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MYCOLOGICAL SOCIETY OF AMERICA NEWSLETTER

Volume 40, No. 1, April 1989

Iris Charvat, Editor

Department of Plant Biology
220 BioScience Center
University of Minnesota
St. Paul, Minnesota 55108
(612) 625-3199

TABLE OF CONTENTS

Sustaining Members (A-L)...................1
Table of Contents................................1
COVER..............................................1
Editor's Letter......................................2
General................................................3
Calendar of Meetings, Forays, Courses
and Workshops.....................................4
Mycotoxin Symposium.............................10
New York Botanical Garden.....................11
MSA Auction.........................................12
Publications and Computer Software
Available........................................13
Publications Needed............................14
MSA Placement Service..........................14
Positions Wanted................................17
Positions Available.............................17
Assistantships or Fellowships
Available........................................19
List of Openings for Mycologists
on Sabbatical....................................20
Mycological Services Available..............20
New Books by Members..........................20
Abstracts of MSA Meetings....................21
Program for MSA Meetings.....................55

Fungi Wanted......................................61
Funds Available for Research...................62
Report -MSA Representative to
Biological Stain Commission....................64
New Mycological Research......................65
NAMA Mushroom Poisoning Case Registry...66
'S87-88 Progress Report: Appendix........70
NAMA Poison Form................................74
Notes & Suggestions on Making
Paraffin Embedded Specimens for
Macroscopic Study. Dr. Walter J.
Sundberg.............................................76
Change of Affiliation............................78
Notes and Comments..............................78
Honors, Awards & Promotions................79
Travel and Visits................................79
Deaths of Members..............................79
Change of Address for Respondence........80
Corrections........................................80
Sustaining Members (L-Z).....................11

Inserts in Center, not numbered
Letter to International Members
Concerning
MSA 1990 Meetings (green insert)
Questionnaire (blue insert)

COVER ILLUSTRATION:

Storage molds associated with post-harvest Cannabis decay.
Top row: sporophores cross-sectioned revealing internal structures all x400.
Bottom row: natural habit of above fungi x25.
Illustrated by John McPartland.
Entire Program for the 1989 MSA Meetings in Toronto, Canada is included.

The change in publication date of the spring Newsletter to April, has permitted us to include in this volume, the entire program (except for room numbers that were not available) for the MSA Meetings in Toronto this summer. When our publication date was June, many members did not receive the Newsletter until after publication of the AIBS Program; hence, no reason for including it. Other societies, such as the Botanical Society of America, have made available their programs to the membership a couple months before the annual meetings. Sandra Anagnostakis, 1989 Program Chair, and myself hope this will help members who are thinking about or plan to attend the MSA Meetings. Please let us know.

Sandy Anagnostakis reminds the membership to send items for the auction to Wendy Untereiner, Department of Botany, University of Toronto, Toronto, ON M5S 1A1, Canada. Complete information given two places in this Newsletter. (See Table of Contents).

Information on the 1990 MSA Meeting to be held on the campus of the University of Wisconsin, Madison, Wisconsin, USA, June 24-28, 1990.

John Taylor, 1990 Program Chair, asks members with suggestions for this meeting to contact him as soon as possible. (Address: Dr. John Taylor, Department of Plant Biology/Botany, University of California, Berkeley, California 94720, Telephone 1-415-642-5366, University FAX 1-415-643-8245.) Note that MSA will not be meeting with AIBS, instead Hal Burdsall has graciously agreed to host the MSA Meeting on the campus of the University of Wisconsin. Since he is now completing his term as President, we thank him for spending another year working for MSA.

Information for the International Membership concerning the 1990 MSA Meeting (green sheet).

In the center of this Newsletter, sent only to the International membership, is a green insert: an announcement of how to obtain an official letter of invitation and information to attend the 1990 MSA Meeting.

New Editor beginning in July, 1989: Dr. Terrence Hammill

With great enthusiasm I pass the Editorship of the MSA newsletter to Terry Hammill. I have changed the address on the Questionnaire (blue insert) to Terry's; please use the new questionnaire in this issue. Good luck, Terry.

I could not have completed this volume of the Newsletter without the very capable and enthusiastic help from Stephanie Marshik, my MSA Newsletter Secretary this academic year. I also want to thank Martha Powell, Treasurer, Meredith Blackwell, Secretary 1986-88, and Walt Sundberg, former Editor, especially for their assistance when I began this position.

Sincerely,

Iris Charvat
Editor of the MSA Newsletter, 1987-1989
CALL FOR CONTRIBUTIONS TO AN EXCHANGE OF MYCOLOGY TEACHING MATERIALS. The MSA Teaching Committee will sponsor an exchange of mycology teaching materials at the 1989 annual meeting of MSA in Toronto. This exchange will be held in conjunction with a Tuesday morning (Aug. 8) symposium on teaching mycology. Table space will be available for multiple (suggested number: 50) copies of teaching laboratory handouts, course announcements or other bulletin board-type material used to lure students into courses; microscope slides that cannot be obtained commercially; and other materials. Space will also be available for display of models, devices, and gimmicks teachers have found useful in teaching mycology. If you have videotapes that can be viewed and legally copied, please contact the committee chairperson (M. Tansey), who will try to arrange equipment for this. Contributors can take material to Toronto and put it out on the tables there, or can send material to M. Tansey in advance.

Since this exchange is a new endeavor, and potential contributors might be wondering what they could contribute, here is what I plan to take and what I'd love to get: I'll put out 50 copies each of past issues of Mycological Teaching Humor and of a detailed lab handout of soil samples for *Histoplasma capsulatum*. I'd love to see some creative and tasteful fliers used to advertise mycology courses--I saw some circus billboard-type fliers for microbiology labs years ago, and remember that they were eye-catching and not unprofessional. I'd love to get a microscope slide of *Coelomycetes* in mosquito larvae. Finally, I also want copied of posters that advertise opportunities for graduate study in mycology. (submitted by Michael Tansey).

MUSHROOM STAMPS from Canada will appear in August, 1989. You will have an opportunity to buy four different stamps at the MSA-AIBS meetings (submitted by Scott Redhead).

SUMMER OPPORTUNITIES FOR FIELD COURSES in 1989 offered at Biological Field Stations are summarized in a poster prepared by the Organization of Biological Field Stations. Most offerings are intended for undergraduate and graduate students in Biology. For a copy, contact Dr. Richard W. Coles, Secretary OBFS, Washington University Tyspon Research Center, PO Box 351, Eureka, MO 63025.

Charles Mims reports that the family, friends, former students and colleagues of DR. E. S. LUTTRELL have established an ENDOWMENT FUND at the University of Georgia to support a special lectureship in honor and memory of Dr. Luttrell. Contributions to this fund are tax-deductible and may be sent to the UGA Foundation, attention Gifts Receiving, Alumni House, Athens, GA 30602. Checks should be made out to the University of Georgia Foundation for Account No. 40R4790.

JOBLINE. Whether you're seeking employment or have an open position that needs to be filled, Jobline can help. Organizations looking for qualified personnel can post job listings on Jobline free of charge by contacting BIOSIS, Special Analysis Department. This service is available on the Menu and Expert Systems of the BIOSIS Connection. Prices: Connect Time-$35.00/hour System. Hit Charge-.15; Telecommunication Charges- $10.00/hour via Tymnet.
Florida ADVANCED ELECTRON MICROSCOPY SHORT COURSE: This intensive short course is aimed at the biologist who has some experience with transmission electron microscope techniques and who wishes to acquire new skills in developing areas within the field. It is not designed for the neophyte. No attempt will be made to teach basic fixation and sectioning skills. Subject matter will include propane jet freezing, freeze-fracture, freeze-substitution, Lowicryl and other new embedding techniques, immunogold labelling, stereo microscopy, serial section reconstruction, and X-ray microanalysis. Hands-on-participation is stressed. Participants are encouraged to bring their own material for fixation, processing and/or sectioning. Equipment available includes Balzers freeze-fracture; JEOL, Philips, and Hitachi TEM's; LKB and Sorvall microtomes; and microcomputers. For application forms and/or further information, contact either Greg Erdos (904-392-1295) or Henry Aldrich (903-392-1096) or write 1059 McCarty Hall, University of Florida, Gainesville, FL 32611.

The 1989 Annual Meeting of the Assoc. of Systematics Collections will be held at the University of Nebraska State Museum, Lincoln, Nebraska, on May 18-20, 1989. The meeting will feature a workshop ON COLLECTION MANAGEMENT AND PRESERVATION on May 19-20. The purpose of the workshop is to bring together elements of the natural history community who are responsible for the collections to explore common problems from different perspectives. Collections managers, curators/researchers, and museum directors will be given an opportunity to share views. Some innovative collection assessment and preservation programs at natural history museums will be reviewed. Representatives of funding agencies such as NSF and the Institute for Museum Services and representatives of organizations such as the National Institute for Conservation (NIC) will discuss strategies for funding and successfully completing collection assessment and preservation projects. The workshop is co-sponsored by the Society for the Preservation of Natural History Collections.

A second workshop at the ASC meeting will discuss education of curators/systematists. Many people feel that universities are educating fewer systematists. The state of the academic discipline of systematics, university programs in systematics, university-museum consortia, and curriculum needs will be discussed.

For speaker list and registration information,
contact ASC, 730 11th St. NW, Second Floor, Washington, DC, 20001, (202) 347-2850. Registration: $12.50. Hotel reservations can be made directly with the Lincoln Hilton at (402) 475-4011 or 800-Hiltons. Discount air fares are available from Goodlife Tour and Travel, Lincoln, NE 800-635-0204.

June 1989

7-9

Joint Canadian and Panamerican SYMPOSIUM ON AEROBIOLOGY & HEATH at Ottawa, Ontario, Canada; sponsored by National Health and Welfare Canada and the University of Montreal at Ontario, Canada; For the second circular of the Symposium along with the scientific programme contact: Dr. H.M. Vijay, Drug Toxicology Division, Health Protection Branch, Sir F.G. Banting Building, Ross Avenue, Tunney's Pasture, Ottawa, Ontario K1A 0L2, Canada. Tel: (613) 957-0962

26-30


July 1989

Course: FIELD MYCOLOGY in the Adirondack Park. A two week course on the biology and taxonomy of the fleshy fungi. Last two weeks in July, 1989. Contact: Timothy J. Baroni, Department of Biological Sciences, PO Box 2000, SUNY - Cortland, Cortland, NY 13045. Phone: (607) 753-2725.

August 1989

3-6

CENTRE FOR PLANT BIOTECHNOLOGY meeting: The Genetics and Cellular Biology of Basidiomycetes to be held at the University of Toronto, Erindale Campus. The proposed topic areas will include mating interactions and breeding systems in Basidiomycetes, Mitrochondrion and cytoplasmic inheritance, viruses and extrachromosomal elements, transformation studies in Basidiomycetes, Molecular and cellular aspects of development and industrial and plant pathological aspects of Basidiomycetes (the final program will be assembled in July 1989). For further information and abstract forms (due June 1, 1989) please contact: Paul A. Horgen, Director, The Centre for Plant Biotechnology, University of Toronto, Erindale Campus, Mississauga, Ontario, Canada L5L 1C6. Telephone (416) 828-5424. Fax: (416) 828-5328.

5

WORKSHOP ON TAXONOMY AND IDENTIFICATION OF COELOMYCETES. A full-day workshop on the taxonomy and identification of Coelomycetes will be offered on
Saturday, 5 August 1989, prior to the 1989 MSA meetings in Toronto, Ontario, Canada. The workshop, co-organized by Mary E. Palm and John Bissett, will provide a hands-on approach to the identification of a number of selected genera and generic-complexes within this group of fungi. Specialists will be participating to treat genera such as the Pestalotiopsis-group, Phoma, Phomopsis, and Fusicoccum/Dothiorella. Drs. Nag Raj, Uecker, Bissett, Samuels, and Morgan-Jones and Sutton has been invited to participate.

MSA MEETING at the University of Toronto, Ontario, Canada. Program Chair, Sandra Anagostakis. See Volume 39, No. 2, p. 36 for complete Program for MSA Meeting. See also Mycotoxin Symposium information given in this volume.

Annual MEETING: SOCIETY FOR INDUSTRIAL MICROBIOLOGY, Seattle Washington. The Program will include symposia, slide and poster sessions as well as a workshop. Contact: Mrs. Ann Kulback, Business Secretary, Society for Industrial Microbiology, PO Box 12534, Arlington, VA 22209-8534, Telephone (703) 941-5373.

WORKSHOP on the IDENTIFICATION OF PHYTOPHTHORA SPECIES. West Virginia University, Morgantown, WV 26506-6057. The workshop on morphology procedures for inducing structures necessary for identification, taxonomy, use of several identification keys, problems in identifying species, and procedures/problems in the detection and isolation of Phytophthora species from plant tissue and soil. The laboratory will consist identification, and keying to species of about 25 species. Live cultures will be used. Instructors: P. H. Tsao, University of California, Riverside, CA; A. F. Schmithenner, Ohio State University, Wooster, OH; and M.E. Gallegly, West Virginia University. The Diagnostic Committee and the Mycology Committee have approved the workshop.

This workshop will be similar to the workshop given by the same instructors in Columbus, OH the week prior to the 1987 MSA Annual meetings. Participants must be restricted to 24 (there are no other restrictions); chronological preference by date of application will be given. Registration fee of about $135.00 per person. Application form and information contact: Dr. Mannon E. Gallegly, 401 Brooks Hall, West Virginia University, Morgantown, WV 26506-6057.

Workshop on Identification of Vesicular-arbuscular and Arbuscular Mycorrhizal Fungi. West Virginia University, Morgantown, WV 26506-6057. This workshop sponsored by the American Phytopathological Society will precede the national meeting. Lectures and laboratory sessions will focus on culturing and

**September 1989**

14-16 TRICEL 1989 - International Symposium on *Trichoderma* Cellulases. At the Technical University, Vienna, Austria, sponsored by the Austrian Society for Biotechnology. For registration and submission of papers contact: C.P. Kubicek, Oesterreichische Gesellschaft Fur Biotechnologie, c/o Institut fur Bodenkultur, Gregor-Mendel-Strausse 33, A-1180, Vienna, AUSTRIA.

