANJALI: Department of Botany, Visva-Bharati University, Santiniketan 731235, W. Bengal, India. "Airspora in Santiniketan, India".

Present report is the result of a survey of airspora in Santiniketan for the last five years. It is noted that fungal spores are present in the atmosphere throughout the year, but they appear in highest concentration in rainy season during July to September. During survey spores of Alternaria, Aspergillus, Cladosporium, Curvularia, Nigrospora, Paecilomyces and Penicillium are mostly encountered. Besides, basidiospores are also present as evidenced by the development of colonies on exposure plates with mycelia showing clamp connections. It is noted that basidiomycete colonies appear only in the rainy season although deuteromycete spores are obtained throughout the year. This coincides with the blooming of many macro-fungi including species of Agaricales and Polyporales during the rainy season in the area.
### MYCOLOGICAL SOCIETY OF AMERICA - AIBS SYNOPSIS PROGRAM
#### August 14-18, 1988

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Session Number and Title</th>
<th>Building and Room</th>
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<tbody>
<tr>
<td><strong>Saturday</strong></td>
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<tr>
<td>8/13</td>
<td>1:30 pm-</td>
<td>Workshop 1. Basidiospore Germination and Tissue Culture Techniques for Agarics, especially those that form Ectomycorrhizae.</td>
<td>Hutchison 103</td>
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<tr>
<td>8/13</td>
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<td>Workshop 2. A Survey of Hypogeous Ascomycetes and Basidiomycetes</td>
<td>Robbins 283</td>
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<tr>
<td>8/13</td>
<td>1:30 pm-</td>
<td>Workshop 3. Polypores of North America</td>
<td>Robbins 291</td>
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<td><strong>Sunday</strong></td>
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<tr>
<td>8/14</td>
<td>8:00 am-</td>
<td>Field Trip. Tours of the Louis M. Martini Winery (Napa Valley) and The Sebastiani Winery (Sonoma Valley)</td>
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<tr>
<td>8/14</td>
<td>9-12:00pm</td>
<td>Meeting of the Council</td>
<td>DeCarli Room, Memorial Union</td>
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<td>8/14</td>
<td>1-4:00pm</td>
<td>Meeting of the Council</td>
<td>DeCarli Room, Memorial Union</td>
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<td><strong>Monday</strong></td>
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<tr>
<td>8/15</td>
<td>8:15 am-</td>
<td>Session 1 - Symposium. Molecular Evolution of the Fungi</td>
<td>Upper Level West, Rec Hall</td>
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<tr>
<td>8/15</td>
<td>8:15 am-</td>
<td>Session 2 - Symposium. The Biology and Genetics of Fungal Populations</td>
<td>Upper Level East, Rec Hall</td>
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<td>8/15</td>
<td>1:10 pm-</td>
<td>Session 3 - Contributed Papers. Fungal Cytology and Ultrastructure</td>
<td>Upper Level West, Rec Hall</td>
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<td>8/15</td>
<td>1:10 pm-</td>
<td>Session 4 - Contributed Papers. Morphology and Taxonomy of Ascomycota.</td>
<td>Upper Level East, Rec Hall</td>
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<td>8/15</td>
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<td>Session 5 - Contributed Papers Physiology and Biochemistry of Higher Fungi.</td>
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<td>Session 6 - Symposium. Cellular and Developmental Aspects in the Zoosporic Fungi</td>
<td>Wellman 2</td>
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<td>8/15</td>
<td>7:00 pm</td>
<td>Session 7 - Symposium. Roland Thaxter and American Mycology: A Centennial Celebration</td>
<td>Hunt 100</td>
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<td>Session 8 - Symposium. Taxonomic Techniques in the Basidiomycetes</td>
<td>Upper Level West, Rec Hall</td>
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<td>Session 9 - Symposium. Molecular Genetics of Methylation of DNA in Fungi</td>
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<td>Session 10 - Contributed Papers. Fungal Ecology and Population Biology</td>
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<td>Session 11 - Contributed Papers. Fungal Genetics and Molecular Biology</td>
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<td>Session 12 - Poster Session. Fungal Cytology, Morphology Taxonomy and Ultrastructure</td>
<td>Upper Level North, Rec Hall</td>
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<td>8/16</td>
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<td>Session 13 - Roundtable Discussion. Questions and Answers on the Use of Molecular Genetic Techniques for the Study of Fungi</td>
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<td>8/17</td>
<td>8:00 am</td>
<td>Breakfast and Business Meeting</td>
<td>Last Resort Restaurant and Pub</td>
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<tr>
<td>8/17</td>
<td>10:30 am</td>
<td>Presidential Address. A View of Fungal Ecology, Martha Christensen</td>
<td>Main Floor, Rec Hall</td>
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<td>8/17</td>
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<td>Annual Lecture. In the Footsteps of Drechsler. George L. Barron</td>
<td>Main Floor, Rec Hall</td>
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<td>Session 14 - Contributed Papers. Physiology and Biochemistry of Lower Fungi.</td>
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8/17  8:00 am- Session 16 - Poster Session.  Fungal Ecology and Population Biology.  Upper Level North, Rec Hall
       6:30 pm*  

8/17  8:00 am- Session 17 - Poster Session.  Fungal Genetics, Molecular Biology, Physiology, and Biochemistry  Upper Level North, Rec Hall
       6:30 pm*  

8/17  6:30 pm- 9:30 pm  Award Presentations and Social  Rec Pool Lodge

Thursday  8/18  8:20 am- Session 18 - Symposium. Biology of Zygomycota I, Physiological, Biophysical and Genetic Aspects of Morphogenesis.  Upper Level West, Rec Hall
           12:00 pm  

8/18  8:55 am- Session 19 - Contributed Papers. Morphology and Taxonomy of Higher Fungi  Upper Level East, Rec Hall
       11:30 am  

8/18  1:20 pm- Session 20 - Symposium. Biology of Zygomycota II, Cytological and Biochemical Aspects of Morphogenesis  Upper Level West, Rec Hall
       4:30 pm  

8/18  1:25 pm- Session 21 - Contributed Papers. Morphology and Taxonomy of Lower Fungi  Upper Level East, Rec Hall
       3:00 pm  

MSA Headquarters during meeting

*Posters will be manned by presenters from 3:30 - 5:30 pm

Program organized by Paul Szaniszlo, Chairman of the Program Committee.
The flagellar apparatus of the motile cells in the water mold *A. macroxyrus* consists of flagellum, basal body, and flagellar rootlet. The function and composition of the rootlet are as yet unknown. Cytoplasmic microtubules originate proximally to the basal body, and are known to be resistant to microtubule depolymerizing drugs. The purpose of this study was to: 1) examine possible modifications to these microtubules which might confer this stability to depolymerization, and 2) gain a more thorough understanding of the structure and function of the flagellar rootlet. Tubulin modifications were studied with two-dimensional polyacrylamide gel electrophoresis. Upon separation of the proteins, two isoforms of Α-tubulin were identified, Α-1, and Α-3. In light of current thinking, Α-1 tubulin is modified to Α-3 by acetylation, and would be a stabilizing factor for microtubules. When gels were transferred to nitrocellulose and probed with antibodies directed against acetylated Α-tubulin, the Α-3 isoform was recognized, demonstrating that microtubules consist at least in part of acetylated Α-tubulin. The entire rootlet structure of genes and zoospores was studied by TEM. This analysis showed that the position of the flagellar rootlet in relation to the basal body may be important in determining the plane of flagellar beat.

**Allen, M. F.,** *see Friese, C. F.*

**Ammirati, J. F.,** *see Rogers, S. O., et. al.*


The primary focus of this ongoing study, which began September 1, 1986, is the determination of spatial and temporal distributions of epigeous ectomycorrhizal fungi occurring on a 60m x 32m permanent plot established within a 14-year-old Douglas-fir plantation. Species of fungi occurring on the plot to date are distributed among the genera *Boletus, Dermocybe (Cortinarius), Gomphidius, Hebeloma, Hyphrophus, Inocybe, Lactarius, Ramaria, Sulfur and Russula.* Spatial distributions of the fungus species in relation to Douglas-fir trees on the plot are reported for the past two years. Inocybe species have been the most common in terms of number of species and number of basidocarps, but *Gomphidius subroseus* Kauf., is the fungus most widely distributed on the plot. Methods for this study are briefly outlined in the June, 1987 MSA Newsletter 38(i):15.

**Ammirati, S. R.,** *see Ammirati, J. F.*

**S. L. ANAGNOSTAKIS,** The Connecticut Agricultural Experiment Station, Box 1106, New Haven, CT 06504. *Taxon as a plant pathologist.*

Thaxter’s first job was with The Connecticut Agricultural Experiment Station. He began this short career on July 1, 1888 and was plunged into practical work that he greatly disliked. Even though he longed to return to his ivory tower, his experimental designs have left a lasting impression on the career of Plant Pathology.

**Anderson, J. B.,** *see Hinz, W. F. A., et. al.*

**Anderson, J. B.,** *see Horgen, P. A., et. al.*

**Anderson, J. B.,** *see Robison, M., et. al.*

**Anderson, J. B.,** *see Smith, M. L.*

**J. B. ANDERSON,** Department of Botany, Erindale College, University of Toronto, Mississauga, Ontario L5L 1C6. *Variation in ribosomal DNA and relationships among *Armillaria* species.*

The genus *Armillaria* is composed of several biological species in North America and Europe. To examine phylogenetic relatedness among biological species, ribosomal DNA (rDNA) from one isolate was cloned and rDNAs from 30 isolates were mapped for eight restriction enzymes. The positions of the large (26S) and small (18S) rRNA cistrons were found by Northern hybridizations of total, cellular RNA with rDNA subclones and by alignment with conserved restriction sites present in rDNAs of other fungi. Several restriction-site and insertion/deletion polymorphisms were observed. Eight North American (Roman numerals) and five European (Capital letters and species epithets) could be placed in six groups with respect to rDNA maps: (1) I and C (*A. ostoyae*); (2) II, (3) A (*A. borealis*), (4) V, IX, X, (5) III, VII, E (*A. lutea*), and B (*A. cepistipes*) and (6) VI and D (*A. mellea* s.s.). All of the rDNA groups were distinguishable from one another by at least two polymorphisms. Only a few polymorphisms were observed within rDNA groups and only in single strains. Most, but not all, polymorphisms were between regressive groups. I will discuss the rDNA polymorphisms in the context of the morphological features, distributions, and interfertility relationships of the biological species.

**Arcidiacono, S.,** *see Wiley, B. J., et. al.*

**Arnott, H. J.,** *see Whitney, K. D.*

**Arconson, J. M.,** *see Bertke, C. C.*

**Arcsuff, T. L.,** *see Nowell, S. Y., et. al.*

**Asbury, C. E.,** *see Lodge, D. J.*

**C. W. BACON,** and D. M. HINTON. *Toxicology and Mycotoxin Research Unit, Richard J. Russell Research Center, USDA/ARS. P. O. Box 5677, Athens, GA 30613.* Pathogenic differences in ten isolates of *Fusarium moniliforme* Sheldon.

Ten isolates of *Fusarium moniliforme* Sheldon (Gibberella fujikuroi (Sawada) Wollenw.) from surface sterilized corn kernels differed in their reaction to a corn seedling bioassay. The corn used to produce seedlings was sterilized to prevent use of fungus-infected seedlings. Four isolates were virulent, killing seedlings after they developed coleoptiles. Six isolates invaded seedlings and half of these were also virulent, killing corn seedlings at the 2 to 4 leaf stage. Such seedlings developed symptoms of wilt; one isolate produced nercosis of leaves. The remaining isolates invaded seedlings which remained symptomless. No isolate was found which interfered with corn germination. All isolates were examined for polygalacturonase and pectinesterase activity using a filter paper disc technique. All isolates produced pectinesterases which favored a medium pH of 4.7, but only a few...
were positive for polygalacturonase activity. There was no correlation between virulence of an isolate and the production of these two enzymes.

E. R. BADHAM, Carolina Fungi, Inc. Box 510, Greensboro, NC 27402. Growing shiitake on sawdust: Is an autoclave necessary?

The yield of the first flush of shiitake mushrooms was studied when grown on supplemented sawdust in bags with microporous breather patches. Approximately 2.2 kg of sawdust medium was filled into 5 l capacity polypropylene bags. One half of these cultures was autoclaved at 1.3 kg/cm² and the other half were placed in heated room for 28 h. The temperature of this room reached 90°C after 12 h and was held between 90 and 100°C for 16 h. Thermocouple probes in the center of the blocks in the heated room indicate that internal temperatures reached 89°C for 14 h in order to provide adequate kill of other molds which are present. Twelve blocks per week were started for 15 consecutive weeks and most were incubated for 13 weeks before being placed in a cooler, humid area for fruiting. ANOVA revealed that the variation in yield was roughly divided between what occurred between weekly experiments and that within weekly experiments. A nonsignificant amount of variation occurred between the two heat treatment groups. An autoclave does not appear to be necessary for the heat preparation of supplemented sawdust substrate used to grow shiitake.

Barr, D. J. S., see Desaulniers, N. L.

D.J.S. BARR and N.L. DESAULNIERS Biosystematics Research Centre, Central Experimental Farm, Ottawa, Ontario, Canada. The flagellar apparatus of the Oomycetes and Hyphochytriumcetes.

There are up to six arrays (rootlets) of microtubules in the Oomycete zoospore. Two rootlets are associated with the anterior kinetosome; one of these contains many microtubules (rib microtubules) attached at right angles to the main rootlet. The third rootlet is associated with the posterior kinetosome. The fourth is a unistranded, band-shaped rootlet that extends from a point between the kinetosomes to the posterior of the cell. Microtubules that extend into the cytoplasm, and microtubules that run along one side of the nucleus comprise the fifth and sixth rootlets. The flagellar apparatuses in Phytophthora parasitica and Lagena radiicola have been examined by computer analysis of serial electron micrographs, and reconstituted in three-dimension using stereo pairs. For public display the stereo pairs have been plotted in red and green on clear acetate, and overlaid for viewing with an overhead projector using red and green glasses to enable the audience to perceive the third dimension. The Hyphochytriumcetes have a single, anteriorly directed flagellum that contains masticogemes. The flagellar apparatus in Hyphochytrium ctenoides is composed of three rootlets. It has been critically compared with the Oomycete flagellar apparatus and the taxa are considered to be related.

C.R. BARRERA, Department of Biology, New Mexico State University, Las Cruces, N.M. 88003. Formation and germination of arthrospores in Mucoor.

Arthrospores, also referred to as arthroconidia and sporelloses, are asexual propagules which are formed by a wide variety of fungi through a process of hyphal fragmentation. The arthroconidia may be further characterized as being enterothecial or holothecial. In some pathogenic fungi such as Coccidioides and Trichophyton, arthrospores represent the major means for the transmission of infection. Our studies on Mucoir rouxii, a nonpathogenic dimorphic Zygomycete, have shown that arthrospore formation can be greatly stimulated and occurs optimally in the presence of 2.5% potassium acetate in yeast extract-peptone medium. Arthrospore formation by M. racemosus does not appear to respond to growth conditions to the extent seen in M. rouxii. Ultrastructural studies have revealed that arthroconidia develop in random sequence along the coenocytic hyphae in terminal and subterminal regions by deposition of a new cell wall internal to the existing hyphal cell wall. The cell wall consists of several distinct layers and forms complete septa which separate adjacent spores. Germination under aerobic conditions occurs by extension of germ tubes whose cell wall originates from the inner layer of the arthroconidial cell wall. Optimum temperature for germination of arthroconidia is 30°C but detectable growth occurs from 15°C to 40°C. Antibiotic susceptibility studies have established the minimal inhibitory concentration for amphotericin B (3.13 µg/ml), nystatin (6.25 µg/ml) and miconazole (25 µg/ml). (Supported by NIH Grant RR-08136).


Bauer, R., see Berbee, M., et. al.

Bauer, R., see Oberwinkler, F.

P. BAYMAN and O. R. COLLINS. Dept. of Botany, University of California, Berkeley CA 94720. Reproductive systems and rDNA polymorphisms in Didymium iridio.

Didymium iridio (Physarales, Myxomycetes) includes both outcrossing heterothallic strains and nonoutcrossing apomictic strains. Isozyme electrophoresis shows intercompatible heterothallic strains to be genetically uniform, regardless of place of origin, while apomictic strains are genetically varied (Mycologia 75: 1044, 1983). We are now comparing variability in heterothallic and apomictic strains using RFLPs of ribosomal DNA (rDNA). This should provide a better estimate of relatedness within D. iridio, and between it and other species in the Physarales.

P. BAYMAN and O.R. COLLINS. Dept. of Botany, University of California, Berkeley CA 94720. Meliosis in a homothallic Coprinus.

Meliosis was studied in a homothallic member of the Coprinus pataoillardi species complex. Cytofluorometry was used to detect late-onset meiotic prophase during the nuclear cycle. An unusual feature of meiosis in C. pataoillardi is that meiotic DNA synthesis occurs after karyogamy, whereas in most higher fungi it occurs before.

Benes, E. S., see Hespenthal, D. R., et. al.


During the 40 plus years that Thaxter studied the Laboulbeniales he described in excess of 100 genera and nearly 1300 species. The collection and preparation of specimens for study, not to mention the de-
This effort was the more remarkable when one considers that Thaxter also made impressive contributions to knowledge of other ascomycetes and other groups of organisms as well—aquatic fungi, Endogonales, Entomophthorales, hyphomycetes, Myxobacteriales, etc. In this short presentation I shall describe a simple method Thaxter employed for gathering Laboulbeniales from dry insect specimens in museum collections and especially a meticulous technique he used in preparing the plates of illustrations that are the symbol of artistic perfection universally associated with Thaxter and his work.


The genus Sclerocystis is a traditional member of the Endogonaceae (Endogonales). However, Walker believes Sclerocystis coremioides. 32611. Electron Microscopic Observations on using scanning electron microscopy (SEM). Other with transmission electron microscopy (TEM). TEM shows we examine chlamydospores and sporocarpic hyphae of that in young sporocarps the chlamydospore walls are relatively thin and the chlamydospores contain only a small amount of cytoplasm. In mature sporocarps, however, the chlamydospore walls are thicker and multilayered, and many are filled with endospores. We have not observed, as yet, young enough stages in the development of the endospores to discuss their ontogeny or to determine if they are a stage in the life cycle of S. coremioides. Ultrastructural details of sporocarpic hyphae and septa are also discussed.

M. BERSE, R. BAUER & F. OBERWINKLER, Universität Tübingen, Institut für Botanik, Auf der Morgenstelle 1, D-7400 Tübingen 1, W. Germany. Electron microscopic study of meiosis in Microbotryum violaceum (Pers.: Pers.) G. Deml & Oberw.

Meiosis in Microbotryum violaceum (Ustilaginales) was examined electron microscopically in conventionally fixed and freeze-substituted basidia with particular attention to the spindle pole body cycle. During early prophase, the spindle pole body consisted of two homogeneous globular elements connected by a middle piece. Later, an electron dense disc appeared in each globular element. In late prophase, when the nucleus emerged from the telospor and entered the germ tube, the spindle pole body consisted of two globular elements, each containing an electron dense disc, but the middle piece was no longer visible. The meiosis I spindle extended between two monoglobular spindle pole bodies each containing an electron dense disc. During interphase I, a putative new spindle pole body appeared between the nuclear membrane and the monoglobular spindle pole body residual from the first division. In meiosis II, a spindle was again established between two monoglobular spindle pole bodies, each of which again contained an electron dense disc. This spindle pole body cycle is compared with that of Ustilago maydis (De Candolle) Corda, Sphaerobolus phalodiensis (Passerini) Donk, Endogonaceae, Phacotus scottii Fell, Sutcliff, Hunter & Phaff, and Serpiderichus johnsonii Nyland. Phylogenetic implications are discussed.

C.C. BEFSE and J.-M. ROYDEN. Department of Botany and Microbiology, Arizona State University, Tempe, AZ 85287-1601. Investigation of chitin synthase activity in protoplasts of Apodachlya sp.

Chitin, a major component of cell walls in Apodachlya sp. (Leptomitales), comprises 18% of wall dry weight. Chitin is present also in Apodachlya as intracellular chitin-glucan cellulin granules. A membrane-associated enzyme, chitin synthase, is responsible for the biosynthesis of chitin. The two distinct locations of chitin deposition suggest that chitin synthase activity may reside in distinct subcellular membrane fractions, plasma membrane and endomembrane. The use of protoplasts as a source of membranes can facilitate the isolation and recovery of pure membrane subfractions for evaluation of chitin synthase activity. Lysates of protoplasts exhibit the highest specific activity of chitin synthase in the mixed membrane fraction.

To evaluate the distribution of enzyme activity, it is necessary to isolate and separate plasma membrane from endomembranes. A proven approach to isolate plasma membrane involves the use of the lectin Concanavalin A (Con A). By binding to the surface of the plasma membrane, Con A acts as a stabilizer by preventing fragmentation and vesiculation during protoplast lysis and allows recovery of large membrane sheets. Also, Con A binding increases the buoyant density of membrane, allowing separation and membrane from isopycnic density gradient centrifugation. Electron microscopic examination of protoplasts treated with Con A-stabilized particles of colloidal gold, shows protoplasts to be amenable to Con A-stabilization. Our studies on the distribution of chitin synthase activity will be discussed.

J. A. BERUBE, and M. DESSUREAULT. Centre de Recherche en Biologie Forêt, Faculté de Foresterie et de Géodésie, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4. Morphological characterization of biological species of the Armillaria mellea complex.

Contrary to the five European biological species of the A. mellea complex which are taxonomically delineated, only two of the eight North American biological species have been described.

In Québec, the root rot fungus A. mellea in the broad sense was found to be composed of five intersterile groups or biological species using mating tests with standard testers. Monosporous cultures of our specimens were compatible with groups I, II, III, V and VI. Results obtained so far indicate that morphological characteristics of the fruiting bodies and rhizomorphs in culture can be used to differentiate groups I, II, III, V and VI. Distinguishing features of rhizomorphs and fruiting bodies are discussed. Two new species are described, and distribution, host range and pathogenicity are documented for all species.


About 360 specific and infraspecific taxa of Russula have been described from the western
A large number of names remain to be evaluated in the fresh hemisphere. The pattern of glycolytic enzyme, tricarboxylic acid cycle enzyme expression, and general polypeptide expression in the mutant and wild type support the hypothesis that there are common elements in the expression of glycolytic enzymes and proteins involved in morphogenesis. Abnormally high levels ofaconitase and isocitrate dehydrogenase in the mutant suggest that pool sizes of citrate may act as a regulator of genes responsive to oxygen.

Bourret, J. A., see Flora, L. L., et. al.

J. A. BOURRET California State University, Long Beach, Long Beach, CA 90840. Spore germination in Pilobolus: transport and role of cyclic AMP.

Spores of Pilobolus longipes are triggered to germinate by glucose. However, the early germination events appear to be independent of glucose metabolism. Instead, glucose-induced spore activation results from the generation of cyclic AMP. These findings have focused attention on how spores transport glucose. Spores contain a glucose transport system which becomes functional at temperatures that permit spore activation. About 2 min after addition of glucose, however, further changes in transport kinetics begin to occur. These shifts towards higher V_max and K_m values that follow addition of glucose were preceded by an increase in cyclic AMP. Spore activation treatments that do not involve glucose transport (e.g. exogenous cyclic nucleotides) consistently resulted in increased transport activity. Inhibition of phosphorylase did not activate spores or induce changes in transport activity, but, in combination with sub-optimal activation treatments, it amplified the germination signals to produce increases in both spore activation and glucose transport activity. These results indicate that altered glucose transport kinetics act with altered spore activation to part of a cyclic AMP-dependent regulatory cascade and are not a direct result of an interaction between glucose and transport system.

Bracker, C. E., see Lel-Morales, C. A., et. al.

P. T. BORGIA. Southern Illinois University School of Medicine, Department of Medical Microbiology, Springfield, IL 62794-9230. Glucose metabolism, polypeptide expression and dimorphism of Mucor racemosus.

We have investigated the morphology, energy metabolism and spectrum of polypeptides synthesized by M. racemosus grown under a variety of cultural conditions. Our results indicate that both mode of glucose metabolism (fermentative vs. oxidative) and morphology, are sensitive to glucose and oxygen but that these two effects could be distinguished. A large number of polypeptide changes correlate with a shift from oxidative to fermentative metabolic mode. Only a few changes occur which correlate with the morphological change. In addition we have isolated a conditional developmental mutant which is capable of oxidative energy metabolism but is highly fermentative and exhibits the yeast morphology when grown aerobically in glucose containing media. The pattern of glycolytic enzyme expression, tricarboxylic acid cycle enzyme expression, and general polypeptide expression in the mutant and wild type support the hypothesis that there are common elements in the expression of glycolytic enzymes and proteins involved in morphogenesis.

During the growing season from May to September 1987, two alder stands near Fairbanks, Al, one in an A. crispa (Ait.) Pursh thicket and the other in A. tenuifolia Nuttall forest, were investigated in terms of myco-ecology. Blocks of cap tissue from several suspected mycorrhizal fungi were incubated on malt and on modified Melin-Norkrans agar. Only species from the genera Alpova, Paxillus, Hebeloma, and Cortinarius grew successfully. In ongoing studies using the growth pouch technique, the morphological features of synthesized ectomycorrhizae of the two Alnus species will be compared with each other and with naturally occurring ectomycorrhizae. In addition, the amount of phosphorus present in the alder foliage will be compared with that of the synthesized fungi and with the nonmycorrhizal controls.

Brummer-Grossmann, F., see Brunner, I. L., et. al.
Mapping studies were performed to evaluate the mode, tempo, and phylogenetic significance of mitochondrial DNA (mtDNA) evolution in 15 species of Suillus and five species from four related genera of the Boletaceae. Among the 15 species of Suillus s.l., mtDNAs vary in size from 36 to 121 kb, differ in sequence order by only one major rearrangement, and have diverged in nucleotide sequence within the large subunit ribosomal RNA gene region by a maximum of 2.6%. Three additional mtDNA fragment orders exist in three related genera examined. Two of the three orders can be transformed into the predominant Suillus order by either one or two single step rearrangements. The fourth requires two or three rearrangements to be converted to any of the others. The minimum estimates of nucleotide divergence within the large subunit ribosomal RNA gene region vary from 8.3% to 11% in comparisons between Suillus and these related species. Cladistic analyses of restriction-site and size differences within the mitochondrial ribosomal RNA gene regions were conducted. The results are congruent with the hypothesized sequence of three of the four mtDNA rearrangements, provide evidence for an expansion of the mitochondrial genome within Suillus, and help to resolve several systematic controversies within the Boletaceae.

B. BUCKNER, C. P. NOVOTNY, AND R. C. ULLRICH. Depts. of Botany and Microbiology, University of Vermont, Burlington, VT 05405

Developmental regulation of the methylation of the ribosomal DNA in the basidiomycete fungus Schizophyllum commune.

The ribosomal DNA (rDNA) of Schizophyllum commune is highly methylated. To investigate the role of methylation of rDNA, a map of the recognition sites (CCGG) of the methylation-sensitive restriction endonucleases, Msp I and Hpa II, was prepared for the rDNA of S. commune strain 4-40. The incidence of methylation at these CCGG sequences was analyzed. Our analyses demonstrate that either of the cytosines of the CCGG sequence can be methylated in S. commune, however methylation of the internal cytosine is more frequent than methylation of the external cytosine. The external cytosines of CCGG sequences near the rDNA transcriptional initiation site are less frequently methylated than those elsewhere in the rDNA. The methylation of these sequences has shown to be developmentally regulated in S. commune. We find that these sequences are more highly methylated in dikaryotic than homokaryotic cells.

B. F. CALLAHAN AND J. D. ROGERS. Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430. Tropical species of Kretzschmaria compared and cultured.

Tropical collections of Kretzschmaria (Xylariaceae) from Indonesia and South America were examined and compared, and when possible cultural features were characterized. Kretzschmaria clausa (Fr.) Sacc. and K. cupulicrosa (Sacc.) Sacc. as well as other Kretzschmaria species are morphologically distinguished from Xyliaria by their small, convex or conical stromata which are usually greater in diameter than in height, and frequently congregated in crusts. In culture, they share features with Xyliaria and Usulina, in that they may produce the slender, cylindrical stromata of the former (unlike the pseudocromic stromata), or the robust, wrinkled and fissured ascomata colonies similar to those of the latter.

Cambareri, E. B., see Selker, E. U., et. al.

M.M. CARREIRO and D. NELSON. Botany Department and Microbiology Department, University of Rhode Island, Kingston, RI 02881. A study of the heat shock responses of psychrophilic and psychrotrophic Morax species.

Cells of organisms in all 5 kingdoms respond to the stress of supranormal temperatures by rapidly expressing a set of proteins called heat shock proteins (hsps). While our knowledge of the protective, regulatory or repair functions of individual hsp is fragmentary, their production has been correlated with the acquisition of thermostolerance in many organisms. The heat shock response of the psychrophile, Moror flavus (optimum growth temperature 20°C and maximum growth temperature 24°C) was compared to that of the psychrotroph, M. hiemalis I. hiemalis (optimum temperature 20°C, maximum temperature 32°C). The purpose of this study was to determine (1) if psychrophiles possess a heat shock response, or (2) if they express fewer hsps or hsps of different size classes, or (3) if the temperatures that trigger the response differ. Cultures were grown at 15°C and heat shocked from 200°C to 36°C. Radioactively labeled proteins were examined using 1- and 2-dimensional gel electrophoresis and autoradiography. Twenty-three hsps were detected in 2-D gels for the psychrotroph and 22 hsps for the psychrophile. The psychrotroph response was first detectable at 28°C and optimal at 32°C. Psychrophile hsps were first seen at 20°C and the response was optimal at 30°C. In summary, the psychrophile expressed a set of hsps comparable to those produced by the psychrotroph, but the temperature which triggered the response was lower.

L. M. CARRAS. Blueberry/Cranberry Research Center, Rutgers University, Chatsworth, NJ 08019. Isozyme variation in Botryosphaeria corticis.