18-21 PHYTOPHTHORA INTERNATIONAL SYMPOSIUM, organized by the British Mycological Society, the British Society for Plant Pathology and the Society of Irish Plant Pathologists, will be held at Trinity College, Dublin, Ireland. Program sessions will include historical perspectives, host-pathogen interactions, variation and speciation, genetics, molecular genetics and strategies for control. A poster session and an inaugural biographical address on the Rev. Miles Berkely, a pioneer in the study of potato blight. Information: Dr. J. A. Lucus, Dept. of Botany, University of Nottingham, University Park, Nottingham NG7 2RD, United Kingdom.

**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. Information: 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.

**August 1990**

28-Sept 3 FOURTH INTERNATIONAL MYCOLOGICAL CONGRESS. Under the
identifying species of endomycorrhizal fungi in the genera *Acaulospora*, *Entrophospora*, *Gigaspora*, *Glomus*, and *Scutellospora*. Lectures will focus on interpretation of spore morphological characters important in identification and their predictiveness, factors affecting variability in these characters, problems associated with keys, how to set up a computerized species database, immunological and molecular approaches to identification, and approaches for single-sporing and pot culturing species from field soils. The laboratory will involve extracting, mounting and single-sporing and pot culturing species from field soils, and extracting, mounting and identifying a minimum of 12 species from living pot cultures. All stages of spore development will be examined for selected species. Prepared slides of other species also will be available for study. Immunological assays using monoclonal antibodies also will be performed. Instructors: Dr. Richard Koske, University of Rhode Island, Kingston, RI and Dr. Joseph B. Morton, West Virginia University, Morgantown, WV.

Participants will be restricted to 24. First priority must go to APS members followed by non-APS applicants. Selection will be chronological, determined by date of application. Registration fee: $75 per person. Write: Dr. Joseph B. Morton, 401 Brooks Hall, West Virginia University, Morgantown, WV 26506-6057 for application and pertinent details. If the response to this notice is large, then consideration will be given to organizing a subsequent workshop.

---

17-20

NORTH EASTERN MYCOLOGICAL FORAY at Franklin Pierce College, Rindge, NH. Dr. Richard Homola from the University of Maine will be our 1989 senior foray mycologist. The College's location is situated on 1000 wooded acres at the base of famous Mt. Manadnock. For information contact: NorthEastern Mycological Foray, Barbara Peabody, RD1, Box 250, Milford, NJ 08848. Telephone: 201-995-9110.

24-27

TELLURIDE MUSHROOM CONFERENCE. The ninth annual Telluride Mushroom Conference, a teaching conference, designed for persons interested in expanding their knowledge of wild mushrooms, will be held in Telluride, Colorado, August 24-27, 1989. An array of nationally recognized mushroom authorities, including Ethan Nadelmann, Gary Lincoff, Andrew Weil, John Corbin, Linnea Gillman and Emanuel Salzman, will present three days of lectures and workshops. For further information, contact: Fungophile, PO Box 5503, Denver, Colorado 80217-5503. Telephone: (303) 296-9359.

30-Sept. 13

Mushroom Study Tour of French Canada and the Maritimes Provinces, August 30-Sept 13, will be led by Gary
auspices of the International Mycological Association, sponsored by Deutsch Forschungsgemeinschaft:
President, J. Poelt. General Information: The Fourth International Mycological Congress will be held from 28th August (Tuesday) to 3rd September (Monday), 1990 at the University of Regensburg. Membership: Full membership of the Congress is open to any person interested in fungi including lichens. Language: The working language will be English. No translation service will be provided. Abstracts must be submitted in English. Invitations: Members, who, for administrative reasons, wish to receive a personal invitation to attend the Congress should write to the Secretary General. Preliminary Reply Form and Second Circular: The Second Circular will be distributed at the beginning of March 1989. To ensure your inclusion on the mailing list for the Second Circular send in the First Circular. A copy can be obtained through the Secretary General.

The Second Circular will contain details of the programme including field trips and sightseeing tours, as well as forms for final registration. Travel and Hotel Arrangements: The Regensburg Travel Bureau and Lufthansa have been appointed respectively official travel agent and official carrier for the Congress. Scientific Programme: The Congress will include general lectures, symposia, poster demonstrations and films. The scientific programme has been subdivided into 7 sections (Organizers in brackets):
A Systematics and Evolution (F. Oberwinkler)
B Morphology and Ultrastructure (R. Agerer)
C Ecology (J. Webster)
D Genetics and Physiology (U. Stahl)
E Biotechnology and Applied Mycology (P> Prave)
F Pathology (J. Schwinn)
G General Topics (B. Hock)

General Lectures and Symposia: General Lecturers and Symposium speakers will be specially invited by the Organizing Committee (Organizers: J. Poelt; M. Moser; J. Webster). Offered Papers: Offers of papers are welcomed (15 or 30 minutes duration including discussion). The Programme Committee will decide whether to accept them for inclusion in the main symposia, or for presentation as posters or as abstracts. A call for submission of abstract of all contributions will be included in the Second Circular, which will contain detailed instructions on the format and layout. Excursions: In the period from 20th to 27th August and from 4th to 11th September, excursions will be offered. All correspondence or inquiries should be addressed to: Prof. Dr. Andreas Bresinsky, Botanisches Institut der Universität, D-8400 Regensburg, Federal Republic of Germany (f. R. G.) Telefone: (0941) 9 43 31 08, Telex: 6 5658 unire d.
MYCOTOXIN SYMPOSIUM
August 10, 1989-Toronto, Canada
(as part of the annual Mycological Society of America meeting)

The Mycological Society of America is sponsoring a special day-long Mycotoxin Symposium on August 10, 1989 at the annual meeting of the MSA in Toronto, Canada. The purpose of this Symposium is to foster better communications between workers in the field of mycotoxins (biochemists, plant pathologists, mycologists, ecologists) and the basic mycologists. Historically, individuals involved in mycotoxin research have developed their own series of meetings and have lost much of their interactive capabilities with the general mycological community. A number of us in the Society have felt that this is a disservice to both mycotoxin research and to mycology in general. The hope is that we will be able to further mycotoxin research by getting both groups to interact more freely.

The Symposium has two major sections, one on economic and social aspects and one on mycological/genetic/biological aspects. We have managed to attract an impressive cast of speakers to present this information.

A list of the speakers and their topics is appended:

**ECONOMIC AND SOCIAL IMPACT**

1. **Mycotoxins in History**-Dr. Mary K. Matossian (University of Maryland)

2. **Effects of Mycotoxins on Human Health**-Dr. Tine Kuiper-Goodman (Health and Welfare Canada)

3. **Effects of Mycotoxins on Animal Health**-Dr. H.L. Trenholm (Agriculture Canada)

4. **Fungi and Mycotoxins in Indoor Air**-Dr. W. Sorenson (National Institute for Occupational Safety and Health)

**MYCOLOGY**

1. **Taxonomic Issues Relating to Mycotoxins**-Dr. P. Nelson (Pennsylvania State University)

2. **Chemistry of Mycotoxins**-Survey of the Diversity and Biogenic Origins-Dr. J. ApSimon (Carleton University)

3. **Physiology of Mycotoxin Production**-Dr. J.D. Miller (Agriculture Canada)

4. **Genetics of Trichothecene Toxin Production in Fusarium**-Dr. A. Desjardins (USDA-ARS)

5. **Plant-Microbe Interactions in Toxigenic Fungi**-Dr. G. Bean (University of Maryland)

6. **Mycotoxin Ecology**-Dr. D.T. Wicklow (USDA-ARS)
Dear Colleague:

You have probably noticed that your MYCOLOGIA mailing label has changed format. This is the result of a new program developed at NYBG that allows us to provide you with better service. Today I wish to explain to you the various elements of the label.

The new label carries information that allows the Society officers and fulfillment staff to process questions, changes, and claims rapidly. Most of this information is embedded on the top line.

SAMPLE: From volume 81 issue #1.

Item 1: Journal code. MYC = MYCOLOGIA.

Item 2: Customer category. This refers to the mode of payment. The categories for Society members are as follows:

These members do not receive the journal, only the Newsletter:

NSAS     Associate member.
NSEM     Emeritus member.
NSFA     Second entry for a family membership.

These members receive both the journal and the Newsletter.

SAFF     Affiliate member.
SCOR     Corresponding member.

Continued ....
SEJO    Emeritus member.
SFAM    Family membership-individual who receives the journal.
SLIF    Life member.
SREG    Regular member.
SSTU    Student member.
SSUS    Sustaining member.

Item 3: Activity year. The year for which the entry is active.

Item 4: Volume number. The volume of MYCOLOGIA that corresponds to the activity year.

Item 5: Issue number. The issue of MYCOLOGIA that was mailed using that address.

Item 6: Customer number. Six digit unique identifier for each customer. (Please use this number whenever you write to the Treasurer inquiring as to the status of your membership.)

Item 7: Last name identifier. (/) The slash is being used to separate the Society members from subscribers to the journal. It should appear before the first word of your last name.

As with all conversion processes, we may have inadvertently introduced an error in your address or coded your entry incorrectly. I apologize for this and encourage you to contact the Treasurer (Dr. Martha M. Powell, Dept of Botany, Miami University, Oxford, OH, 45056 U.S.A.) and indicate where the correction should be made.

I thank you for your help and look forward to serving you better.

Cordially,

Maria L. Lebron-Luteyn, Ph.D.
Director of Scientific Publications

MSA Auction: The annual MSA Auction to raise money for our Endowment Fund will be held on Wednesday evening at the social. Volunteers with professional auctioneering skills are needed to help with this event. Please send items for auction to Wendy Untereiner, Department of Botany, University of Toronto, Toronto, ON M5S 1A1, Canada. Items should be sent by Post (NOT BY UPS) and valued at $10 to $38 on the customs slip.
PUBLICATIONS, COMPUTER SOFTWARE AND SLIDES AVAILABLE FOR GIVE-AWAY, SALE OR EXCHANGE

AMMIRATI, J.: KEYSYSTEM: FOR CONSTRUCTION OF DICHOTOMOUS DIAGNOSTIC KEYS. Interactive computer software that organizes, manipulates, and prints data for construction of dichotomous keys. Accomodates 74 species, 50 diagnostic characters, and 9 states for each character. Keysystem tracks species and character states that are available at decision points, allows for terminal and blank nodes, and furnishes species lists and division numbers for nodes. A manual contains instructions and examples, including forms for preliminary organization of data. For 80-column Apple IIe and printer. One floppy disk and manual, $10, from Jay C. Quast, 1565 Jamestown St., S.E. Salem, Oregon 97302, (503) 371-8030. The Keysystem was developed by Jay Quast and submitted to this publication by Joe Ammirati.

ATKINSON, R. G: For sale: complete, unbound volumes of MYCOLOGIA. Will sell Vol. 67 (1975) to Vol. 74 (1982) for $150 or $20 per volume.

DESJARDIN, DENNIS E: Will exchange the 3rd Edition of Singer's "Agaricales in Modern Taxonomy" (1975) for a copy of the 2nd ed. (1962)

KLICH, MAREN: PENKEY, an experimental computer-assisted identification system for Penicillium and related teleomorphs is available free of charge. PENKEY will run on any IBM PC or AT compatible computer. Please send a formatted 5 1/4 in. diskette to Maren Klich.


For free, I have reprints by M. K. Nobels, including her wood decay fungi keys, and the book by D.B.O. Savile, ARCTIC ADAPTIONS IN PLANTS.

RHOADES, FRED: ASKATAAXO synoptic key driver plus keys to mushrooms, lichens, molds. $5 for IBM PC 5 1/4" disk.
TE STRAKE, DIANE: Ellis and Everhart, 1890, NORTH AMERICAN PYRENOMYCETES (Best offer). Hesler and Whetzel, 1920, MANUAL OF FRUIT DISEASES.


PUBLICATIONS NEEDED

J. F. Ammirati is looking for a bound or unbound set of MYCOLOGIA, Vols. 1-29 only.

Harold W. Keller is looking for MYCOLOGIA, 1943-1953, preferably bound.

Richard W. Kerrigan is looking for reprints on Agaricus; old literature on mushroom cultivation.

Don C. Prusso is looking for THE GASTEROMYCETES OF THE EASTERN UNITED STATES AND CANADA by Coker and Couch. He would like either the 1928 ed. or a Dover reprint.


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.

The success of the Placement Service is contingent upon receipt of accurate information that honestly describes prospective employees and open positions. Forms can be sent to the coordinator, Dr. Robert Pohlad, MSA Placement, Biology Department, Ferrum College, Ferrum, VA 24088
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: 

Send to: Dr. Robert Pohlad, MSA Placement, Biology Department, Ferrum College, Ferrum, VA 24088
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 print out. 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 to: Dr. Robert Pohlad, MSA Placement, Biology Department, Ferrum College, Ferrum, VA 24088

POSITIONS WANTED

STEPHANIE DIGBY seeks an academic and/or research position in Mycology. Ph.D. in 1989 with Kenneth Wells. Interests include compatibility, morphology and development, systematics, host-parasite relationships.

POSITIONS AVAILABLE

Research Associate: US Dept. of Agriculture, Agric. Res. Service. ARS is seeking a research entomologist, postdoctoral research associate, GS-11, for the Wheat & Other Cereal Crops Research Unit, Stillwater, OK. Incumbent will study pathogens for the control of aphids, particularly Russian wheat aphid & greenbug. Experience in insect pathology desired. Two year appointment. PhD must have been received within the past three years. Salary commensurate with experience ($27,716 to $36,032). US citizenship is required. For additional research program information, contact Dr. Robert Burton at (405) 624-4126. For information on application/procedures/forms, contact Carol Gramlich at (301) 344-1508. Send CV & telephone nos. of 3 references to Dr. Robert Burton, USDA-ARS, 1301 N. Western Street, Stillwater, OK 74075. Applications in response to this advertisement should be marked S-8-037. The position is immediately available. ARS is an Equal Opportunity Employer.