Botryosphaeria corticis is the causal agent of blueberry stem canker, an important disease in commercial blueberry plantings in New Jersey and the southeastern U.S. Although eight races of the pathogen have been identified, there is little information available on the amount of variation within and among populations of B. corticis. The apparent genetic variability of B. corticis has hindered development of durable resistance in blueberry cultivars. Isozyme studies have been valuable in quantifying genetic variation in a number of fungal taxa. Isozyme variability was studied in isolates of B. corticis collected from 21 different blueberry varieties in New Jersey, North Carolina and Georgia. Horizontal starch gel electrophoresis of mycelial extracts from 5- to 30-day-old cultures was performed using several buffer systems. A preliminary study indicated that 15 of the 40 enzymes assayed produced interpretable banding patterns. Age of fungal culture, buffer system and length of electrophoretic run were found to affect enzyme patterns. A total of 22 putative loci were detected, eight of which were polymorphic. Results indicate that an expanded isozyme analysis may be useful in studying the variability of B. corticis in wild and cultivated blueberry populations.

E. CERDA-QUILED. Departamento de Genética, Facultad de Biología, Universidad de Sevilla, Sevilla, Spain.

Phycomycetes genetics and development.

The genetics of Phycomyces blakesleeanus allows practical procedures for the routine isolation of mutants; for complementation analysis in heterokaryons and for quantitative studies of the relationship between phenotype and allele ratios; for the determination of recombination frequencies counting mass meiotic products or unordered tetrads; for transformation with and expression of exogenous DNA. These methods can be used to elucidate the mechanisms of...
clear-cut developmental transitions in the Phycomycetes life cycle. Massive spore germination is induced by exogenous acetate, propionate, or propionate, mutants with reduced response to these agents lack an early burst of cyclic AMP believed to be the critical activating signal. Other mutants require no activating treatments, either because their spores do not become dormant or because they germinate readily even in the sporangium. There are two kinds of sporangiothecia, the macrophores and the microphores. Most mutants defective in macrophorogenesis fail to form microphores and to complete the sexual cycle. Under certain conditions, light given to a defined stage of mycelial development stimulates macrophorogenesis and inhibits microphorogenesis. Each of these two photo-morphogenetic effects is the sum of two responses with different action spectra and other parameters. The four responses depend on two genes involved in photoreception for phototropism and on certain genes governing carotenoid synthesis.

Chen, A. W., see Meier, R.

Ganoderma lucidum, an overview.

Ganoderma lucidum, a "divine" ancient Chinese mushroom, now receives unprecedented attention. Renewed interests are shown on concept of species, strains through studies on ultrastructure, triterpenoid & enzyme patterns, and soluble proteins by isoelectric focusing. Within the last 5-10 years, highly oxidized lanostane-triterpenoids from FTOH extracts have been continuously isolated and characterized. C20, C27, & C24 varieties are found in fruiting bodies of various strains, while C30 was isolated from mycelium of a strain producing C27 lucidenic acids in fruiting bodies, indicating vegetative/reproductive conversion of triterpenoids. Polysaccharides, on the other hand, have been obtained from aqueous extracts. These include low m.w. H2O soluble glycans (Ganoderan A & B), high m.w. GL-1, a branched arabinopyroglucan, and H2O insoluble but alkalii soluble high m.w. glucan, G.A. Physiological studies on tissue cultures, animal & mammalian models including clinical trials suggest these biologically active molecules can *strengthen the immune system,*facilitate O2 transfer in erythrocytes and scavenger plasma free radicals(OH - & O2-) this has been linked to the antilaging theory,*effect host mediated tumor regression, coronary circulation, inhibit platelet aggregation, be hypotensive/hypoglycemic, & sedative/anticholinergic/therapeutic on neuro system, detoxify liver, and treat mushroom poisoning. Studies are being made here.

M. A. CHEN and E. B. SMALLEY. University of California, Dept. of Plant Pathology, Berkeley, CA 94720. Morphology of isolates of Ceratocystis ulmi from Wisconsin.

Ceratocystis ulmi isolated from branches and bark of recently killed elms in southern Wisconsin (175 samples, 13 locations) were examined and the colony characteristics of the pathogenic and aggressive strains were described. Sperothix conidiophores from vegetative hyphae often extended at right angles. Conidiophores are slender, tapered and produce conidia sympodially on short dendrites along the conidiogenous portions of hyphae. The conidia taper to a truncate base and accumulate in minute, mucilaginous droplets. Graminum produced erect synnemata composed of tightly packed, pigmented hyphae elements comprising the stalk of synnemata, diverge at the apex, forming separate conidiogenous branches. Differences in the fungi carried by bark beetles in Wisconsin and China (Kininlang) are discussed.

C. Y. CHEN, Mycology Laboratory, Institute of Biological Sciences, National Taiwan Normal University, Taipei, 117, Taiwan, R.O.C.. Three species of the genus Basidiobolus from Taiwan.

Newly isolated strains from the excreta of amphibians, reptiles and domestic animal dungs have been examined and identified as Basidiobolus ranarum, B. haemoporum and B. meriatoosporum, and reported from Taiwan as new. Their culture, morphological characteristics and habitats have also been described. Mycological investigations of such fungi as B. ranarum will be discussed in relation to the graduate study and teaching of mycology in Taiwan.

Choi, K. C., see Kim, B. K., et al.

Christensen, M., see Stahl, P. D.

M. CHRISTENSEN, Department of Botany, University of Wyoming, Laramie, WY 82071. A view of fungal ecology.

Prior to the turn of the century, there were some delightful observations relative to "fungi in the cycle of life," but expansion of knowledge in fungal ecology subsequently -- where they live and what they do -- has been slow by comparison with the progression of understanding in plant ecology and animal ecology. Thus, at present, the unknowns and need-to-be-knowns in fungal community ecology far exceed the knowns.

Recently I contemplated the sponsoring of an advertisement, to be run in Ecology, Science and Nature, that would read:

WANTED Renaissance men for work in fungal ecology.

We are at that stage in our development as a key discipline within biology where we ought to be attracting individuals with broad experience and expertise. The exciting challenges of fungal ecology, involving as they do problems in time, space and a complexity of interactions, deserve the best efforts of contemporary Renaissance men and women!

C. W. CHO and M. S. FULLER. Department of Botany, University of Georgia, Athens, GA 30602. Observations of the water expulsion vacuole of Physophthora palmivora.

The water expulsion vacuole of Physophthora palmivora was studied with the light microscope after the mobility of the spores had been slowed by using low Ca++ media. For transmission electron microscopy, the zoospores were prepared using freeze-substitution. The water expulsion vacuole consists of a central vacuole that collapses and empties its contents to the external medium. The central vacuole is surrounded by a series of interconnected vacuoles that we are calling the surrounding vacuoles. When the central and surrounding vacuoles empty, or modify their function, many coated pits are observed on their membranes as the vacuoles reduce their total surface areas. These coated pits are present in large numbers in the cytoplasmic areas of the water expulsion vacuole. Other coated pits are derived from the cell surface and serve to maintain a constant overall surface area in the spores. Several changes associated with stages of collapse of the central vacuole were consistently observed and led us to the conclusion that, following the emptying and collapse of the central vacuole, the surrounding vacuole is transformed and becomes the new central vacuole. The new surrounding vacuole is generated from the aggregation of microvesicles and small vacuoles that we believe are derived from recycling coated vesicles. The processes involved in membrane recycling during the functioning of the water expulsion vacuole will be discussed. We were unable to get label to associate with the coated pits. Therefore, our hypothesis as to how the water expulsion vacuole functions is based upon an assumption that coated vesicles are moving away from the membranes where they are observed.
Senescence in the myxomycete Physarum polycephalum.

Macroplasmodia of the myxomycete Physarum polycephalum grown in axenic cultures have been shown to undergo senescence and death in a regular manner indicative of a determinate lifespan, while microplasmodia grown in axenic shake cultures are apparently immortal. However, when subcultured on agar they become senescent after a period of vigorous growth which becomes progressively shorter with increasingly older shake cultures. On axenic agar, senescent plasmodial fragments revive and after several days produce new vigorous plasmodia which will then undergo a second senescent-like event. This recurrent senescence cycle, which can be repeated many times, together with the lack of senescence in the constantly fragmenting shake cultures indicates the production of a senescence factor during the later stages of aging. Small fragments which do not contain the factor will revive on agar (the rest of the plasmodium will lyse) or be continuously selected for in shake cultures. Senescence is characterized by a declining growth rate, loss of pigment, progressive increase in nuclear polyplody, and an increase in the number and size of spherical osmophilic bodies in the mitochondria. A mutant plasmodial strain has been isolated which no longer undergoes senescence under any conditions and is believed to have lost its ability to produce the senescence factor.

Clay, K., see Leuchtmann, A.

Collin, O. R., see Bayman, P.

Collins, O. R., see Bayman, P.

O.R. COLLINS. Department of Botany, University of California, Berkeley, CA 94720. Further studies on heterothallism in Stemonitis flavogenita. At that time, 9/39 crosses, while the remaining three tended toward self-fertile and six were sterile. Ten years later we once again recovered stable + and - mating type self-fertile and six were sterile. For example, from one such cross 339/345 progeny were self-fertile and six were sterile. Ten years later we once again recovered stable + and - mating type clones, this time from a descendant of one of the 339/345 self-fertile clones originally obtained from a + x - cross. We understood neither the stage in the life cycle at which conversion took place nor the cause of the conversion in the one clone in which it was known to have occurred. The main purposes of this paper are to report: 1) conversions in 18 different clones, all siblings of #36; 2) the life cycle stage at which they occurred; and 3) the probable cause of conversions.

Cook, C. L., see States, J. S.


Distribution of Acremonium coenophialum in developing inflorescences and seedlings of tall fescue. A. coenophialum is known to infect the reproductive and vegetative tissue of tall fescue. Research that linked the presence of A. coenophialum with reduced weight gains and alkaloid-like poisoning in cattle was responsible for renewing interest in this endophytic fungus. However, information on the endophyte's life cycle within the host grass was incomplete. This investigation traces the progression of the fungus during tall fescue development by examining histologically aseptically cultured seedlings and field-grown inflorescences of tall fescue.

The endophyte invades inflorescence primordia soon after reproductive growth is initiated. Intercellular hyphae grow into grass ovaries after differentiation of the styles and enter the ovule via the funiculus. The fungus proliferates throughout the nucellus and invades the shoot meristem sometime later in embryo development. Post germination, the endophyte continues to grow from the seed remnant via the scutellum into the meristems of the developing seedling. A. coenophialum is also observed on roots of aseptically cultured seedlings and is found intracellularly in root hairs and epidermal cells. This discovery may have important implications in assessing the ecological and evolutionary significance of endophyte-host associations.

Cook, S., see Dickman, A.

CHESTER R. COOPER, JR. 1 JAMES L. HARRIS, 2 and PAUL J. SZANISZLO 1 Department of Microbiology, University of Texas, Austin, TX 78712, and 2 Texas Department of Health, Austin, TX 78756. Differentiation of Clinical Strains of Dematiaceous Yeasts by Restriction Fragment Polymorphisms.

Clinical isolates of dematiaceous (melanized) yeasts often prove difficult to identify due to their reduced morphologies. We developed a method to identify such fungi by comparing their DNA restriction fragment length polymorphisms (RFLPs) with those exhibited by known form-species of other dematiaceous fungi. Our methods employed restriction endonuclease digestion of agarose-embedded, proteinase-treated chromosomes followed by gel electrophoresis of the resulting DNA fragments. Within form-species RFLPs remained generally consistent, but were distinct among various form-species. Based upon the similarities and differences of RFLPs, unmarked clinical isolates could be assigned to certain taxonomic affinities. The successful use of this method to help identify dematiaceous fungi should be generally applicable to the classification of other types of imperfect fungi in the clinical laboratory.

CHESTER R. COOPER, JR. and PAUL J. SZANISZLO. Department of Microbiology, University of Texas, Austin, TX 78712. Evidence for diploidy in Wangiella dermatitidis, a pathogen of humans.

Wangiella dermatitidis, a pathogen of humans, is an imperfect, dematiaceous fungus. In our study, an albino mutant, Me13, spontaneously derived from the parental strain 8656, was more resistant to the lethal effects of ultraviolet light when compared to a haploid (H1-2) and a diploid (UT-6) strain of Saccharomyces cerevisiae, and a putative diploid strain (300) of Candida albicans. Conversely, the frequency of mutants among survivors of the Me13 strain was less than those among survivors of the other fungal strains. The types of auxotrophies exhibited by mutants derived from the S. cerevisiae.
strain HL 2 varied considerably, whereas those from strain UT-6 were usually restricted to histidine and leucine, conditions normally masked by known heterozygous loci. Very few auxotrophs were found among the survivors of the M. albicans and M.13 strains. In the former, most were Met-; the latter were restricted solely to Ade-, Arg-, Met-, and Ura- phenotypes.

These collective results are analogous to those derived during studies concerning the ploidy of C. cladosporioides. We suggest that the M.13 strain of W. dematiitidis, and by inference the 8656 strain, are diploids with particular heterozygous loci. Studies of other strains of W. dematiitidis and other Dematiaceae will determine the extent of diploidy among these fungi.

Correll, J. C., see Leslie, J. F., et. al


It has just been shown that when some chemotypes of the Cladonia chlorophaea complex grow intimately intermixed in nature, their sporulating progeny include individuals that do not match the chemotype of the maternal parent but do match that of a different but nearby chemotype. This was the first proof of gene flow in lichens and the first evidence that some (but not all) morphologically indistinguishable lichen chemotypes hybridize. This analysis involved the isolation of single spores from lichens in natural populations because artificial crosses are as yet impossible. These cultures of hybrid origin provide excellent material for analysis with molecular-genetic markers. In this study I am re-examining a family of sporelings using restriction fragment length polymorphism in ribosomal RNA genes and randomly cloned DNA fragments. Genetic recombination is indicated by the polymorphism of markers between sibling sporelings and gene flow by the exchange of markers. Genetic variability among sporelings, gene flow between chemotypes and the limits of reproductive isolation will clarify species concept in the lichens.

Desaulniers, N. L., see Barr, D. J. S.

N. L. DESaulniers and D. J. S. BARR. Biosystematics Research Centre, Central Experimental Farm, Ottawa, Ontario, Canada. Three-dimensional reconstruction of the flagellar apparatus in fungal zoosporcs.

Zoospores were examined by computer analysis of serial electron micrographs. The kinetosomes, flagella, nucleus, cell membrane, and rootlets have been plotted in different colors for easy differentiation of the cell components, and displayed in three-dimension using stereo pairs. These can be viewed using a stereoscope, but by only one person at a time. To enable a larger audience to see the three-dimensional illustrations, the stereo pairs have been plotted separately, one in red and the other green, on clear acetate. They are then overlaid, displayed on a screen by an overhead projector and viewed with red and green glasses.

D. E. DESJARDIN and R. H. PEtKersen. Department of Botany, University of Tennessee, Knoxville, TN 37996-1100. Microphale brevipes re-evaluated.

The genus Microphale is currently composed of three sections: sect. Microphale (9 spp.), sect. Perforantia (4 spp.) and sect. Rhizomorphigena (2 spp.). Features diagnostic for taxa of the first two sections include: (1) pilei composed of gelatinized, non-diverticulate hyphae; (2) pruinose or pubescent, centrally oriented stipes of inamyloid tissue; and (3) either lack or form poorly developed rhizomorphs. In comparison, M. westii (= M. brevipes), the type of sect. Rhizomorphigena, has pilei composed of non-gelatinous diverticulate hyphae (similar in organization to pileipelli in Marasmius sect. Androsacei), glabrous eccentric stipes with dextrinoid cortical hyphae and well developed rhizomorphs from which the basidiomata often arise. In addition, micromorphology of the stipe tissue is distinctive. We conclude that M. brevipes belongs in Marasmius and transfer sect. Rhizomorphigena to that genus where it is listed with sect. Androsacei.

Dessureault, M., see Berube, J. A.

ALAN DICKMAN and STANTON COOK. Department of Biology, University of Oregon, Eugene, OR 97403. Persistence and spread of Phellinus weirii in a mountain hemlock forest.

Phellinus weirii, a root-rotting basidiomycete, is common in old growth mountain hemlock forests, where it spreads from centers and forms patches where it infects trees and alters the plant community. Fungal isolates collected from 61 infestations were subjected to clonal analyses by the use of vegetative incompatibility reactions. Forty-four individual genets were detected; thirteen of these were composed of from 2 to 4 distinct substitutions. Spatial dispersion of ramets and genets supports the inference that many infestations are sibling ramets of genets that have survived stand-destroying fire. The age distribution of genets yields the inference that infestations have been initiated by basidiospore infection during the past 1300 yr. Several genets are older than 1000 years. Fire has reduced the visible area of infestation of the fungus. It probably has done so by favoring less susceptible host species, and by reducing the modal size of dead roots and logs.

S. DIGBY and K. WELLS. Botany Department, University of California, Davis, CA 95616

Ustilago cynodontis: partial intersterility groups.

Compatibility in Ustilago cynodontis is controlled by two alleles at one locus. The alleles are designated A and a2. This genetic system is modified by partial intersterility between the five groups of collections so far identified. The interaction between the groups is summarized below.

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(M) CA, AUSTRALIA, TAIWAN (I) CA, FRANCE, ISRAEL (II) CA, OR, HAWAII, BULGARIA (IV) CHINA (V) CA

Current data suggest that the sterility factors, if present, are closely linked to the compatibility locus. Intergroup pairings have been conducted by infecting the host, Cynodon dactylon. The progeny of both inter- and intragroup pairings are being analyzed to determine if sterility genes can be detected.

Uikanto, M. R., see Logan, D. A.

Donoghue, J. D., see Przybylovec, P. R.
The influence of ambient ozone on decomposition of litter of ponderosa pine and Jeffrey pine was studied by collecting surface needle litter from nine experimental plots which traverse an ozone gradient in the San Bernardino mountains of southern California. Evolution of CO$_2$ from litter needles in the laboratory was greatest with litter from plots exposed to the highest levels of ozone. 

**Diversity index values** (Shannon and Simpson) for litter fungi were highest in the high ozone plots and lowest in the low ozone plots. These results suggest that needles from severe ozone plots are predisposed to enhanced decomposition. The possibility of enhanced decomposition in severe ozone plots due to the greater nutrient content of needles in ozone-impacted areas will be discussed.

Dykerstra, M., see Te Strake, D., et al.

M. J. Dykerstra, I. F. Salkin, M. R. McGinnis and M. G. Rinaldi. School of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606, New York State Department of Health, Albany, NY 12201, Department of Pathology, University of Texas Medical Branch, Galveston, TX 77550 and Department of Pathology, University of Texas Health Science Center, San Antonio, TX 78284.

Conidio genesis is compared by electron microscopy in Scopulariopsis breun tii, Scedosporium apiospermum, and Scedosporium inflatum.

A comparison of conidium formation in Scopulariopsis breun tii, Scedosporium apiospermum and Scedosporium inflatum was conducted with transmission- and scanning electron microscopy. It had been suggested in earlier light microscope studies that occasional sympodial branching was found in S. apiospermum and S. inflatum. Careful examination of the sub-apical region of conidigenous cells of these species revealed that the process of percur rent proliferation occasionally caused the subapical conidigenous swelling to push through the apical conidium such that it remained adherent to the side of the conidigenous apex by a fragment of primary wall material. If this process was not observed by time-lapse light microscopy, it would give the false impression of sympodial branching. A detailed description of the wall layers laid down during conidio genesis and the fate of these layers will be discussed. Annulations are also examined.

Edelmann, R. E., see Pazur, C. J.


Bracker (1968) and Hamill (1981) utilized electron microscopy to detail sporangiosporogenesis in Gibberella fujikuroi and Mucor mucedo, respectively, both representing type-species of genera which produce multispored spores. To this can now be added the type-species Zygorhynchus heterogamus, which has been studied in both transmission and scanning electron microscopy and found to match Bracker’s model with few exceptions. During spore cleavage, an abundance of endoplasmic reticulum closely associated with developing cleavage furrows. These furrows have a very granular matrix which coalesces into electron opaque granules, which migrate to the periphery of the furrows, and later fuse to form the primary (ectal) layer of the newly differentiated spores. At the time spores reach maturity, the sporangial cytoplasm has been so condensed that large electron translucent spaces separate the spores. Approaching maturity, autophagic vacuoles nearly fill the columellar region through the process by which the cytoplasmic contents are utilized to form putative enzyme-containing vesicles which fuse with the col umellar plasmalemma and whose contents can be seen as electron opaque granules outside the col umellar wall. These granules correspond to the sporangial matrix spaces between the spores, and are believed to be enzymes which facilitate sporangial wall dissolution and spore release.


J. J. Ellis, Northern Regional Research Center, ARS, USDA, Peoria, IL 61604. Lesser known species in section Liseola of Fusarium and near relatives in the Fusarium oxysporum group.

Comparisons of DNA relatedness among 15 strains representing the anamorphic species Fusarium fujikuroi, F. subglutinans, F. annulatum, F. sacciae, F. proliferatum, and F. anthophilum suggest that they represent genetic varieties of the teleomorph Gibberella subglutinans. The near relatives F. oxysporum, F. dihamini, and F. nygamai represent two, possibly three, genetic species closely related to the section Liseola. While strain NRRL 13564 F. nolphilone (teleomorph: Gibberella fujikuroi) shared 49 to 58% relatedness with other species of the section Liseola, other strains examined showed higher relatedness (77 to 96%) with one or more genetic varieties of G.
The latter three species gave 32 to 58% relatedness to strains in section Liseola whereas F. graminearum gave 18% or less.

J. T. ELLIS, V. V. POPPA, and Y. SANCHEZ. Ultrastructural Laboratory, Biological Sciences, University of Texas at El Paso, El Paso, TX 79968-0019. The distribution of microbodies within Achlya recurva oogonia.

Morphometric analyses are in progress to determine the distribution of microbodies within Achlya recurva oogonia. Spectrophotometric assays and cytochemical studies of the sexual stages of Achlya recurva have demonstrated the presence of catalase. Enzyme assays have verified the presence of the glyoxysome cycle enzyme, isocitrate lyase, in fungal extracts of Achlya hyphae. Cytochemical tests such as the 3,5-diminoazizidine reaction, cerium chloride and copper ferricenium have been utilized to search for the presence of catalase, alpha-hydroxysacid oxidases and malate synthase within precleavage oogonia. Our goal is to determine if precleavage oogonia have both peroxisomes and glyoxysomes simultaneously, or if the microbodies present are restricted to one population of either peroxisomes or glyoxysomes.

G. W. ERDOS Department of Microbiology & Cell Science, University of Florida, Gainesville, FL 32611. Investigations of spore wall glycoproteins using monoclonal antibodies in Dictyostelium.

As a part of our continuing study of the role of protein glycosylation in the development of the cellular slime molds we have examined the glycoproteins of the spore wall, using monoclonal antibodies directed against carbohydrate epitopes, and their relationship to the structural polysaccharides. We have been able to establish 3 domains in the spore coat based on the distribution of these epitopes and using other affinity probes have localized the cellulosic domain and the distribution of the high galactose mucopolysaccharide. The organization of the spore wall is more complex and different than previously believed. It was also determined that all of the glycoproteins as well as the galactose polysaccharide are prefered in a single compartment, the prespore vesicle and released to the cell surface during spore formation. Only the cell wall is synthesized extracellularly. From examination of prespore vesicles, there is no apparent spatial organization of the various components that reflect their arrangement in the mature spore, leading to the assumption that the spore wall undergoes a process of self assembly as the cellulosic portion is synthesized and deposited. There is some evidence, however, that several of the spore wall glycoproteins travel as a complex, possibly mediated by one of the endogenous lectins.

F. J. ESPINOSA-GARCIA and J. H. LANCENHEIM. Department of Biology, University of California, Santa Cruz, CA 95064. The leaf endophytic fungal community of a coastal redwood (Sequoia sempervirens (D.Don) Endl.) population.

Leaf endophytic fungi were isolated from 159 samples of one to twelve years-old needles of mature or juvenile trees (saplings or sprouts) in a redwood forest in central California. Of the samples, 98.7% were infected by at least one fungal species. There was not a clear dominant species as occurred in northern California redwoods studied by Carroll & Carroll, where Chrysophyllum spp. of the order Chrysonales (Phli. & Hk.) Seaver was isolated from all the sampled trees. Of the 20-25 species recognized, the most abundant were (percent of incidence): Meria? sp. (37.1%), Cryptosporiopsis aubieti Petra (23.9%), Gamarosporium sp.14.5%, Gmelinalesporium sp.14.3%, Sol (10.7%), Pestalotia funerea Desm. (10.7%) and Phomopsis occulta Trav. (8.8%). Some of the isolated species are well known pathogens, at least in other conifers. The species composition in needles of progressing age in single branches suggest a mosaic pattern of leaf occupation, without a particular sequence of succession or colonization. However, some species were more frequent in young or old leaves. Some species (including the nonendophytic) were not found in certain individuals. In comparing the fungal communities we found ca. 80% similarity between mature and juvenile trees. Ecological implications regarding the observed fungal distribution patterns for redwood population biology will be discussed.

Fallon, R. D., see Newell, S. Y., et. al.

Fenn, M. E., see Dunn, P. H.

Ferrer, L. M., see Flora, L. L., et. al.

L. L. FLORA, L. M. FERRER, and J. A. BOIRRETT. California State University, Long Beach, Long Beach, CA 90840. A nonregulatory trehalase from Pilobolus longipes.

Fungal trehalases may be divided into two groups. Trehalases in the first group generally have an acid pH optimum, are heat stable, and have K values of about 1 mM. As yet, there is no evidence that any of these trehalases are activated by protein phosphorylation and consequently are described as nonregulatory. Nonregulatory trehalases are widespread in fungi but have not been found in the zygomycetes. By contrast, the trehalases in the zygomycetes and two genera of yeasts are regulated by cyclic AMP-dependent protein phosphorylation. These enzymes have neutral pH optima, low heat stabilities, and low substrate affinities. The absence of nonregulatory trehalases from the zygomycetes has been suggested as having possible evolutionary significance. Since the spores of P. longipes are triggered to germinate by cyclic AMP, it would seem to be an unlikely candidate to possess a nonregulatory trehalase. However, in this report we describe a nonregulatory trehalase from P. longipes sporangia. This enzyme is found internal to the spores, has a pH optimum of 5.6, a K value of about 0.7 mM, and is fairly heat stable. The molecular weight is lower than that of other trehalases (ca. 60,000). We have no evidence that this trehalase is regulated by cyclic AMP. A possible role for this enzyme in spore germination is discussed.

Flores-Carreon, A., see Ruiz-Flores, E., et. al.

ROBERT FOGEL and JOHN LUSSFENHOP. University of Michigan Herbarium, Ann Arbor, MI 48109, and University of Illinois at Chicago, Chicago, IL 60680. A Soil Biotron for Experimental Studies of Soil Biota.

Spatial and temporal relationships of roots, microorganisms, and insects can be observed directly and manipulated in the soil biotron constructed in 1987 at the University of Michigan Biological Station in northern, lower Michigan. Soil was replaced around the windows in July 1987.
and during the 1988 growing season the 1.5m distance between the windows and the native forest soil profile has been undergoing colonization. Data will be presented on root growth rates and the distribution of invertebrates around roots and mycorrhizae. In order to encourage mycologists to use the soil biotron, a number of potential experiments that can be done in the facility will be described.

Fortin, J. A., see Gardes, M., et. al

Fortin, J. A., see Kope, H. H.

Foss, E., see Selker, E. U., et. al.

Foster, L. M., see Ross, I. K., et. al.

C.F. FRIESE and M.F. ALLEN. Utah State University, Dept. of Biology and Ecology Center, Logan, UT 84322-5305. The interaction of harvester ant activity and VA mycorrhizal fungi.

At our Wyoming research site, the disks of the Western harvester ant can comprise over 25% of the total surface area. These disks are patch disturbances across the landscape of this semi-arid shrub steppe. We asked whether the ants also may be interacting in symbiosis with the VA mycorrhizal fungi growing in association with the surrounding vegetation. Detailed excavation of 2 ant mounds revealed 3 distinct zones of soil and root material. The central zone consisted of a root mat, a region of densely packed roots (60% by volume) that had been clipped and woven into the structure of the mound. This root clipping action appears to be a mound maintenance function by the ants. The clipped root material contained as much as 3,000 times the number of spores found in other zones or in association with the surrounding vegetation. Glomus mosseae was the dominant spore (63%) in all the samples. The large volume of roots with spores concentrated around ant seed caches creates ideal patches for plant establishment once the mounds are abandoned (approx. 5-10 yrs.)

Fuller, M. S., see Cho, C. W.

Fuller, M. S., see Roberson, R. W.

M.S. FULLER and R.W. ROBERSON. Department of Botany, University of Georgia, Athens, GA 30602. The effects of the sterol biosynthesis inhibitor, cyproconazole, on hyphal tip cells of Sclerotium rolfsii.

Hyphal tip cells of Sclerotium rolfsii were examined with light microscopy and transmission electron microscopy (TEM) after being treated with the sterol biosynthesis inhibitor (SBI) cyproconazole. Cyproconazole is a triazole that inhibits the demethylase involved in C14-demethylation of lanosterol, resulting in the net accumulation of precursor sterols and fatty acids. There is a concomitant decrease of the functional sterol which in the case of S. rolfsii is ergosterol. The SBI sensitive step is a cytochrome P450 mediated reaction. In this study the effects of the fungicide were tested at EC50 and EC90 concentrations. Cells examined with TEM were prepared using freeze-substitution. After treatment with cyproconazole the cytoplasmic organization of hyphal tips was altered. Within the apical region, the Spitenkorper was either reduced in size or completely absent. Apical vesicles of the Spitenkorper had a granular, electron-transparent content while microvesicle content was similar to control cells. Within the subapical region, ER appeared undulated with a slightly inflated lumen. Vacuoles were more numerous in treated cells than in control cells and contained spherical inclusions of varying electron opacities. The inclusions were embedded in a granular electron-translucent ground matrix. Electron-opaque depositions were observed in the cell wall and were more numerous at higher EC values. Light microscope observations, including cytochemistry, will be correlated with the TEM observations.

M. GARDES, B. KROPP and J.A. FORTIN. Centre de Recherche en Biologie Forestière, Faculté de Foresterie et de Géodésie, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4. Restriction fragment length polymorphisms among isolates of the ectomycorrhizal fungus Laccaria bicolor (Maire) Ort.

In Québec, inoculum of L. bicolor, a widespread mycorrhizal fungus, is used for some reforestation programs. Monocaryotic and dicaryotic isolates are both able to form ectomycorrhizae but intraspecific variation in mycorrhizal ability exists. Moreover, several biological species of L. bicolor have been found. One objective of this study is to evaluate the relationship between these different biological species using both nuclear and mitochondrial restriction fragment length polymorphisms. Another objective is to provide nuclear and mitochondrial markers to follow the progress of introduced strains in the field.

Garratt, P. W., see Selker, E. U., et. al.

Gemma, J. N., see Koske, R. E.

J.N. GEMMA and R.E. KOSKE. Botany Department, University of Rhode Island, Kingston, RI 02881.

Mycorrhizal associations in Hawaii Volcanoes National Park.

Mycorrhizal associations of plant species colonizing new terrestrial surfaces and a recent geothermal area in Hawaii Volcanoes were surveyed. Root samples of thirty plant species (140 samples) were collected in 1987 from six collection sites; lava flows of different ages (1950, 1973, 1979), two volcanic ash deposits (1959) and a geothermal area (1937). The most extreme habitats (1979 lava flow and the geothermal area) contained only vesicular-arbuscular mycorrhizae (VAM). The other sites contained up to three types of mycorrhizae (VAM, ericoid, and orchid). Native plant species tended to form VAM while alien plant species generally lacked mycorrhizae. In the geothermal area, VAMF were associated with plants (including a native bryophyte and a native pteridophyte) in soils where temperatures ranged between 30-40°C within 2.5 cm of the surface.

Gessner, R. V., see Mohamed, M., et. al.

Glasson, L., see Ulrich, R. C., et. al.

Gibson, J. L., see Benny, G. L.

J. L. GIBSON and J.W. KIMBROUGH. Department of Plant Pathology, University of Florida, Gainesville, FL 32611.

Developmental ultrastructure of ascospore formation in Disciotis venosa (Pezizales; Morchellaceae).

Observations using transmission electron microscopy (TEM) were made on ascospore development of Disciotis venosa (Pezizales; Morchellaceae). Various stages in ascospore ontogeny were observed, from the delimitation of haploid spore nuclei by the ascospore delimiting membranes to the development of the tertiary wall layer. Particular emphasis was focused on spore wall ultrastructure, including the development of the primary, secondary, and tertiary (epispore) wall layers. Cytological details of the surrounding epiplasma and sporoplasm, as they relate to spore development, also were observed. Various cytochemical procedures were used at the TEM level to further characterize and contrast ascospore wall ultrastructure, including the thiosemicarbazide-silver proteinate stain for complex polysaccharides and the barium permanganate post stain used to increase wall opacity. The ultrastructural observations for D. venosa are compared with similar data in the literature for other taxa of Pezizales.

Gonzalez, D., see Vilgalys, R.
DOLORES GONZALEZ and RYTAS VILGALYS.
Department of Botany, Duke University, Durham, NC 27706.
Molecular cloning and restriction analysis of ribosomal RNA genes from Rhizoctonia solani anastomosis group 4.

The plant pathogenic fungus Rhizoctonia solani is comprised of at least nine biologically diverse anastomosis groups (AG's). We compared multiple isolates from each AG by restriction analysis of their nuclear ribosomal RNA genes (rDNA). Southern blots of digested genomic DNA from the different AG were hybridized to a cloned rDNA gene from Coprinus cinereus. Preliminary estimates for the size of the rDNA repeating unit in R. solani range from 8.7 to 10.0 kb. Many AG's of R. solani have characteristic rDNA restriction patterns, suggesting that these groups are genetically distinct. To study the detailed structure and organization of ribosomal genes in R. solani, we have cloned a single rDNA repeating unit from AG 4. Restriction mapping of rDNA in other AG's using the cloned rDNA from AG 4 as an homologous probe will permit us to examine phylogenetic relationships within this species complex.

R. D. GOOS. Department of Botany, University of Rhode Island, Kingston, RI 02881.

Biogeography of the stinkhorn fungi.

The stinkhorn fungi are members of the families Clathraceae and Phallaceae of the order Phallales. The two families show many similarities in structure and biology, and it seems readily evident that they share a common ancestry. Along with other features, these include (1) a spongy basidioma initially enclosed within a peridium, (2) spores produced in a mass of slime, and (3) production of a fetid odor attractive to insects. Several important differences in the two families also exist. These include: (1) all of the Phallaceae have a simple, columnar structure, while the Clathraceae bear multiple arms that are variously fused, anastomosed or spreading, (2) in the Clathraceae, the gleba is borne on the inside of the arms, while in the Phallaceae, it is borne externally on the columnar stalk, (3) development within the egg stage differs in the two families. Some species of both families are commonly encountered, and are world-wide in distribution, while other species show strongly disjunct distribution patterns. The reasons for such localized distribution of certain species, most of which belong to family Clathraceae, are unknown. This paper will review the known distribution of the stinkhorns, and will attempt to offer some explanation for their peculiar distribution.

Gordon, T. R., see Jacobson, D. J.

J. V. GROTH, A. P. ROELFS and J. W. McCAIN. Department of Plant Pathology, University of Minnesota, St. Paul, MN 55108. Phenotypic and genetic diversity in rust pathogens.

Existing information on patterns of diversity in rust pathogens of annual crop plants suggests that the frequency of sexual reproduction can be one of the more influential of the many determinants of diversity. The stem rust fungus of wheat (Puccinia graminis f. sp. tritici) and the bean rust fungus (Uromyces appendiculatus) have more- and less-sexual populations because of direct human intervention and naturally, respectively. Most of the population of P. g. tritici in the U.S. possesses limited diversity with few, relatively fixed genotypes. A western, sexual population has nearly random distribution of virulence and isozyme markers. Sexual U. appendiculatus is more predictable in small areas on nonselective hosts. Levels of heterozygosity are often above Hardy-Weinberg expectations. Genetic loads as measured by frequency of visible, aborted uredinia are highest immediately following a bulk crossing, and decline rapidly through subsequent asexual generations. Likewise, in P. coronata, diversity of virulence phenotypes decline rapidly with distance and time from sexual reproduction. In these fungi sexual recombination results in many unift genotypes that are eliminated during asexual generations.

C. M. GRUBB and O. K. MILLER, JR. Department of Biology, Virginia Polytechnic and State University, Blacksburg, Virginia 24061. Effect of copper on ectomycorrhizal fungi.

Five species of ectomycorrhizal fungi were tested for their ability to tolerate copper, both in vitro and in association with seedlings of Pinus densiflora (Japanese red pine). Three isolates of the conifer associated Suillus granulatus were examined, as well as Suillus plicatus, Pladera bicolor, and Pisolithus tinctorum. Boletellus meruliodes was included as a control, since it is not thought to be mycorrhizal with conifers. Although P. tinctorum, B. meruliodes, and S. plicatus exhibited the most growth on copper sulfate amended agar media, in vitro tolerance was not necessarily correlated with the ability of the fungus to form mycorrhizal roots in perlite to which a nutrient solution containing copper was added. In addition, the isolates of S. granulatus varied in their ability to form mycorrhizae with P. densiflora under different experimental conditions. Transmission electron microscopy of fungal hyphae using a copper-specific stain shows species and general differences in the ability of the fungus to bind copper ions to hyphal sheaths or cell walls. Binding of metal ions to hyphal surfaces appears to be one mechanism of metal tolerance in ectomycorrhizal fungi and subsequent improvement of host plant growth under phytotoxic conditions.

Gutierrez-Corona, J. F., see Ruiz-Flores, E., et. al.

Haack, K. R., see Selker, E. U., et. al.


Previous systematic work on tropical and South American Collybia species, with rare exception, was conducted by several floristicians who relied on general collectors for second hand observations and herbarium material primarily gathered from lowland and temperate habitats. These past perceptions show little congruence with each other and with the current circumscription of the genus. Recent concentrated attention in a variety of regions indicates a greater diversity than previously realized, while nearly half the previously described taxa remain as recognizable Collybias. The present subgeneric hierarchy, with slight modification, appears to adequately circumscribe Collybia in South America.

T. M. HAMMILL. Department of Biology, SUNY College at Oswego, Oswego, NY 13126. Ultrasound structure of zygosporogenesis in Mucor mucedo.

The general model for zygosporogenesis in the Mucorales describes growth of a pair of compatible zygophores toward one another until they touch, initiating proclametangial differentiation. In the region of contact between the pair of progametangia, a fusion wall forms from progametangial walls, maintaining the separation of progametangial contents. Progametangia are subdivided by centripetal growth of gametangial septa, resulting in gametangia and suspensors. The fusion wall differentiates, calculating for gametangial plasmogamy and its enclosed zygospore differentiate after the mating.
Zygosporogenesis in Mucor mucedo has been studied using scanning and transmission electron microscopy, and many details of the process have been clarified. Data will be presented about (A) structure and formation of progametangia, gametangial septa, and the fusion wall, (B) disappearance of the fusion wall at the stage of plasmagamy, (C) initiation of ornamentations on zygosporangia, (D) structure and formation of ornamental "warts" on mature zygosporangia, (E) cytology during zygosporogenesis, (F) appearance of zygosporangia, and (G) microhyphae over zygosporangial surfaces.

Hanlin, R. T., see Skarshaug, A. J.

Cercophora is a genus of sordariaceous fungi that is characterized by cylindrical ascospore initials with a gelatinous appendage at each end. The mature ascospore is two-celled, with an enlarged, bulbous upper cell and a slender, hyaline lower cell (pedicel). The ascoma is an ostiolate perithecium bearing unitunicate asci. In Cercophora palmicola the mycelium forms a pseudo-

Don E. Harney, Biology Department, University of Hawaii at Hilo, HI 96720-4091. Zoosporangia and calcium dynamics.

Zoospores of Phytophthora are particularly sensitive to extracellular concentrations of calcium. Calcium chloride solutions of less than 50mM will hasten encystment whereas concentrations over 50mM will cause immediate cessation of swimming, shedding of flagella, and secretion of a cyst wall. Although many inorganic ions and even vortexing can trigger encystment in Phytophthora zooeis, calcium is the only inorganic ion which also promotes rapid cyst germination and germ tube extension. Ultrastructural studies utilizing transmission electron microscopy have shown the presence of calcium binding substrates in zoospores which may act to bind calcium and then release calcium into the cytosol upon environmental signals to stimulate exocytosis of secretory vesicles containing cyst wall materials. In germinating cysts these sites may sequester calcium and maintain steep cytosolic gradients of calcium in developing germ tubes. The use of chlorotetracycline to remove calcium from the cytosol of germinating cysts causes immediate cessation of germ tube extension. The addition of calcium ionophores to zoospores of Phytophthora, which floods the cytosol with calcium, stimulates the production of multiple germ tubes from a high percentage of cysts. These initial observations of the effects of calcium on zoospores and germinating cysts of Phytophthora suggest several models for the role of calcium in encystment and germination in fungal zoospores in general and several promising lines of research into understanding calcium dynamics in these cells.

Heyburn, T., see Powell, M. J.

DAVID S. HIBBETT and RYTAS VILGALYS.
Department of Botany, Duke University, Durham, NC 27706. Improved methods for rapid isolation and sequencing of fungal 16S and 25S ribosomal RNA for phylogenetic analysis.

Techniques are described for the rapid isolation and sequencing of 16S and 25S ribosomal RNA (rRNA) from filamentous fungi. To isolate rRNA, liquid-cultured mycelium is gently homogenized in an extraction buffer containing guanidine isothiocyanate. This is followed by phenol extraction and ethanol precipitation. Resuspended rRNA is stored in the presence of a ribonuclease inhibitor (RNAin, Promega Biotech). The entire isolation can be completed in two hours. The crude rRNA is free of high molecular weight DNA and is suitable for direct dideoxy sequencing using reverse transcriptase as described by Lane et al. (1985). From published sequences, we have identified ten potential primer sites (universally conserved sequences of 15 to 20 bases from which sequencing reactions can be initiated). Comparison of sequences obtained with these primers will permit identification of regions of variability in the 16S and 25S rRNAs. Data sequence from these variable regions will be very useful for evaluating morphologically based phylogenetic hypotheses as well as establishing classification schemes for taxonomically confusing groups of fungi.
We have cloned and characterized the ribosomal DNA (rDNA) repeat of *Agaricus brunnescens* (= *A. bisporus*). The rDNA was found to be a tandemly repeated unit 8.3 kilo-basepairs (kbp) in length. The rDNA was mapped for six restriction endonucleases and we determined the positions of the genes encoding the 26 S, 18 S, and 5.8 S rRNAs. Using cloned *A. brunnescens* (Ag 50) rDNA as a hybridization probe, we compared the rDNA restriction site maps for six isolates of *A. brunnescens*, five isolates of *A. bitorquis*, and three isolates of *A. campestris*. Variation in the rDNA was used to group the isolates. The hybridization pattern for all six *A. brunnescens* isolates were identical. Both *A. bitorquis* and *A. campestris* could be subdivided into two groups. The primary difference between *A. brunnescens* and *A. bitorquis* was the presence of a 0.7 kbp length mutation in the non-transcribed spacer region of the rDNA. Despite the almost perfect conservation of the coding region between species, the non-transcribed spacer region of *A. campestris* and the other two *Agaricus* species was too divergent to propose a simple series of mutational events to account for the differences. Interstram and interspecies variation in the mt DNAs was also surveyed by RFLP analysis. The data were in close agreement with the rDNA data in that distinct species could be recognized and few exceptions were observed between *A. brunnescens* and *A. bitorquis* than between *A. campestris* and the other two species. Within species there was no correlation between groups assigned by rDNA data and mt DNA data. This was due to the unlinked inheritance of nuclear and mitochondrial genomes.

Hogen, M. E., see Edelmann, R. E.


Hogen, P. A., see Robison, M., et al.

**Paul A. Horgen, Karl F. Kukurewicz, and James B. Anderson.** Mushroom Research Group, Center for Plant Biotechnology, Department of Botany, University of Toronto, Erindale Campus, Mississauga, Ontario. Relatedness of three species of *Agaricus* inferred from RFLP analysis of the ribosomal DNA repeat and mitochondrial DNA.

The stimulus for trichospore extrusion ('germination') in species of *Smittium* (Trichomycteces) during passage through host guts was examined by means of mosquito larva dissections and in vitro extrusion experiments. Trichospore extrusion in *S. culisetae* was stimulated by a sequence of two phases: phase I, which consisted of potassium at pH 10, and phase II, which involved a drop in pH to 6-6. Exposure of trichospores to less than 15 min at each phase was sufficient for optimal extrusion. The extrusion process generally occurred in less than 10 sec. Trichospores of *S. culisetae* extruded and formed holdfasts during phase II whereas *S. culicis* trichospores extruded at phase I and formed holdfasts only during phase II. Phases I and II correspond to the host midgut and hindgut, respectively, and requirements for trichospore extrusion are consistent with the physiological conditions of the host digestive and excretory systems. The sequence of phases also suggests a basis for hindgut specificity and host range specificity in *Smittium* species.


The treatment of systemic candidiasis with liposomal amphotericin B has proven to be a much more effective therapy than that of the free drug. This is due largely to the fact that larger doses of the antifungal can be safely administered in the liposome-encapsulated form.

Our study explores what effect antibody specific to *Candida albicans* will produce when attached to liposomes containing amphotericin B. This was accomplished through the comparison of liposomal amphotericin B compounds bearing specific, nonspecific, or no immunoglobulin in the treatment of a murine model of candidiasis.

Results of the study indicated an increased therapeutic effect, over liposomal amphotericin B, imparted by the addition of specific antibody to the surface of amphotericin B - encapsulating liposomes.

Hu, F.-S., see Clark, J.


A *Leptosphaeria* sp. which occurs commonly on wood submerged in lotic habitats in central Illinois was isolated and its development, morphology and specificity and host range specificity in xenic culture was studied using TEM and SEM. This species is characterized by superficial to immersed pseudothecia with a central containing filiform, septate pseudoparaphyses surrounded by gelatin and slender breficate asci. The ascosporcs are 3-septate, brown with light. Cell walls have verrucose and sometimes have a gelatinous sheath. This species is an early colonist and persistent on submerged wood and forms soft-rot cavities and causes weight-loss in cottonwood and ash sapwood.

R.A. HUBNER, USDA-ARS Plant Protection Research Unit, Boyce Thompson Institute, Tower Road, Ithaca, NY 14853. *Roland Thaxter and the rise of insect mycology.*

Roland Thaxter's career-long concern for insect fungi combined his love for cryptogamic botany with an even earlier active interest in entomology. It is little appreciated that his first six publications (which appeared between 1877 to 1884) were wholly entomological. Thaxter's first published study on insect fungi was his dissertation, an 1888 monograph of...
entomophthoralean fungi that is still a vital reference. His deep working knowledge of both entomology and mycology gave Thaxter a perspective on and sympathy for insect-fungus associations that was unprecedented in his day and which allows him to be regarded rightfully as the founder of insect mycology.

This presentation will trace some of the ways in which Thaxter's studies have been extended and enriched in the last hundred years: His treatment of the Entomophthorales contained the seeds for a substantial proportion of the taxonomic revision implemented in the last decade. He was among the first to study the trichomycetes. He described a number of unusual entomogenous deuteromycetes, and was an early advocate of trying to connect the sexual and asexual states of fungi to understand their systematics. Thaxter's detailed observations on the "Thaxteriidae," a series of minute ectoparasitic deuteromycetes strongly resembling the Laboulbeniales, have recently gained much increased significance with one of the most surprising new discoveries about fungal life cycles in recent decades.

L. J. HUTCHISON. Department of Botany, University of Toronto, Toronto, Ontario, Canada M5S 1A1. Do ectomycorrhizal fungi produce conidia?

Many diverse groups of fungi are known to form ectomycorrhizae with temperate woody plant species. Despite this dissimilarity in taxonomy, they share similar ecological, physiological and morphological characteristics, among which is the absence of conidia. Such propagules are commonly produced by saprophytes and parasites.

The literature, however, contains many examples to the contrary, whereby conidia have been reported in ectomycorrhizal fungi. These reports appear to be based on misidentifications of basidiomata/ascomata or else contaminants which grew out from such structures. It is also possible that various structures observed on the hyphae have been misinterpreted as conidia by various researchers.

A hypothesis is proposed to explain the absence of conidia in ectomycorrhizal fungi.

D. J. JACOBSON and T. R. GORDON. Department of Plant Pathology, University of California, Berkeley, CA 94720.

The use of mitochondrial DNA to characterize populations of Fusarium oxysporum f. sp. melonis.

Classically, Fusarium oxysporum f. sp. melonis (Fom) has been separated into four distinct races by pathogenic reaction to three differential cultivars of muskmelon (Cucumis melo). We have recently characterized six vegetative compatibility groups (VCGs) within Fom and have correlated this trait with both pathogenic race and geographic distribution. Differences in the mitochondrial DNA between isolates, as visualized by restriction fragment length polymorphisms (RFLP) were used as an additional trait for characterizing Fom. Isolates within each VCG have similar mtDNA RFLP patterns, while RFLP patterns differ between VCGs. This suggests that both VCG and mtDNA are important genetic traits that can be used to define populations of Fom. In addition, some Fom isolates are considered vegetatively self-incompatible and cannot be placed within a VCG. It is hoped that RFLP analysis will also elucidate the affinity of self-incompatible isolates to known VCGs, thus allowing an evaluation of their importance in nature.

CAROL JANERETTE. Plant Science Department, University of Delaware, Newark, DE 19717-1303.

In vitro spore production by Pisolithus tinctorius.

Asexual spore production by the ectomycorrhiza-forming fungus Pisolithus tinctorius has not been previously documented. Examination of mycorrhizal masses produced when P. tinctorius was axenically incubated for periods up to six months revealed the presence of abundant sporulating hyphae and spores. It is probable that asexual spores produced by P. tinctorius play a major role in the wide distribution and persistence of this fungus in the soil.

Jensen, B. C., see Selker, K. U., et al.

P.A. KAISER. Dept. of Biological Sciences, University of Illinois at Chicago, Chicago, IL 60680.

Collemboal affect on mycorrhizal colonization in soybeans.

Two greenhouse pot studies of 30 days and 60 days duration have demonstrated that the addition of the collemboal, Polsonama candida, decreases the colonization of soybean, Glycine max, by the mycorrhizal fungus, Glomus deserticolam. In the 30-day experiment, soybean seeds were placed in 2-liter pots with a 1:1 mixture of soil, perlite and peat. pots were set up. Pots received either 60 g mixed mycorrhizal inoculum or a 100 ml filtrate of the inoculum and either 300 living P. candida individuals or 300 dead individuals. The result was a 37% reduction in percent mycorrhizal infection in roots grown in the presence of living collemboals along with the inoculum as compared to plants grown with dead collemboal and inoculum. Surprisingly, up to 62% fewer living collemboal were harvested from the pots containing the colonized plants. A 60-day experiment was used to see when colonization would be most affected by the collemboal. The initial design was repeated with two new treatments: collemboal not being added until day 15 into pots with either inoculum or filtrate. At day 60, significant differences were seen in percent mycorrhizal infection: a day 1 collemboal addition resulted in a 34% reduction while with a day 15 addition there was only a 15% reduction (both were compared to plants grown with dead collemboal and inoculum).

Kaplan, D. L., see Wiley, B. J., et al.

H. W. KELLER. Department of Biology, The University of Texas at Arlington, Arlington, TX 76019. Two species of Physarum in culture: one new-one old.

Two species of Physarum, strikingly similar in their habits, were found as intermixed fruitings on decaying alfalfa bales. Both species were cultivated from spore to spore on sterilized bavine dung and on a variety of agar media under controlled laboratory conditions. One species was identified as Physarum spinosporum U. Ellis. & Lundq., recently described as new to Science based on moist chamber cultures of dung from herbivorous animals. This species has unusual spores with spines approaching 1 µm long and half of the spore is smooth while the other half, are fewer, scattered spines and a prominent ridge. Spore size and ornamentation remained constant when grown on different substrata. In contrast, the new taxon has spores that are paler and smooth on one side but become wrinkled after drying, giving a conspicuously reticulate appearance. The plasmodium is abundant consisting of a network of hyaline threads interconnecting white angular or irregular lime knots. A lobed, calcareous pseudocolumella often fills the center of the fructification. A white phaneroplasmodium was observed in agar culture. The conspicuously wrinkled-reticulate spores serve to distinguish this taxon from all other species of Myxomycetes.
Several genetic loci in Agaricus bisporus are polymorphic, as determined by gel electrophoresis followed by enzyme-specific activity staining. In addition to the limited genotypic diversity known to characterize cultivated isolates of this species, some wild isolates that are within the morphological circumference of A. bisporus have been found to have both new genotypes and new alleles. Thus a broader gene pool exists in nature than has been utilized to date by commercial mushroom spawn developers.

The tetrasporic relatives of A. bisporus in section Hortenses do not share alleles with it at several of the loci examined thus far. Where alleles are shared, evolutionary relationships can begin to be seen. In conjunction with mating studies, we are beginning to assess both the number of biological species involved in this group and their phylogeny.

J. L. Kerwin, Department of Entomology, University of California, Davis, CA 95616. A model for the physiological bases of oosporegenesis.

The induction and maturation of oospores by sterol auxotrophic gonycetes involves a complex series of developmental events. The obligate requirement for sterols with specific cyclopentanophenanthrene ring and side chain structures is pivotal for the completion of meiosis. Recent reports of replacement of sterol function by phosphatidylcholine are suspect due to the presence of trace levels of sterols. Unsaturated fatty acids provided as acylglycerols or phospholipids in growth media have a synergistic effect with sterols in the induction of oosporegenesis and enhance spore viability. Membrane-mediated adenylyl cyclase activity may be enhanced by unsaturated fatty acids. Cyclic nucleotides regulate the induction of oosporegenesis, with cyclic AMP promoting and cyclic AMP inhibiting this process. Calcium and calmodulin are involved in the regulation of oospore development, in part by controlling cyclic nucleotide levels. Lipoxigenase and probably cyclooxygenase products affect all stages of oosporeogenesis. Lipoxigenase regulation of guanylate cyclase is implicated in the induction process.

Keudell, K. C., see Mohamed, M., et al.

A. S. KHALTEL, Botany Department, College of Science, King Saud University, P.O.Box 2455, Riyadh 11451, Saudi Arabia.

Incidence of vesicular-arbuscular mycorrhizae in some desert plants and correlation with edaphic factors.

Poots and rhizospheric soils of representative plants of Anisocladium lanatum Boiss., Horwoodia dicksoniae Turrill, Anthemos deserti Boiss., Rhyza stricta Decnet, Panicum turgidum Forsk and Tripleurospernum auriculatum (Boiss.) Rech. from two locations (Nasr & Alhsia) close to Riyadh in Saudi Arabia, were collected and examined for vesicular arbuscular mycorrhizae (VAM). Speres were recovered from the two soils and, identified as Glomus fasciculatum and Glomus musseae. However, G. musseae was the dominant vesicular-arbuscular mycorrhiza in the sand dunes around Riyadh. The only edaphic factor which seemed to correlate with the dominance of G. musseae was the alkalinity of the Soil.


To make fusion of two fungi, Ganoderma lucidum and Ganoderma applanatum, intraspecies protoplast fusion and fusion of isolated nuclei or chromosomes into protoplasts were carried out. Protoplast fusions were made by a modified method of Peberdy using polyethylene glycol (MW 4000) at 30°C for 10 min. It was shown that protoplasts were obtained from the 3.5 day cultured mycelia of G. lucidum and G. applanatum by treatment with a combination of two enzymes, Novozym 234 and Cellulase onozuka R-10, for 2-3 hours. As an osmotic stabilizer, 0.6 M sucrose was the best for formation and regeneration of the protoplasts from the mycelia of G. lucidum and G. applanatum. Regeneration frequency was the maximum at the concentration of 0.75% top agar. For isolation of auxotrophic mutants from the mycelia of G. lucidum, UV radiation was the mutagenic agent of choice. Seven nucleic acid-requiring, seven amino acid-requiring and six vitamins-requiring auxotrophs were obtained from UV irradiation to give 0.38-7.5% survival. The interspecies fusion frequency between the mycelial protoplasts of G. lucidum and G. applanatum, and the infraspecies frequency of those of G. lucidum ranged from 0.5% to 4.0%. Viable hybrlds were obtained by transfer of nuclei or chromosomes from the protoplasts of G. lucidum into the protoplasts of G. applanatum by the modified methods of protoplast fusion. The fusion products showed distinct biochemical differences in pigment production and electrophoretic patterns of the esterase isozymes.

Klabrough, J. W., see Gibson, J. L.

Kleven, N. L., see McLaughlin, D. J., et al.

N. L. KLEVEN and D. J. McLAUGHLIN, Department of Botany, University of Minnesota, 228 Biological Science Center, 1445 Gortner Avenue, St. Paul, MN 55108. Is Pachymyces ferrugineus adapted to aquatic spore dissemination?

In preparation for cytological investigation, a single spore isolate of Pachynmys ferrugineus was grown under a variety of conditions. Variations of sporulation patterns were characterized from aerated and non-aerated broth, agar plates and aerated water cultures. Conidial production was characteristic of all cultures except agar. The greatest amount of conidial production occurred in aerated water while the least was observed in non-aerated broth. Secondary or repeating conidia were produced in aerated water and aerated broth cultures. Basidial production occurred with varying frequency in all cultures; however, basidiocarp organization occurred only on agar plates. Basidia from agar cultures consistently produced 5-7 spores while in aerated broth basidia produced only 2-4 spores. Sporulation patterns of Pachynmys ferrugineus were compared to results of other culturing experiments involving organisms from both aquatic and terrestrial environments and the evolutionary and phylogenetic significance of gasteroid adaptations to wet environments is discussed.

Klitcich, C. J. R., see Leslie, J. V., et al.

Klopper, K. L., see Edelman, R. E.
Studies of developmental changes in sclerotia have mainly been conducted on laboratory-grown material nurtured under axenic conditions or on field sclerotia sampled once or twice during the growing season. To compare these data with field-collected sclerotia, we sampled sclerotia of *Sclerotinia sclerotiorum* and *Monilinia fructicola* in the field from early May to late November, 1987, and with light microscopy, histochemical staining, and electron microscopy followed changes in structure, storage products, and cellular organization. Sclerotia of *S. sclerotiorum* were collected from white beans in Guelph, Ont. and from lettuce at Bradford Marsh, Kitch, Ont.; *S. fructicola* were from apricots and peaches in Harrow, Ont. and from peaches in Vineland, Ont. Histochemical staining for carbohydrates, proteins, lipids, phenolic compounds, and polyphosphates was conducted. Ultrastructural changes were especially interesting. “Cyst-like” structures of unknown composition and purpose were previously described from field sclerotia exclusively of *Myriosclerotinia borealis*, but were observed in overwintered sclerotia of both species in this study. Other ultrastructural novelties were observed including abnormal aggregations of mitochondria and changes in mitochondrial profiles. Utilization of storage products was similar to that described in previous studies. Anatomical differences from in vitro-grown sclerotia, especially in overwintered sclerotia, were observed.

Kohn, L. M., see Novak, L. A.

Koehn, R. D., see Kuehn, K. A.

Koehn, L. M., see Novak, L. A.

Koehn, L. M., see Novak, L. A.


Koschke, R. E., see Gemma, J. N.

Kosche, R. E., see Gemma, J. N.

Langenheim, J. H., see Espinosa-Garcia, F. J.

Langenheim, J. H., see Espinosa-Garcia, F. J.

Leal-Moraes, C. E., Bracker and S. Hartnick-Garcia, Department of Plant Pathology, University of California, Riverside, CA 92521 and Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907. Localization of Chitin synthetase in Chitosomal and Plasma Membrane Fractions from *Saccharomycetes cerevisiae*.