Postdoctoral Fellow: San Diego State University seeks a Postdoctoral Fellow for a project to study the ecology of VA mycorhizal fungi and chestnut blight fungi. Focus is on two projects developing methods to tract species, ecotypes and genes in the environment with Dr. Michael Allen, Department of Biology, Systems Ecology Research Group, San Diego State University, San Diego, CA (619) 594-4460. Please send C.V. and three letters of reference to: SDSU Foundation, Personnel Department, 5178 College Avenue, San Diego, CA 92182-1900.
POSITIONS AVAILABLE

Penn State University has a faculty position in mushroom science. A tenure-track position is available for an individual with demonstrated strength in cellular and/or molecular fungal/plant physiology to conduct research on edible mushrooms. Development of a research program that will involve the culture of edible fungi and complement the Penn State mushroom science effort is expected. Opportunities exist for cooperative research with scientists throughout the University, including faculty of the College of Agric., Biotech. Institute, and interdisciplinary graduate program in Plant Physiology. Individual will be expected to participate in graduate education programs and teach formal courses as appropriate, and to participate in extension education, especially the transfer of new science and technology to the mushroom industry. Ph.D. and experience in mycology, plant physiology, biochemistry, plant pathology, molecular biology, or related discipline required. Rank commensurate with experience. Send application letter, resume, transcripts, and names of three references by June 30, 1989, to Dr. P. J. Wuest, Department of Plant Pathology-Box J, Penn State University, 211 Buckhout Lab., University Park, PA 16802. An affirmative action/equal opportunity employer. Women and minorities encouraged to apply.

University of Maine has an opening for a Post-doctoral or Research Assistant position which requires experience and interest in the isolation and identification of hymenomycetous fungi and other fungal species that inhabit wood. Persons interested in accepting the position at the post-doctoral must have or be near completion of the doctoral degree. The majority of the work will concern cultural studies and identification of the fungi in the laboratory. Knowledge of the cultural characteristics of microfungi and hymenomycetes is desired. Other research concerning innumological studies of hymenomycetous fungi may be carried out depending on the interests and qualifications of the applicant. Send resume, transcripts and three letters of recommendation to (or for more information contact): Dr. Barry Goodell, Wood Science & Technology, Dept. of Forest Biology, College of Forest Resources, University of Maine; Orono, ME 04469. An equal opportunity/affirmative action employer.

UNIVERSITY OF VERMONT has a postdoctoral position that is available with Drs. Charles P. Novotny (Dept. of Microbiology) and Robert C. Ullrich. This is a full time position which requires the applicant to have a Ph.D. with training in Molecular Genetics. Responsibilities include use of molecular genetics to characterize multiallelic mating-type regulatory genes (MAT) from the filamentous basidiomycete, Schizophyllum commune. Future work concerns: structure and expression of MAT alleles, MAT gene products and MAT control of MAT regulated genes. See Munoz-Rivas et al., 1986, Mol. Gen. Genet. 205:103; Specht et al., Expt'l Mycology, vol. 12, in press; Froeliger et al., 1988, Genome (Canad. J. Cytol, Genet.) 30(supp. 1): 300, abstract 32. 63.22. Send curriculum vitae including transcripts, reprints, statement of research interests and have three letters of reference sent to: Dr. Robert C. Ullrich, Department of Botany, Life Sciences Bldg., University of Vermont, Burlington, VT 05445.
ASSISTANTSHIPS AND FELLOWSHIPS AVAILABLE

Clark University: Teaching assistantships available to study lichen fungi; study towards M.A. or Ph.D. degrees. Contact: Vernon Ahmadjian, Dept. of Biology, Clark University, Worcester, MA 01610-1477.

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

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.

San Diego State University: Assistantships are available to work on the ecology/physiology of Mycorrhizae for M.S. and Ph.D. candidates at the Department of Biology. Contact Mike Allen, Dept. of Biology, San Diego State University, San Diego, CA 92182.

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

Texas Tech University: Teaching and graduate research assistantships (M.S. or Ph.D.) are available to graduate students interested in studying the roles of saprophytic or symbiotic fungi in the functioning of desert ecosystems. Specific research areas include: spatial and temporal patterns of VA mycorrhizal plants, microfloral-microfounal interactions within the root-region, decomposition and nutrient dynamics of wood, and the autecology of wood decomposing basidiomycetes. Contact John Zak, Department of Biological Sciences, Texas Tech University, Lubbock, TX 79416. Telephone (806) 742-2718.

University of Maine has an opening for a Post-doctoral or Research Assistant position which requires experience and interest in the isolation and identification of hymenomycetous fungi and other fungal species that inhabit wood. Persons interested in accepting the position at the post-doctoral must have or be near completion of the doctoral degree. The majority of the work will concern cultural studies and identification of the fungi in the laboratory. Knowledge of the cultural characteristics of microfungi and hymenomycites is desired. Other research concerning innumological studies of hymenomycetous fungi may be carried out depending on the interests and qualifications of the applicant. Send resume, transcripts and three letters of recommendation to (or for more information contact): Dr. Barry Goodell, Wood Science & Technology, Dept. of Forest Biology, College of Forest Resources, University of Maine; Orono, ME 04469. An equal opportunity/affirmative action employer.
University of Minnesota: Teaching Assistantships and Fellowships from the Plant biology Graduate program. Contact Director of Graduate Studies, 220 BioScience Center, University of Minnesota, St. Paul, MN 55108.

University of Minnesota: Assistantship available: Graduate assistantship immediately available in mycology in the Plant Pathology graduate program: M.S. 2 yrs; Ph.D. 3 yrs. at $10,606 (usually with an annual increase) with tuition waived. Systematics, ecology of fungal plant pathogens. Please contact Elwin L. Stewart. 495 Borlaug Hall, Department of Plant Pathology, University of Minnesota, St. Paul, MN 55108. Phone (612) 625-9207 or 625-8200.

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.

MYCOLOGICAL SERVICES AVAILABLE

GENERAL

HUMBER, RICHARD A.: Cultures & identifications of entomopathogenic fungi.

BASIDIOMYCETES

DESJARDIN, DENNIS E.: Will identify specimens of Marasmius, Marasmiellus, and Micromphale.

MYXOMYCETES

KELLER, HAROLD K.: Will identify Myxomycetes especially Corticolous species from living trees and vines.

NEW BOOKS BY MSA MEMBERS

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


Weber, Nancy S., A MOREL HUNTER'S COMPANION; James A. Weber, chief photographer $14.95 + $2.05 postage and handling; Michigan Book Central, PO Box 330034, Lansing, MI 48901; published by Two Peninsula Press.
During a survey of thermophilic fungi, a number of species and strains belonging to the genus *Aspergillus*, *Humicola*, *Penicillium*, and *Trichoderma* were collected from different habitats. In order to differentiate these strains on the basis of their temperature relationships, a separate experiment was performed in which all the strains of above five genera were grown on Emerson Yeast's medium at five different temperatures (20, 40, 45 and 50°C). The radial mycelial growth in each case was recorded daily up to 5 days to categorize thermotolerant and thermophilic fungi. The loss of pigmentation at high temperature was determined in 3 albino strains of thermotolerant and 1 thermophilic fungi.

**D. A. ANDERS and J. C. ZAK.** Department of Biological Sciences, Texas Tech University, Lubbock, TX 79409.

Autecology of selected Chihuahuan and Sonoran Desert wood decay fungi.

Ten basidiomycetes isolated from creosotebush (*Larrea tridentata*) wood in contact with soil surface in the Chihuahuan and Sonoran deserts were grown under varying temperature and water potential regimes to determine intra and interspecific variability in growth responses to changes in substrate temperature and moisture availability. Temperature optima ranged between 20 - 30°C for all isolates. Growth rates sharply declined after 30°C, with no growth observed for any isolates at 40°C. Growth rates of one Chihuahuan desert species, *H. typhina*, was relatively constant over the low temperature range (10 - 20°C). For all but the slow growing isolates, growth rates decreased significantly beginning at 0.5 MPa, with minimal growth by 5.0 MPa. The autecology of desert basidiomycetes is similar to that observed for isolates from more mesic environments. However, slow growing species may exhibit broader ecological amplitudes with respect to temperature and moisture requirements than the fast growing species, providing the slow growing isolates with a competitive advantage.

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

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

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

**Ansel d’Imieux, M., see Thibaut, M.**

**R. K. ANTICEUS, D. B. SINSRALESH and A. E. LINKINS.** Biology Department, Clarkson University, Potsdam, NY 13676. Characterization of extracellular acid phosphatases from an ectomyorrhizal *Entoloma*.

An isolate of *Entoloma*, which forms ectomycorrhizae with the arctic willow *Salix rotundifolia*, produces high acid phosphomonoesterase activity when grown under phosphate limiting conditions. Studies were undertaken to characterize and purify these enzymes. Crude extracellular enzyme shows optimal activity at pH 5.0, high activity between pH 3.5 and 5.0 and little activity above pH 6.5. In general the pH response of soluble enzyme resembles that of enzyme bound to cell surfaces. Soluble enzyme demonstrated an energy of activation (Ea) of 11,000 cal/mole, a value similar to that determined for cell surface enzyme. The Km for soluble enzyme for the substrate p-nitrophenyl phosphate was significantly lower than that of cell surface enzyme. Soluble phosphatases retained 50% of the initial activity after 24 h at 50°C. The effects of a wide range of inhibitors were also tested, sodium fluoride and sodium orthovanadate were the most potent inhibitors of phosphatase activity.

Separation of extracellular phosphatases by membrane filtration, gel filtration and electrophoresis detected the presence of at least two enzymes of different molecular weights. The higher molecular weight fraction contributes most of the extracellular activity and shows activity against a wide range of substrates.

**J. W. ASIMON.** Ottawa–Carleton Chemistry Institute, Carleton Campus, Carleton University, Ottawa, Ontario, Canada, K1S 5B6

An overview of the major biosynthetic pathways leading to major classes of mycotoxins will be presented, as well as the examination of some aspects of chemistry of current interest.

**Arnavil, V., see Silver, J. C., et al.**

**ARCHANA ASTHANA and C. A. SHEARER.** Department of Plant Biology, University of Illinois, 505 S. Goodwin St., Urbana, IL 61801. Antagonistic activity of species of *Pseudohalonectria* and *Ophioceras* against a broad range of fungi.

In *vitro* antagonistic activity of species of two closely related freshwater, lichenicolous, ascomycete genera, *Pseudohalonectria* and *Ophioceras*, were studied. Species were tested in paired culture on agar against a range of fungi representing different orders of the major classes of fungi. Percent inhibition or stimulation of radial growth was measured. Species were characterized by their ability to inhibit and to resist inhibition. Species in each fungal order tested were inhibited to some extent by all except one species of *Pseudohalonectria*. Growth of Oomyctes and Ascomycetes was strongly inhibited at a distance by *Pseudohalonectria* spp. Species of *Ophioceras* were generally less inhibitory than species of *Pseudohalonectria*. Growth of *Pseudohalonectria* and *Ophioceras* spp. was stimulated by some test species. Culture filtrates of *P. longirostrum* were strongly inhibitory to yeasts and filamentous fungi. Studies are underway to optimize conditions for production of antagonistic substances and to isolate and identify them.

**C. V. BACON and D. H. HINTON.** Toxicology and Mycotoxin Research Unit, USDA/ARS, Russell Research Center, P.O. Box 5677, Athens, GA 30613. Iterative germination in *Epichloë typhina*: The whole story.

The germination process in ascospores and conidia of *Epichloë typhina*, an endophyte of prairie wedgegrass,
Sphacelotheca obtusa was studied relative to its role in the infection process by the fungus. We showed earlier that ascospores of E. typhina germinated, produced phialides along its length and conidia but produced no mycelium. This form of microcycle conidiation was referred to as iterative germination. We now report that these conidia produced from ascospores undergo additional iterative germinations producing conidia approximately half the germinating conidia size. These conidia undergo yet an additional cycle of iterative germination, producing still smaller conidia. These conidia, produced after the third cycle of germination, finally undergo typical germination producing mycelia. This series of microcyclic germinations occurred without exogenous nutrients, on a variety of substrates, including leaves of its host, and with these infections, an unknown cultural induction period. Therefore, it is concluded that these series of microcyclic iterative germinations are obligate processes and that microcyclic conidia might be involved in the infection process.

L.O. Batalden and D.J. McLachlin, Department of Plant Biology, University of Minnesota, 220 Biological Science Center, 1445 Gortner Avenue, St. Paul, MN 55108. Restriction fragment polymorphisms in mitochondrial DNA in Paxillus involutus.

Nineteen isolates of P. involutus, a mycorrhizal member of the Paxillaceae (Boletales), from a variety of geographic locations from North America and Europe were obtained. MO DNA was isolated from mycelium grown in culture. The restriction fragment patterns and physical maps using eight restriction endonucleases were compared. P. involutus was found to have a circular genome of 40 kilobases with variations in restriction sites and length mutations. Four subgroups were elucidated within this species by this method, two from North America and two from Europe. The two European subgroups identified correlated with two of the three intersterile groups identified by Fries (Myco 24:403-409, 1985). One North American group was intersterile with both of the European intersterile groups; one was intersterile with one European intersterile group (M. Fries, pers. comm.). These two intersterile subgroups were also the most closely related on the basis of the number of common restriction fragments. Some correlation was noted between the intersterile/matemental group and the mycorrhizal association. Mitochondrial restriction polymorphisms appear to give information about this fungal species which correlates with biological speculation identified by intersterility.


Aspergillus flavus Link causes aflatoxin contamination of cottonseed and other crops. Populations of A. flavus are complex and vary widely in physiological and morphological characters. Understanding the population structure may result in new strategies for control of aflatoxin contamination. Therefore, genetic diversity in the A. flavus population of a single Arizona cotton field was studied. Soil and cotton boll isolates were assigned to vegetative compatibility groups (VCGs) by use of nitrate non-utilizing mutants. Results suggest that both soil and boll populations are genetically diverse, though certain VCGs predominated. There is overlap between soil and boll populations. Single bolls may contain members of several VCGs. This study may help to determine the importance of soil populations in cotton plant infection and the movement of inoculum from field to field.

C.A. Bean, J.O. Kuti and T.J. NC. Departments of Botany and Horticulture, University of Maryland, College Park, MD 20742. Trichothecenes and their possible involvement in pathogenicity of Myrothecium Roridum.

Macroyclic trichothecene roridin E, produced in culture by a strain of Myrothecium roridum pathogenic to muskmelon (Cucumis melo L), and roridin A and myrotoxin A+B, trichothecenes from M. roridum strains non-pathogenic to muskmelon were investigated for their role in pathogenicity of M. roridum. Roridin E did not affect the growth of the pathogen in vitro but significantly increased sporulation and lesion diameter on inoculated muskmelon leaves whereas roridin A and myrotoxin A+B did not affect sporulation or lesion size. All the trichothecenes induced phytotoxic reactions in muskmelon and increased electrolyte leakage from muskmelon leaf tissue. Muskmelon cultivar rankings with respect to the phytotoxic responses and level of electrolyte leakage induced by roridin E were similar to cultivar rankings after inoculation with M. roridum. Roridin A and myrotoxin A+B did not elicit cultivar-specific response. Characteristic lesions caused by the pathogen were similar to lesions caused by roridin E. These results suggest that roridin E is involved in the establishment of pathogenicity by M. roridum in muskmelon tissue.

M. J. Berbee and J. L. Kerwin, Department of Entomology, University of California, Davis, Davis CA 95616. Surface characteristics of Lasenidium giganteum zoospores.

Zoospores of the mosquito-parasitizing oomycetous fungus Lasenidium giganteum recognize and encyst upon mosquito cuticle as a first step in infection. We present the ultrastructural morphology of the zoospore, with particular emphasis on cytochemical surface characters possibly involved in mosquito recognition. Using Thierry and thiosemicarbazide-silver proteinate stains, carbohydrates and perhaps sulfhydryl groups were localized in the plasma membranes and elsewhere in the zoospores. Evidence from fluorescence and light microscopy studies with labeled concanavalin A suggests that glucose and mannose residues are present in the plasma membrane. A cell coat containing materials staining positively for peroxidase extends beyond the carbohydrate-containing layer. The presence of carbohydrates is consistent with involvement of plasma membrane glycoproteins or glycolipids in host recognition.

S.W. Berch. Department of Soil Science, University of British Columbia, Vancouver, B.C. V6T 2A2. Distribution of vesicular-arbuscular mycorrhizal (VAM) fungi with land use.
The purpose of this study is to determine whether land use affects species composition of VAM fungi. On UBC’s Research Farm at Oyster River, Vancouver Island, B.C., the record of land use dates back several decades. Recently, an intensive soil survey was carried out. With this background information, the following sites were selected: 1) ungrazed forest, 2) grazed forest, 3) shore, 4) pasture, 5) silage corn, 6) winter wheat. In May 1980, soils were sampled from 5 locations per site. Samples were divided in two, one part to be assessed directly for the presence of spores, the other to be used as inoculum for pot cultures with onion which were harvested after five months.

Identification of VAM fungi from the field and pot culture is currently underway. Trends indicate that species of VAM fungi do differ depending on the type of land use. Little or no sporulation of VAM fungi occurred in cultures originating from undisturbed forest although large amount of VAM fungal hyphae were present. A number of different Glomus species have been found including Glomus scintillans and a new species similar to Glomus monosporum.

Berch, S. M., see Sancayainq, R. P.

Beremand, M. N., see Desjardins, A. P., et al.

H. BERTRAND, Department of Microbiology, University of Guelph, Guelph, Ontario Canada N1G 2W1. Molecular biology of plasmid-induced senescence in Neurospora crassa.

Isolates of Neurospora from Hawaii and India consist of two classes: strains that can be propagated indefinitely, and strains that senesce and die after short periods of vegetative reproduction. The mitochondria of senescence-prone strains contain one of two linear, double-stranded DNA plasmids, kalilo or maranhar. These plasmids induce senescence by integrating into the mitochondrial chromosome (mtDNA) by a process that causes a large deletion at the point of insertion, and generates very long, (up to 40 kbp) inverted repeats of target DNA flanking the ends of the insertion sequences. Although kalilo and maranhar are unrelated at the nucleotide level, both have inverted long terminal repeats that are linked to terminal proteins and contain only two genes encoding RNA and DNA polymerases, respectively. Integration of the plasmid into mtDNA does not involve a transposase, but may require plasmid-encoded functions and DNA intermediates that are normally involved in the replication of the linear elements. Circumstantial evidence indicates that the integration of the plasmids may convert the circular mtDNA of Neurospora into linear chromosomes that depend on plasmid-encoded proteins for replication. The senescence plasmids of Neurospora are a new class of mobile elements. -- Research supported by NSERC Canada.

L. A. RÉBÉDÉ, M. DESSUREAULT. Centre de Recherche en Biologie Forestière, Faculté de Foresterie, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4.

Use of gel electrophoresis protein pattern to identify biological species of Armillaria.

The root pathogen, Armillaria mellea in the broad sense is comprised of nine reproductively isolated groups or biological species in North America. Haploids and diploids isolates of mycelia, rhizomorphs and fruiting bodies of species I, II, III, V, VI, VII, IX, X, and XI from different geographical area were tested for their soluble protein pattern by SDS-PAGE. Patterns showed variability within and between species of close and far geographical regions. Distinct bands allows to differentiate biological species from one another. The usefulness of this technique to recognize the nine different biological species will be discussed.

Bulkin, A., see Foster, L., et al.

C. F. BILLS, Merck, Sharp & Dohme Research Laboratories, P.O. Box 2000, Rahway, NJ 07065. Influence of isolation media on the perception of community structure of soil microfungi.

Because direct observation of soil fungi is often impractical, their populations are necessarily estimated by indirect cultural methods, such as dilution plating, baiting, or trap culture. Despite the inherent disadvantages of the dilution plate method, the method remains popular for comparative studies of soil microfungal communities. A major limitation of the method relates to the selective influence of media on the growth of fungi prior to their detection and enumeration. A single soil sample from a pine barren bog was diluted and plated onto several different isolation media. For each medium, 300-500 developing colonies were isolated at random, enumerated, and identified. The different isolation media are compared in terms of the fungal taxa isolated and their frequency of occurrence.


M. BLACKWELL AND D. MALLOCH. Department of Botany, Louisiana State University, Baton Rouge, LA 70803, U.S.A., and Department of Botany, University of Toronto, Toronto ON MSS 1A1, Canada. The importance of arthropod dispersal in coprophilous habitats.

Precise spore dispersal is essential to coprophilous fungi because the dung substrate is rapidly decomposed and new substrates are seldom contiguous. Dispersal of coprophilous fungi with forcibly discharged spores and herbivore gut passage is well known; however, we regularly observe a diversity of species with an entirely different, highly effective, dispersal system. Dispersal relies upon phoretic mites of insects and the insects themselves to deliver spores directly to new substrates. The ascomycetes of this group are characterized by having long necked perithelia with early evanescent asc; ascosporas extruded to the neck are ovoid to cylindrical with adhesive material at attachment sites. Several zygomycetes in the habitat have sporangia with specialized attachment structures. The fungal life cycles are closely timed to those of the arthropod dispersers. The taxonomic diversity of species with this life history indicates that the mechanism must have arisen many times. Additional species of Pyxidiophorus, Scharenzmoma, Ceratoctyasis, Rhabdochulus, and Dycomycetes, all common in dung, are also known from other substrates such as trees, plant debris, and fungal fruiting bodies where they are associated with arthropods. Shifts in arthropod habitats have probably been essential to the spread of groups of species characteristic of the diverse substrates. Many of the species sporulate early in the substrate succession only on substrates that have never been dried. This may explain their previously supposed rarity in coprophilous habitats.
The resulting protein phosphorylation cascade is thought to be responsible for relief of dormancy. An important question is: How does glucose cause an increase in cAMP content? The earlier suggestions that increased cAMP levels result from depolarization of the plasma membrane or a transient intracellular acidification are inconsistent with the observation that 6-deoxy-glucose (6-DG) also causes a rise in cAMP. A recent study proposes that generation of the glucose-induced cAMP signal may be at the level of transport-associated hexose phosphorylation. This research tests this hypothesis with germinating spores. Glucose and 6-DG concentrations of 0.5 mM caused complete activation whereas about 200 mM fructose was required to produce a measurable response. Competition studies demonstrated that all three sugars share a common transport system with $K_m$ values of 1, 6 and 9 mM for glucose, fructose and 6-DG respectively. Dorman spores contain a constitutive hexokinase with $K_m$ values of 0.1 and 5 mM for glucose and fructose respectively. 6-DG was not phosphorylated. These results argue against the idea that the receptor for generation of the cAMP signal is the glucose carrier.

**T. M. BOURETT and R. J. HOWARD.** Central Research and Development Department, DuPont Experimental Station, Wilmington, DE 19880-0402.

Penetration peg ultrastructure in the rice blast pathogen is highly specialized.

**Appressoria of the rice blast fungus, Magnaporthe grisea, produce a penetration peg capable of penetrating the surface of the host plant and a number of artificial substrata. We examined the ultrastructure of pegs formed on cellulose film using freeze substitution. Throughout development the peg was surrounded by a single-layered cell wall continuous with the innermost layer of the pore wall-overlay. The peg cell wall could be labeled with both ConA and wheat germ agglutinin conjugated to colloidal gold. The cytoplasm of the peg and adjacent region of the appressorium was nearly devoid of ribosomes and lacked larger organelles (such as mitochondria, membrane cisternae, vacuoles etc.). The peg cytoplasm consisted primarily of cytoskeletal elements and filasomes. During peg elongation vesicles were also found within the peg. Using immunocytchemistry we have demonstrated that actin is a major constituent of peg cytoplasm. Actin may be important in imparting rigidity to the peg during mechanical penetration of the host/substratum.**

**L. L. BOWERMAN and R. D. GOOS.** Botany Dept., University of Rhode Island, Kingston, RI 02881. Fungi associated with living leaves of Nymphaea odorata.

Little work has been done on the fungi associated with emerged leaves of aquatic plants. The water lily is unique in that its leaves have the abaxial surface exposed to air and the adaxial surface immersed in water. It thus offers the potential for colonization by both aquatic and terrestrial air-borne fungi. This paper presents the results of isolations made from water lily leaves during the 1988 growing season. Over 30 different fungi were isolated in this study. Of these, Dichetophthora nymphaearum and Scelerotium sp. appear to be regularly associated with water lily leaves. The myxomycete Diderma effusum was also found.

**Brown, D., see Clark, J.**

**T. D. BRUNS, R. FOGEL, and J. W. TAYLOR.** Department of Botany, University of California, Berkeley, CA 94720 and University of Michigan Herbarium, Ann Arbor, MI 48109. Amplification and sequencing of DNA from fungal herbarium specimens.

We have utilized the polymerase chain reaction to amplify and sequence DNA from 30 collections of dried fungi obtained from four different herbaria. The collections had been dried and stored under a variety of conditions for 1 to 30 years. DNA was extracted from 5 to 30 mg of ground tissue and a 415 bp fragment of the mitochondrial large subunit ribosomal RNA gene amplified. Sequences obtained from DNA cloned from a culture and that from DNA amplified from the corresponding dried voucher collection were found to be identical, but collections of different taxa yielded unique sequences. Controls lacking DNA failed to produce amplified products. This application of the polymerase chain reaction increases the value of fungal herbaria for molecular systematic and population genetic studies. Furthermore, this approach permits one to study fungi that have not been cultured.

**Bruns, T., see Gardes, M., et al.**

S.A. BRUNT and J.C. SILVER. University of Toronto, Toronto, Ontario, Canada. Preliminary characterization of the gene(s) which encode hsp85, a component of the Achlya steroid receptor.

The steroid hormone antheridiol, regulates sexual development in Achlya. Analysis of in vitro translation products of RNA isolated from control, heat-shocked or hormone-treated mycelia demonstrated an increased accumulation of mRNA encoding a similar 85 kDa protein in both heat-shocked and hormone-
treated cells. This hormone and heat-shock-induced 85 kDa protein was shown to be a component of the Achlya steroid-receptor complex. Preliminary Southern hybridization analysis using a Droso phila hsp85 clone, suggested that there were at least two putative hsp85 genes in the Achlya genome. The Droso phila probe was used to screen an Achlya genomic library and a putative Achlya hsp85 gene clone was isolated and characterized by restriction mapping. Northern blot analyses using the Achlya clone, indicate that this clone recognizes an mRNA species of approximately 2.8 kb which is substantially enriched in both heat-shocked and hormone-treated cells relative to controls. Initial Southern hybridization analyses using this Achlya hsp85 clone indicate that there may be in fact be more than two hsp85-related gene sequences in the Achlya genome. Whether these putative Achlya hsp85 genes are each regulated by both stress and steroid hormone remains to be determined. (Supported by NSERC grants to J.C.S.)

Brunt, S. A., see Silver, J. C., et al.

Carnell, L., see Bourret, J. A.

L. M. CARRIS and A. W. STRETCH. Rutgers University and USDA-ARS, Blueberry and Cranberry Research Center, Chatsworth, NJ 08019.

Two taxa of Apostrasseria causing black rot of cranberry.

Two cultural types of Apostrasseria (Shear) Nag Raj (Coelomycete) cause black rot of cranberry (Vaccinium macrocarpon Ait.), an important fruit rot found in all commercial cranberry growing regions in North America. Both types form one-celled, hyaline conidia with mucoid apical appendages from annellidic conidiogenous cells that are characteristic of Apostrasseria. The types differ in cultural characteristics including colony morphology, sporulation requirements, conidial size and shape, and number of nuclei per conidium. The fruit rot symptoms caused by the two fungi are readily distinguished in artificially inoculated fruit. The two types, usually referred to as dark and light strains of Apostrasseria lunata (Shear) Nag Raj (= Ceuthospora lunata Shear) appear to be distinctive, stable taxa that occur together over a wide geographic range. Based on the current taxonomic concept of Apostrasseria delimited by Nag Raj in 1983, the dark strain corresponds to A. lunata, the type species of the genus, and the light strain represents a new taxon.

R. J. CHACKO, G. J. WEIDEMANN and D. O. TEBEEST, Dept. of Plant Pathology, Univ. of Arkansas, Fayetteville, AR 72701.

Heterokaryosis in Colletotrichum gloeosporioides f. sp. aesculinae.