Leal-Moraes, C. E., Bracker and S. Hartnick-Garcia, Department of Plant Pathology, University of California, Riverside, CA 92521 and Department of Botany and Plant Pathology, Purdue University, West Lafayette, IN 47907. Localization of Chitin synthetase in Chitosomal and Plasma Membrane Fractions from *Saccharomycetes cerevisiae*.

Cell-free extracts of *Saccharomycetes cerevisiae* were fractionated by a combination of isopycnic and velocity sedimentations to separate membranous components. These improved procedures were used to examine the subcellular distribution of chitin synthetase in homogenates from exponentially growing walled cells of wild-type *S. cerevisiae*. Chitin synthetase activity was found in two distinct vesicle populations of nearly equal abundance but possessing different buoyant density and particle diameter. One fraction contained 45-65% of the total chitin synthetase and was identified as chitosomes because of microvesicular size and characteristic low buoyant density (1.15). The second fraction (35-55%) was identified as plasma membrane because of its high buoyant density (1.22), large vesicle size, and presence of vanadate-sensitive ATPase. This fraction co-sedimented with the main peak of β-1,3-glucan synthetase. A third, minor peak of chitin synthetase was associated with a population of large vesicles that had a density similar to chitosomes but were separated by velocity sedimentation. Essentially all of the chitin synthetase in the three vesicle populations is symmetric; therefore, we regard these vesicles as precursors of the final active form of chitin synthetase whose location in the cell has yet to be unequivocally identified.
Oxidative activity is localized in the granular matrix of kinetosome associated organelles (K-bodies) of secondary Saprolegnia zoosporae at pH 9.2 using the 3-TT-clinitol oxidase cytochemical procedure of Novikoff and Goldfischer (1969). The heme inhibitor, sodium azide, and the specific catalase inhibitor, aminotriazole, fail to decrease this reaction, though it is inhibited by potassium cyanide. When dihydroxyphenylalaine (DOPA) is used as a substrate for oxidation, reaction product is found throughout the K-body. The inclusion of catalase in the incubation medium does not inhibit the reaction, although the phenoloxidase inhibitor, diethylthiocarbamate, eliminates it completely. These results indicate that a phenoloxidase enzyme is present in the K-body. This is the first report of phenoloxidase in zoospores of Oomycetes. The implications of this finding in light of current hypotheses of K-body function are discussed.

Recent work has implicated basidiospores in both asthma and allergic rhinitis. To determine the identity, concentration, and seasonal occurrence of the airborne basidiospores in Tulsa, the atmosphere is being monitored with Burkard Volumetric Spore Traps. Basidiospores are present in the atmosphere most of the year. At times, the total basidiospore concentration is one-third of the total airborne. During the past year, spores of several genera of basidiomycetes have been identified from air samples. These include Agaricus, Boletus, Clitocybe, Conocybe, Corrinus, Entoloma, Ganoderma, Inocybe, Panellus, and Panus. Isolates from the spring Agaricus and Coprinus spores are the dominant basidiospores in the atmosphere. These continue to be present during the late summer and fall when Ganoderma spores are also abundant. Field studies being conducted in conjunction with the air sampling have shown that basidiospores of these genera are prevalent in the Tulsa area.

Mucor racemosus is induced to undergo morphogenesis in response to a variety of chemical, environmental, and nutritional factors. Several changes in the translational apparatus accompany the morphogenetic response including: 1) increased rate of protein synthesis; 2) phosphorylation of ribosomal protein S-6; and 3) changes in the level of methylation and activity of elongation factor 1α (EF-1α). The hypothesis has been proposed that methylation of EF-1α activates the protein during sporangiospore germination. In order to further study the regulation of EF-1α in M. racemosus, the genes encoding this protein, TEF 1, 2, and 3, have been cloned and sequenced. These data show that: 1) the genetic organization of the 3 TEF genes differs significantly; 2) the EF-1α proteins are different at only one of 438 amino acids; and 3) the transcription of the 3 genes may be regulated by the sequence located near the 5' end of the gene. Gene specific, synthetic oligonucleotide probes were used in standard Northern analyses of RNA purified from several morphologies of the fungus. These data suggest that: 1) there is
differential expression of TEF 1, 2, and 3 mRNA during morphogenesis; and 2) the pattern of transcript accumulation of TEF 1, 2, and 3 correlates with the presence or absence of the 11 bp regulatory sequence.

E. D. Lipson, Department of Physics, Syracuse University, Syracuse, NY 13244–1130. Phototropism and other blue light responses of Physomyces.

The blue-light responses of Physomyces blakesleeanus include phototropism, light-growth response, light-induced carotene synthesis, and light-induced sporangiophore initiation [1]. Action spectra of phototropism indicate that multiple interacting receptor pigments mediate this response. Furthermore, night-blind mutants affected in genes madA and madB have greatly altered action spectra and are thus likely to be photoreceptor mutants, which may serve as a genetic assay for components of the photoreceptor system. Physomyces exhibits photosensory adaptation that enables phototropism and the light-growth response to operate over the range of 1000 to 1% in light intensity. The substantial wavelength dependence of the biphasic dark-adaptation kinetics suggests that the photoreceptor system itself mediates adaptation. Experiments on system analysis of the light-growth response suggest that there is a unified sensory transduction complex that mediates not only light reception but also growth modulation. Other projects in this laboratory involving comparative biochemistry and spectrophotometry of mutant and wild-type strains are directed toward the isolation and identification of blue-light photoreceptors and other molecules involved in photosensory transduction in Physomyces. (Supported by grants from the National Science Foundation, and the National Institutes of Health.)


Evidence from a tropical montane rainforest suggest that binding of litter by fungal strands, cords and rhizomorphs helps retain litter on steep slopes, thereby protecting the soil from surface erosion. These connections are primarily formed by species of Collybia, Marasmius, Marasmiellus and Mycena. Five uniform slopes of 63%, 66%, 68% and 84% were chosen and 40 marked & numbered leaves were released near the top of each slope. Downslope movement from corresponding stakes was determined every two days for 20 days. Odd numbered leaves remained undisturbed, whereas even numbered leaves had their fungal connections broken at 2-day intervals. Leaves where fungal connections were broken moved faster and farther than undisturbed leaves on steep slopes (p < 0.001 for slopes > 6%; p > 0.05 for 16% slope). Slopes with poor basidiomycete colonization lost their litter cover during storms, exposing the soil surface to erosion. Absence of fungal litter-connections in some areas may reduce local soil fertility via reduced litter inputs to soil and loss of soil organic matter through erosion. Patchy colonization of litter by basidiomycetes may therefore contribute to heterogeneity of soil organic matter and fertility in wet montane forests.

D. A. Logan and M. E. Disanto. Bioscience and Biotechnology, Drexel University, 32nd and Chestnut St., Philadelphia, PA 19104. Regulation of peptidase activity during morphogenesis in Mucor racemosus. A study of the in vivo regulation of peptidase activity of Mucor racemosus was carried out. Peptidase activity was measured with an enzyme-coupled colorimetric assay. There was no detectable changes noted in total peptidase (tripeptide hydrolysis) or carboxypeptidase (N casein-Phe-Leu hydrolysis) activity of spores stored in water for up to 4h. Peptidase specific activity of spores decreased after entering growth media composed of yeast extract, peptone, and glucose. Total peptidase and carboxypeptidase activity decreased 25% and 80%, respectively, then increased to a maximum level prior to the most active spore-to-hyphae conversion. Total peptidase and carboxypeptidase increased 2-fold and 5-fold, respectively, then returned to pre-germination levels. The increase in peptidase activity may be due to de novo enzyme synthesis since the increase was inhibited by cycloheximide. The results suggest that peptidase activity is a biochemical correlate of morphogenesis in M. racemosus. Fractionation of crude extracts by isoelectric focusing resulted in the detection of 6 carboxypeptidase activities with pI's of 4.6, 6.0, 8.8, 9.0, 9.7, and 10.3. Fractionation of extracts by gel filtration revealed the presence of 3 triucine hydrolyzing activities (238 kD, 123 kD, and 76 kD) and 2 N casein-Phe-Leu hydrolyzing activities (84 kD and 46 kD). Thus, a multiplicity of peptidases was present in extracts of M. racemosus.

Lopez-Romero, E., see Padraza, M.

Lopez-Romero, E., see Ruiz-Klozes, E., et al.


The genus Nectriella Nitschke (1870) (Ascomycetes, Hypocreales) was erected for fungi that are immersed totally or partially in their substrates, possess one-septate ascospores and have soft, brightly pigmented (red to yellow) perithecioid ascocarps. One group of species in the genus is saprophytic, occurs on mostly herbaceous substrates, and is usually erumpent. These species conform to the type species, N. fuckelii. The other group includes twelve species. They usually remain immersed, are lichenicolous, often parasitic, and most have a suggestion of clypeate development. The few anamorphs known are phialidic. A description of the combined characters of the lichenicolous species of Nectriella and a discussion of the desirability of retaining them in Nectriella or of placing them in the genus Plectoria or of placing them in the genus Plectoria Clements (1931), type species N. robernii Mont. & Desmaz., will be presented. The evolutionary implications for fungi found in association with presumably ancient lichens will be discussed.


The gametophytic and sporophytic hyphae of Coelomomyces develop in the hemocoels of its respective microcrustacean and mosquito hosts. During the development of the fungus these arthropods will pass through several juvenile stages, involving extreme metamorphoses, to adulthood. If the fungus is to attain maturity it must
not interfere with the development of its host even though it is parasitizing it. For example, Aedes aegypti larvae, parasitized by C. stercorivora, may pulate and produce infected adults. Maturation of fungal hyphae in the ovaries of adult A. aegypti appears to be in response to hormonal changes in the insect associated with the taking of a blood meal. The fungus must also synchronize its life cycle to those of its hosts. After a blood meal the infected female mosquito oviposits fungal resting sporangia in place of eggs; these release zoosporangia which infect the copped host. The gametophyte is heterothallic and, to ensure that gametes of the opposite mating types are present in the same place at the same time, gametogenesis and gamete release are cued by a temporal gating mechanism.

Lussenhop, J., see Fogel, R.

Luttrell, E. S., see Mims, C. W., et al.

MacKay, W., see Zak, J.

CLINT MAGILL and JANE MAGILL. Departments of Plant Pathology & Microbiology and Biochemistry & Biophysics, Texas A&M University, College Station, TX 77843.

Phymatotrichum omnivorum is a soil borne plant pathogen that causes considerable crop losses in certain soils in the southwestern USA. It is especially difficult to eradicate, as resting sclerotia are formed deep in the soil, and can remain viable for more than a decade. DNA isolated from sclerotia contains 2.27 Mbol 5-methylcytosine on HPLC analysis, whereas DNA from mycelia contains only 0.78%. Restriction analysis with Hpall and MspI shows that CG sequences are primary sites of methylation. Sclerotia are formed in the presence of 5-azacytidine, an inhibitor of methylation, but these sclerotia fail to germinate.

Magill, J., see Magill, C.

Malloch, D., see Blackwell, M.

Malloch, D. W., see Thorn, R. G.

R. MANSAU and H. P. UPADHYAY, Department of Nematology, University of California, Riverside CA 92521 and Dept. de Micologia Universidade Federal de Pernambuco, Recife, Brasil. Morphological and taxonomic studies on predacious hyphomycete genera.

The morphology and arrangement of hyalophragmoconidia produced singly and acrogenously at the tip of simple conidiophores as a main characteristic of the genera Dactylella Grove and Monacrosporium Oudemans has been studied by a number of workers recently without a clear resolution of these genera with respect to the nematode-trapping forms. Drechsler originally assigned fungi with such conidiogenesis to the genus Dactylella and hyalophragmoconidia produced in groups and acropleurogenously on hyaline, simple or branched conidiophores to the genus Monacrosporium. From a study of one of the largest collections extent of predacious hyphomycetes we have determined that related isolates clearly overlap the current concepts of these and related genera. Fungi similar to all three genera may produce conidia either singly or in groups at the tip of simple or branched conidiophores or acropleurogenously. Monacrosporium-like fungi can be segregated from Dactylella in having conidia of fusiform, ellipsoidal, obovoid or broadly turbinate shape but with at least one of the median cells of much greater width and volume than the distal or proximal cells. Monacrosporium genera are not valid and Dactylellaria should be reserved for species with at least partly pigmented fructifications such as the non-predacious forms which have been assigned to this genus. Precise and rational identification of nematode-trapping fungi is important in applied studies and ecological investigations on this important group of fungi.

M.S. MANOCHA, Dept. of Biol. Sciences, Brock University, St. Catharines, Ont. L2S 3A1 Canada Cell wall metabolism in mycoparasitic interactions of Mucorales.

Piptocephalis virginiensis is a biotrophic, haustorial mycoparasite of mucorouscous fungi. Among members of the order Mucorales, there are susceptible hosts, nonhosts, and only one known resistant host. Studies with susceptible host, Choanephora cucbitarum, and resistant host, Phascomyces articulatus, have shown marked differences in their response to partial proteolysis by a mycoparasite. Localized accumulation of chitin precursor, N-[α]-acetylglucosamine, is observed at the penetration sites on the resistant host but not the susceptible host. Both the hosts, however, show similar localized incorporation of label at the mechanically wounded sites. The pattern of localized incorporation of [1-14C]-GlCNac at wounding or penetration sites is not altered by previous treatment with cycloheximide. Chitin synthase preparations from the two hosts are similar in properties except for their response to partial proteolysis by different proteinases. Whereas the chitin synthase of the resistant host is stimulated by commercial and host derived preparations of acid and neutral proteinases, the chitin synthase of the susceptible host is stimulated by acid and inhibited by neutral proteinase. Chitinase activity of both the hosts is stimulated by the commercial and host proteinases. Proteinase obtained from the mycoparasite, however, enhances chitinase but suppresses chitin synthase activity of both the hosts. The role of host proteinases in regulating the activity of their own chitin synthase and chitinase is suggested.

Marasas, W. F. O., see Wingfield, M. J., et al.

G. MARTINEZ-CADENA. Instituto de Investigación en Bio logía Experimental, Facultad de Química, Universidad de Guanajuato. Apartado Postal 187, Guanajuato, Gto. 36000, México. Regulation of invertase secretion by the pH of the growth medium in Phycomyces blakesleeanus.

The Zygomycete Phycomyces blakesleeanus is able to utilize sucrose as a carbon source, however there is no report on the presence of invertase in the fungus. In this work it was investigated whether Phycomyces indeed synthetizes an invertase, the response of the enzyme to catabolite repression, and to additional environmental factors. Levels of invertase activity in cells grown in the presence of glucose were almost negligible. However, when Phycomyces was grown in medium plus glucose at pH 4.5, and then transferred to medium without glucose at the same pH, invertase activity could be detected 30 min after the transfer, and dramatically increased during the next 100 min.

This catabolite repression was overcame when xylose was added together with glucose to the growth medium.
Derepression of invertase activity was obtained if the fungus was grown in a medium with glucose and at pH 7.3. This pH dependent derepression was not due to enzyme distribution or stability. Therefore, it seems that invertase synthesis is regulated both by glucose and pH of the growth medium.

GEORGIANA MAY, Dept. of Biology, University of N. Carolina, Chapel Hill, NC 27514
Genetically different dikaryons of Coprinus cinereus partition resources when fruiting.

Though the physiological relationship of the agaric mycelium to the formation of fruiting bodies is well described, little is known of the interactions between genetically different mycelia. This study addressed the question, "Do genetically different dikaryons of C. cinereus partition resources or do they share resources in the production of fruiting bodies?" Answering this question is central to understanding evolution of the agaric Basidiomycetes.

Specifically, the hypothesis tested was: if genetically different dikaryons partition resources, then the total fruiting body dry weight produced by any one genotype is directly proportional to mycelial area whether the genotype is grown in mixed or pure culture. To test this, genetically different dikaryons of C. cinereus were paired in several configurations to produce mycelial areas of varying sizes. Previously, I had determined that these dikaryons display antagonistic (self/non-self recognition) responses when paired (IBNS, in press, 1988). Fruiting bodies were collected as they appeared, their sizes measured and total dry weight per mycelial area determined. A direct relationship between mycelial area and total fruiting body dry weight was demonstrated. Such results support the hypothesis that dikaryons partition rather than share resources at the time of fruiting.

Hayer, J. M., see Wiley, B. J., et. al. 
McCain, J. W., see Groth, J. V., et. al. 
McClunis, M. K., see Pykes, M. J., et. al. 
McLaughlin, D. J., see Kleven, N. L.

D. J. MCLAUGHLIN, N. L. KLEVEN AND E. W. A. BORBM. 
Dept. of Botany, University of Minnesota, St. Paul, MN 55108. Genetic and ultrastructural characters in Helicogloea and their significance for the phylogeny of the auriculariaceous fungi.

Simple-septate auriculariaceous fungi (Auriculariaceae sensu lato) have been of fundamental importance in phylogenetic proposals for the basidiomycetes. Basidial morphology is diverse among these organisms, and their evolutionary relationships remain unclear. A variety of ultrastructural characters hold promise in determining their relationships to other simple-septate species. Two species of Helicogloea have been examined. Besides septa the characters analyzed include the manner of branch initiation, cross-connections between the mitochondrial and ER, spindle pole body (SPB) and nuclear features. The simple septa show structural diversity. Branch initiation involves breaking the outer layer of the hyphal wall. Smooth ER is organized into stacks joined by rod-shaped cross-connections which also bind mitochondria at the stalk periphery. The SPBs are layered disclike lobules between the ER and nuclear envelope. Other mitotic characters include an ER cap which encloses the cytoplasmic face of the SPB. The ultrastructural characters are similar to those of some basidiomycetes, auriculariaceous species, and some of these characters are present in a number of gasteroid genera.

R. MEIER and I. CHARVAT. Botany Department, University of Minnesota, St. Paul, MN 55108. Ultrastructure and fluorescence of germinating Glomus spp. spores.

A developmental study of the early stages of vascular-arbuscular mycorrhizal fungal (VAMF) spore germination involving Glomus spp. is underway to better characterize these events, both ultrastructurally and at the light microscope level. Spores of G. fasciculatum and G. mosseaes were incubated in 0.75% water agar sandwiched between two cellulose membranes. Each membrane "bag" was then placed next to a surface-sterilized, germinated corn seed, and both were buried at a 1 inch depth in conainers filled with moistened, sterile silica sand. Spores of both VAMF species germinated within 3 days using this technique. After 3 days in sand, the spores were retrieved from the "bags" and processed for transmission electron microscopy (TEM). Dormant spores, also analyzed with TEM, were difficult to fix at the center. Preservation of the spore wall revealed a thick structure with 4 apparent layers. Previous germination experiments using agar media-only required extended incubation periods, resulting in high contamination, poor germination rates and non-reproducibility. However, such studies were useful for examining fluorescence of germinated G. fasciculatum spores, which were incubated on amended water agar media for a period of 10 weeks at 23 C. placed in a solution of fluorescein diacetate (FDA) and viewed under epifluorescence to determine viability of germ tubes. Bright fluorescence was observed in secondary spores and portions of the germ tube adjacent to the secondary spores. Old spore walls were not seen to fluoresce with FDA staining, but were earlier seen to autofluoresce.

A. S. METHVEN. Botany Department, Eastern Illinois University, Charleston, IL. 61920. Taxonomic and nomenclatural notes on Clavariadelphus.

To supplement a systematic study of the North American taxa of Clavariadelphus, an attempt was made to examine all extant type specimens, including designation of neotypes when type specimens did not exist. Neotype designations and descriptions are presented for Clavaria ligula, C. pectinallaria, C. truncata, and Clavariadelphus pectinallaria var. americanus.

As part of an ongoing study of the world taxa of Clavariadelphus, C. mirus, C. truncata var. amonegenus, and C. truncata var. umbonatus are redescribed following an examination of type specimens and additional representative material.

Three new taxa to science are also presented, including C. himalayensis from India, C. fasciculatum from Mexico, and C. yunnanensis from China.

R. J. MEYER. USDA-ARS, SBML, BERIC-WS, Bldg. 011A, Rm. 313, Beltsville, MD 20705. Variation in mitochondrial DNAs and extrachromosomal elements in Trichoderma viride.

Trichoderma viride is a species aggregate that has been difficult to subdivide into biological species. Scanning electron microscopy studies revealed two groups within T. viride. Group I has conidia with broadly rounded warts and Group II has conidia with pointed pyramidal warts. Subsequent studies have focused on the relationship between these groups and whether each group represents a single species or a species complex. One approach to these problems has been an analysis of the mitochondrial DNAs (mtDNAs) from seven Group I and five Group II strains from a variety of localities. The mtDNAs were obtained from isolated mitochondria, digested with various restriction enzymes, and analyzed by gel electro-
phoresis. With the exception of two strains in Group I, the strains could be distinguished from one another based on restriction fragment (RF) banding patterns. However, the patterns from the other ten strains were not all completely different. The greatest similarity in RF banding patterns occurred within groups. In fact, some RFs corresponded to the morphological Group I and others to Group II, and these RFs were present in all strains of either Group I or Group II. Extrachromosomal elements (ECEs) were present in mtDNA preparations from eight of the twelve strains. Each strain had a unique ECE pattern. The information from the mtDNA and ECEs will be useful in separating T. viride into identifiable biological species when combined with other methods of analysis.

A technique for germination of zygospores of Mucor piriformis is described. Zygospores were produced on acidified potato–dextrose agar. Strips of agar with zygospores were washed with sterile fiber papers and placed at 23°C in petri dishes at room temperature (23 ± 1°C). The tops of the petri dishes were offset 1 cm to allow slow drying for 5 days. Once dried, the agar strips with zygospores were washed with sterile water to remove contaminating sporangiospores. Excess water was removed with paper towels and the agar strips incubated at room temperature in the same closed petri dish. Zygospores germinated in 2–3 days at 23°C and germination continued when transferred at 0°C. The majority (95%) of germinated zygospores developed only one germ–sporangiphore, although a few zygospores with two germ–sporangiphores were noted. Of the germ–sporangia tested, 95.6% yielded only 1-mating type germ–sporangiospores. 2.2% yielded only 0-mating type germ–sporangiospores, and 2.2% yielded both types. Zygospores produced on peach and nectarine fruits artificially inoculated with fungal spores germinated and produced germ–sporangia of the + (95.8%) and only one of the − (4.2%) mating type. In orchard surveys, in the Hood River Valley in Oregon, zygospores were found in 1.8% of leaves infected naturally by Mucor piriformis. The significance of these findings in the ecology and epidemiology of M. piriformis will be discussed.

Milgrim, C., see Ullrich, R. C., et. al.

O. K. MILLER. Biology, VPI & SU, Blacksburg, VA 24061. The formulation of species concepts in the Agaricales.

Traditional morphological characters have been used to form the agaric species concept. These include spore size, shape, color, as well as pileipellus and trama morphology, cystidia, macromorphology, growth habit, and substrate preference. More recently spores and other morphological characters have been studied in detail by the increased use of SEM & TEM microscopy. In vitro and in vivo studies of basidiole development have traced the ontogeny of tissues. The phenotypic variability of color, microchemical reactions and morphological features have been shown by a wide range of fruiting experiments. Chemical analyses have revealed the existence of common extra metabolic pathways shared by taxa within and among morphological features. Population studies have employed mating compatibility, coupled with mycorrhizal synthesis. Laccase enzyme systems, cultural descriptions of the anamorph, algalike patterns, and DNA hybridization in order to study closely related taxa. These methods have provided a basis, on which to examine similarities and differences at the species or subspecies level. A fuller knowledge of the phenotypic expression of the genome has provided a broader basis for decision making on the species level. This has led to a reexamination of species limits within and among agaric genera and subgeneric species complexes.

Miller, J., O. K., see Brunner, I. L., et al.

Miller, O. K., Jr., see Gruhn, C. M.

S.W. MILLER and F.W. SPIEGEL. Department of Botany and Microbiology, University of Arkansas, Fayetteville, AR 72701. Populations and succession of protostelids on Zea mays

Since the discovery of protostelids in 1958, very little has been done in relation to the ecology of these organisms. Questions about population densities and possible succession of species as the substrate ages have not been studied. To determine if succession occurs it was necessary to sample a substrate from its formation until complete decomposition. Tassels of Zea mays are ideal for a study of this kind. Previous observations had shown that Zea mays is an excellent substrate for protostelids, and the uniform size and shape of the florets gives a consistency to sampling. Samples were taken weekly for seven months and observed by microscope to determine species presence and population densities. There was a distinct pattern of succession.Protostelium mycophagum is a pioneer species. P. irregularum population stayed fairly constant throughout the study. Six other species, primarily Schizoplasmodium cavestolaeides and Endostelium zonatum, appeared during the fifth week. The populations of these later species persisted and increased as the study progressed. Further study on other substrates should reveal if the succession of protostelids is a general phenomenon on decaying plant parts.

C. W. MIMS, E. S. LUTTRELL and S. C. ALDERMAN. Department of Plant Pathology, University of Georgia, Athens, GA 30602. Ultrastructure of the haustoria of Cercosporidium personatum.

Scanning and transmission electron microscopy were used to examine haustoria of Cercosporidium personatum, the cause of late leaf spot of peanut. These highly branched, irregularly septate, and multinucleate structures were found in epidermal, palisade, and spongy mesophyll cells of infected leaves. At the site of host cell penetration, haustorium diameter was the same or slightly less than that of an intercellular hypha of this fungus. A collar appears at the penetration site. Haustorial branches terminated in host cells and were initially separated from host cytoplasm by an extra-haustorial membrane. Host cells containing haustoria eventually died although haustoria remained intact and appeared healthy even in cells whose cytoplasm and nuclear contents had disintegrated. At this point it appears that the haustoria of C. personatum are morphologically distinct from those produced by members of other major groups of plant pathogenic fungi.

C. W. MIMS and E. A. RICHARDSON. Department of Plant Pathology, University of Georgia, Athens, GA 30602. Ultrastructure of appressorium development in the haploid phase of Gymnosporangium juniperi-virginianae.

When incubated on moist dialysis membrane basidioles of Gymnosporangium juniperi-virginianae, either germinated by repetition to produce secondary spores or gave rise to germ tubes that formed appressoria when their tips contacted the dialysis membrane. In this study appressorium development was studied using freeze-substitution fixation and transmission electron microscopy. A slender germ tube emerged from the side of a spore and grew down toward the
The association.

Our results indicate the following: As has now been found for certain insects, mammals.

Results obtained with the Department of Biology, University of This study

mitochondria, microbodies, multivesicular bodies, Golgi bodies and vesicles, strands of ER and vacuolar elements. Eventually a zone devoid of lamellar organelles fibrous material at the tip to be an adhesive substance coated the germ tube and appressorium and spread down from the appressorium onto the membrane. Appressoria contained numerous mitochondria, microbodies, multivesicular bodies, Golgi bodies and vesicles, strands of ER and vacuolar elements. Eventually a zone devoid of lamellar organelles fibrous material at the tip of the appressorium. Considerable vesicular activity was noted in this region. The wall of the appressorium appressed against the membrane became extremely thin. Eventually the appressorium deposited a saucered shaped pad of material between its plasma membrane and the dialysis membrane.

SUSAN B. MITCHELL. Dept. of Biology, University of South Carolina, Columbia, SC 29208. Ultrastructural features of a pigment producing species of Trichoderma Pers. ex Fr.

The fine structure of vegetative mycelia of a pigment producing species of Trichoderma has been investigated by the standard techniques of transmission electron microscopy. Walls, septal structures, nuclei, mitochondria, vacuoles, opaque bodies, plasmalemmasomes, lomasomes, and possible Golgi apparatus have been described and discussed.

Possible developmental features of lomasomes and functional relationships of ultrastructural entities to the secretory process were considered. The association of apparent glycogen deposits with mitochondria and opaque bodies with plasmalemmasomes in control mycelia as opposed to experimental mycelia implied occurrence of an energy related synthetic process involving incorporation or utilization of material from the opaque bodies. The modification of plasmalemmasomes to lomasomes with structural features similar to adjacent Golgi-like vesicles in experimental hypae indicated a mechanism for secretion.

M. MOHAMED, R. V. GESSNER and K. C. KEUDELL.
Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. Use of ELISA to differentiate species of Dendyphilla.

Relationships between the marine dermatomyces Dendyphilla arenaria and D. salina were determined using Ouchterlony Immunodiffusion (O1) and Enzyme-Linked Immunoabsorptive Assay (ELISA). Data obtained from the O1 test showed cross reactivity between the two species, one of which was not removed by cross-absorption, and therefore did not distinguish between the two species. ELISA results for D. arenaria and D. salina were 1:65,000 and 1:32,000, respectively for homologous titers, and 1:4,000 to 1:16,000 for heterologous titers. The ELISA data obtained demonstrated that these two species are not identical immunologically, however, strains within each species are antigenically similar. ELISA was able to differentiate between species of Dendyphilla and may prove to be a useful tool to distinguish between other taxa of fungi.

D. MOORE. Microbiology Research Group, Department of Cell and Structural Biology, Medical School, The University, Manchester M13 9PT, UK. In vitro studies of hymenium morphogenesis in Coprinus cinereus: ammonium and glutamine inhibit sporation.

Cystidia differentiate in response to a contact stimulus from a cystidium; basidia and cystidia differentiate from the tips of branches arising from transal hyphae. Paraphyses arise as branches of subbasidial cells. Of these four differentiated cell types, only basidia are committed to their particular pathway of differentiation. On explantation to agar medium, paraphyses and cystidia revert to vegetative hyphal growth whereas basidia do not. Depending on the stage of meiosis reached at the time of explantation, basidia are able to continue their development and complete the sporulation process in vitro. The refinement of the in vitro method has produced a biosay for the effects of various chemicals on developing hyphens. Results obtained with the in vitro assay system will be described and their relevance to the control of basidium differentiation discussed.

Muhrstein, L. K., see Porter, D.
Mueller, G. J., see Rogers, S. O., et. al.
G. M. MUELLER. Dept. of Botany, Field Museum of Natural History, Chicago, IL 60605-2496. Laccaria in northern South America.