Colletotrichum gloeosporioides f. sp. aesculinae (CGA) is used as a bioherbicide to control northern jointvetch (Aeschynomene virginica) in the rice and soybean growing regions of the Mississippi River delta. Like many other members of the genus, CGA lacks a known teleomorph and genetic diversity is presumed to arise through heterokaryosis and mitotic recombination. The potential for genetic exchange within CGA and related plant parasitic Colletotrichum species was investigated by crossing strains of CGA with nutritional deficiencies examined through 14C-phenylalanine labelling of the substrate, e.g., plant lignocellulose, and trapping of 14CO2 from inoculated substrate during incubation. The role of the fungal delignification in nutrient cycling, particularly in the continuity of Carbon cycling is analyzed. Wheat–coleoptile bioassay of the mycelium extract indicated that CGA has beneficial plant growth promoting regulator. It is to be tested on pine. Possible pathogenicity of the fungus on Pinus palustris is being monitored.

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

Cochran, B. J., see Nelson, R. T., et al.


Roots of several salt marsh plant species were examined for the presence of vesicular–arbuscular mycorrhizal (VAM) fungi. Samples were taken from introduced, planted material in a salt marsh restoration project and from native material in adjacent marsh areas on the Indian River, Clinton, CT. After ten years the replanted area still has placed devoid of vegetation. The introduced salt marsh plants were devoid of VAM fungi, while high marsh species from the adjacent areas showed consistent infection. A comparison of species sampled from the disturbed region and from the adjacent non-disturbed areas will be presented.

Cotty, P. J., see Bayman, P.
In conjunction with a revision of the genus \textit{Leplostaphera}, the morphology of the teleomorph and anamorpha of the type species of the genus, \textit{L. doliolum}, was examined. Pseudothecia from the type specimen of \textit{L. doliolum} were fixed and embedded in resin and sectioned for examination with light microscopy. Pseudothecia and pycnidia from a culture of \textit{L. doliolum} were fixed and embedded in resin and sectioned for examination with light and transmission electron microscopy. Ascospores and conidia were examined with light and scanning electron microscopy. The morphological features of \textit{L. doliolum} are described and illustrated.

Cranes, J. L., see Huhndorf, S. M.

J. CLARK and D. BROWN. School of Biological Sciences, University of Kentucky, Lexington, KY. 40506.

Growth of the myxomycete \textit{Stemonitis flavigena} in defined medium.

Only 85 of the approximately 500 species of Myxomycetes have been grown in culture and of these only 19 species have been cultured without a live bacterial or yeast food source (Hu and Clark 1988). Of these 19 species only 3 species of Physarum have been grown on defined medium. This report describes a defined medium for a fourth species, \textit{Stemonitis flavigena}, which is in a different order.

Medium (per liter): 2.5 ml of 0.4 M MgSO4.7H2O, 0.5 ml of CaCl2, 6 ml of 0.25% hematin in 12 NaOH, 12 ml of 0.25 M NaHPO4, 8 ml of 0.25 M KH2PO4, 0.16 g of methionine, 1.0 g of glycerol, 1.0 g of arginine, 1.0 g of valine, 0.5 g of leucine, 0.5 g of lysine, 0.5 g of isoleucine, 0.2 mg of thiamine, 0.1 mg of biotin, 15 g of washed noble agar and double glass distilled water to one liter.


Taxonomic studies of myxomycetes of boreal orchards.

Fungi isolated from the myxomycetes of mature terrestrial orchards were studied with respect to their cultural morphology and taxonomic disposition. In most cases isolates could be assigned to the genera \textit{Haplophysina} but subdivisions, some corresponding to Moore’s recently proposed generic concepts (\textit{Eolotrichia}, \textit{Coratotricha} and \textit{Monilopsis}), could be recognized. Endophytes belonging to the following taxa were identified: \textit{Eolotrichia repens}, \textit{E. antiqua}, \textit{Coratotricha goodayae–perennis}. Anamorphic material of an unidentified species of \textit{Sebacina} was found only in the myxomycetes of \textit{Platycodon speciosula}. A series of isolated bearing distinctive clamped monilioid cells and belonging to \textit{Sistotrema} was found in \textit{Piperia unisclerosa} and \textit{Platycodon obusata}. A strain from \textit{Coeleglossum viride}, with broad hyphae (11–12 μm diam.), large globose monilioid cells and dark brown, and dusky, resembles Burnet’s 1936 description of \textit{Phlebiopsis anomala} which is redescribed and renamed \textit{Monilopsis anomala}.

Currah, R. S., see Richardson, K.

Currah, R. S., see Stoyke, G., et al.

K. J. CZYMMER and T. M. HAMMILL. Department of Biology, SUNY College at Oswego, Oswego, NY 13126.

Electron microscopy of ascosporogenesis in the sexual yeast, \textit{Schizosaccharomyces octosporus}.

Electron microscopy was used to examine details of sexual reproduction in a culture of \textit{Schizosaccharomyces octosporus} isolated during a fungal floristic study in Oswego Hospital. Cultures were grown on Difco PDA in continuous dark at 20°C. Cultures were fixed 2.5–5 d after inoculation. Plasmogamy between mating pairs of cells was preceded by the localized accumulation of vesicles beneath cell walls at the points of contact between the cells. Thinning and dissolution of cell walls at the contact points presumably resulted from activity of wall-lyzing enzymes contained in the many vesicles. Fused yeast cells initially displayed a thin conjugation canal, but later developed a more cylindrical shape. Nuclei migrated into the conjugation canal, perhaps through the mediation of cellular microtubules. Karyogamy occurred in the conjugation canal. Meiosis I and II followed in the cylindrical ascus mother cell, and appeared to be uninuclear, i.e., the entire process occurred within the confines of the original nuclear envelope surrounding the diploid zygote nucleus. Following a single post-meiotic mitosis, an enveloping pair of membranes formed around each nucleus and some accompanying cytoplasm, delimiting ascospore initials. A new cell wall formed between layers of the envelope surrounding each ascospore initial, resulting in eight ascospores surrounded by the original zygote wall (now the ascus wall). Release of ascospores resulted from deterioration of the ascus wall.

V. F. PET. Bioecosystematics Research Centre Agriculture Canada, Research Branch Central Experimental Farm Ottawa, Ont., Canada K1A 0C6. Morphology and growth requirements of \textit{Endocarpis pisiformis} Link: Fries in culture.

Strains of \textit{Endocarpis pisiformis} Link: Fries were maintained in pure culture and grown on several natural and synthetic media. Slow-growing yellow isolates were obtained; they produced rami- fied coenocytic hyphae bearing two types of inflated cells: thin-walled cells, and laminated thick-walled cells. The thick-walled cells were easily detected among the thin-walled ones by their capacity to autofluoresce under U.V. light, a characteristic also observed with the ascospores of the same species.

A pH of 6.0, a temperature of 20°C and alternation of light and darkness (12h/12h) were the optimal edaphic conditions for mycelial growth. All the tested strains grew well on several carbon and nitrogen sources; best growth was obtained with trehalose and cellulose (1%2g/l), with sodium nitrate and glucose (5mg/l). Thiamine (100 μg/l) was found essential for the maintenance of the vitality of the strains. Better growth was obtained with a mix of thiamine, pyridoxine and biotin (200 μg/l).

R. A. DARVEAUX. State University of New York, College of Environmental Science & Forestry, Faculty of Environmental & Forest Biology, Syracuse, New York 13210-2529.

Fungi from pine and spruce cones.

Cones of \textit{Pinus sylvestris} L., \textit{P. strobus} L., and \textit{Picea abies} (L.)
Karst. were collected from two forests near Syracuse. When the cones were pulled apart, the scales and axes were surface sterilized, cut into small (2 mm x 2 mm) pieces and inoculated onto 5 types of media. Fungi were isolated at 4, 10, 18, 25, and 35 days after inoculation. The cones harbored a wide variety of fungi and the isolates from them included new, as well as, rarely encountered species. Other results were: 1) scales were more likely to be colonized by fungi than the axes; 2) some species were isolated only from either scales or axes, but all fungi that were isolated more than three times came from both parts; 3) there was no difference in the number of species inhabiting cones of *Pinus sylvestris*, *P. strobus* or *Picea abies*; and 4) there were more fungal species isolated at one site, possibly indicating a higher species richness.

P. T. DePriest, Department of Botany, Duke University, Durham, NC 27706. Molecular-genetic survey of the *Cladonia chlorophaea* complex (lichen-forming Ascomycotina) from Mt. Rogers, Virginia.

Four morphologically indistinguishable chemotypes of the *Cladonia chlorophaea* complex are sympatric in the Southern Appalachians. Recent studies indicate that two of these chemotypes hybridize. In the present study, I used molecular-genetic markers to detect gene flow and reproductive isolation in the four chemotypes at Elk Park, a grassy bald on Mt. Rogers. A preliminary survey of individual podetia from different soil mats, representing the three most abundant chemotypes, detected restriction-pattern polymorphisms for the ribosomal RNA genes. Within single mats, podetia of different chemotype showed distinct restriction patterns while those of identical chemotype usually had similar patterns. Individual podetia of the same chemotype from different mats varied but shared diagnostic fragments. Two chemotypes, one with cryptohydroxamic acid and the other with grayanic acid, each had a characteristic pattern whereas the humar-protopcteric acid chemotype had two common diagnostic patterns. These data suggest that most chemotypes are genotypically distinct and that members of the same chemotype in a mat may represent clonal or inbred families. A more intensive study of individuals from mats of pure and mixed chemotype will use restriction patterns of random DNA fragments from a genomic library as well as ribosomal RNA genes. The variation in genetic markers within and between chemotypes will be compared to determine if chemotypes are polymorphisms of one species or reproductively isolated sibling species.

A. E. Desjardins, M. N. Beremand, Y. P. Salch, T. M. Hohn, and S. P. McCormick. USDA-ARS, Northern Regional Research Center, 1815 N. University St., Peoria, IL 61604. Genetics of trichothecene toxin production in *Fusarium*.

Wild-type strains of Gibberella pulicaris (anamorph: *Fusarium sambucinum*) differ in the level of trichothecene toxins they produce and in the extent and pattern of toxin oxygenation and esterification. Precursor feeding experiments with *Fusarium* cell cultures have identified O₂ as the source of all noncarbonyl oxygens in various trichothecenes and suggest that some nonproducer strains of *G. pulicaris* contain structural information for all or part of the trichothecene pathway. *G. pulicaris* is a heterothalic ascomycete and is amenable both to classical genetic analysis and to transformation using a system based on resistance to hygromycin B (1). Conventional genetic analyses of wild-type strains are being used to identify genes that regulate toxin levels as well as genes that code for the ability to hydroxylate and esterify certain carbons of the toxin molecule. Results suggest that multiple, unlinked nuclear loci are involved in the control of trichothecene biosynthesis. Regulation of toxin production is also being investigated by analysis of hygromycin-resistant transformants some of which were transformed with a plasmid containing portions of the gene coding for an enzyme (2) specific to the trichothecene pathway.


D. E. Desjardins, Department of Botany, University of Tennessee, Knoxville, TN 37996. Taxonomic potential of culture morphology in *Marasmius*.

Although the importance of the use of culture morphology in the taxonomy of wood-rotting *Aphyllophorales* is well established, the taxonomic potential of culture morphology of agarics has rarely been investigated. Ninety isolates representing 29 species of southern Appalachian *Marasmius* were grown under controlled conditions on various media to determine the value of culture morphology in the genus. Very little interspecific variation in culture morphology was observed in isolates grown on malt extract agar, the traditional medium used in systematic studies of *Aphyllophorales*. In contrast, isolates of *Marasmius* grown on potato dextrose agar (PDA) revealed species-specific morphologies for nearly all taxa investigated. On PDA, infraspecific variability in culture morphology was low, while interspecific variability was high. No single culture character could be used to clearly separate taxa; however, a combination of selected macro- and micromorphological features were suitable for species or species-complex determination. Taxonomically valuable diagnostic features include: a) mean growth rate; b) culture mat coloration and texture; c) reverse color; d) culture mat tissue-type; e) occurrence of differentiated elements such as dendostrictocitimid elements or swollen intercalary cells; f) formation and distribution of crystals; g) clamp connection formation; and h) degree of hyphal diverticulation. Asexual propagules, such as conidia, chlamydospores, arthrospores or oidia were not formed by any *Marasmius* cultures examined.

Dessureault, M., see Bérubé, J. A.

Dixon, D. M., see Haines, J. H., et al.

Dixon, D., see Sigler, L., et al.

Duchesne, L. C., see Smith, M. L., et al.


A Basidiobolus isolate from a frog ulcer has been maintained for over two years at room temperature and, unlike most isolates, continues to produce numerous conidia as well as zygospores. When the isolate was first examined, it produced many sporangiospores by endogenous cleavage of the protoplasm of the discharged conidia as originally described by Drechsler in 1955 for his new species, *B. mallei*. After our isolate appeared to lose its natural capacity for this type of cleavage after several months in culture. In 1967, Srinivasan and Thirumalachar demonstrated that the addition of ammonium chloride to growth media induced several species of *Basidiobolus* to form...
sporangiospores. Endogenous cleavage in our isolate is stimulated by the presence of ammonium chloride. It appears that the process begins with successive bipartitioning as originally described by Drehlscher and is then followed by a more irregular cleavage process. Finally, we have studied the effect of light on gametangial formation and discharge in our isolate and have found that endogenous cleavage apparently occurs at a low rate before discharge but many more cleaved proplasts are seen in conidia which have discharged several days before examination.

K.N. Egger, K., see Stoyke, G., et al.


In 1984, Yang and Wilcox (Mycologia 76: 675) identified Tricharina mikolae as a teliomorph of E-strain fungi that form ectendomycorrhiza on coniferous and deciduous trees. Later, Yang and Korf (Mycologia 76: 675, 1984) delineated a new genus, Wilcoxina, that they segregated from Tricharina on the basis of the mycorrhizal habit and the presence of Complexipes anamorphs. Despite these differences in the teliomorphs, Wilcoxina and Tricharina share significant morphological similarities and at least one species of Tricharina, T. praecox var. intermedia, is known to infect roots of lodgepole pine, although this association appears to be pathogenic (Egger and Paden, Can. J. Bot. 64: 2719, 1986). In order to examine more closely the relationship between these genera, I surveyed restriction fragment polymorphisms in the rDNA region of taxa of Wilcoxina and Tricharina. These data were used to construct restriction maps which were then analyzed to infer phylogenetic relationships.


Reports on the occurrence of 13,000 fungi on 8,800 host plants have been collated from 4,000 literature sources. The 13,000 fungi and 8,800 host names are those currently accepted by the respective taxonomic communities as determined by a survey of the relevant taxonomic literature. Only fungi growing on an identifiable plant host have been placed in the data base and thus, mycorrhizal and soil fungi are not represented. Other general features of the data base will be discussed. The information in this data base has been used to elucidate similarities of fungal assemblages at different taxonomic levels on different hosts. For example, in the Solanaceae 71% of the species found on Solanum melongena (eggplant) are also found on Solanum tuberosum (potato) but only 14% of the species on eggplant are found on Lycopersicon esculentum (tomato). In comparing the fungi on Quercus, Fagus and Acer, less than 1% of the genera found on Fagus are also found on Quercus, but 24% of the genera found on Fagus also occur on Acer. Of the 305 different fungi reported from the Asclepiadaceae, Gentianaceae and Aplaciae only one, Phleoctina solani, was reported on members of all three families.


Wogel, R., see Bruns, T. D.

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

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

L. Foster, A. Billin, K. Kozak and Ian Ross. Biological Sciences, University of California, Santa Barbara, CA 93106. Unusual chemical and physiological properties of Corpinus congregatus phenoloxidase.

The membrane-associated, hyphal tip phenoloxidases of C. congregatus have proven difficult to purify and characterize. Although normally confined to the membrane of the hyphal tips and not secreted into the medium, the fungus can be induced to secrete laccase. Laccase secretion is inducible and specific to the inducing substance, with different laccase isozymes being secreted with different inducers. Secretion may be induced by specific contaminant fungi or by specific nutritional environments. Under induction conditions, laccase is virtually the only protein secreted. Using this purified form, we have determined that the enzyme is quite different from those of other fungi previously reported. It consists in the non-denatured state as an enzymatically
active band on acrylamide gels of relatively slow mobility. On denaturing gels, this band disappears and 5 bands that are all of much faster mobility appear at the bottom of the gel. The implications of this apparent multi-meric state of the laccase and other characteristics will be discussed.

Puller, M. S., see Wubah, D. A.

Puller, M. S., see Robertson, R. W.

M. GARDES, K. K. Y. WONG and J. A. FORTIN. Centre de Recherche en Biologie Forestière, Faculté de Foresterie et de Géodésie, Université Laval, Sainte-Foy, Québec, Canada, G1K 7P4. Interactions among monokaryotic and dikaryotic strains of Laccaria bicolor on roots of Pinus banksiana

Certain monokaryotic and dikaryotic strains of Laccaria bicolor (Maire) Urton are able to form ectomycorrhizae on seedlings of Pinus banksiana Lamb. Dual inoculations were carried out under aseptic conditions using strains which have different degrees of compatibility. Fungal cultures were reisolated from short roots of the seedlings and identified using isozyme or RFLP patterns. Inoculations with genetically different dikaryons were performed to study competitive interactions. The persistence of monokaryons was examined using combinations of a monokaryon and a compatible dikaryon or monokaryon. These results are compared with results obtained in a parallel study which evaluated interactions between strains without the plant.

M. GARDES, T. J. WHITE, J. A. FORTIN, T. BRUNS and J. TAYLOR. Université Laval, Québec, Canada and University of California, Berkeley, CA. Identification of indigenous and introduced mycorrhizal fungi by amplification of ribosomal RNA genes

Most plants are associated with symbiotic fungi. In the association called ectomycorrhiza, the fungus forms a structure which encloses rootlets. Ectomycorrhizae form on most of the commercially important tree species in the boreal zone. The identification of fungal colonizers remains problematic because it is difficult to morphologically distinguish mycorrhizae of different species, to reisolate the fungal partner and to induce fruit-body formation in culture. The polymerase chain reaction (PCR) is a method for amplifying small amounts of DNA and is useful for evolutionary studies over a broad range of taxonomic levels. We have designed synthetic oligonucleotide primers which amplify the internal transcribed spacer (ITS) of the nuclear ribosomal RNA genes of fungi. These primers amplified the ITS of DNA isolated from Laccaria bicolor cultures and ectomycorrhizae from white spruce roots inoculated with L. bicolor. This region is sufficiently variable in sequence to distinguish among L. bicolor strains as well as other species of mycorrhizal fungi. Partial DNA sequence data from the ITS and the mitochondrial large ribosomal RNA gene were used to design species and strain-specific DNA probes. In combination with PCR, these probes will be useful for studying the genetic structure of natural populations of mycorrhizal fungi and the persistence of strains used as inoculants in forestry applications.

K. V. GESSNER, C. S. YOON, and M. A. ROMANO. Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. Population genetics of the Morchella esculenta complex.

The genetics of six populations of Morchella deliciosa and M. esculenta from Illinois and Wisconsin were studied using starch gel electrophoresis. Electromorph frequencies for single ascospore cultures were determined from fourteen enzyme systems encoded by twenty presumptive structural loci. Electrophoretic data obtained demonstrated high genetic similarity in M. deliciosa and M. esculenta when they occur at the same locality, indicating they are likely derived from a common ancestral population. A substantial amount of genetic drift (Fst = 0.165) was observed between Illinois and Wisconsin populations. Populations of the two phenotypes, however, did not cluster separately indicating that the two phenotypes should not be separated into different taxa.


Sexual development in Schizophyllum is regulated by four multiallelic mating-type genes: Aα, Aβ, Aγ and Aδ. There are nine Aα alleles in the worldwide population. We isolated two Aδ alleles. Aδ was isolated by walking the chromosome in a cosmid library. Aα was isolated by using the insert of an Aα-containing cosmid to probe a cosmid library from an Aδ strain. The isolated cosmids activate A-regulated development when transformed into recipients carrying alternative Aα alleles. Mating-type transformants were screened microscopically for A-activated development, and were confirmed by mating tests and genetic analyses of progeny. The transforming alleles are active in Aα and Aα″ DNA respectively do not hybridize to DNA from other Aα strains, and do not hybridize to the DNA from Aδ, Aβ or Aγ loci. Aα alleles map to the same region of the chromosome, but are embedded within a 4-6 kb region of heterogeneous allele-specific sequence. The structure, sequence and functional domains of Aα and Aα″ will be discussed.

J. L. GIBSON and J. W. KINSAHOON. Department of Biology, Stetson University, Deland, FL 32720 and Department of Plant Pathology, University of Florida, Gainesville, FL 32611. Ascospore development and wall ontogeny of the truffle Hydnobolites cerebriformis Tularensis.

Few ultrastructural studies have focused on spore development of the truffles (Tuberaceae). This is unfortunate since these ascomycetes have been the focus of recent taxonomic shifts with most families transferred to existing or new familial rank in the order Pezizales (Discomycetes). Recent studies have focused on ascospore development in certain genera and families of Pezizales. Thus, it seems appropriate that comparative data on ascospore ontogeny in the truffles would be useful in assessing their phylogenetic relationships to the Pezizalesan fungi. This study examines ascospore development in general and wall development in
particular in the truffle *Hydnobolites cerebriformis*. Transmission electron microscopy (TEM) is utilized in examining spore initiation in the young ascus as well as primary wall and secondary wall development. The morphological features of the ascospore are related to fine structural observations. Structural and ultrastructural features of this truffle are related to existing data on Pezizales.

D. A. GLAME. Department of Plant Pathology, University of Illinois, Urbana, IL 61801. Teaching mycology for plant pathologists.

Ever since the inception of plant pathology, it has existed in a close relationship with mycology. Plant pathologists traditionally have received substantial training in mycology, and because the majority of plant pathogens are fungi, mycology likely will continue to be included in plant pathology curricula. Plant pathology departments in the U.S. tend to be research oriented departments without undergraduate programs. Departments frequently offer graduate level coursework to be taken after an introductory course. However, recent trends are forcing departments to reconsider the role of mycology courses in their curricula. As departments added courses in areas such as phytopathology, epidemiology, and molecular biology, graduate students have devoted less time to mycology. In addition, graduate student numbers are declining, further reducing demand for courses. Mycology teachers in such settings are faced with the problem of how to provide effective mycological education in less time than previously available. These issues will be discussed in the context of a course on plant pathogenic fungi taught at the University of Illinois.

Dolores Gonzalez and Rytas Vilgalys. Department of Botany, Duke University, Durham NC 27706. DNA sequence analysis of ribosomal RNA genes from *Rhizoctonia solani*.

We recently cloned an entire ribosomal DNA gene belonging to anastomosis group (AG) 4 in *Rhizoctonia solani*. Restriction analyses have revealed little variation between the RNA coding regions of the cloned plasmid pTP1 and the coding regions from other AG's, suggesting that members of the *R. solani* group represent a closely related species complex. We have begun to sequence portions of the ribosomal DNA corresponding to different coding and non-coding regions, in order to locate parts of the rDNA repeat which vary sufficiently to be useful for phylogenetic analysis. Based on published sequence data from other fungi and eukaryotes, we have identified over 20 universally conserved regions spaced within either the coding regions from other fungi and eukaryotes, we have identified over 20 universally conserved regions spaced within each phenotype. Minor restriction pattern variation within each group was due to slight length differences in the major fragments and the presence of additional faint bands. Although a single rDNA phenotype usually dominates within a population, different phenotypes were also observed within a locality and even from the same cone. Several rDNA restriction phenotypes appear to be widely distributed over localities separated by at least 300 miles. The genetic basis for rDNA polymorphism in *Xylaria* is unknown, but is likely to be due to a combination of restriction site mutations, length variation and different methylation patterns. These results suggest a fine-grained population structure for *X. magnoliae* together with the potential for genetic exchange and dispersal between widely separated locations.

L. F. GRAND and S. MEIER. Department of Plant Pathology, North Carolina State University, Box 7616, Raleigh, NC 27695-7616. Morphotypes of ectomycorrhizae of *Abies fraseri* and *Picea rubens* in North Carolina.

The status of ectomycorrhizae of *Abies fraseri* and *Picea rubens* were studied on Mt. Mitchell, NC at various elevations as part of an investigation of a decline of these species at high elevations in the Southern Appalachian Mts. This report deals with morphotypes of ectomycorrhizae of *Abies fraseri* and *Picea rubens* recognized. Two morphotypes of *A. fraseri* (tannish brown and grayish brown) and *Genococcum geophilum* comprised 85% of all ectomycorrhizae. Two morphotypes of *P. rubens* (tannish brown and woolly white) and *C. geophilum* comprised 91% of all ectomycorrhizae.

Gunasekaran, M., see Ike, J., et al.

Gunasekaran, M., see Mohan, N., et al.

Halling, R., E., see Medven, A. S.


An outbreak of sporotrichosis in New York from *Sphagnum* peat harvested in Wisconsin has made a number of clinical isolates available for study. Isolates were also made from natural substrate to document the source of the fungus. One clinical and
several natural isolates produced a teleomorph identified as Ophiostoma stercoreum (Robak) Melin & Nannf. when grown on rich media (PDA, CMA) for several weeks at room temperature. Aeciospores exude from the perithecial beak but clump together in aqueous solutions, preventing single spore isolations by the dilution plate method. They were found to be readily dispensed when placed in mineral and silicone oils. The conidia of the Sporothrix state are just the opposite and clump in oil and disperse in aqueous solutions.

Hamill, T. M., see Czymmek, K. J.

Hamill, T. M., see Manning, M. A.

Hanlin, R. T., see Edelman, R. E., et al.

RICHARD T. HANLIN. Dept. of Plant Pathology, University of Georgia, Athens, GA 30602. Observations on the anamorph of Ophiostoma vaccinii.

Ophiostoma vaccinii causes a leafspot disease of Vaccinium arboresum, a common understory shrub in the southeastern United States. The fungus produces bright orange-red lesions in which the anamorph forms. The anamorph was originally described as a xylem vessel with aeciospores, but it is unique in several respects. Fungal hyphae proliferate throughout the leaf, including the epidermis. Conidioma development begins with the formation of a mycelial mat beneath the epidermis. A layer of conidiophores forms on the surface of the mat, slightly raising the overlying epidermis. In the center of the conidioma, just beneath the mycelial mat, a triangular mass of pseudoparenchyma cells forms and grows upward, perforating the epidermis. Conidium formation ensues, pushing up the epidermis further. As the conidioma develops, the hyphae that fill the epidermal cells secrete a dark pigment, forming a shiny black clypeus. As the conidia form they are oriented toward the pore. The epidermis remains intact in the mature conidioma, except for the pore, through which the conidia escape. Thus the conidioma can be regarded as a modified xylem vessel, with a convex surface and distinct black clypeus that is perforated by a small pore.

Harris, J., see Sigler, L., et al.

Hartnett, D. C., see Hetrick, B. A. D., et al.

Hazenberg, M., see Sedliff, P. C.

J. B. HETRICK and G. H. KAMINSKY. Biology Department, York University, Toronto, Canada. Cytokeletal involvement in tip growth of Andropogon gerardii. 1.

The distribution of organelles and microtubules in hyphal tips of the monokaryotic Andropogon gerardii were quantitatively determined at high resolution from serial section electron microscopy of freeze-substituted cells. 1) Organelles and microtubules were non-uniformly distributed, each showing a characteristic longitudinal gradient starting at different points behind the tip. In addition, the cytoplasmic cross-sectional area was divided into radial regions. 2) Organelles preferentially aligned in either the apical (microtubule and Golgi bodies) or the peripheral (cytoplasmic, wall, vesicles and spherical vesicle) region. 3) The nuclei were no larger or as open to both regions but were always oriented with their centrosomes facing the plasma. Microtubules occurring in the extreme tips, became more abundant sub-sparingly, were predominantly short and increased in mean length with distance from the tip. The correlated patterns of organelle and cytoskeleton organization from tips and previous work show that neither the organelles nor the detected arrays of actin are sufficient to account for most cytoskeletal arrangements. However, based on the distribution and orientation of the predominantly elongated wall vesicles, we suggest that the wall vesicles travel radially from their origins at the centrally located Golgi bodies to the cell periphery where they are transported longitudinally to the hyphal tip in conjunction with the plasma- and actin- associated arrays. Our data also suggest that the hyphal tip contains a cortical actin patch with which the auxin system, at least part of, via these centrosomes and actin-based microtubules, and above mechanical integrity is increased by both the peripheral actin cables and a high density of microtubules. We suggest that the endoplasm is less strong and has physiological properties much subject to the formation and structural integrity of the plasma membrane.