At least six species of Laccaria have been collected in northern South America. Probably the only native species of Laccaria in the area are L. amethystea (Bull.) Murrill, L. gomezii nom. prov., L. laccata (Scop. : Fr.) Berk. & Br., and, if recognized as a distinct species, L. tetrospora Sing., all found growing under Quercus humboldtii in Colombia. Many specimens of L. bicolor (Maire) Orton and occasional collections of L. proxima (Boud.) Pat. have been collected under Pinus radiata throughout South America, where the tree has been widely introduced, and under P. patula in Colombia. At present, no data on Laccaria occurring with Pinus caribaea, another commonly planted pine, is available. Laccaria fraterna (Cooke & Massee) Pegler is restricted to Eucalyptus plantations.

DONALD O. NATVIG. Department of Biology, University of New Mexico, Albuquerque, NM 87131. Evolutionary studies of Neurospora using restriction analysis of anonymous nuclear fragments.

We have employed randomly selected, cloned fragments of N. crassa (74A) single-copy nuclear DNA as radiolabeled probes to examine for restriction fragment polymorphisms among species of Neurospora (Nativig et al. 1987 Evolution 41:1003-1021). This study complements similar studies employing analysis of mitochondrial DNA (Taylor et al. 1986 Evolution 40:716-739). We have now used this approach to explore sexual questions with regard to evolution in the genus. Our results indicate the following:

1. In most cases, genetic relatedness as determined by restriction analysis correlates well with mating behavior, a result that supports the current biological species concept for the genus. Strains assigned to N. sitophila, N. discreta, N. crassa and N. tetrasperma appear to represent distinct monophyletic groupings. Certain strains assigned to N. intermedia, however, appear to be distantly related, and as a result their nearest neighbors in tree-building analyses vary somewhat depending on the method employed.

2. As has now been found for certain insects, mammals and amphibians, there is some evidence that among strains of Neurospora mitochondrial genomes and nuclear genomes may have different evolutionary histories.
3. Restriction analysis employing anonymous cloned nuclear DNA fragments in hybridization experiments appears to be a valuable approach toward the rapid acquisition and analysis of data for evolutionary studies of fungi.

Nelson, D., see Carreiro, M. M.


The imperspicuity of the interiors of decaying-litter systems has hindered development of methods for following dynamics of fungal production in decomposing material of vascular plants. It has been possible to measure standing crop of fungal biomass or mass in vascular-plant litter (direct microscopy of homogenates, glucosamine, ergosterol, immunosorbent assay), but there has been no method in mycology analogous to the titrated-thymidine method of measuring bacterial productivity. We are in the process of developing such a radioisotopic technique, based on the incorporation of 1-4C sodium acetate into ergosterol (Ac-ERG). We now know that: a) Ac-ERG is saturable at 5-10 mCi Ac for both salt-marsh ascomycetes and dead leaves of marshgrass (Sparrtina alterniflora); b) 5 mCi Ac is not inhibitory to growth of salt-marsh ascomycetes in extract of marshgrass leaves; c) Ac-ERG is constant between 0.5-4% of incubation for dead leaves; d) production by salt-marsh bacterial assemblages does not interfere with the Ac-ERG technique; e) a conversion factor (1.5-3.5, depending on species?) is necessary for calculation of fungal μ from the measured rate of ergosterol u based on 14C Ac incorporation.

T. NIEMELÄ. Department of Botany, University of Helsinki Unioninkatu 44, SF-00110 Helsinki, Finland. The division of the polyphore genus Phellinus.

J.L. FIASSON and T. NIEMELÄ presented (Karstenia 24, 1984) a framework for the division of Phellinus (Hymeno-chaetales) into more natural genera. Seven genera emerged from the European material. The new classification was predominantly based on biochemical differences, especially the absence of functional stromatal species in the fruitbodies. Biological, macroscopical and microscopical characters were used as support. Most new genera are earlier known as "species complexes": Pomitiporia is the former "Phellinus robustus complex", Forodaeadae the "F. pini complex", Ochroporus the "P. igniarius complex", etc. Further evidence is now presented to encourage the division. Contrary to common belief, the species within these more natural genera seem to be well-defined both in their microscopical, ecology and other characters, if properly studied. However, the amount of species and their diverse microscopical characters are still fairly obscure in some inadequately studied groups, e.g. Forodaeadae. The genera show separate patterns of microscopical characters. Examples are presented on the important microscopical differences between the genera; some characters (the hyphal system, setae, encrusted hyphae) are compared in detail. Some specific microscopical differences within Forodaeadae and Ochroporus are discussed.

L.A. NOVAK and L.M. KOHN. Department of Botany, University of Toronto, Erindale Campus, Mississauga, Ontario, Canada, L5L 1C6. Electrophoretic analysis of major stromal proteins in the Sclerotiniaceae.

Developmental storage proteins have been reported from sclerotia, but not from indeterminate or substral stromata. Preliminary to comparative studies of these proteins in the Sclerotiniaceae, we investigated two substral stromal species, Sclerotinia homeocarpa and Lamellaria subresinosa, one sclerotal species, S. sclerotorum, and one sclerotal anamorph, Sclerotium cepivorum, for the presence of these developmental proteins. Total protein was extracted from mycelia, sclerotal initials, and sclerotia or substral stromata. One-dimensional SDS-PAGE revealed that all isolates examined produced at least one major protein of mol wt 32-37 kda which comprised up to 45% of the total protein. The protein was observed only from sclerotal and stromatal extracts and not from mycelial extracts. Intraspecific variation in the molecular weights of this protein was not observed. A minor protein of mol wt 15-17 kda, comprising up to 14% of the total protein was also produced by S. cepivorum, Sclerotinia selenorum, and S. homeocarpa. Contrary to previous reported data for basidiomycetous sclerotia, molecular weights of these proteins in the Sclerotiniaceae fall within a characteristic range. Structural and immunological relatedness of these proteins could prove to be taxonomically and phylogenetically informative.

Novotny, C. P., see Buckner, B., et al.

Novotny, C. P., see Ullrich, R. C., et al.

F. OBERWINKLER & R. BAUER, Universität Tübingen, Institut für Biologie 1, Spezielle Botanik, Auf der Morgenstelle 1, D-7400 Tübingen, W. Germany. The ultrastructure of mycoparasitic interactions in Heterobasidiomycetes.

Species of mycoparasitic Heterobasidiomycetes are known in the Auriculariales s. 1., the Tremellales s. str., and the Filobasidiales. The ultrastructural characteristics of the cellular interactions are discussed and interpreted comparatively. The tremelloid haustorium commonly initiates from a clamp and prolongs into a thread-like filament which may attach to a host cell. The cellular connection between the parasite Platycladus periplophare and the host Hypoderma pratermisum represents a hitherto unknown type of ultrastructural differentiation. Cells of the parasite which attach to host cells form distinct vesicular bodies with electron dense contents and electron transparent marginal regions. The vesicular content is extruded through a break in the cell wall of the parasite and then interacts with the cell wall of the host.

Oberwinkler, F., see Bauer, R., et al.

L.M. ONGAY-LARIOS. Instituto de Investigación en Biología Experimental, Facultad de Química, Universidad de Guanajuato. Apartado Postal 187, Guanajuato, Gto. 36000, Mexico. Induction of microcrycle phorogenensis in Mucor rouxii. Although germ-tube formation is the usual outcome of fungal spore germination, alternative developments are known. The immediate sporulation without or with very limited vegetative development has been induced in several fungi. This study describes a cultivation system which induces the expression of microcycle phorogenesis in Mucor rouxii.

Direct sporangiophore production from spores in the absence of mycelial phase was obtained in Mucor rouxii by a two-step treatment. First the spores are incubated for 12-24h at 28°C in liquid culture media in the presence of 1,4-diamino-butane (DAB). This treatment inhibits germ-tube formation but allows spherical growth leading to the production of enlarged cells. These enlarged cells are washed and transferred to 2% agar plates and incubated at room temperature for 36-48h. After this incubation period about 10% of the spores are able to directly produce sporangiophores without mycelial phase. The sporangiophores are similar to, but smaller than the normal aerial sporangiophores. The average number of
spores produced per sporangiophore is 14 against several thousands spores produced in aerial sporangiophores. The spores are the same size and shape than spores produced in aerial sporangiophores. If the spores are incubated in normal conditions they are able to germinate, grow and differentiate normally.

Park, S. H., see Kim, B. K., et. al.

Parrish, F. W., see Wilfred, A. C., et. al.

C.J. PAZUR and R.E. EDELWAN. Department of Botany and Plant Pathology, Michigan State University, East Lansing, MI 48824.

An ultrastructural study of the zone of interaction between vegetatively compatible and incompatible isolates of Leuocostoma persoonii (Nits.) Hohn.

Mycelial plugs of compatible and incompatible isolates of the anamorph of Leuocostoma persoonii (Leucocyctospora leuocostoma Sacc.) were paired on Clarified oatmeal agar and grown at 20-22 C, in the dark, for 12 days. Vegetatively incompatible interactions resulted in the formation of a darkened barrage zone with pycnidia at the point of contact between the isolates. Compatible interactions remained light and did not form pycnidia as a result of contact. Agar sections of the zones of interaction were removed, fixed in 2% glutaraldehyde, 2.5% paraformaldehyde and 1% osmium tetroxide, and prepared for observation by scanning and transmission electron microscopy. Both compatible and incompatible pairings resulted in anastomoses. Compatible isolates fused and continued to grow as they did prior to fusion, with hyphae submerged in the agar. Incompatible isolates produced aerial mycelium upon contact. Anastomosis between incompatible isolates resulted in death of adjacent cells beyond the point of fusion. Pycnidia formed 40 to 150 microns behind the cellular hyphae. Sections were examined to determine the extent of fusion and cytoplasmic exchange in both compatible and incompatible pairings.

Pearson, S. L., see Tansey, M. R., et. al.

M. PEDRAZA1 and E. LOPEZ-ROMERO1,2, IIBE, Fac. de Química, Univ. de Guanajuato, Apdo. Postal 182, Guanajuato, Gto. 36000 (1) and Depto. de Genética y Biologia Molecular, CINVESTAV del IPN, México (2).

Chitinases in Mucor rouxii.

Maximum specific and total activity of chitinase in cell-free extracts from M. rouxii (mycelium) occurred after 10 h and 12 h of cell growth, respectively. Expression of chitinase activity was paralleled by that of chitin synthetase. Chitinases. Chitinases were purified by a procedure involving a) salting-out with ammonium sulphate, b) gel filtration and c) ionic exchange in DEAE Bio-gel A. This procedure allowed us to separate two chitinases (I and II) with different molecular weight and ionic charge. Both chitinases digested nascent chitin preferentially over preformed chitin yielding diacetylchitohexose as the sole product of hydrolysis. Antibodies raised against chitinase II did not cross-react with chitinase I indicating that the two enzymes are also immunologically distinct. The role of chitinolytic activity in fungal growth and morphogenesis in currently under study in our laboratory.

D. D. PERKINS and B. C. TURNER. Department of Biological Sciences, Stanford University, Stanford CA 94305.

Neurospora populations are abundant in warm climates and are readily sampled. Four heterothallic and nine homothallic species are represented among 3000 isolates from arable habitats. These species are similar in vegetative appearance, karyotype, and mating-type alleles but are reproductively isolated. Geographical ranges differ but overlap. — Populations are polymorphic for genes preventing heterokaryon formation (shown in N. crassa); most colonies represent homokaryotic individuals from single heat-activated ascospores. — Genetic variation has been studied by us and others in N. crassa and N. intermedia. Isozyme polymorphisms resemble those in outbreeding diploid organisms. DNA restriction fragment length polymorphisms are abundant. Phase-specific recessive genes that adversely affect the sexual diphas are present at many loci. — Chromosomal Spore killer factors exert melotic drive. — Mitochondrial genomes differ in length mutations, nucleotide substitutions, and presence of mitochondrial plasmids. In a few strains, a single nucleotide polymorphism follows infection of an element into mitochondrial DNA. — The genus also contains true homothallic species, which are all aconidiate, suggesting that the major role of conidiation may be in fertilization. Heterothallic, homothallic and pseudohomothallic species in the same genus permit comparing genetic correlates of different life styles. — The large base of genetic cytological and molecular information; the ease of population sampling, preservation, and analysis; and the availability of a large existing culture collection all recommend Neurospora for ecological and evolutionary genetics. (Support: P.H.S. 1AI0462)

Petersen, R. H., see Desjardin, D. E.


Thaxter played a major role in building the Harvard cryptogamic collections. These collections were initiated by Asa Gray and consolidated and added to by W. G. Farlow’s purchases and exchanges. Through Thaxter’s own collecting activities and through the acquisitions he orchestrated, the Farlow Herbarium became a major, world-class collection. With financial support from Mrs. W. G. Farlow, he negotiated the addition of the holdings of Buchholz and Merrill, Patouillard, Thiessen, Fleischer, Schiffner, and several small collections. Thaxter’s own collections were always select and represented all groups of cryptogams. His trips to the Southeastern U.S., southern South America, Trinidad, and Grenada resulted in many valuable and interesting collections.

J. C. POMERVILLE, Department of Biology, Texas A&M University, College Station, TX 77843.

Calcium ions as the transduction signal for gamete chemotaxis in Allozymes marinae.

In the aquatic fungus A. marinae, it has previously been shown that the sexual pheromone siniren brings about the attraction of the posteriorly unflagellate male gametes to the attractant-generating female cells. The purpose of this study was to determine what transduction agent is responsible for generating the change in male gamete behavior. Experiments are reported which indicate that the binding of anion ions triggers the influx of calcium ions (Ca2+) into male gametes. Through the use of 42Ca2+ and several washing experiments, it is demonstrated that initially there is a substantial binding of the cation to the cell surface. However, with the addition of siniren there is a three-fold increase in cellular radio-
activity over that for male gametes incubated in 45Ca2+ alone. Addition of sirenin to washed cells does not produce a change in motile behavior or stimulate the release of detectable intracellular Ca2+ stores. Several additional experiments using competitive ions (Co2+, Ni2+, and La3+), antibiotics (necycycin), and calmodulin antagonists (verapamil, nitrendipine) provide further evidence for the presence of Ca2+ channels in the plasma membrane of the male gametes.

Pomerville, J. C., see Aliaga, G. R.

Pomerville, J. C., see Sewall, T. C.

Poppa, V. V., see Ellissey, J. T., et. al.

D. PORTER & L. K. MUEHLSTEIN. Botany Department, University of Georgia, Athens, GA 30602. Toward a monograph of the marine slime mold genus Labyrinthula.

With the recent demonstration that a species of Labyrinthula is the causative agent of the wasting disease of eelgrass, Zostera marina, it has become essential to be able to identify and distinguish the various species of this common genus of marine protists. Since the genus was first described by Cienkowski in 1867 there have been more than 15 separate species named; unfortunately only one has been described from axenic culture. Olive (1975) suggested recognition of eight species of Labyrinthula, but even among these it has been nearly impossible to assign existing culture isolates of Labyrinthula to previously described species. Our approach to the taxonomy of Labyrinthula involves collection, uniform culture conditions, storage, description and comparison. We have more than 120 isolates of the genus from both the Atlantic and Pacific coasts of North America and the Caribbean. They are maintained in monoxenic culture with a yeast as a food source. Long term storage is by cryopreservation in liquid nitrogen. The morphological parameters that are presently being analyzed include cell size and shape, cell inclusions, colony growth pattern, colony pigmentation, substrate and developmental stages. Thus far none of the approximately 10 different species that we have in uniform culture conditions are clearly assignable to existing species.

Martha J. Powell and THERESE HEYURM. Department of Botany, Miami University, Oxford, OH 45056.

Is Zoophagus an assemblage with diverse affinities?

The rotifer capturing fungus, Zoophagus, is assigned to the Peronosporales because descriptions of zoospore discharge resemble those for Pythium. In some isolates of this genus, however, zoospores are not produced, but only fusiform gemmae that resemble conidia or cylindrical sperangia. This situation led Sparrow to suggest that there are "several distinct fungi, alike in their vegetative stage and capturing organs, but differing in their nonsexual reproductive structures." Thus the oomycetous affinity of Zoophagus isolates which produce gemmae is questionable. Certain cytological features aid in distinguishing oomycetes from higher fungi. Consequently for a gemma-producing isolate of Zoophagus, we have used conventional fixation and quick-freeze preparative techniques to examine ultrastructure of: 1. mitochondrial cristae; 2. storage carbohydrates; 3. Golgi apparatus or Golgi equivalents; 4. nuclear associated organelles; 5. hyphal apices and 6. septa. This study will elucidate whether or not some isolates which resemble Zoophagus have taxonomic affinities other than with Oomycetes.

Powell, M. J., see Lehner, Jr., L. P.

Powell, M. J., see Roychoudhury, S., et. al.

P.R. PRZBYLOWICZ and J. D. DONOGHUE. NW Mycological Consultants, Inc., 702 NW 41st St., Corvallis, OR 97330. Cropping characteristics of two Lentinula edodes strains on different media related to strain selection and production.

Two strains of Lentinula edodes were grown on different media and observed through cropping. The size and number of primordia, number and weight of mushrooms were recorded. Moisture contents of the fresh mushrooms were calculated. Effects of strain and media on biological efficiency, yield and cropping pattern were examined. The enriched medium increased yield and biological efficiencies, but had higher contaminant populations. Cropping pattern was influenced by primordia size which was strain-dependent. The number of aborted primordia and the mushroom moisture content were also strain-dependent. These characteristics relate to management practices and selection of strains for maximum productivity.

P. J. FUKKILA. Department of Biology and Curriculum in Genetics, U. North Carolina, Chapel Hill, N.C. 27514. DNA methylation in Coprinus cinereus.

We have shown previously that methylated DNA fragments at a centromere linked sequence are transmitted through meiosis, although variations in the number of adjacent methylated sites were observed (Zolan and Fukkila, Molecular and Cellular Biology 6, 195-200, 1986). This variation was not specific to any particular phase of the sexual cycle, as the gains or losses of methylation were observed at a similar frequency in monokaryotic isolates with three developmental histories. Those derived from meiotic products, those derived from non-melicetic veil cells that cover the fruiting bodies, and those derived from monokaryons.

We have also examined DNA methylation at a locus of known function. The ACC2 gene (encoding isocitrate lyase) is normally not methylated. Following targeted gene disruption, a low level of methylation was detected. Since most cells appear to remain unmethylated, it seems unlikely that methylation has a causal role in inactivating gene expression in these Acr transformants.

M. B. RAIU. Department of Biological Sciences, Stanford University, Stanford, CA 94305. Sexual development mutants of Neurospora crassa.

Over 200 mutant genes that affect the sexual cycle of N. crassa have been identified. These include mutants with inactive mating type, mutants that are male- or female-sterile, and mutants that affect perithecal or ascus development, meiosis, postmeiotic mitosis, and ascospore genesis or development. Some mutants are pleiotropic, affecting sexual as well as vegetative phases. The mating type mutants, except all m42, are completely sterile both as male and as female parents. Many mutants that affect post-fertilization development produce normal-sized perithecia, but these are often barren. Some mutants show dramatic effects on ascus or ascospore development. For example, giant spore (gen), Banana (Ban) and Perforated (Pef) result in giant ascospores which often enclose all four products of meiosis and their mitotic derivatives. Pef ascii also have multiple apical pores rather than the normal single pore. Some crosiers of Ban and Pef become highly multinucleate. The conditional mutants Fm-1 and Fm-2 skip a postmeiotic mitosis and produce.
four-spored asc at restrictive temperature. Spore killer strains show meiotic drive, causing the death of ascospores not carrying the killer allele. Many other mutants affect ascus or ascospore shape and pigmentation, perithecial development, or ascospore discharge. Most of the known Neospora mutants affecting sexual development represent mutations in distinct genes. Thus the total number of genes required for normal sexual development must be much greater than 200. (Support: U.S.P.H.S. AI 01462).

S.A. REDHEAD. Biosystematics Research Centre, Agriculture Canada, Ottawa, Ont., KIA 0C6. A biogeographical overview of the Canadian mushroom flora.

The Canadian mushroom flora will be shown to be composed of numerous elements exhibiting distributional patterns similar to those of vascular plants, lichens, bryophytes, and various animal groups. Circumpolar (High Arctic, Arctic/alpine, Bipolar), Circumboreal (Taiga, Hardwood forest, Bicoastal), Boreal Endemic, Bicoastal Endemic, Western Cordilleran Endemic, Eastern Deciduous Forest Endemic, East Coast Plain Endemic, Amphi-Beringian (Bureesian/Western Cordillera, Asian/Western Cordillera, Asian/West Coast), European/West Coast, Amphi-Atlantic (European/West Coast, European/Arctic), Amphi-Pacific (Asian/Great Lakes or Coastal Plain, South Pacific/Great Lakes, Gwonawanda/West Coast), Pantropical/Eastern Deciduous Forest, and Continental/Mediterranean elements all appear to be represented in Canada. Progress in mapping representative species will be discussed.

S.A. REHNER Department of Botany, University of Washington, Seattle, WA 98195. Phylogenetic relationships of evelate species of Agrocybe with unifactorial mating systems as inferred from rDNA restriction maps.

Evolutionary relationships among selected taxa of the genus Agrocybe (Bolbitiaceae, Agaricales) have been investigated through cladistic analysis of restriction endonuclease maps of the nuclear ribosomal gene repeats. Six taxa, currently assigned to either section Pedidae or Micros copia, share several morphological and life history characteristics in common including: small stunted basidioecarps, absence of a partial veil, occurrence in grassland habitats, basidiospore length exceeding 10 μm and a bipolar heterothallic mating system. To distinguish the alternatives that some or all of these taxa acquired this suite of characters independently or as a consequence of common ancestry, restriction maps utilizing 19 restriction enzymes were constructed, alligned and subjected to cladistic analysis. From the results of the cladistic analysis it can be inferred that the group is monophyletic. The evolutionary relationships among these taxa will be outlined and the patterns and trends in character evolution will be discussed.

DON R. REYNOLDS. Natural History Museum of Los Angeles County, 900 Exposition Boulevard, Los Angeles, California 90007. Loculoascomycetes emend.

Ascomycete classification based on the ascus requirement in the loculoascomycete paradigm is reexamined. Character Compatibility Analysis is used to generate a most convex clade for representative families. The character suite utilized includes traditional ascocarp and centrum traits and several ascostromatal ascus types. The bitunicate ascus sensu lato is scored as a nonpolarized multistate series corresponding to fissitunicate, semisfissitunicate, and rostrate denticose. Corresponding monophyletic and paraphyletic taxa are outlined.

Richardson, E. A., see Mims, C. V.

Rinaldi, H. G., see Dykstra, M. J., et al.

Roberson, R. W., see Fuller, M. S.

R. W. ROBERSON and M. S. FULLER. Botany Department, University of Georgia, Athens, GA 30602. Ultrastructural examination of hyphal tip cells of Sclerotium rolfsii fixed by freeze-substitution.

The hyphal tip cell of Sclerotium rolfsii was studied after fixation by freeze-substitution. The cytoplasm of the tip cell was highly polarized with a dense cluster of apical vesicles and microvesicles in the apex of the hypha that represented the Spizentecken, and a general parallel orientation of subapical organelles along the longitudinal axis of the growing hypha. Microvesicles were mostly concentrated at the center of the Spizentecken and were arranged in discrete, linear rows. Membrane-bound apical vesicles contained a finely granular matrix and were divided into two groups based on their electron opacities. Filamens were present in both the apical and subapical regions of the hypha. The apical region of the hypha was more localized in peripheral regions of the cytoplasm. Microtubules were observed in all regions of the hypha. Microfilaments were closely associated with apical vesicles and microvesicles in the Spizentecken. S. rolfsii had an elaborate vacuolar system that contained spherical inclusions of various sizes and electron opacities embedded in a finely granular ground matrix. Golgi body equivalents were identified as enlarged cisternae of varying shapes, sizes, and electron opacities. Mitochondria was present throughout the subsapical region. Ribosomes were often aligned along the outer cytoplasmic surfaces of the mitochondria.

MARY ROBSON, JAMES B. ANDERSON, and PAUL A. HORGEN, Mushroom Research Group, Centre for Plant Biotechnology, Department of Botany, University of Toronto, Erindale Campus, Mississauga, Ontario. DNA Sequence Analysis of Agaricus Mitochondrial Plasmids.

Two cloned inner fragments of the mitochondrial plasmid, pEM, found in Agaricus bitorquis strains Ag4 and Ag7, possess homology to regions of the mitochondrial genomes of other A. bitorquis strains and the commercial mushroom Agaricus bisporus (=brunnescens). These fragments totaling 4.5 kb in length and representing 60% of the entire plasmid, have been sequenced. A 3.5 kb portion of the A. bisporus mitochondrial genome possessing homology to both pEM fragments is being sequenced. Several smaller, discrete restriction fragments of the mitochondrial genome of a related, non-plasmid-containing A. bitorquis strain, that also show homology to pEM, have been cloned. Sequence comparisons may elucidate the insertion/deletion history of the mitochondrial genome and thus the evolutionary relatedness of plasmid and mitochondrial DNAs.

Rodrigues, K. F., see Samuels, G. J.

Ruelas, A. P., see Groth, J. V., et al.

Rogers, A. L., see Hospenthal, D. R., et al.

Rogers, J. D., see Callan, B. E.

S.O. ROGERS, G.J. MUELLER and J.F. AMMIRATI, Department of Botany, and C. BLEDSOE, College of Forestry Resources, University of Washington, Seattle, WA 98195, Identification of ectomycorrhizal fungi using ribosomal DNA (rDNA) hybridization.

Fungi which form ectomycorrhizae with conifers and other woody plants often are difficult, if not impossible, to identify in the absence of basidioecarps. Even when basidioecarps are found "associated" with a particular plant, it may be hard to determine that its mycelium is connected to the roots of the host. DNA extraction and hybridization techniques are employed that provide for an identification of these fungi from fresh and dried basidioecarps, cultured cells, and infected roots. Southern hybridizations using a rDNA probe indicate that the rDNA hybridization pattern is constant for a species during all assayed stages of the life cycle. Individuals of the same species at different locations appear to exhibit identical hybridization patterns. However, the hybridization patterns of different genera, and species of the same species, often exhibit differences from one another. Thus, identification of a species from fresh, and in
many instances dried basidiocarps, mycelia and ectomycorrhizal roots is possible using this technique.

**ROSEMeyer, M., R. KLUSON, AND S. GLIessman.**
Agroecology Program, University of California, Santa Cruz 95064. Variation in the level of vesicular arbuscular mycorrhizal (VAM) formation in *Phaseolus vulgaris* with cropping system, level of fertilization, and bean cultivar in a tropical Andept soil.

A traditional, slash mulch and a conventional, clean cultivation cropping system for the production of black bean, *Phaseolus vulgaris* cv. 'chimbolo' were compared in a high elevation, phosphorus-fixing Andept soil. In a slash mulch system the seeds are broadcast into second growth vegetation, which is then cut down to form a mulch through which the bean seedling emerges. Within the clean cultivation system, six levels of 10(N-30(P)-10(K)-10(S) fertilizer were applied and for both systems the following parameters in 5 replications were determined: percent mycorrhize formation, dry weight biomass of nodule, root and shoot yield, total biomass of nodule, root and shoot peaked at 975 kg/ha fertilizer, seed yield continued to increase. VAM fungal infection remained uniformly high throughout conventional and slash mulch treatments. Four indeterminate, traditional, dry bean varieties and two determinate "modern", fresh pod varieties were compared in 3 replications with respect to level of VAM, dry weight of nodules, root, top green pod fresh weight. Implications in the development of inoculum production programs will be discussed.

**I. K. ROSS, L. M. FOSTER, AND A. BILLIN.**
Dept. of Biological Sciences, University of California, Santa Barbara, CA 93106. Induced extracellular secretion of a membrane-associated phenoloxidase of *Coprinus congregatus*.

We have previously shown that a laccase-type phenoloxidase located in growing hyphal tips of *C. congregatus* is associated with the plasma membrane and is not secreted into the medium under normal growth conditions. We have found that we can induce the mycelium to secrete extracellular phenoloxidase in large amounts. On non-denaturing acrylamide gels the extracellular enzyme appears to be the same as the membrane-associated one. From silver stained denaturing gels we have discovered that only this enzyme is secreted. The phenoloxidase is secreted under conditions that cause total cessation of growth (elongation) but not protein synthesis. Confrontation with a species of *Penicillium* that causes total inhibition of growth of *C. congregatus* results in copious secretion of the phenoloxidase as an extracellular enzyme. Lowering the pH to 3.5-4.5 in the presence of small oligosaccharides also causes growth inhibition and enzyme secretion. Such secretion can continue for at least a week in the absence of any visible growth. Any change in conditions that permits the slightest growth cuts of the phenoloxidase secretion and the enzyme becomes an intracellular membrane associated one.

**Ross, I. K., see Kerrigan, R. W.**

**SONALI ROYCHoudhury, MARTHA J. POWELL, AND WILL H. BLackwell.**
Department of Botany, Miami University, Oxford, OH 45056. Parsimony analysis of the phylogeny of Chytridiomycetes using ultrastructural characters.

Study of the ultrastructure of the zoospore has contributed to hypothetical reconstruction of the phylogeny of the Chytridiomycetes. Phylogenetic analyses have only recently been applied to quantify the degree of similarity of members of this class. The resulting phenogram has been compared to the existing classification system. No cladistic study, however, has been applied to the Chytridiomycetes. This study remedies this deficiency by using parsimony techniques to develop plausible hypotheses of the evolutionary history of the taxa comprising the Chytridiomycetes. This cladistic analysis has been conducted to expand earlier phylogenetic studies in order to obtain a better understanding of the relationships of the members of this group. Taxonomic implications of these analyses and comparison of methods and results are discussed. We have attempted to arrive at a consistent and logically satisfying scoring method to yield a single most parsimonious tree.

E. RUIZ-FLORES1, E. LOPEZ-ROMERO1,2, A. FLORES-CARREON1,2 and J. F. GUTIERREZ-CORONA1. Instituto de Investigación en Biología Experimental, Fac. de Química Universidad de Guanajuato. Apartado Postal 187, Guanajuato, Gto. 36000, México. (1) and Departamento de Genética y Biología Molecular, CIWVISTAV del IPN; México, D.F. (2). Altered expression of chitin synthetase activity in a developmental mutant of Phycomyces.