Heath, I. B., see Jackson, S. L.

Heath, I. B., see Kaminsky, S. G. W., et al.

Henning, J. F., see Lopez-Franco, R. M.

Henning, J. F., see Lopez-Franco, R. M.

B. A. D. HETRICK. Dept. of Plant Pathology, Kansas State Univ., Manhattan 66506. Factors controlling VA mycorrhizal fungus spore germination.

While many root-infecting fungi germinate in response to host root exudates, some VAM fungi germinate in the absence of a host when environmental conditions are conducive. Since these conditions which stimulate spore germination also support active root growth, germination in response to environmental conditions rather than specific exudates may rely on a germination strategy for fungi with wide host ranges. The soil microflora also affect spore germination of VAM fungi. Some VAM fungi require microorganisms for germination, either to directly stimulate spore germination, metabolize self-inhibitors or cause them to be leached from spores. Microbial regulation of spore germination is a strategy resembling that of some wood-rotting fungi and ectomycorrhizal fungi. For other VAM fungi, the soil microflora appears to interfere with germi- nation. Factors limiting spore germination expand the role of P in regulating mycorrhizal symbiosis.

B. A. D. HETRICK, G. W. T. WILSON, and D. C. HARTNETT. Dept. of Plant Pathology and Div. of Biology, Kansas State Univ., Manhattan 66506. Relationship between mycorrhizal dependence and plant competition.

The impact of mycorrhizal symbiosis on growth of Andropogon gerardii (AG), an obligate mycotroph, and Koeleria pyramidata (KP), a facultative mycotroph, was compared. Mycorrhizal fungus inoculation resulted in 50 times larger AG plants but did not alter growth of KP. When these plants were grown together, AG dominated when the mycorrhizal symbiosis was present and KP dominated when it was not. Dry weight of mycorrhizal AG was not altered whether grown alone or with KP, but mycorrhizal KP grew well only in the absence of competition and failed to grow appreciably if AG was present. Without mycorrhizal fungus inoculation, AG did not grow and had no deleterious effects on KP. When F fertilization was substituted for mycorrhizal fungus inoculation, AG grew better than in competition with KP at low F levels but was not affected by competition at high F levels. KP was not affected by competition at low F levels but high F fertilization resulted in reduced dry
weight of KP plants when in competition with AG. Phenologic separation of growing seasons avoids interspecific competition between warm- and cool-season grasses and may be one mechanism contributing toward their coexistence. Since low temperatures limit mycorrhizal nutrient uptake, phenologic separation of growing seasons could also avoid the competitive advantage of warm-season grasses conferred by their mycorrhizal dependence.

Hinton, D. M., see Bacon, C. W.

Hoch, H. C., see Kwon, Y. H.

Hohn, T. M., see Desjardins, A. E., et al.

P. A. HORGEN, K. F. KOKUREWICZ and J. B. ANDERSON. Mushroom Research Group, Centre for Plant Biotechnology, Department of Biology, University of Toronto, Erindale Campus, Mississauga, Ontario, Canada. L5L 1C6. Basidiospore germination studies in Agaricus bisporus (=A. bruinenescens).

A standard set of conditions yielding highly-reproducible germination kinetics for basidiospores of the commercial mushroom, Agaricus bisporus will be described. Spores of three commercial, one wild-collected, and one intraspecies hybrid were examined. The effects of presence or absence of growing mycelium, temperature, culture media, and spore age were examined. Cycloheximide completely blocked basidiospore germination and the incorporation of 3H-Leucine into protein, whereas actinomycin D had no effect on germ-tube emergence. Furthermore, 3H-Uridine is not incorporated into spores before or during germination, neither in the presence nor absence of actinomycin D. Two types of basidiospore dormancy exist for A. bisporus (a) exogenously dormant spores and (b) constitutively dormant spores, both of the Group II type as described by Van Etten et al. (1976) in which protein synthesis precedes RNA synthesis. When single-spore isolates of both spore types were allowed to grow and were subjected to fruting, basidiospores were produced from both "early" and "late" categories. If spores were collected from the second-generation basidiospores and germination kinetic measurements were made, the kinetics were similar for both categories. RFLP analysis was used to determine if either spore population possessed a higher percentage of homokaryons. An analysis of the Agaricus spore system for proposed developmental studies will be made.


Horgen, P. A., see Royer, J. C., et al.

J. S. HORTON and C. A. RAPER. Dept. of Microbiology, University of Vermont, Burlington, VT 05405. Characterization of a circular DNA plasmid in Schizophyllum commune with homology to chromosomal DNA.

We have discovered a DNA plasmid of 5 kb in strains of Schizophyllum commune differentiating the specialized hook cells of the so-called A developmental sequence, controlled by the A mating-type genes. The plasmid appears to be circular, and has been shown through Southern analysis to hybridize to portions of both the nuclear and mitochondrial genomes of Schizophyllum. Plasmid DNA also hybridizes to that portion of the 1 kb ladder DNA (size marker) that is derived from the 2 micron circle of Saccharomyces cerevisiae. The Schizophyllum plasmid has been cloned in lambda gt10, and will be tested for biological function in Schizophyllum by DNA-mediated transformation.

Howard, R. J., see Bourett, T. M.

RUYI SHANG KESE and Hai-Hua Wang. Applied Microbiology Laboratory, National Taiwan University, Taipei, Taiwan, ROC. A system for identifying different Ganoderma species.

Little previous research exists into the clear identification of Ganoderma isolates. Ganoderma’s important medicinal properties have been recognized for more than 500 years in China, and demand for its cultivation is on the increase. It is therefore important to establish a system to clearly identify different isolates.

The system used in this research was:

1) Morphology (colony, mycelium, fruiting body, basidiospores).
2) Growth kinetics of the mycelium. 3) Extracellular enzymes assay by API-ZYM kits. 4) Electrophoretic patterns of laccase and esterase isoenzymes. 5) DL-Mat mating and incompatibility test. Using the above system it was possible to separate the following species and their isolates: G. aplensum (Pers.) Wallr., G. boreinense Pat., G. fomes among Chen and Chen, G. Torvifatum (Fr.) Pat., G. lucidum (W. Curt. : Fr.) Karst., G. microsporum Hase, G. neo-japonicum Imaz., G. tropicum (Jung) Bres., G. tsugae Mart.

Hubbs, M., see Royer, J. C., et al.

S. M. Huqndorf and J. L. Crane. Illinois Natural History Survey, 607 E. Peabody Dr., Champaign, IL 61820. Another look at the morphology of Leptosphaeria coniothyla.

The morphology of the type specimen of Leptosphaeria coniothyla (Fukeli) Sacc., and a collection from raspberry canes from southern Wisconsin were studied and compared using SEM and TEM. The anamorph, Coniothyla fukellii Sacc., was obtained in culture from the new collection. Previous studies have shown that the immersed pseudothecia have cylindrical, 8-spored asci, with pale brown, 3-septate, ellipsoid ascospores (CMI Descriptions No. 653). Electron microscopy revealed that the ascospore and conidial walls are smooth, with little to no surface ornamentation. Semi-thin sections through pseudothecia show that the sepal, filiform pseudoparaphyses have gelatinous coatings and branch and anastomose throughout the centrum. The ascocarp is composed of inner layers of small crushed cells and several outer layers of pseudoparenchymatic, polygonal cells.


G. A. HUNT. Balco Canfor Reforestation Centre, Ltd., R.R. 3, Kamloops, B.C. V2C 5K1, Canada.

Effect of cultural practices on occurrence of mycorrhizal fungi in container-grown conifers

Natural establishment of mycorrhizal fungi on Engelmann spruce (Picea engelmannii Parry), interior Douglas-fir (Pseudotsuga menziesii glauca (Bisseter) Franco.), and lodgepole pine (Pinus contorta Doug.), grown in a container nursery in the southern interior of British Columbia was monitored over three years.
Diversity and abundance of fungi was related to level of fertility and quality of peat moss. When levels of nitrogen and phosphorus were relatively high, colonization of spruce and pine was dominated by *Thelephora terrestris* Fries and *Laccaria* Berk. & Br.; under reduced fertility, diversity and abundance of other fungi increased. These included *Amphinema byssoides* (Fr.) J. Eriks., E-strain, and *Inocybe* (Fr.) Fries on spruce, and *Myccelium radicis* (obso1.) on spruce and pine.

Peat moss particle size affected colonization. Fungal growth decreased when the fraction of fine particles (coarse < 0.15 mm) exceeded 14%; this was associated with reduced water drainage and aeration compared to peat with a 9% fine fraction.

Spruce seedlings colonized abundantly by *Amphinema* had greater dry weight of shoots and roots compared to trees colonized predominantly by *Thelephora*.

The collection sites are flowing in between University, 4700 Keele St., Toronto, Ontario, Canada.

### Polyphenol oxidase activity has been used as an
catalyst for white rot of wood in laboratory test, with

### In order to determine the role of actin in apical
growth of hyphae of *Saprolegnia ferax*, hyphal growth
rates were compared with the distribution of actin in the

### Indian mangrove forest of Sunderban is one of the
densest forest which is located in the southern

### The rate of decomposition increased until about the
45th day of incubation, then decreased.
Nuclear migration was examined in hyphae of *Pleurotus ostreatus* after
conjugate mitosis. Very soon after telephase, N1 and N2 migrate apically,
the more apically is N1. Simultaneously, N3 moves distally. N4 remains
in the clamp until it fuses with the hypha, then migrates towards N3.

The nuclei have characteristic rates of migration: N1 moves faster than
N2 or N3 which have similar rates. N4 migrates much more quickly than
the other nuclei. Osmotic holding (OS) TEM shows that migrating N1, N2
and N3 have extensive NAO-associated microtubule (MT) arrays which
extend ahead of and behind the nuclei. N4 had no NAO-associated MTs.

There was no consistent relationship between the position of the NAO
with respect to the nucleus and the direction of migration. These observations
suggested that nuclear migration resulted from a non-NAO-MT motor and
that NAO-associated MTs were impeding nuclear migration.

Hyphae were treated with 50 μM MBC/0.2% DMSO dissolved in liquid
growth medium during mitosis in an attempt to destroy NAO-associated
MTs. Careful timing of the drug application permitted mitosis to be
completed normally. Analysis of MBC/DMSO nuclear migrations showed
that the rate was significantly increased over control rates for N1, N2 and
N3, with N1 having the greatest increase. N4 was not examined. These same
treated hyphae were conventionally fixed (CF) and serial sections showed
that the number of NAO-associated MTs was not significantly reduced from
FS nuclei but that the nuclear morphology was altered. DMSO CF controls
showed the same nuclear alteration, thin nuclear extensions, as the
MBC/DMSO-treated nuclei. The number of NAO-associated MTs for
DMSO/CF nuclei was not noticeably altered. The nuclear protrusions
were not associated with the NAO or cytoplasmic-MTs, nor were they
consistently leading the migration.

The effect of MBC/DMSO can be ascribed in large part to DMSO. The
NAO-associated MTs do not seem to affect the rate of nuclear migration
since the rate could be increased without reducing the number of
NAO-associated MTs. The effect of the drugs could be to enhance a non-MT motor.

Kaminsky, S. G. W., see Heath, J. B.

Kane, J., see Summerbell, R. C.

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

Kay, E., see Vilgalys, R.

Keller, G. S., see Roeper, R. A., et al.

R. W. KERRIGAN, Department of Biology, Erindale College, University of Toronto, Mississauga, ON, L5L 1C6 Canada. Are
basidiomycetes heterothallic? (Or, why
amphithallism may be the common re-
productive syndrome among higher fungi.)

There are conceptual problems with the
characterization of fungal species as
"heterothallic," "homothallic," etc. These
terms properly describe reproductive
pathways; applied to species they lead to
assumptions about limitations on the
reproductive behavior of the organism.
There is good reason to believe that
tentially important reproductive behaviors
such as automixis (secondary homothallism) will be infrequently observed under typical
experimental conditions. I will explain
why, and will present data to illustrate
several methods of directly or indirectly
testing the extent of automictic
reproduction in apparently "heterothallic"
species. Examples of data that permit
various tests will be shown.

Definitional problems with "thallisms"
derv from a desire to use the older terms
of Blakeslee while reflecting a more modern
understanding of reproductive cytogenetics.
The result is a distortion of their specific
meanings. I will compare the older terms,
and Lange's "amphithallism", with the more
modern terms automixis/heteromixis. Each
has a specific meaning and contextual
association. For clear communication,
different contexts require different terms.

Kerr, J. L., see Berbee, M. L.

Khan, R. S., see Krug, J. C.

Kimthorough, J. W., see Gibson, J. L.

Kirkpatrick, N., see Reid, I. D., et al.

GLEN R. KLASSEN, Department of Microbiology, University of Manitoba, Winnipeg, Manitoba R3T 2N2. Subrepeat structure of the intergenic region in the
ribosomal DNA of *Pythium ultimum*.

In plants and animals, but not in fungi, the inter-
genic region of the randomly repeated ribosomal DNA (rDNA) is dominated by complex arrays of direct sub-
repeats. In animals, some classes of subrepeats have
been identified as promoters and enhancers of trans-
scription, and in plants the variability in subrepeat
number has been correlated with ecological factors
(Flavell et al, Mol. Biol. Evol. 3, 547). Restriction
endonuclease site maps of the rDNA repeat in four
isolates of *Pythium ultimum* show that the intergenic
region has from seven to twelve copies of a 350 bp
subrepeat immediately upstream of the external trans-
cribed spacer. There is also an array of smaller sub-
repeats immediately downstream of the large subunit
ribosomal RNA gene. Thus, the intergenic region is
made up almost entirely of subrepeat arrays, and each
of the *Pythium* isolates is unique with respect to the
number of subrepeats in the arrays. These findings
support the hypothesis that Oomycetes are more
conserved related to higher eucaryotes than to fungi.

In addition, *P. ultimum* may have advantages as a
model system for the study of the relationship
between the structure of the intergenic region and
transcriptional controls as they relate to pathogenicity.