In germinating spores from wild-type *Phycomyces blakesleeanus* cell wall composition shifts from a glucose-type polymer (dormant spore wall) to a chitin-like polymer (vegetative mycelium wall). Chitin synthetase activity has been undetectable in extracts prepared from dormant spores, but becomes detectable and increases after 4h of germination.

We found that the developmental mutant S356 of *Phycomyces*, which is affected in the pattern of sporangiophore production, makes spores which stain in high proportion with Calcofluor-white. Protease-activated extracts from S356-derived dormant spores showed a much higher chitin synthetase activity than those found in extracts from the wild-type strains C5 and NRRL1555. In extracts of the mutant strain, but not in those from the wild-type strains, chitin synthetase activity could be detected without exogenous proteolytic activation. Such high chitin synthetase activity in the mutant extracts was not affected by a mixture of protease inhibitors. Chemical analysis of the cell walls of spores from the mutant and the wild-types revealed that there were not differences in the chitin and chitosan content, though the mutant cell walls contained significantly higher amounts of protein and uronic acids. Results are discussed in relation to the mechanism of regulation of chitin synthetase and development in this organism.

J. RUIZ-HERRERA. Centro de Investigación y Estudios Avanzados and Universidad de Guanajuato. P.O. Box 187, Guanajuato, Gto. 36000, Mexico. Role of calcium and proton currents in wall growth.

It is characteristic of filamentous fungi to accumulate a great number of apical microvesicles. Considered to be the equivalent of the "Spitzenkorper" it is generally assumed that they are responsible for fungal apical growth. The mechanisms involved in vesicle migration are open to discussion. In order to gain information on the mechanisms involved in the process, we studied the effect of numerous inhibitors affecting different cellular functions on chitin bi-
The secondary zospore of the oomycete Aphanomyces serves as an important means of dispersal for this organism, yet the function of many of its organelles remains unknown. One such organelle in saprolegnaceous fungi is the kinetosome-associated organelle termed the K-body. Previous work on the K-body in Saprolegnia suggests a role in adhesion of cysts to the substrate. In a portion of the matrix, the tubule filled cavity, carbohydrates have been localized cytologically; and hence, this portion of the organelle contains material thought to be used in adhesion. Unlike the K-body in Saprolegnia, the K-body of Aphanomyces is composed and consists entirely of tubules with a slightly different structure from those seen in Saprolegnia. The purpose of this study is to use the silver methenamine technique to detect possible sites of carbohydrates in the K-body of Aphanomyces in an initial attempt to determine if K-bodies in these two genera are functionally homologous. Fine structure and composition of the K-body in Aphanomyces euteiches will be described and possible functional correlations will be discussed.

T.C. SEWALL and J.C. POMMERVILLE. Department of Biology, Texas A&M University, College Station, TX 77843. Gametogenesis in Allomyces macrogynus.

osynthesis in vivo by Phycomycetes germlings. Of these, this acid known as "renal sac" of molgidul tunicates (phylum Chordata). The consistency of the association suggests that this symbiosis may be a mutualism. In at least some molgidul species, however, the symbiosis involves a third taxon as well. Electron microscopy indicates the presence of Nephromyces of intracellular inclusions of prokaryote morphology. They are especially conspicuous in the trophic (filamentous) stages of Nephromyces, but are also present in reproductive stages. DAPI and mithramycin stains confirm the presence of DNA in the inclusions; differential staining patterns suggest that the DNA content of the inclusions differs qualitatively from that of either the nuclei or mitochondria of Nephromyces itself. Based on the presence of DNA, and on their strong ultrastructural resemblance to gram-negative bacteria, these inclusions are identified as bacteria. Bacteria have been found thus far in Nephromyces isolated from Molgula occidentalis, and from both field-collected and laboratory-raised populations of M. manhattensis. This suggests the possibility that intracellular bacteria are a consistent, general feature of Nephromyces, and broadens the possible taxonomic, metabolic and ecological dimensions of the Nephromyces-molgulid symbiosis. The possible role of symbiotic bacteria in Nephromyces' striking urate oxidase activity will be discussed.

Salkin, I. F., see Dykstra, M. J., et. al.


Batistia annulipes is an ascomycete that is virtually impossible to misidentify yet the individual characters that it presents are so highly generalized that it is impossible to convincingly place it into an order. Colonies derived from single ascospores of B. annulipes were black and produced dark, Phialophora- or Chloridium-like phialides from which unicellular conidia were produced in slimy chains. Ultimately conidiomata that mimicked the teleomorph formed in culture. Identical conidiomata were found in nature associated with ascomata of B. annulipes. Phialides and conidia identical to those in culture formed on the capitulum of the conidium. These conidiomata are identified as Acrostroma annelioynema. The formation of the phialides excludes Batistia from the Xylariales. The Pyrenomycete order with the largest concentration of species that have similar phialides, black ascomata, and brown ascospores is the Sordariales. Batistia is accordingly assigned to that order. Batistia is not considered to be related to Cephatotheca in spite of its cephalothecoid peridium. Because Batistia does not appear to have any close relatives, we refer it to its own family in the Sordariales.

Sanchez, Y., see Ellzy, J. T., et. al.


We have found that a novel genetic mechanism, operating in the period between fertilization and karyogamy, recognizes duplicated chromosomal segments and alters them. The mechanism efficiently inactivates both copies of duplicated genes. At the DNA level, the position of restriction sites change and cytosines in the duplicated region become methylated. The existence of this process, termed "RIP" (rearrangement induced premeiotically), was discovered by studying the fate of transforming DNA through a cross. Sequences already represented in the host became altered at extremely high frequencies. Both elements of the duplication, that from the transforming DNA and that from the host, became rearranged, whether or not they were elements of the duplication, that from the transforming DNA and that from the host, became rearranged, whether or not they were sequences. On the other hand, foreign sequences are not immune to RIP process. The RIP does not depend on foreign sequences. On the other hand, foreign sequences are not immune to the process. Nevertheless, exceptional sequences exist, such as rRNA genes, which are not normally subject to RIPing.

A variety of chromosomal rearrangements have the effect of creating duplications, either immediately, or after recombination involving parental and rearranged chromosomes. We suggest that the RIP process may serve to maintain the gross organization of the genome. In addition, RIPping could contribute diversity to the process of evolution. As part of our broader studies on DNA metylation in Neurospora, we are currently investigating the basis of the apparent association between metylation and sequence alterations in the RIP process.

T.C. SEWALL and J.C. POMMERVILLE. Department of Biology, Texas A&M University, College Station, TX 77843. Gametogenesis in Allomyces macrogynus.
Gametogenesis in the Chytridiomycete Allomyces macrogyrus occurs by the sequential formation of flagella, cleavage furrows, and the nuclear cap resulting in uninucleate, uniflagellate gametes. Gamete cleavage requires the formation of a gamete plasma membrane and a nuclear cap membrane, the origins of which are obscure. As A. macrogynus lacks the stacked Golgi complex responsible for cleavage membrane formation in other zoosporic fungi. We demonstrated ultrastructurally that cleavage furrow formation was virtually complete within the first 25 minutes of gametogenesis. When the Golgi complex inhibitor, monensin, was added during gametogenesis, cytoplasmic cleavage was disrupted but not nuclear cap formation. In addition, nuclear cap membranes but not cleavage furrows were stained in induced gametangia that were impregnated with zinc iodide-osmium tetroxide, an ER-specific marker. Activities of Golgi and ER membranes were found at separate buoyant densities which corresponded to known values for Golgi and ER from other systems. A. macrogyrus, then, does appear to contain non-stacked Golgi cisternae which are the probable origin of new gamete plasma membrane formed during gametogenesis.

Shamsai, R., see Tansey, M. H., et. al.

C. A. SHEarer. Department of Plant Biology, University of Illinois, 289 Morrill Hall, 505 S. Goodwin Ave., Urbana, IL 61801. Pseudohalonectria (Lasiosphaeraceae), an antagonistic genus from wood in freshwater.

Pseudohalonectria Minoura & Muroi was established in 1978 for P. lignicola, an ascomycete found on balsa wood submerged in a Japanese lake. Pseudohalonectria lignicola and five new species of Pseudohalonectria have been isolated from wood in freshwater and are able to complete their life cycles in axenic culture. These fungi are described and illustrated. All six species are similar in overall morphology and produce bright yellow to brownish perithecia, asci with thimble-shaped apical apparatuses, long, septate, tapering paraphyses and hyaline, phragmosporous ascospores. All of the species produce yellow pigmented hyphae in culture, stain wood on which they grow yellow, and produce soft-rot cavities in balsa wood. All Pseudohalonectria species inhibit the hyphal growth of other filamentous fungi in paired culture; there is, however, considerable variation among species in their susceptibility to inhibition by other fungi.

R. V. SHUKLA. Department of Botany, C.M.D. College, Bilaspur, M.P., India, 495 001. Loss of pigmentation in fungi at high temperature.

Körha, an industrial town in Bilaspur District of Madhya Pradesh, India is well known for abandoned coalfields and high ambient temperature. During investigations of thermophilic fungi, three melanin-deficient white strains derived from the blue green fungus Aspergillus Fumigatus and Penicillium citrinum and the black pigmented fungus Scytalidium thermophilum were collected from warm habitats of the coal mines. The constant high temperature and the pressure of organic matter in the mines considerably affect the pigment production in fungi. The above thermotolerant albino strains have been considered useful to correlate and to concentrate over the disease hypomelanosis or amelanosis (leucoderma) in humans inhabating conditions under maximum atmospheric room temperature 30-48°C and other environmental pressure in the region. The temperature, nutritional and chemotaxonomic studies of different mesophilic, thermotolerant, thermophytic species belonging to the same genus of fungi may lead to both the melanization and loss of pigmentation in warm blooded man and animal life subjected to unfavourable conditions in the environment.

A. J. SKANSKIAKE and R. T. BAHLIN. Dept. of Plant Pathology, University of Georgia, Athens, GA 30602. Developmental studies in Phyllachora maydis.

Phyllachora maydis, a foliar pathogen of Zea mays, is a tropical member of the Phyllachorales. Initial stages of perithecium development occur in the mesophyll parenchyma of the host. Development in P. maydis begins with a deeply staining ascogonium followed by the appearance of a coil. The coil is surrounded by enveloping hyphae that form the perithecial wall. Centrum development proceeds with the growth of paraphyses which fill the centrum. No pseudoparenchymatous cells were observed. The ascogenous hyphal system forms a basal hymenium. Asci  grow up among the paraphyses, which persist to maturity. An ascus develops in a lycogenous manner, lined with paraphyses. Centrum development is of the Xylaria-type.

Smalley, E. B., see Chen, M. M.

M. L. SMITH and J. B. ANDERSON. Department of Botany, Erindale College, University of Toronto, Mississauga, Ontario, Canada, L5L 1C6. Identification of biological species of Armillaria with mitochondrial DNA restriction fragment length polymorphisms.

Members of the genus Armillaria are important root pathogens occurring on a wide variety of host plants. Through mating tests it is known that Armillaria is comprised of several intersterile groups or biological species. In this study, restriction fragment patterns were assayed by Southern hybridizations of whole-cell DNAs with radiolabeled mitochondrial DNA and with cloned mitochondrial DNA fragments from one isolate of biological species I. UPGMA (Unweighted Pair-Group Method using Arithmetic means) cluster analysis of the fragment patterns consistently recognized the biological species as distinct. In all isolates tested, the biological species could be identified by mitochondrial DNA restriction fragment patterns. We are now using restriction fragment length polymorphisms to examine mitochondrial inheritance in crosses, to compare the distributions of mitochondrial and nuclear markers in natural populations, and to infer phylogenetic relationships among North American and European biological species with outgroup comparisons.

KAREN SNETSELAAR and KENNETH D. WHITNEY. Department of Botany, Iowa State University, Ames, Iowa 50011. Mycorrhizal calcium oxalate in Monotropa uniflora.

Light and scanning electron microscopy revealed crystalline deposits in mycorrhizal roots of Monotropa uniflora collected in Iowa. Polarization microscopy demonstrated a conspicuous birefringent zone within the fungal mantle. Energy-dispersive x-ray microanalysis of individual crystals yielded emission spectra with strong calcium peaks, and silver nitrate/dithiooxamide staining indicated that the crystals are composed of calcium oxalate. Although Monotropa mycorrhizae are unusual in the limited fungal penetration of host cortical cells and in the heterotrophic nutrition of the plant, the external fungal mantle is well-developed and resembles that of many ectomycorrhizae.
A number of ectomycorrhizal fungi produce calcium oxalate in culture and in vivo. In the presence of high-calciuim substrates, mycorrhizal forest trees have been shown to exhibit enhanced growth when compared to similar, non-mycorrhizal trees. This suggests that fungal regulation of calcium may be an important feature of mycorrhizal symbiosis. In Monotropa, the mycobiont appears to sequester calcium -- as calcium oxalate -- in a specific region of the fungal mantle.

MITCHELL L. SOGIN. National Jewish Center for Immunology and Respiratory Medicine, 1400 Jackson St., Denver, Colorado 80206. Evolutionary diversity within the Fungi and their phylogenetic relationships to other eukaryotes.

The phylogenetic relationships among representatives of several fungal lineages and other eukaryotes were explored by comparing the sequences of their small subunit ribosomal RNA coding regions. Phylogenetic trees constructed by distance matrix methods estimate the extent of genetic diversity and relative branching order for several fungal lineages including the Chytridiomycetes, Basidiomycetes, Zygomycetes, and a number of Ascomycetes. The separation of fungi from other eukaryotes occurred after the branching of plants, animals, and a number of protist lineages. This period of massive evolutionary radiation occurred well after the early branching displayed by diplomonads, microsporidians, euglenoids, and kinetoplastids. The phylogenetic relation of oomycetes to other protist lineages and the taxonomic placement of "Pneumocystis" within the Fungi or Protista will be discussed.

Specht, C. A., see Ullrich, R. C., et al.
F. W. SPITZEL. Department of Botany and Microbiology, University of Arkansas, Fayetteville, AR 72701. The microtubular cytoskeleton of the various amoebae of protozoa.

The protozoa have a variety of different types of amoeboid cells ranging from amoeboid flagellates to uninucleate amoebae to plasmodia. These forms of amoeboid cells which never become flagellate are referred to as obligate amoebae and have been hypothesized to have evolved independently in several different lineages of protozoa that are derived from a common flagellate ancestor. One test for this hypothesis is to compare the microtubular cytoskeletons of the amoeboid states of several flagellate protozoa to look for patterns of similarity and difference. Five species of flagellate protozoa were treated with a monoclonal antibody to tubulin and examined with indirect immunofluorescence. Amoeboidflagellate states of all species had similar flagellar and profilagellar apparatuses and varied mainly with respect to the abundance of other cytoplasmic microtubules. The microtubular cytoskeletons of the obligate amoebae were distinct both from each other and from the amoeboidflagellates of their respective species. These results tend to support earlier suggestions based on ultrastructure that the protozoa evolved from a common flagellate ancestor and that several clades evolved obligate amoebae independently.

Supported by NSF Grant BSR 8600639.

Spiegel, F. W., see Miller, S. W.
Spotts, R. A., see Michelides, T. J.

PETER D. STAHL and M. CHRISTENSEN. Department of Botany, University of Wyoming, Laramie, WY 82071. Population variation in Glomus mosseae.

Experiments were conducted to examine the population dynamics of the broadly distributed vesicular-arbuscular mycorrhizal fungus Glomus mosseae. Uniform garden studies, which have been widely used to clarify concepts of population differentiation and ecotypes in plants, were employed to determine if population variation in G. mosseae is the result of genetic differentiation or phenotypic plasticity.

Isolates of this common root endophyte obtained from diverse habitats in Arizona, California and Colorado were subjected to uniform garden studies in the field, greenhouse and laboratory. Both direct observations of the fungi and their effects on host plant growth and physiology were used to assess variation among the populations.

Under identical environmental conditions, the individual G. mosseae isolates differed in spore germination, hyphal growth, formation of mycorrhizae, spore production and influence on host biomass yield, tissue phosphorous content and water relations. These results are interpreted as an indication that genetic differentiation is the mechanism that allows for such wide distribution of this fungus and that the individual isolates tested are genetically different ecotypes.

JACK S. STATES and CAROL L. COOK. P. O. Box 5640 Northern Arizona University, Flagstaff, AZ. 86011 Seasonal patterns of fruitbody production by epigeous and hypogeous fungi associated with Ponderosa pine.

Fruitbody production of hypogeous and epigeous fungi associated with different age-class stands of Ponderosa pine was studied over a three year period. A major portion of the total annual fruitbody biomass was attributed to hypogeous fungi, particularly those in the young age-class stands. During periods of high moisture and temperature the diversity, abundance and biomass of epigeous fungi exceeded that of the hypogeous fungi. This result was most pronounced in the mature age-class stands. Artificial irrigation of selected pine stands stimulated fruitbody production of saprophytic fungi during the dry season. Fruitbodies of the mycorrhizal fungi appeared earlier in sites with irrigation treatment but they occurred in abundance only in late summer and fall. The positions of fruitbodies within the stands were mapped and the distinctive distribution patterns for major species are presented and discussed. The result of greatest importance was a marked difference in fruiting response as influenced by environmental factors and host association.

STOVALL, M. E. Department of Botany, Louisiana State University, Baton Rouge, LA 70803. Two forms of Balanisia cyperi infecting Cyperus spp.

Balanisia cyperi Edg. was first described from the sedge Cyperus virens Michx. The fungus has also been reported on C. rotundus L. based upon the presence of a hypogalium on the inflorescence, a host/fungal character that is an important feature of species of Balanisia. Infected populations of C. virens and C. rotundus have similar geographical distributions. Comparative laboratory and field studies were used in an attempt to determine if fungal isolates from C. virens and C. rotundus are similar. Ascomata were never observed in natural populations nor on artificially inoculated plants of both species of sedge. Fungal isolates from both sedges had almost identical growth rates and morphologies when cultured on six different artificial media. However, there were significant differences in success of artificial infection. When C. rotundus was inoculated with a conidial suspension of B. cyperi from infected inflorescences of C. rotundus, 63% of the plants became infected; 3% infection resulted when C. rotundus was inoculated in a similar manner with B. cyperi from C. virens. Balanisia cyperi appears to exist in at least two forms which exhibit host specific-
ity. This may be common throughout the Balansiae and would explain literature reports of selective infection of several host species growing in close proximity.

J. B. SUTHERLAND. Department of Bacteriology and Biochemistry, University of Idaho, Moscow, ID 83843. Acid protease regulation in the white-rot fungus Phanerochaete chrysosporium.

Mycelia of the white-rot fungus Phanerochaete chrysosporium (Corticidaeae), grown on malt extract agar, were used to inoculate flasks of a liquid medium at pH 5.5 containing D-glucose as a carbon source, ammonium chloride as a nitrogen source, and magnesium sulfate as a sulfur source. Three-day-old mycelia grown in this liquid medium to stationary phase at 27°C were washed with sterile 0.1 M sodium acetate buffer at pH 5.5 and transferred to an induction medium containing a soluble protein (bovine serum albumin), a peptone (Difco Neopeptone), or no supplement. Some of the mycelia were transferred to media lacking glucose, ammonium chloride, or magnesium sulfate. After 24 hours, culture media were assayed for extracellular acid protease activity; denatured hemoglobin at pH 5.2 was the substrate and ninhydrin was the detection reagent. Phanerochaete chrysosporium produced acid protease activity in media containing soluble protein or peptone regardless of the presence of other carbon, nitrogen, or sulfur sources. However, under these conditions, attempts to derepress the enzyme by simply omitting glucose, ammonium chloride, or magnesium sulfate from the medium were insufficient for the production of acid protease.

Szansiszlo, P. J., see Cooper, Jr., C. R.
Szansiszlo, P. J., see Cooper, Jr., C. R., et. al.

M. R. TANSEY, R. SHAMSAI, and S. L. PEARSON. Department of Biology, Indiana University, Bloomington, IN 47405. Mycology teaching laboratory applications of a modification of the Gaur & Lichtward rapid technique for screening soil samples for Histoplasma capsulatum Darling: 4 years' experience.

Soil samples contaminated with bird or bat feces were screened for macroconidia of *H. capsulatum* using a slightly modified version of the visual technique of Gaur and Lichtwardt (Mycologia 72:259, 1980). Four classes, each of 20-25 students, applied this technique to field samples they collected. The laboratory exercise was adapted to a study of microfoci of occurrence of *H. capsulatum*, in which 25 evenly spaced samples were taken from a 1-meter quadrat; it was also used to examine residential birdfeeder stations. Students were inclined to report negative samples as positive for *H. capsulatum*; use of culture-proven positive controls and other authentic material helped to correct this error. A detailed laboratory exercise handout describing the rationale, protocol, and safety procedures is available; this includes comments for the instructor. Student evaluations of this laboratory exercise were highly positive, and most found the handout sufficient for use without supplementary instruction.

ISABELLE I. TAVARES. Herbarium, Department of Botany, University of California, Berkeley, CA 94720. Thaxter, the Laboulbeniales, and the future.

Thaxter's awareness of defects in his classification system of the Laboulbeniales, based on antheridia characters, has led to the establishment of a new system based on perithecial characters. His inability to demonstrate spermatization conclusively suggests a new area of investigation. The proliferation of species that occur in different positions on host insects shows the need for experimental studies. Reports of haustoria in unrelated genera suggest the need for further investigation of haustorial structure and of cytological changes induced in hosts, as well as the mechanism of nutrient absorption in those taxa lacking demonstrable haustoria. Modifications of the apical cells of perithecia that facilitate spore discharge should be investigated, particularly with transmission electron microscopy. The stigmata-like structures on receptacle cells of *Rhachomycetes* also should be examined anatomically. The apparent disappearance of cell walls during perithecial maturation in some genera should also be studied, using electron microscopy.

Taylor, T. N., see White, Jr., J. F.

D. TE STRAKE, D. LIM, and M. DYKSTRA. Biology Dept., University of South Florida, Tampa 33620 and College of Veterinary Science, North Carolina State University, Raleigh 27607. Florida Lesioned Fish - Tale of the Zeoprose?

Oomycetes appear to be a major factor in Ulcerative Disease Syndrome of menhaden and other estuarine fish along the Atlantic seaboard. While most of the lesions in fish collected in the St. Johns River in 1987 contained species of *Vibrio* and/or *Aeromonas*, not all contained fungi. The distribution of Oomycetes in this river was monitored monthly at 5 stations ranging in salinity from 0.0/oo to 9.0/oo. Both carbohydrate and protein baits were used to collect an array of water molds. A number of these were isolated and physiologically surveyed for selected enzyme activities. Studies in the Pamlico River of North Carolina revealed no recoverable Oomycetes from mid-channel where lesioned fish were collected. Similar observations were noted from the St. Johns River, but these fungi were readily collected from the shoreline. This habitat information will be discussed in relationship to the occurrence of fish lesions.

H. D. THIERS. Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132. Correlation Of Habitats In California As An Aid In Formulating Species Concepts.

The thrust of this paper is to elaborate upon the possible role of ecological niches in defining a species of fleshy fungi. California has a number of very distinct habitats that support a surprisingly large number of these fungi. Many of these niches are characterized by major differences in temperature regimes, available moisture, relative humidity, soil, and phanerogamic vegetation. The most favorable site is one that is supporting the greatest diversity and abundance of higher Basidiomycetes, the mesic coastal forest in the northern half of the state. The forests in the mountains not only support a diverse mycota but are also the site of significant evolutionary diversity of fleshy fungi. Other so-called niches, each of which supports a distinctive mycota, include the sand dunes along the coast, the deserts in the southern part of the state and the snow banks in the mountains. The value of mycorrhizal associations is difficult to overestimate as accounting for the diversity of species. In the future more attention must be given to the constituents of the soil and their effects upon the evolution of species of these fungi.
As presently recognized the genus *Gastroboletus* consists of sectozioid boletes related to at least those different from the sporocarps. In an effort to form a more coherent grouping of these fungi the following new classification is proposed. Those species having affinities with the genus *Suillus*, those having affinities with *Leccinum* will be transferred to the new genus *Gastrosuillus*, and those related to *Boletus* will remain in *Gastroboletus*. In *Gastroboletus* sectozioid species of at least two different sections have been described. Those related to species in section Boletus will be placed in section *Gastroboletus* and those related to species in section Submentosii will be put in section *Gastrosubmentosii*.

D.D. THOMAS. Department of Biological Sciences, University of Windsor. **Endogenous developmental pathways of asexual spores of Achlya sp.: effects of calcium and antieridiol.**

The Oomycete genus *Achlya* is characterized by asexual spore encystment immediately after emergence from the sporangium. The subsequent development of these cysts in the absence of exogenous nutrients was examined. If the freshly emerged cysts are maintained in the original sporulation induction medium (5 x 10^{-4} M CaCl₂ or deionized distilled water) under static conditions at room temperature, they serve as sporangia and each releasing a secondary zoospore. If shaken at room temperature for 12 hours, the cyst preparation yields spores that germinate by means of germ tubes. *Endogenous germination and germ tube elongation*, which may be extensive (over 1.5 mm from a spore with a diameter of 15 microns), depend on the calcium concentration in the medium. In a homothallic *A. pseudohilatella* both such germ-lings respond strongly to antieridiol, producing antieridial branches not only from the germ tube, but also from the spore itself. This demonstrates the precocity of sexual responsiveness in a homothallic isolate, and confirms previous work showing that exogenous nutrients are not a prerequisite for the antieridial response.

D. P. THOMPSON, Health Research Center and Biology Department, P.O. Box 9672, Southern University, Baton Rouge, LA 70813. Effect of carvacrol on growth of *Aspergillus* species in vitro.

Carvacrol, a major component of thyme oil, was screened for antifungal activity against spore germination and mycelial growth of eight toxigenic fungi. The toxigenic fungi included six strains of *Aspergillus flavus* and two strains of *Aspergillus parasiticus*. The Micro-atmosphere method of Keller and Kober was used to test the efficacy of carvacrol. Filter paper discs (5-mm diameter), soaked with variable amounts of carvacrol (5, 10, 20, 50, and 100 μl), were placed in the center of the Petri plates. The surface of potato dextrose agar was streaked in radial lines with conidiophores of the test fungi. The Petri plates were then turned upside down, placed in plastic bags and incubated for 7 to 14 days at 27 C. After the incubation period, the plates were observed for total or partial inhibition of growth. Total inhibition of spore germination and mycelial growth was reached with a minimum of 5 μl of carvacrol against the eight strains of toxigenic fungi. Carvacrol may be employed against the growth of other toxigenic fungi and as a possible alternative naturally occurring fungitoxic agent.

R.G. THORN and D.W. MALLOCH. Department of Botany, University of Toronto, Toronto, Ontario, Canada, MS 1A1. *Piptoporus pseudobetulinus*, a polypore new to North America, and a white-rotter in a brown-rot genus.

*Piptoporus pseudobetulinus*, considered a rarity and previously known only from Finland and the U.S.S.R., has recently been collected in Ontario. The collections are remarkable in several ways. Firstly, the species appears common in Ontario and can be collected wherever suitable habitat is found. Fruiting occurs in late spring and fruiting bodies are short-lived, perhaps explaining how the species could have been overlooked. In Eurasia *Piptoporus pseudobetulinus* is host-specific to *P. tremula*. In Canada it is restricted to *Populus balsamifera* and does not occur on *P. tremuloides*, even though the latter is considered the North American vicariant of *P. tremula*. *Piptoporus pseudobetulinus* causes a motiled white rot and reacts positively for laccase and peroxidase, but negatively for tyrosinase. In contrast, *Piptoporus betulinus* causes a cubical brown rot and lacks laccase, peroxidase and tyrosinase. These differences pose interesting questions about cultural character and taxonomy at both generic and specific levels.

P. W. TOOLEY, Foreign Disease-Weed Science Research, USDA-ARS, Frederick, MD 21701. Genetics and biology of *Phytophthora infestans* populations.

Central Mexico is believed to represent the center of coevolution between *Boletus* species and *Phytophthora infestans*, causal agent of potato late blight. Both mating types (A1 and A2) of the fungus exist in nearly equal frequency in Mexico. In contrast, only a single mating type (A1) has been found outside of Mexico until recently, restricting non-Mexican populations to asexual reproduction. In 1984 and 1985 however, the A2 mating type was reported to occur in several European countries, making sexual reproduction now possible in non-Mexican *P. infestans* populations. Population studies aimed at assessing the role of the sexual stage in generating pathogenic variation were initiated in 1983. Isozyme markers were used as neutral measures of population diversity. The Mexican, sexual population was found to be more diverse at isozyme and virulence loci, compared with isolates from the U.S., Canada, Europe, and Peru. Ploidy differences were also found to exist between sexual and asexual populations. Cytological studies indicated that Mexican isolates were diploid, while British isolates were tetraploid or of mixed ploidy. These results were supported by recent studies in which Feulgen-DNA cytophotometry was used to measure nuclear DNA content. Mexican isolates contained about one-half the DNA of most U.S., European, and Peruvian isolates. Non-Mexican isolates appeared to include some diploids, but also triploids, tetraploids, and aneuploids. Relationships among mating type distribution, ploidy level, and genetic and pathogenic diversity need to be clarified to better understand the population biology and evolution of *P. infestans*.

Tortolero, O., see Hanlin, R. T.

Turner, B. C., see Perkins, D. D.

F. A. UECKER. USDA, ARS, Systematic Botany, Mycology and Nematology Lab, BARC-West, Beltsville, MD 20705. The conidiogenous apparatus in *Phomopsis*. 

H. D. THIERS. Department of Biology, San Francisco State University, 1600 Holloway Ave., San Francisco, CA 94132. **Gastroboletus Revisited.**
The conidiogenous layer arises early in development of the conidioma, produces conidia for a few days, and is then lost. Older conidiomata may contain many conidia but no conidiogenous cells. Conidio- phores are composed of several cells, each of which may become conidiogenous. Each cell is uninucleate, the nucleus migrating into the conidium after the conidium is nearly its maximum length. Conidium formation is enteroblastic and phalidical. Alpha- and beta conidia are formed in the same conidioma from conidiogenous cells that may be morphologically similar or different. Usually a conidiogenous cell produces a single conidiogenous locus, but sometimes two are formed. Similarities and differences between alpha and beta conidiogenous cells within the same conidioma, between isolates, and between species are discussed.

Ullah, A. H. J., see Wilfred, A. G., et al.

Ullrich, R. C., see Buckner, B., et al.

R. C. ULLRICH1, L. GIASSON1, C. MILGRIM1, C. A. SPECHT1 and C. P. NOVOTNY2. Departments of Botany and Microbiology, University of Vermont, Burlington, VT 05405. Isolation of Aa mating-type genes and directed alteration of mating type of Schizopyllum commune by genetic transformation.

The multiallelic mating-type (or incompatibility) genes are master regulatory genes that control the life cycles of Basidiomycetes. They are thought to encode molecular switches whose three-dimensional conformation controls the expression of other nuclear genes. We isolated the Aa4 mating-type allele by walking the chromosome from PAT1 in a cosmid library made with DNA from an Aa1 strain. Cosmids containing Aa4 DNA were recognized by transformation of Schizopyllum.

The cosmid insert containing Aa4 was used to probe a cosmid library made with DNA from an Aa1 strain to isolate the Aa1 allele. Investigators in several laboratories have been unable to alter mating-type specificity by autogenesis or recombination in either of several species of Basidiomycetes. On the contrary, transformation of Schizopyllum with Aa DNA has been shown by mating tests and genetic analysis of progeny to alter the Aa-dependent mating-type specificity of recipient cells. Transfomants and progeny exhibit the Aa mating type of the source strain for the transforming DNA or of pseudo-heterozygotes carrying the Aa alleles of both the recipient and the DNA donor.

K. VÄNKY, Universität Tübingen, Institut für Biologie I, Spezielle Botanik, Auf der Morgenstelle 1, D-7400 Tübingen 1, W. Germany.

Spore morphology in the taxonomy of Ustilaginales.

After a short historical review the morphological characters used in the classification of Ustilaginales are enumerated. The most important of these are considered to be spore size and spore surface ornamentation. A classification of spore surface ornamentation is proposed, based on results obtained by SEM. The proposed classification permits an accurate description of surface ornamentation including qualitative and quantitative differences and even combination of several characters which may be present concomitantly. The limits of usable information, stemming from, for example, variability or hybridization, are also analysed. The correlation between spore surface types and genera are discussed. Examples are given where species and genera are distinguished by spore morphology.

Rytas VILGALYS, Department of Botany, Duke University, Durham, NC 27706. Molecules and morphology in mushroom systematics: Phylogenetic analysis of the Tricholomataceae.

The phylogenetic history of fungi remains a mystery. Progress in understanding phylogeny of the Agaricales has been slow because of their poor fossil record, phenotypic plasticity, and general mycological unawareness of robust analytical approaches to phylogenetic reconstruction. The higher Basidiomycotina present an ideal group for phylogenetic studies. The higher morphological complexity of agarics provides a larger number of phylogenetically informative characters than in other fungi. Rigid intraspecific and interspecific systematic relationships are not apparent and thus facilitates cladistic analysis. The recent advent of molecular approaches to phylogenetic studies now provide a potentially unlimited supply of systematic data for the mycologist. Molecular data are qualitatively different from morphological evidence, and provide an independent source of phylogenetically useful information. I
will present results of several phylogenetic analyses of the agaric family Tricholomataceae, based on data from DNA hybridization, rDNA restriction mapping, and morphological/ecological characters. These results will be contrasted with several different classification schemes recently proposed within the family. Several approaches to resolving these conflicting axonimies will be presented.

Vilgalys, R., see Hibbett, D. S.


Yeasts and hyphal cell wall in Mucor rouxii had two distinct polyuronides (I and II). The uronic acid of the wall was equally divided between the two polymers. Polymer I constituted approximately 90% of the uronic acid in both wall types. Hence the content of polymer II was much lower in M. racemosus than in M. rouxii. In addition, the major polymer I in hyphal wall from M. racemosus was resolved by ion-exchanged chromatography into two sub-fractions (IA and IB). The pattern of hyphal polymer I changed as a function of growth time and growth medium. The presence of polymer IA correlated with the presence of arthroconidia in the culture. Short term labeling experiments with 'C-glucose showed a switch from the synthesis of polymer IB to that of polymer IA during arthroconidiation. Polymer IB probably forms part of the wall of those cells with different properties from the major polyuronide of the yeast wall. A comparable change in the pattern of hyphal polymer I was observed in M. rouxii, but this occurred at a later time due to a slower rate of arthroconidiation.

Wells, K., see Digby, S.

Welty, R. E., see Cook, K. L.

H. C. WHISLER. Department of Botany, University of Washington, Seattle, WA 98195. Thaxter's peculiar fungi in 1988.

Thaxter's work on insect and plant parasites did not preclude an active interest in other microfungi found during his frequent forays to the Bostonian wilds. His studies on "new or peculiar" fungi included such diverse groups as the Myxobacteriales, Monoblephariidales, Leptomites, and Ecriniales, as well as the addition of new taxa to the Zygomycetes and Deuteromycetes. A brief review of Dr. Thaxter's fungi, as seen in 1988, re-emphasizes the importance of "peculiar" organisms to contemporary research and future directions in basic biology.

J. P. WHITE, JR. and T. N. TAYLOR. Dept. of Botany, The Ohio State University, Columbus, OH 43210. Sporocarp development in some pre-modern fungi.

The development of the sporocarp walls of several different Triassic fungi collected in Antarctica is examined. Fructifications of these fungi resemble sporocarps of modern Ascomycetes, however, they develop in ways which have not been documented for modern Ascomycotina. In a new species, a thick multicellular layer forms within a thinner preformed layer resulting in a tripartite wall. In another fossil sporocarp the wall develops by a repetitive budding process. From a large central cell numerous smaller cells bud off to form a multicellular outer sporocarp wall layer. Mycocalcium sporocarps develop by the formation of an interwoven mycelial layer surrounding a central cavity. This layer gives rise to a palisade of acuminate cells which produce a thick noncellular inner sporocarp wall. The sporocarp walls in these fungi are compared and the suggestion offered that they have their closest affinities with members of the Endogonaceae.

KENNETH D. WHITNEY and H. J. ARNOTT. Department of Botany, Iowa State University, Ames, Iowa 50011 and Department of Biology, The University of Texas at Arlington, Arlington, TX 76019-0047. Cystidial calcium oxalate crystals in Oxyporus latemarginatus (Aphyllophorales, Basidiomycetes).

Oxyporus latemarginatus, a member of the basidiomycete order Aphyllophorales, produces large, whitish, resupinate basidiocarps on decaying wood. In addition to containing basidia and basidiospores, the pores of this fungus also have cystidia which bear druse-like calcium oxalate crystals. Cultures prepared from mass-spore sowings of O. latemarginatus initiated basidiocarps. When basidiocarps contained basidiospores, along with crystal-bearing cystidia. These basidiocarps consist of slightly elevated plaques of fungal tissue with numerous, embedded calcium oxalate crystals. The crystals are quite large, often up to 80 μm across. The crystals are initiated at the apices of cystidia, coincident with basidiospore initiation, and their growth parallels the development of the basidiocarp. The immobilization of large amounts of calcium oxalate in these crystals suggests a possible regulatory role for calcium during basidiocarp initiation and development.

Whitney, K. N., see Smetselaar, K.

PAUL WIDDEN and SHARON HARNEY. Biology Department, Concordia University, 1435 de Maisonneuve Blvd. W., Montreal, Quebec, H3G 1M8 Canada. The entomopathogen Paeillocyces farinosus: a primary saprophyte on Balsam Fir needles?

We have studied the abundance of microfungi in two Canadian balsam fir forests on freshly fallen litter during two summers. During the past summer we have also monitored fungi on dead needles caught in nets above the ground, before they can be invaded by secondary saprophytes, colonizing from the soil.

Paeillocyces farinosus has proved to be a regular member of the litter flora, often occurring on 20% Czapek-Box agar. We have also found it to be abundant in some samples of dead leaves that were caught in the nets. These data suggest the possibility that the fungus is coming into the litter on needles from the tree rather than invading from the soil.

Further studies in the laboratory indicate that, in pure culture, strains of P. farinosus, isolated from both conifer litter and from diseased spruce-budworms, have an extensive capacity to produce hydrolytic enzymes, can grow actively on sterilized fir litter, and are extremely resistant to desiccation.

These results are consistent with the view that P. farinosus may be an important primary saprophyte on balsam fir needles. If this is so, the fungus may be well situated in the environment to infect spruce
budworms feeding in the canopy. This may explain the high incidence of infection in the budworm populations of these forests.


Physiological requirements for the production of the biopolymer elsinan by species of Elsiniae.

In order to determine optimum environmental conditions for the production of elsinan, the following parameters were evaluated: culture, growth medium, incubation period, pH, carbon and nitrogen sources, and phosphate concentration. A medium was devised for the optimum yields of high, medium, and low weight average molecular weight biopolymer products. Batch systems, scale-up batch, and continuous fermentations of one liter and 10 liters were also evaluated, as were processing conditions. Elsinan biopolymer products with weight average molecular weights from less than 500 thousand to over 4 million, with a dispersity of around two were produced. The chemical/physical properties of these defined molecular weight fractions are now being evaluated.

A. G. WILFRED, A. H. J. ULLAH, and F. W. PARRISH. Southern Regional Research Center, USDA-ARS, P. O. Box 19687, New Orleans, LA 70179. Phosphatases from Aspergillus ficuum.

Inositol hexaphosphate (phytic acid) is an antinutrient in oilseeds used for animal feed. Typically, it binds essential minerals and interferes with the digestibility of starch and proteins. Phosphatases, such as phytase enzyme, from Aspergillus ficuum are capable of hydrolyzing phytic acid, thus eliminating the antinutrient effect. Factors which promote maximal phytase production during A. ficuum fermentation have been established including the type of starches and modified starches used as carbon source, inhibition by inorganic phosphate, and the strain of A. ficuum. An improved sporulation medium for A. ficuum is reported in the present study. Procedures to improve phytase production by A. ficuum have been attempted by mutagenesis of fungal Conidia and screening for mutants with increased phytase production. In addition, properties of phytase enzyme and two other phosphatases from A. ficuum in relation to phytic acid hydrolysis are reported.

M. C. WILLIAMS and R. W. LICHTWARDT, Dept. of Biology, Kearney State College, Kearney, NE 68849 and Dept. of Botany, University of Kansas, Lawrence, KS 66044. A preliminary report on studies of the incidence of Trichomycete gut fungi found in New Zealand and Australia.

We concentrated our studies on arthropod gut fungi of the Trichomycete order Harpellales from aquatic insect larvae but examined some adult marine and terrestrial crustaceans and millipedes which contain species of the order Ecriinales. Several cosmopolitan species of trichomycetes as well as fungal spp apparently restricted to the fauna of New Zealand and Australia were found. The midgut fungus Harpella melaninae was found in most Austrosimilum spp larvae that we sampled and the widespread hindgut fungus Smittium similis was sometimes found in consort with Harpella as well as in several species of chironomidae Larvae. On several occasions bloodworms were infested with the worldwide gut fungus Stachylena grandisporg. A new trichomycete genus of the Harpellales was described with one species in New Zealand and another in Australia. Several new and possibly endemic species of fungi were found in both countries. Host collections in Australia were limited to the eastern and southeastern parts of the country and in New Zealand both the South and North Islands.

W. J. WINGFIELD, P. S. VAN WYN and W. F. O. MARASAS. 1Plant Protection Research Institute, Stellenbosch 7600; 2Department of Plant Pathology, University of the O.F.S., Bloemfontein 9300 and 3Institute for Nutritional Diseases, Tygerberg 7505, South Africa. The taxonomic significance of Ophiostoma species on Proteaceae in South Africa.

We have recently found that species of Ceratocystis sensu lato occur in the inflorescences of Protea in the Western Cape Province of South Africa. The classification schemes for these fungi are almost entirely based on Northern Hemisphere examples and appear to be inadequate for South Africa Proteaceae from Protea. For instance, the recently described Ceratocystis protaeae, with its new anamorphic genus Knoxadiales, was assigned to this genus because it has falcate ascospores. It, however, also shares characteristics with Ophiostoma and Ceratocystis sensu stricto. Adding to the confusion, we have found a closely related fungus with a Knoxadiales anamorph, but which has reniform ascospores and no sheaths. Using the currently accepted classification, this fungus should probably be placed in Ophiostoma. Thus two closely related fungi would be in different genera. Ophiostoma includes species with a wide range of sheath forms and we contend that separate Ceratocystis protaeae from Ophiostoma based on ascospore sheath morphology is illogical. We thus intend to reduce Ceratocystis protaeae to synonymy with Ophiostoma.

C. W. WYN, Department of Botany, University of Hawaii, Honolulu, Hawaii 96822. Utilization of mating, and fruiting studies in defining species of Auricularia.

Currently, species of Auricularia are defined by the morphology of the basidiocarp in cross section. The most characteristic used to define species, in cross section, are the length of the abhynial hairs, the presence or absence of the medulla, and if present, the morphology and width of the medulla. However, morphological examination of Auricularia cornea, A. fuscosuccinea, A. polytricha, and A. tenus by the author, indicates a great deal of variation in these characteristics that have published in the literature. Mating, and fruiting studies were also carried out in the above species, as well as in Auricularia auriculajulude, and A. delicata. The results of these studies demonstrated that the cross section of the basidiocarp was as variable as the author had believed. It was also concluded, based on the sense of Low, that published in the literature. The presence and absence of the medulla, and the length of the abhynial hairs are apparently inherent characteristics, and thus, can be utilized in delimiting species.

W. C. WYN, Department of Plant Pathology, University of Georgia, Athens, GA 30602 USA. Zygospor formation of Rhizopus stolonifer from Taiwan.

Rhizopus stolonifer is a common teaching material in introductory biology in Taiwan. Strains of R. stolonifer have been isolated since 1963 in Taiwan but zygospor formation has never been observed or reported in this area. This study describes and illustrates zygospor formation resulting from mating experiments of plus and minus strains of R. stolonifer isolated from fading flowers in Taiwan. The average dry weights of mycelium of plus and minus strains growing on liquid Synthetic Mucor Agar at 26° C for five days are 0.1253 g and 0.0317 g, respectively. A comparison of the morphology of both strains growing on different media shows that the plus strain has
larger sporangiospores than the minus strain but the sporangiophores of the plus strain are shorter than those of the minus strain. The diameter (90.9-171.1 μm) of zygospores is similar when the two compatible strains were grown on PDA or MEA at 26°C in darkness for five days, but when they were grown on SMA the diameter (111.1-141.4 μm) of the zygospores is smaller.

K. S. YOON, Department of Microbiology, Kangwon University, Chunchon 200, Korea and I. B. HEATH, Department of Biology, York University, Downsview, Ont. M3J 1P3, Canada. Dynamics and ultrastructure of nuclear motility in Pleurotus ostreatus.

To study the behaviours of migrating nuclei, live mycelium of dikaryotic P. ostreatus was examined with phase contrast video microscopy. After a conjugate nuclear division in the clamp, the first three nuclei migrate relatively slowly at rates of approximately 3.5 μm/min, but the migration of the fourth nucleus, which occurs much later (35-45 min), is also faster at 14.7 μm/min. Because the paths and the destinations of these migrations are well known, it is possible to predict the in vivo behaviour of nuclei detected on their migratory paths following fixation. We can therefore correlate the behaviour and the ultrastructure of nuclei moving at different rates and differentiate between the possession of differing motile machinery versus the differential regulation of morphologically constant machinery. We shall present the results of the analysis of correlations between the motile behaviour and ultrastructural data from these nuclei.


Decomposition rates, nitrogen dynamics, and fungal colonization of creosotebush wood on the soil surface in the Chihuahuan and Sonoran Deserts were examined over a 2 year period. Although decomposition rates were low in both deserts, mass loss rates were higher in the Sonoran than in the Chihuahuan Desert. These differences were due to a greater incidence of termite grazing in the Sonoran Desert. Wood in both deserts lost about 40% of its initial nitrogen during the first year. There were no differences in wood nitrogen values between the first and second year. Species composition of the fungal assemblages associated with creosotebush wood in the two deserts was similar, with little change in the composition of these assemblages over time. The high abiotic stresses associated with woody litter in arid
systems (high temperature & low moisture availability) severely restricts the number of fungal species that can successfully colonize this habitat. Basidiomycetes were a major component of the fungal assemblages from the Sonoran, reflecting the long-term woody nature of this ecosystem.

P. L. ZAMBINO and T. C. HARRINGTON. Department of Botany and Plant Pathology, University of New Hampshire, Durham, NH 03824. A reexamination of the mycangial fungi of the southern pine beetle. Isolates from 14 mycangia, 24 exoskeletons, and from galleries of the southern pine beetle (*Dendroctonus frontalis*) were identified by sexual and asexual morphology, by interfertility, and by enzyme electrophoresis. *Opistostoma minor* (Hedge.) H. & P. Syd. was homothallic, occurred in stained wood and galleries, and was isolated from 15 exoskeletons and 5 mycangia. The *Sporothrix* state of *Opistostoma nigrocarpa* Davidson, a heterothallic species, was common in nonstained galleries and frass and was isolated from 9 exoskeletons and 2 mycangia. The *Sporothrix* sp. was very similar in anamorph morphology and enzyme electrophores to *O. nigrocarpa* associated with a closely related bark beetle, the western pine beetle (*D. brevicolus*). The recently described *Ceratocystis ranaculosus* Bridges & Perry was isolated from 8 mycangia. Pairings among mycangial isolates, a culture of *C. ranaculosus* from the type location, and the designated type culture of *Ceratocystis minor* (Hedge.) Hunt var. *barrasii* Taylor produced minute perithecia with ascospores typical of *C. ranaculosus*. *Ceratocystis ranaculosus* was heterothallic, showed differences from the other two taxa in 12 enzymes, and had restricted growth on cycloheximide. No holotype specimen of *C. minor* var. *barrasii* was designated, but the original description of the teleomorph is more similar to *O. nigrocarpa* than to *C. ranaculosus*. On the basis of morphology, interfertility, and isozyme patterns, the type culture (and anamorph description) of *C. minor* var. *barrasii* is conspecific with *C. ranaculosus*.

THE MYCOLOGICAL SOCIETY OF AMERICA
Application for Membership

Date on which you wish your membership to begin: January 1, 19...

Signature of member endorsing your application:

DUES INFORMATION (check one)

<table>
<thead>
<tr>
<th>Membership Type</th>
<th>Dues</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Associate Member</td>
<td>$15.00</td>
<td>(Newsletter only)</td>
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<tr>
<td>Regular Member</td>
<td>$35.00</td>
<td>(Includes MYCOLOGIA and Newsletter)</td>
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<tr>
<td>Emeritus Member with</td>
<td>$35.00</td>
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<td>MYCOLOGIA</td>
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<tr>
<td>Student Member</td>
<td>$15.00</td>
<td>Maximum eligibility: 5 years</td>
</tr>
<tr>
<td>Affiliated Society</td>
<td>$35.00</td>
<td></td>
</tr>
</tbody>
</table>

Complete form and dues are to be sent to Dr. Martha Powell, Treasurer, Dept. of Botany, Miami University, Oxford, Ohio 43065. Phone: (513) 529-4200.
Two hundred one incidents of actual or potential mushroom poisoning were reported to the NAMA Mushroom Poisoning Case Registry in the year ending 30 June 1987. Now in its fifth year of operation, the Registry has accumulated reports of 589 cases.

A brief review of the Registry's mode of operation is appropriate. Reports are invited and accepted from any and all sources in North America— including individuals, organizations, poison centers and health-care providers. Incidents need not be recent and can reflect events from as far back as the reporter is sufficiently confident of the data to complete the report form. In compiling the data no symptoms were rejected or interpolated. No corrections were attempted for observer, patient or volunteer bias. The reported species identifications were not challenged. However, when appropriate, synonyms were recorded and reported for certain of the species or symptoms actually reported. One should keep in mind the limitations of these data. The reporting is voluntary and irregular; therefore, the results cannot be interpreted as representing the actual incidence or distribution of human poisonings or mushroom species. It should also be emphasized that there may not be valid assurance that the ill effects experienced were due to toxicity of a memorable mushroom rather than an unrecognized incidental microbial infection, ingestion of chemical toxicant, or individual allergy or hypersensitivity. In some cases even exposure to a mushroom may be uncertain.

Most of the year's cases (118) represented misadventures with various wild mushrooms as food, but the most typical event involved a child (72 cases) and an accidental (66 of those cases) but asymptomatic encounter with, but not necessarily ingestion of, mushroom (59 cases). Most often such events were treated with ipecac (42 cases) with the dual benefits of prophylaxis and education, but 7 cases were only observed to confirm a continued absence of symptoms.

Only 8 reports of "bad trips", i.e. recreational use of mushrooms to achieve psychedelic effects but with unintended unpleasant consequences were received. Consumption of alcohol was reported in 32 cases, which may have contributed to unfortunate experiences associated with species generally regarded as edible, such as Morchella esculenta, Grifola frondosa, Laetiporus sulphureus, in addition to the predictable Coprinus atramentarius. Non-accidental, non-"recreational" ingestion of raw mushrooms accounted for 13 cases. Only 19 cases involved ingestion of mixed species.

1Part of the 1987 Annual Report of the Toxicology Committee to the NAMA Board of Trustees
Table 1 lists the species of mushrooms involved in the 1986-7 cases associated with a single and named species. Nine species, underlined in Table 1, were reported to the Registry for the first time in the 1986-7 report-year.

Table 2 presents the symptoms of those new species represented by 2 or more cases and for additional species now represented by 2 or more Registry cases. While alcohol may have contributed to the effect of *Tricholoma pardinum* its toxicity has been recognized. *Ramariopsis lentofragilis* has not been listed in the common guidebooks. The remarkable aspect of its toxicity was the pain noted in all 3 cases, severe enough to have been treated with opiates. Only 2 other Registry cases, with 2 other species, record severe pain treated with analgesics.

*Suillus granulatus*, generally regarded as a choice edible, caused allergic dermatitis in 2 individuals; and a similar sensitivity had previously been reported with *Suillus americanus*. It is interesting that all those with allergic reactions to *Suillus* are mycologists. While the toxicity of *Paxillus involutus* is widely recognized, cases, including fatalities, have largely been in Europe. The present cases, 2 particularly severe, were from the Pacific Northwest. Deadly Amanitas have recently been most publicized on the East and West Coasts, but the Registry’s cases involving *Amanita bisporigera*, from Michigan and Ontario, should serve as a reminder that the hazard exists throughout North America.

Recently there has been considerable discussion about the overpicking of wild mushrooms for commercial purposes. Along with this, and sometimes confused with it, is concern about the safety of domestic marketing of non-cultivated mushrooms. Concern is prudent and rational, particularly as the practice spreads and may be involving less knowledgeable participants. To date, however, no case has been reported to the Registry involving commercially sold or served wild mushrooms. Reports of such incidents are particularly invited.

The Mushroom Poisoning Case Registry continues to welcome reports of old or new cases. Special thanks is given to individuals and organizations who have submitted reports.
<table>
<thead>
<tr>
<th>Species</th>
<th>New Cases</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species unknown</td>
<td>75</td>
<td>135</td>
</tr>
<tr>
<td>Mixed species</td>
<td>19</td>
<td>54</td>
</tr>
<tr>
<td><em>Laetiporus sulphureus</em></td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td><em>Amanita verna/viros</em></td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td><strong>incl. definite virosa</strong></td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td><em>Chlorophyllum molybdites</em></td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td><em>Omphalotus olearius</em></td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td><strong>Tricholoma pardinum</strong></td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>Amanita muscaria</strong></td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td><strong>incl. var. formosa</strong></td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td><em>Amanita pantherina</em></td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td><em>Leccinum aurantiacum</em></td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td><em>Panaeolus foenisecii</em></td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td><em>Armillaria mellea</em></td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td><em>Cantharellus cibarius</em></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><em>Grifola frondosa</em></td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td><em>Leptota rachodes</em></td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td><em>Morchella esculenta</em></td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td><strong>Ramariopsis lentofragilis</strong></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><em>Agaricus placomyces</em></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td><em>Coprinus comatus</em></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>Gymnopilus spectabilis</em></td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td><em>Paxillus involutus</em></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><em>Suillus granulatus</em></td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Agaricus augustus</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Agaricus hondensis</em></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><em>Amanita bisporigera</em></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Amanita frostiana</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Amanita gemmata</em></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><em>Amanita smithiana</em></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Calosciypha fulgens</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Coprinus atramentarius</em></td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td><strong>Cortinarius violaceus</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Gyromitra esculenta</em></td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td><strong>Leptota seminuda</strong></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Morchella angusticeps</em></td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td><em>Panaeolus acuminatus</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><em>Pleurotus ostreatus</em></td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td><em>Psilocybe semilanceata</em></td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td><em>Tylopilus eximius</em></td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

*Underline species first reported in 1986-7*
Table 2
Symptoms from Recently Reported Species
2 or more new total cases in 1986-7

<table>
<thead>
<tr>
<th>Species</th>
<th>Cases</th>
<th>Symptoms</th>
</tr>
</thead>
</table>
| *Tricholoma pardinum*; 6 new |       | vomiting 100%
sweating 17%                                                              |
|                              | cases,| reported from Ontario                                                     |
|                              | all with alcohol                                                                 |
|                              | 2 new | cases, all with alcohol                                                                 |
|                              | cases | all with alcohol                                                                 |
| *Ryamariopsis lentofragilis*;| 3 new | pain, chest or abdomen 100%
weakness 100%
intestinal cramps 67%
nausea 33%
tremor 33%                                                                  |
|                              | cases | reported from Maine                                                       |
| *Suillus granulatus*; 3 new  | cases | dermatitis, face 67%
malaise 33%
nausea 33%
diarrhea 33%
head heavy 33%                                                              |
|                              | cases | reported from Colorado and Massachusetts                                  |
| *Paxillus involutus*; 3 cases| cases | #1: dry mouth, blurred vision
#2: incoherent; kidney damage with thirst and polyuria
#3: weakness, muscle spasm, hemolysis, anemia, severe back pain, kidney failure, retinal necrosis, bone marrow damage, cardiac involvement |
|                              | 2 new | reported from Oregon and Washington                                       |
| *Agaricus placomyces*; 2 new | cases | #1: headache, sneezing, rhinorrhea
#2: nausea, sweating, intestinal cramps, vomiting, diarrhea |
|                              | cases | reported from Idaho and Michigan                                          |
| *Amanita bisporigera*; 2 cases| cases | intestinal cramps (2)
nausea
vomiting
diarrhea
muscle spasm
death (1)                                                             |
|                              | 1 new | reported from Michigan and Ontario                                        |
| *Tylopilus eximius*; 2 cases | cases | nausea
vomiting
intestinal cramps (2)
diarrhea (2)
sweating
chills
weakness
disoriented
drowsy                                                                  |
|                              | 1 new | reported from New York and Maine                                          |
## SPECIES AND THEIR SYMPTOMS

### Cumulative Summary

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Cases</th>
<th>Location(s)</th>
<th>Symptoms</th>
</tr>
</thead>
</table>
| **Amanita brunnescens** | 5 | CA | *death*: 80%
| | | | *liver damage*: 100%
| | | | *kidney failure*: 100%
| | | | *coma*: 80%
| | | | *comatose*: 40%
| | | | *nausea*: 40%
| | | | *vomiting*: 40%
| | | | Other: *diarrhea, delirium, disoriented, dizzy, incoherent, intestinal cramps, weakness*

| **Amanita gemmata** | 4 | OR, NH | *diarrhea*: 75%
| | | | *dizzy*: 50%
| | | | *nausea*: 50%
| | | | *weakness*: 50%
| | | | Other: *abdominal pain, drowsy, flushing, formication, severe hallucination, hypothermia, miosis, muscle spasm, palpitation, unconscious, visual disturbance, vomiting, salivation, sweating*

| **Amanita muscaria** | 14 | MD, OR, PA, WA | *vomiting*: 93%
| | | | *nausea*: 79%
| | | | *intestinal cramps*: 64%
| | | | *drowsy*: 57%
| | | | *weakness*: 57%
| | | | *sweating*: 50%
| | | | *chills*: 36%
| | | | *dizzy*: 36%
| | | | *hallucination*: 36%
| | | | *disoriented*: 28%
| | | | *diarrhea*: 21%
| | | | *flushing*: 21%
| | | | *muscle spasm*: 21%
| | | | *salivation*: 21%
| | | | *mucus viscous*: 14%
| | | | *fever*: 14%
| | | | *headache*: 14%
| | | | *hypotension*: 14%
| | | | *palor*: 14%
| | | | *tachycardia*: 14%
| | | | *tired*: 14%
| | | | *tremor*: 14%
| | | | Other: *aching bones, cardiac arrhythmia, deep sleep, hematemesis, unconscious*

| **Amanita ocreata** | 5 | CA, OR | *death*: 80%
| | | | *liver damage*: 100%
| | | | *kidney failure*: 100%
| | | | *coma*: 80%
| | | | *comatose*: 40%
| | | | *nausea*: 40%
| | | | *vomiting*: 40%
| | | | Other: *diarrhea, delirium, disoriented, dizzy, incoherent, intestinal cramps, weakness*

| **Amanita pantherina** | 20 | CO, ID, OR, WY, WA | *nausea*: 75%
| | | | *drowsy*: 70%
| | | | *weakness*: 70%
| | | | *dizzy*: 55%
| | | | *intestinal cramps*: 50%
| | | | *vomiting*: 40%
| | | | *ataxic*: 35%
| | | | *dreams*: 35%
| | | | *forgetful*: 35%
| | | | *hallucination*: 25%
| | | | *flushing*: 25%
| | | | *confused*: 20%
| | | | *disoriented*: 20%
| | | | *chills*: 15%
| | | | *comatose*: 15%
| | | | *diarrhea*: 15%
| | | | *drunk-feeling*: 15%
| | | | *muscle spasm*: 15%
| | | | *salivation*: 15%
| | | | *sweating*: 15%
| | | | *fever*: 10%
| | | | *hematuria*: 10%
| | | | *rash*: 10%
| | | | Other: *agitated, altered mental state, convulsions, dischronation, incoherent, palpitation, respiratory failure, sleep, visual disturbance*

| **Amanita phalloides** | 16 | All CA | *diarrhea*: 94%
| | | | *vomiting*: 75%

---

*Species with 3 or more cases; totals from all cases through 30 June 1987*
<table>
<thead>
<tr>
<th>Condition</th>
<th>Amanita virosa 17 cases: MI, NY, RI</th>
<th>Amanita ?verna/virosa? 3 cases: DC</th>
<th>Armillaria mellea 17 cases: BC, CO, OR</th>
<th>Armillaria ponderosa 4 cases: WA</th>
<th>Cantharellus cibarius 6 cases: CA, MI, OR</th>
<th>Chlorophyllum molycytits 35 cases: AR, CA, CO, DC, FL, LA, MD, Mexico, MI NC, SC, TX, PA, VA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>94%</td>
<td>100%</td>
<td>65%</td>
<td>75%</td>
<td>50%</td>
<td>49%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>71%</td>
<td>100%</td>
<td>62%</td>
<td>75%</td>
<td>50%</td>
<td>74%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>47%</td>
<td>100%</td>
<td>53%</td>
<td>50%</td>
<td>50%</td>
<td>43%</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>29%</td>
<td>100%</td>
<td>35%</td>
<td>33%</td>
<td>50%</td>
<td>34%</td>
</tr>
<tr>
<td>Kidney failure</td>
<td>18%</td>
<td>67%</td>
<td>29%</td>
<td>24%</td>
<td>24%</td>
<td>34%</td>
</tr>
<tr>
<td>Weakness</td>
<td>18%</td>
<td>67%</td>
<td>29%</td>
<td>24%</td>
<td>24%</td>
<td>34%</td>
</tr>
<tr>
<td>Other: flushing, liver damage,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>edema; Meixner reaction</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>cases: 7 negative, 4 positive</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Collybia acervata 4 cases: OR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intestinal cramps all cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Corrinus atramentarius 5 cases: ID, MI, NY, WY</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>All with alcohol</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flushing</td>
<td>40%</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Tachycardia</td>
<td>40%</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Weakness</td>
<td>40%</td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Other: burning, chills,</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Disoriented, dizzy, diarrhea,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>limbs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy, nausea, palpitation,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sense of suffocation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweating</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other: altered perception,</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Lacrimation, mydriasis, rash,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salivation, tachycardia, tremor</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grifola frondosa 6 cases: IN, MA, MI</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>50%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nausea</td>
<td>50%</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Weakness</td>
<td>50%</td>
<td></td>
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<td></td>
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<tr>
<td>Drowsy</td>
<td>33%</td>
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<tr>
<td>Vomiting</td>
<td>33%</td>
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<tr>
<td>Other: severe abdominal pain,</td>
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<tr>
<td>Chills, confusion, dehydrated,</td>
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<tr>
<td>Diarrhea, drunk-feeling, flushing, sensation to sound, sleep, slowed speech</td>
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<tr>
<td>Gymnopilus spectabilis 5 cases: MA, OR, VA</td>
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<tr>
<td>Hallucination</td>
<td>100%</td>
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<tr>
<td>Drunk-feeling</td>
<td>80%</td>
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<tr>
<td>Dizzy</td>
<td>60%</td>
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<tr>
<td>Visual disturbance</td>
<td>60%</td>
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<td>Macropsia</td>
<td>(40)</td>
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<td>Mushroom Species</td>
<td>Cases</td>
<td>Symptoms</td>
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<tr>
<td><strong>Gyromitra esculenta</strong></td>
<td>11</td>
<td>IA, MI, PQ - 7 treated with pyridoxine</td>
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<td></td>
<td></td>
<td>Vomiting 90%</td>
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<td></td>
<td></td>
<td>Nausea 82</td>
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<td></td>
<td></td>
<td>Diarrhea 27</td>
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<td>Liver damage 27</td>
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<td>Jaundice 27</td>
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<td>Delirium 18</td>
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<td></td>
<td>Dizzy 18</td>
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<td>Intestinal cramps 18</td>
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<td></td>
<td>Kidney failure 18</td>
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<td>Loss of feeling 18</td>
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<td></td>
<td>Pain 18</td>
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<td>Paralysis 18</td>
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<td>Sweating 18</td>
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<td></td>
<td>Weakness 18</td>
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<td>Other: abdominal discomfort, anxiety, cardiac arrhythmia, confused, dehydrated, diplopia, disoriented, dreams, fever, flushing, headache, mydriasis, olfactory changes, retching, respiratory failure, weakness</td>
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| **Laetiporus sulphureus**             | 13    | All CA; 8 with alcohol                                                    |
|                                       |       | Nausea 100%                                                               |
|                                       |       | Vomiting 69                                                               |
|                                       |       | Intestinal cramps 38                                                     |
|                                       |       | Flushing 15                                                               |
|                                       |       | Sweating 15                                                               |
|                                       |       | Other: abdominal discomfort                                               |
|                                       |       | Diarrhea                                                                  |

| **Leccinum aurantiacum**              | 9     | CO, OR, WA                                                                |
|                                       |       | Nausea 100%                                                               |
|                                       |       | Vomiting 78                                                               |
|                                       |       | Chills 56                                                                  |
|                                       |       | Diarrhea 44                                                                |
|                                       |       | Intestinal cramps 33                                                      |
|                                       |       | Sweating 33                                                                |
|                                       |       | Burning/aching 22                                                          |
|                                       |       | Dizzy 22                                                                   |
|                                       |       | Weakness 22                                                                |
|                                       |       | Other: uncoordinated                                                       |

| **Leucoagaricus naucinus**            | 4     | CA, FL, NC                                                                |
|                                       |       | Nausea 100%                                                               |
|                                       |       | Diarrhea 75                                                                |
|                                       |       | Vomiting 50                                                                |
|                                       |       | Other: dizzy, intestinal cramps, salivation, sweating, weakness           |

| **Morchella angusticeps**             | 3     | CO, MI: all with alcohol                                                  |
|                                       |       | Vomiting 50%                                                              |
|                                       |       | Diarrhea 50                                                                |
|                                       |       | Other: dizzy, throat constricted                                           |

| **Morchella esculenta**               | 10    | ID, MD, MI, OH, WA, WI - 4 with alcohol                                   |
|                                       |       | Nausea 90%                                                                |
|                                       |       | Vomiting 80                                                                |
|                                       |       | Diarrhea 50                                                                |
|                                       |       | Intestinal cramps 20                                                      |
|                                       |       | Other: abdominal discomfort, chills, sweating, weakness                   |

| **Omphalotus olearius**               | 16    | IN, MA, MI, NC, NJ, OH, VA                                                |
|                                       |       | Vomiting 100%                                                             |
|                                       |       | Nausea 88                                                                  |
|                                       |       | Salivation 31                                                              |
|                                       |       | Diarrhea 25                                                                |
|                                       |       | Sweating 19                                                                |
|                                       |       | Dizzy 12                                                                  |
|                                       |       | Intestinal cramps 12                                                       |
|                                       |       | Weakness 12                                                                |
|                                       |       | Other: abdominal pain                                                      |

| **Panaeolus foenisaceti**              | 8     | AK, CA, CO, MA, OR                                                         |
|                                       |       | Hallucination 38%                                                          |
|                                       |       | Nausea 38                                                                  |
|                                       |       | Dizzy 38                                                                   |
|                                       |       | Other: altered mental state, coma, diarrhea, drowsy, fever, hyperactive, inattentive, insomnia, sleep, sweating, visual disturbance |

| **Paxillus involutus**                 | 3     | OR, WA                                                                    |
|                                       |       | Case 1:                                                                    |
|                                       |       | Incoherent, thirsty, polyuria, kidney failure                              |
Case 2:
- muscle spasm, hemolysis, kidney failure, severe back pain, retinal necrosis, bone marrow damage, cardiac involvement, weakness, anemia

Case 3:
- dry mouth, blurred vision

**Pholiota squarrosa** 9 cases: CO, MN, WY
- vomiting 100%
- nausea 67
- intestinal cramps 56
- Other: diarrhea, flushing, malaise, salivation, weakness

**Pleurotus ostreatus** 4 cases: MI, OR, VT - 3 with alcohol
- nausea 75%
- vomiting 50
- weakness 50
- Other: dizzy, dry mouth, dyspnea, flushing, hallucination, itching, malaise, sweating, tachycardia, tingling in limbs

**Psilocybe cubensis** 3 cases: OH, OR, WA
- 1 case, death (anaphylaxis)
- flushing 67%
- muscle spasm 67
- disoriented 67
- Other: anxiety, delirium, diarrhea, drowsy, fever, hallucination, hyperactive, hypotension, inattention, mydriasis, pain, respiratory failure, talkative, visual disturbance

**Psilocybe semilanceata** 6 cases: OR, WA
- hallucination 62%
- anxiety 50
- fear of dying 50
- nausea 50
- Other: agitated, altered mental state, disoriented, dizzy, flushing, intestinal cramps, muscle spasm, palpitation, suicidal, thirsty, unconscious, visual disturbance, weakness in legs

**Psilocybe semilanceata** 3 cases: ME
- pain 100%
- in chest, severe (67)
- abdominal (33)
- weakness 100
- Other: nausea, tremor

**Scleroderma citrinum** 3 cases: NC, OR, PA
- 1 case asymptomatic after induced emesis
- 1 case inhaled spores
- nausea 67%
- Other (inhalation): sneezing, tachycardia, unconscious, vomiting, weakness

**Suillus granulatus** 3 cases: CO, MA
- 2 cases: contact dermatitis of face
- 1 case: nausea, diarrhea, malaise, head felt heavy

**Suillus luteus** 5 cases: NJ, NY
- intestinal cramps 80%
- diarrhea 60
- nausea 40
- weakness 40

**Tricholoma pardinum** 6 cases: all ON
- vomiting 100%
- Other: diarrhea, sweating

Kenneth W. Cochran

NAMA Toxicology Committee
and
Departments of Epidemiology and of Pharmacology
The University of Michigan
Ann Arbor, MI 48109-2029
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NAMA Poison Form

North American Mycological Association Mushroom Poisoning Report Form

This is only a reporting form. For emergency treatment, contact your physician or the nearest poison center or hospital emergency room.

Please answer all the questions on this form by checking the appropriate box or by writing in the information requested, using a separate form for each person. Please check the “don’t know” box if you do not know the answer.

I. Name of person filling out this form: __________________________
   Address: ________________________________________________
   Telephone: ( ) ________________________________

   This form is about:
   myself ☐ patient ☐ student ☐ club member ☐ other ☐

II. About the incident: Don’t Know
   A. Was mushroom eaten Raw ☐ or Cooked ☐ ☐
   B. How much mushroom was eaten? ____________________________ ☐
   C. Was mushroom eaten: by a child ☐, accidentally ☐,
      for food ☐, intentionally for recreation ☐
   D. Was mushroom eaten at more than one meal? Yes ☐ No ☐ ☐
   E. Was more than one kind of mushroom eaten? Yes ☐ No ☐ ☐
   F. When was mushroom collected? _______ Where?__________ ☐
   G. When was mushroom eaten? Date _______ Time _______ ☐
   H. When was the first sign of illness? Date _____________________
      Time ___________ Onset interval: _____________ hours ☐
   I. Was any alcohol consumed with mushroom, or within 24 hours
      after mushroom was eaten? Yes ☐ No ☐ ☐
   J. How many persons ate mushrooms? ____________________________ ☐
   K. Were all persons who ate mushrooms ill? Yes ☐ No ☐ ☐
   L. Were persons in the group who did not eat mushrooms ill?
      Yes ☐ No ☐

Please duplicate if additional copies are needed, or request copies from Dr. Lampe at the address on the other side or by telephone to (312) 645-4559, (312) 649-5646, or (313) 971-2552.
III. A. What were symptoms of poisoning? Check all symptoms which occurred:

- Nausea
- Salivation
- Intestinal Cramps
- Flushing
- Vomiting
- Chills
- Muscle Spasm
- Drowsiness
- Diarrhea
- Rash
- Hallucination
- Dizziness
- Sweating
- Weakness
- Disorientation

Don't Know

Were there other symptoms? Yes □ No □

What were the other symptoms? ________________________________

B. Did person ever eat this mushroom before? Yes □ No □

C. Were the effects the same? Same □ Different □

D. Was treatment given? Yes □ No □

What was the treatment?

________________________________________________________________________

What were the results of treatment?

________________________________________________________________________

Case or chart number (if available) ______ (Important for follow-up)
Patient's age ________________ Patient's sex __________
Patient's name (optional) _______________________________________________

IV. About the mushroom:

A. Name the species: ________________________________________________ □

B. Who identified the species? ________________________________ □

Herbarium specimen number (if available) ________________________________

C. Were any special mushroom tests done? Yes □ No □

List the tests and results: ___________________________________________

V. Other comments about the case or the mushroom, or attach a separate note:

________________________________________________________________________

Please send completed form to: Dr. Kenneth F. Lampe
Department of Toxicology
American Medical Association
535 North Dearborn Street
Chicago, IL 60610
FUNDS AVAILABLE FOR RESEARCH

SINDEN SCHOLARSHIP. The James W. Sinden Scholarship Committee of the American Mushroom Institute is pleased to announce the availability of a single scholarship of up to $2,000 to be awarded on a yearly basis to a graduate student conducting dissertation research involving edible mushrooms and/or other edible fungi. The fund has been established in the name of Dr. James Sinden in recognition of his outstanding contributions to the science and industry related to the commercial mushroom. The due date for 1989 has not been determined; however, applications were accepted until May 15, 1988 after which the Committee reserved the right of refusal. Will need:

- Undergraduate and graduate transcripts;
- Four letters of recommendation - two of which should be from persons familiar with your academic record.
- Results of the Aptitude Section (quantitative and verbal) of the Graduate Record examination. Dates GRE was taken.
- One page statement of the thesis research project and career plans.
- Copy of application for admittance to University (if available).
- List of current scholarships or grants if any to support your research activities.

Applicant must adhere to financial policies relative to the grant as stated by the J. W. Sinden Scholarship Committee. Applications available from: Dr. James W. Sinden Scholarship Committee, American Mushroom Institute, 907 East Baltimore Pike, Kennett Square, PA 19348. Phone: (215) 388-7806.

SOIL BIOTRON AVAILABLE FOR RESEARCH, a new underground soil biology laboratory in a mixed hardwood forest in northern lower Michigan will be available for research in summer 1988 and thereafter. The laboratory, located at the University of Michigan Biological Station, is modeled after the successful East Malling laboratory. Funded by the National Science Foundation to facilitate manipulative experiments with roots, mycorrhizae, microbes, and invertebrates; the Soil Biotron differs from most lysimeter-rhizotrons in having removable windows for access to soil biota. Tree species surrounding the facility include bigtooth aspen, red oak, red maple, beech, and small white pines. Temperature and water potential data at four depths are currently being recorded and photographs showing the initial condition of each window (544 total) have been taken. Nearly 400 trees adjacent to the biotron have been permanently tagged and their diameters recorded. Support facilities available in the nearby Lakeside Laboratory include a culture room with laminar flow hood, darkrooms, chemical analysis laboratory, microcomputer with digitizing pad, and a computer link to Ann Arbor and many Universities.

We invite researchers interested in either collaborative research or individual projects to write to us for additional information on the feasibility of specific research projects, the availability of a summer fellowship supporting initial research, equipment available, and use fees at the following address:

Biotron
The University of Michigan Biological Station
Natural Science Building
Ann Arbor, Michigan 48109-1048
Telephone: (313) 761-4461
KENNETH W. COCHRAN, has been appointed Executive Secretary of the North American Mycological Association, succeeding Harry S. Knighton. Correspondence to NAMA should be addressed to: North American Mycological Association, 3556 Oakwood, Ann Arbor, MI 48104-5213; telephone (313) 971-2552. Replacing Ken Cochram, as the new chairman of the NAMA Toxicology Committee is Dr. Kenneth F. Lampe, Department of Toxicology, American Medical Association.

CHESTER R. COOPER, a graduate student with Paul Szaniszlo at the University of Texas was awarded one of five Raymond W. Sraber Fellowships presented by the American Society for Microbiology to facilitate travel of students to its Annual Meeting. The meeting was held in May at Miami Beach. Mr. Cooper presented two papers.

MICHAEL MCGINNIS was presented with the Meridian Award for Medical Mycology, Medical Mycological Society of the Americas.

MARIO W. RAJCHENBERG, Department of Biological Sciences, Fac. de Cs. Exactas y Naturales, University of Buenos Aires, Argentina, was awarded one of the "B. A. Houssay" (Nobel Prize) prizes granted by the National Research Council of Argentina for outstanding young scientists.

STEVE STEPHENSON was elected president of the West Virginia Academy of Science in April, 1988. He also was this year’s recipient of the William A. Boran Award for Teaching Excellence at Fairmont State College. This award is given each year to the individual selected as the college’s most outstanding teacher.

ROY WATLING as from December 31, 1987 was proposed a fellow of the Institute of Biology (F. I. Biol.). He was promoted to serve as senior principal scientific office at the Royal Botanic Garden, Edinburgh during last summer and continues to sit on Council as Meetings Secretary of the Royal Society of Edinburgh. His conservation interests within BMS will be continued, more relevant through his membership of the Advisory Committee on Science for the National Nature Conservancy.

TRAVEL & VISITS

DANIEL P. MAHONEY is on sabbatical leave from California State University, Los Angeles from August, 1987 to July, 1988. He will be working jointly with Dr. Ann Bell at Victoria University of Wellington (Wellington, New Zealand) in the systematics and ecology of dung-inhabiting members of the Sordariaceae in New Zealand.
STEVEN STEPHENSON, who spent the 1987 field season working with Dr. T. N. Lakhanpal at Himachal Pradesh University in northwestern India, would like to make note of the fact that Dr. Lakhanpal would be very interested in having other mycologists come to India in order to work on the higher fungi of the northwestern Himalayas. In other words, he would be a willing host for anyone who wanted to work at Himachal Pradesh University. Dr. Stephenson would be happy to provide whatever information he could to anyone who might be interested.

JORGE E. WRIGHT notes that the Mycology Lab. of Biological Sciences, Fac. de Cs. Exactas y Naturales, University of Buenos Aires, was visited by a team of North American mycologists making a survey of Agaricales, formed by Drs. Roy Halling (N.Y. Bot. Garden), Gregory Mueller, Mrs. Mueller and technician Jon Pollischook.

NOTES AND COMMENTS

BO LIU sorrowfully informs us that the Mycological Herbarium of Shanxi University was destroyed by fire in November, 1984. All fungal books and papers disappeared. Bo would appreciate any free secondhand books and papers on taxonomy or morphology of fungi for the purpose of rebuilding his herbarium in the near future. Department of Biology, Shanxi University, Taiyuan, The People's Republic of China.

MARION L. LOHMAN, a 1928 Miami University graduate and student of Bruce Fink, died December 22, 1987 in Florida. Shortly before his death, Dr. Lohman donated his fungal herbarium, consisting of 1100 packets of Hysteriaceae and Hawaiian fungi (including type specimens), to the Willard Sherman Turrell Herbarium (Miami University). In addition, Dr. Lohman sent his literature collection on the Hysteriaceae and duplicate reprints of his publications. The material will soon be available for study, both at MU and on loan. Duplicate material will be distributed on exchange. Contact Michael A. Vincent, assistant curator, for loans or more information.

MIKE RINALDI is happy to announce the commencement/opening of the new system wide Veterans Administration Mycology Reference Laboratory at the Audie L. Murphy Memorial Veterans' Hospital, San Antonio, Texas. This laboratory is a special clinical resource center for use by Veterans Administration medical facilities throughout the country.

A. WEINTRAUB: For sale: SMALL PORTABLE INTERMITT compression air pump. An Electric Jobett Extremity Pump with meter and hose. Simplified methods for isolation, cultivation of fungi. A simple mushroom growth chamber, for mycology, botanical and plant pathology. Simple decontamination by surface sterilization for large equipment that can't be autoclaved.
CHANGE OF AFFILIATION OR STATUS

PETER AUSTWICK has retired from the Robens Institute of the University of Surrey where he has been Senior Research Fellow in a project on "Sick Building Syndrome" sponsored by the Health Promotion Research Trust. He is continuing in consultancy work in air-conditioning and his interests in Basidiomycetes.

ERIC W. A. BOEHM has completed the M.S. with Dr. D. J. McLaughlin (Department of Botany) and is now with Dr. E. Stewart (Department of Plant Pathology, University of Minnesota) using mtDNA RFLP and conidiogenesis to delineate spp. relationships within Septoria and allied genera.

TOM CHASE moved in September to the Pacific Southwest Forest and Range Experiment Station to work with Bill Orrosina, Fields W. Cobb and John Taylor at UC Berkeley on Heterobasidion annosum.

JOSEPH R. NEWHOUSE recently received the PhD degree in plant pathology from West Virginia University. His research was under the direction of William L. MacDonald, PhD, and was entitled "A Transmission Electron Microscopic Study of Virulent and Hypovirulent Strains of Endothia Parasitica". He has accepted a post-doctoral position with the USDA-ARS Foreign Disease Week Science Research Unit, Fort Detrick, Building 1301, Frederick, MD 21701, and will be working with Paul Tooley, PhD on ds-RNA in Phytophthora infestans. His new phone number is 301-663-2632.

DR. SCOTT ROGERS: Postdoctoral Fellow, Botany Department, University of Washington, from October 1987 to December 1988. Molecular "botanist" - Application of DNA methodologies/techniques to fungus. He is a graduate of the U of W - 1987.

MICHAEL WINGFIELD has assumed a position as an Associate Professor, Microbiology/Mycology at University of Orange Tree State, Blaemtontein as of July 1, 1988.

DR. JORGE E. WRIGHT retired as Full Professor of the University of Buenos Aires, Argentina, as of March 1, 1988, but continues working as Principal Researcher of the Argentine Nat’l Research Council in the same Laboratory.

KWON YOON has been in Dr. I. B. Heath’s Lab since September, 1987 (on his sabbatical leave) studying nuclear motility. He will stay here until early August, 1988.

WENYING ZHUANG has completed his PhD at Cornell University and return to the Institute of Microbiology, Academia Sinica, Beijing, People’s Republic of China.

NOMINATIONS FOR AWARDS

1989 OBERLY AWARD NOMINATIONS

Nominations are sought for the 1989 Oberly Award for bibliographic excellence in the agricultural or related sciences. To be eligible, a bibliography must have been published in 1987 or 1988, and at least one author, editor or compiler must be a U.S. citizen. Bibliographies will be judged on usefulness, scope, accuracy, format, explanatory features and Indexing methods. The award is administered by the Science and Technology Section of the Association of
College and Research Libraries Division of the American Library Association. It will be presented at the 1989 annual meeting of the American Library Association in Dallas, Texas. Nominations in the form of a letter, including if possible a copy of the bibliography, should be sent by January 1, 1989 to: Carolyn L. Warmann, Chair, Oberly Award Committee, Reference Department, Carol Newman Library, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061.

The award consists of a small cash prize and professional recognition. Past winners have included:


 Corrections

Past Recipients of MSA Graduate Fellowships

1971 James Clark
1972 Jeffrey Pommerville
1973 William Timberlake
1974 Robert Fogel
1975 Martha Sherwood
1976 Scott Redhead and John Taylor
1977 Kurt Dahlberg and Linda Kohn
1978 James Anderson and Larry Gauriloff
1979 Michael Allen and Robert Antibus

1980 Thomas Harrington and Steven Warner
1981 Charles Jacobs and Kenneth Whitney
1982 Faye Murrin and Bruce Tucker
1983 John Hammer and Karl McKnight
1984 Thomas Bruns and Thomas Chase
1985 Rodney Roberts and Georgiana May
1986 John S. Horton and Richard W. Kerrigan
1987 Kathleen Margaret Thomson Cason and Dennis E. Desjardin

Past Recipients of the Graduate Research Prize--Oral Presentation

1971 Terrence Hammill
1972 Rand McNitt
1973 Martha Powell
1974 Ellen Farr
1975 Richard Humber
1976 Dennis McCabe and Terry Hill
1977 IMC-2: no award made
1978 William Mulleavy
1979 Donald Betterly

1980 Laurel Davis and Susan Meyer
1981 Gregory M. Mueller and Geraldine Russo
1982 Edmond Badham, Thomas Bruns and Elaine Huizar
1983 Gerald Bills and Steven Horton
1984 William E. Hintz and R. W. Martin
1985 Steven L. Miller and Margaret E. Silliker
1987 Eric W. A. Boehm and Kathleen M. T. Cason

DEATHS OF MEMBERS

Dr. J.A. von Arx (on April 13th 1988, at the age of 66 years.)

Professor Flordeliz R. Uyenco (May 4, 1988)
CHANGE OF ADDRESS FOR RESPONDENCE

Peter Austwick, 10, The Mall, East Sheen, LONDON SW14 7EN. Phone: 01.876.9787.

Eric Boehm, Department of Plant Pathology, 495 Borlaug, University of Minnesota, St. Paul, MN 55108.

Tetsuo Muroi, Koshien-kyuban 14-7, Nishinomiya 663, Japan.

Joseph R. Newhouse, USDA-ARS, Foreign Disease-Weed Science Research Unit, Fort Detrich, Building 1301, Frederick, MD 21701. Phone: (301) 663-2632.

Ian Reid, National Research Council Canada, Biotechnology Research Institute, 6100 Avenue Royalmount, Montreal, Quebec, Canada H4P 2R2. Phone: (514) 496-6100.

Ingo Schulz-Weddigen, Bodensee-Naturmuseum, Katzgasse 5-7, D-7750 Konstanz, West Germany

Michael J. Wingfield, Department of Microbiology, University of Orange Free State, P. O. Box 339, Blaemontein 9300, Rep of South Africa. Phone: (051) 401-2396.

Wenyang Zhuang, Institute of Microbiology, Academia Sinica, Beijing, People's Republic of China.

Kwon S. Yoon, temporary change until August, 1988. Department of Biology, York University, 4700 Keele Street, Downview, Ont. M3J IP3 Canada. Phone: (416) 736-5511. Address after August, 1988: Department of Microbiology, Kangwon University, Chunchen 200, Korea. Phone: 0361-53-0087 (ext. 2891).

BACK COVER

Diagrammatic sketch of a fertile hypha of a Thelebolus species which is isolated from the soil collected from Mount Kenya in East Africa.

The species has been placed in CMI herbarium under Thelebolus stercoreus (Tode per Fr.) Kimbr. The species is under investigation as T. stercoreus is characterized by the formation of a single large ascus and a subapical ascus ring visible in congo red. These and other characters do not agree with this species. Mujeeb H. Zoberi
MILES INC., Pharmaceuticals and chemical research and manufacture, Elkhart, Indiana 46515.

MYCOTAXON, LTD., Publishers of Mycotaxon, an international journal of the taxonomy and nomenclature of fungi and lichens, P.O. Box 264, Ithaca, New York 14851.

NEW BRUNSWICK SCIENTIFIC, INC., Manufacturers of Precision Research Apparatus, P.O. Box 986, 44 Talmadge Road, Edison, New Jersey 08817.

NORTHWEST MYCOLOGICAL CONSULTANTS, 702 NW Fourth St., Corvallis, Oregon 97330.

ORTHO PHARMACEUTICAL CORPORATION, Research Division, Route 202, P.O. Box 300, Raritan, New Jersey 08869-0602.

PELCO, Transmission & Scanning Electron Microscopy Instruments & Supplies, Ted Pella, Inc., P.O. Box 510, Tustin, California 92680.

PFIZER, INC., Fine chemicals and pharmaceuticals by means of microorganisms, 235 East 42nd Street, New York, New York 10017. (203) 441-9100.

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PITMAN-MOORE, INC., Animal Health and Nutrition Products, 421 East Hawley Street, Mundelein, IL 60060.

ROHM AND HAAS CO., Specialty monomers, polymers, industrial biocides and agricultural chemicals, Research Laboratories, Spring House, PA 19477.

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SMITH KLINE AND FRENCH LABORATORIES, Prescription medicines and other health care products, Division of Smith Kline Corporation, P.O. Box 7929, Philadelphia, Pennsylvania 19101.

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THE UPJOHN COMPANY, Pharmaceutical Research & Development, 301 Henrietta St., Kalamazoo, Michigan 49007.
Newsletter includes:

- Questionnaire, see blue sheet.
- Abstracts and Program for the MSA Meetings (Aug. 13-18, 1988, Davis, California)
- For International Members, information sheet and check list for the 1989 MSA Meetings (Toronto, Canada).
MYCOLOGICAL SOCIETY OF AMERICA NEWSLETTER

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QUESTIONNAIRE

Please return this questionnaire to the Editor by November 15 (for the December 15 issue); by May 15 (for the June issue).

From: ........................................ [ ] This is an address change. Editor will transmit to MSA Secretary and Mycologia

Phone: (...)..............................

NEW FEATURES

Submit manuscript to editor or call for further information.

Descriptions of useful teaching, research, photographic methods (1-2 typed pages)

Brief research notes

Mycological essays (historical, biographical, current issues)

Regional checklists

Letters to the editor
GENERAL ANNOUNCEMENTS

Forthcoming events (conferences, workshops, forays, special courses). Include date and address for further information.

Mycological services available (identifications, special trainings, slides available, cultures available). Specify class, genera, groups.

Fungi wanted, specify class (cultures or specimens, special requirements)

Labs with opening for mycologists on sabbatical. Specify topics for study.

Publications and Computer Programs for give-away, sale, or exchange:
Publications needed:

New books by members (include bibliographic data, cost, etc.):

Major honors, awards, promotions received:

Vacancies for mycologists (include name of person to contact):

Assistantships or fellowships available (include contact person):


Changes in affiliation (include retirements):
Notes and comments (use space below):

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