M. A. KLICH and L. S. LEE, USDA, ARS, Southern
Regional Research Center, P.O. Box 19687.
New Orleans, LA 70179. Seasonal changes in
susceptibility of cotton flowers and bolls to
infection by *Aspergillus flavus*.

*Aspergillus flavus* produces aflatoxin, a potent
carcinogen in cottonseed in the field. The following
experiments were conducted in Arizona where aflatoxin
is a chronic problem. Involucral nectaries of
flowers and developing bolls were inoculated with
*A. flavus* spores, beginning when the first flowers
formed in mid-June and ending in late July. Bolls
were harvested at maturity, ginned, delinted and then
either plated on agar media to determine the percent
infected seed or processed by TLC to determine
aflatoxin levels. Results show that inoculated
flowers formed early in the season produce bolls with
the highest number of infected seed and the highest
aflatoxin levels. Late season flowers produce seed
with virtually no A. flavus contamination or aflato-
in. In another study, in which involucral
nectaries of flowers or two week old bolls were
inoculated, it was established that the level of
susceptibility of cotton flowers and young bolls to
infection by *A. flavus* remains constant for at least
and former's while others were very poor. The implications will be discussed.

Fusarium strains with an unusual appearance have been isolated from sorghum in Kansas. On semi-synthetic complete medium or PDA, the colonies produce a yellow-brown, diffusible pigment giving them a speckled, metallic appearance. Based on spore morphology these strains would be classified as Fusarium moniliforme, although the microconidial chains are short and false heads are seen occasionally. Yellow strains are heterothallic and intertissue with each other when sexual crosses are made on 20% carrot agar. None of the yellow strains could cross successfully with standard G. fujikuroi (teleomorph of F. moniliforme) testers, however, indicating that the yellow strains are genetically isolated from G. fujikuroi and that they form a separate species that we have named Gibberella thapsina. Yellow strains were isolated almost exclusively from sorghum. Over 20% of the 300 Fusaria isolated from sorghum stalks and seeds in Kansas were yellow strains, but only one of 250 isolates from maize was a yellow strain. Similar strains have been identified by W. F. O. Marasas from sorghum grown in South Africa. The Kansas yellow isolates belong to several vegetative compatibility groups, and therefore are multiple strains rather than clones of a single strain.

Klopperens, K. L., see Edelmann, R. E., et al.

Kneip, E. J., see Pfister, D. H.

Knight, D. H., see Miller, S. L., et al.

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


Kozak, K., see Foster, L., et al.


Two monokaryotic cultures of Laccaria bicolor, one of which was essentially nonmycorrhizal, were crossed to form a dikaryotic culture which was strongly repressed in its mycorrhizal ability. In order to study this effect, the respective nuclei were reisolated from the dikaryon. The resulting monokaryons were found to form mycorrhizae identically to the originals used to make the cross. When these isolated nuclei were recrossed, the resulting dikaryons were all poorly mycorrhizal. However, when the two original monokaryons were recrossed several times, some of the new dikaryons were good mycorrhiza formers while others were very poor. The implications will be discussed.

J.C. KRUG and R.S. KHAN. Department of Botany University of Toronto, Toronto, Ontario, Canada M5S 1A1. Simplified trends in the Xylariaceae.

The Xylariaceae typically includes genera possessing a sterile stroma, a complex ascapical apparatus which stains blue in IKI, pigmented ascospores germinating through an elongated slit and a symposium anamorph. There are a number of instances in which these structures have been simplified or lost. These include the modification of the stroma to a filament upon which the perithecia are borne superficially, the reduction of the stroma to a simple clypeus or surface mycelium, the absence of a stroma, the possession of ascii with a dextrinoid or negative reaction in IKI, the absence of a distinct apical structure and non-ostiolate ascocarps. On several occasions simplified members of the Xylariaceae have been isolated from our soil samples. One of these is Coniochaeta nodulisporioides which will be shown as belonging to the Xylariaceae. The paper will discuss a fungus referable to Arvellospora.

Kuti, J. O., see Bean, G. A., et al.

Y. H. KWON and H. C. HÖCH. Department of Plant Pathology, New York State Agricultural Experiment Station, Cornell University, Geneva, NY 14456. Nuclear DNA synthesis: time course during appressorium formation in Uromyces.

Uredospore germinals produce appressoria in response to specific topographical signals. The two nuclei undergo mitosis during this cell differentiation event. Previous studies, based on cell populations grow asynchronously, indicated that DNA synthesis occurred prior to mitosis in the appressorium. In this study, video-intensified fluorescence microscopy was used to further elucidate the time course of DNA synthesis during appressorium formation. Examination of individual cells stained with the DNA-specific binding fluorophore, DAPI, revealed that fluorescence intensity of nuclei increased after nuclear division and almost doubled by the time appressoria matured. Fluorescence intensities were 40×10^3 AU, 40×10^3 AU, 40×10^3 AU, and 40×10^3 AU for non-germinated spores (two nuclei), germ tubes (two nuclei), immature appressoria (four nuclei after telophase), and mature appressoria (four nuclei), respectively. The results indicated that DNA synthesis occurred after nuclear division, in preparation for the next round of mitosis that normally occurs during vesicle development.


Lee, L. S., see Klitch, M. A.

STEVEN B. LEE and John W. Taylor. Department of Botany, University of California, Berkeley, CA 94720. Molecular evolution of Phytophthora using polymerase chain reaction amplified internal transcribed spacer sequences of ribosomal DNA.
The genus Phytophthora includes several species of important plant pathogens. The high degree of intraspecific morphological variability and the lack of definitive species characteristics has limited the number of phylogenetic studies in this genus. We are studying the molecular evolution of several species of Phytophthora. We have used the newly developed polymerase chain reaction to amplify and developed polymerase chain reaction to amplify and directly sequence ribosomal DNA and internal transcribed spacer regions of Phytophthora cinamomi, P. palmivora, P. megakarya, P. capsici, and P. citrophthora. This sequence data can be used to construct a phylogeny of these five species and will provide an easily expandable database for further phylogenetic analysis in this genus and related taxa. In addition, our data can be used to construct species-specific oligonucleotide probes which may provide a simple, reliable method of species identification.

Leslie, J. P., see Klittich, C. J. R.

J. L. L. and J. B. HEATH. Department of Biology, York University, 4700 Keele St. Toronto, Ont. Canada. M3J 1P3. Ultrastructural studies of gut fungi.

Five isolates of anaerobic gut fungi were isolated from dung samples from horse, elephant, cow and gaur in Australia and Canada. These isolates were studied with both light and electron microscopy. Two Australian isolates were identified as Piromyces and three Canadian isolates as Neocallimastix. Based on the ultrastructure of zoospores and other criteria, the Australian isolates from horse dung were identified as a new species, Piromyces equi. However, as we look at more isolates, we see there is a discrepancy between using light and electron microscopy to classify the fungi. Currently, genera are defined on light microscopic characteristics such as number of flagella and shape of rhizoids. While the ultrastructure of zoospores is very similar on most characteristics, there appears to be a major dichotomy between Neocallimastix spp. and Piromyces equi, which have an even diameter circumflagellar ring and two struts and Caecomyces equi and Piromyces spp., which have a C-shaped vertical thickening on the ring and three struts. More isolates need to be examined to establish which criteria are more suitable at the generic level. Zoosporogenesis in the gut fungi is very similar to that in other Chytridiomycetes with respect to the formation of the flagellar and cleavage vesicles.

L. L. DE-WEI and E. C. SETLIF. School of Forestry, Lakehead University, Thunder Bay, Ontario, Canada, P7B 5E1. Effects of ectomycorrhiza and fibrous pulp wastes on the growth of container-grown jack pine seedlings.

Jack pine seedlings were grown in multipots filled with different ratios of fibrous pulp waste, peat moss, and vermiculite and inoculated with Laccaria proxima. Pulp waste fibers, representing 10%, 20%, 30%, 40% and 50% of the final volume, was added to a 3:1 peat/vermiculite mixture. After three months, seedling length and dry weight were measured.

Seeding dry weights at pulp ratios of 0% and 10% with mycorrhiza were significantly higher than the peat:vermiculite control without mycorrhiza. There was no significant difference between 20% pulp waste with mycorrhiza and the non-mycorrhizal control treatment. Based on seedling length, 0%, 10%, and 20% pulp waste additions with mycorrhiza were significantly better than the non-mycorrhizal control, and 30% and 40% pulp waste treatments were insignificantly different. Pulp wastes without mycorrhiza were all detrimental to growth; thus utilizing pulp wastes with mycorrhiza as a component of the regular peat:vermiculite medium for growing jack pine is feasible, but requires more research.

W. L. LILLY. Dept. of Biology, Southeast Missouri State University, Cape Girardeau, MO 63701. Electrophoretic detection of multiple proteolytic activities in control and nitrogen-starved colonies of Schizophyllum commune homokaryons.

Derepression of proteolytic activity during nitrogen starvation has been shown to occur in Schizophyllum commune homokaryons. This derepression occurs within the first 6 hours of transfer of exponentially growing 4-day old colonies from minimal medium to medium containing 0.01 g/L-l-asparagine (0.01N). Proteolytic activity doubles in the 0.01N colonies between 6 and 12 hours and again from 12 to 24 hours. Control colonies show no significant difference in activities over this time period. Electrophoresis of these extracts in native polyacrylamide gels containing 0.02% or 0.1% gelatin reveals at least four different forms of proteolytic activity. Maximum activity for all bands was obtained when the gels were incubated at pH 6.0, although some of the bands show greater inhibition by high pH than others. Extracts of colonies grown on 0.01N medium show the loss of one of the proteolytic activities and the appearance of two new bands. One of these low-nitrogen derepressed activities is highly active and is the most slowly migrating protease detected. The other band is much less active and is the fastest migrating protease we detected. Both of the derepressed proteases show increasing activity between 6 and 24 hours after transfer to 0.01N medium even though total protein in these extracts decreases over this time.

W. L. LINGLE. Botany Department, University of Georgia, Athens, Georgia 30602. Effects of veratryl alcohol on growth and bioluminescence of Panellus stipicus.

Veratryl alcohol, a product of lignin degradation, is known to stimulate the production of lignin peroxidase by white rot basidiomycetes grown under culture conditions that normally inhibit the production of lignin peroxidase. The stimulation by veratryl alcohol is most likely achieved through feedback regulation at the molecular level. The effects of various concentrations of veratryl alcohol on growth rates and bioluminescence levels were determined for the white rot fungus Panellus stipicus. Long-term studies, in which petri plates containing liquid growth medium amended with veratryl alcohol were inoculated with a homogenate of mycelium and assayed twice a week over a 7 week period, revealed differences in the onset of bioluminescence, the intensity of bioluminescence and in dry weights. These differences were influenced by the concentration of the growth medium. Preliminary short term studies, in which 19 day old mycelial mats grown on the surface of liquid medium were transferee capsule, were transferred to fresh medium amended with various concentrations of veratryl alcohol revealed that the initial effects of veratryl alcohol on bioluminescence in mature cultures is evident within 48 hrs. Results of these studies may indicate a relationship between induction of lignin degradation and bioluminescence.

Cenococcum geophilum frr., a cosmopolitan mycorrhizal fungus, is well known for its extremely wide host and habitat range. Mycorrhizae of C. geophilum have been observed in diverse ecological habitats ranging from hot, semiarid to arctic-alpine environments. The great ecological diversity of C. geophilum sharply contrasts its taxonomic status as a monospecific genus. C. geophilum exists as a sterile mycelium and thus lacks sexual or asexual spores which are important taxonomic criteria. The few morphological characters available such as colony color, texture, growth rate, and hyphal characters are insufficient to distinguish isolates thus masking genetic diversity. Analysis of restriction enzyme data may be particularly useful to delineate genetically distinct individuals in the Mycelia Sterilia group where morphological characters are limited. The objective of this study is to characterize and differentiate isolates of C. geophilum obtained worldwide by comparing restriction fragment length polymorphisms (RFLPs) in ribosomal DNA. Southern hybridizations with EcoRI, HindIII, PstI, and HindIIIdigested whole cell DNA indicate that RFLPs in ribosomal DNA do exist among the C. geophilum isolates tested.

A. LOGRIECO, A. BOTTALICO, G. MULE' and M. SOLFRIZZO Istituto Tossine e Micotossine da parassiti vegetali, Via Amendola 197/F, 70126 Bari, Italy.

Alternaria species in cereal grains from Mediterranean countries and their ability to produce mycotoxins.

Samples of cereal grains from Mediterranean countries were collected to determine the incidence of Alternaria species and their ability to produce Alternaria-mycotoxins on autoclaved rice and wheat kernels.

A. triticiina and A. alternata were the species more frequently isolated and occasionally A. tenuissima and anamorph state of Pleospora infectiosa were also encountered. Of the two major species only A. alternata was able to synthesize mycotoxins and in particular: tenuazonic acid (up to 6,000 mg/Kg), alternariol methyl ether (up to 59 mg/Kg), alternariol (up to 118 mg/Kg), altenuene (up to 37 mg/Kg), altetroxin I and II (up to 32 and 105 mg/Kg respectively).


The slit and other sorts of metabasidia exits in rust fungus probasidia.

Simple, microscopically visible pores are the most common kind of structure through which metabasidia develop in rust fungus probasidia (teliospores). When pores are present, their number and distribution pattern are useful for taxonomic purposes. But many rust species lack any discernable probasidial exit apparatus; some may develop directly into metabasidia, or some develop by a more or less elongation of the probasidium, or others by enzymatic dissolution and mechanically cracking open the probasidial wall.

We found complex pores, with internally differentiated pore plug material, in Puccinia johnstonii and Macrophomys fraxini. A ring of thinwall material, which is an area through which metabasidia develop, is present in Puccinia vitata and Phragmopyxis leonensis. In addition to the simple pore, which we have found clearly demonstrable for the first time in some species of Ravenella, a new kind of exit, the slit, analogous to the germ slit of Hypoxylon ascospores, occurs near the inner walls of probasidia that compose the probasidial heads of most species of Ravenella and the monotypic Cystomyces.

Lord, K. M., see Read, N. D.


In the Nectriella battle, the lost, missing and dead (after Schumacher, 1988) have been identified and disposed. Over 132 names have been described in the genus Nectriella (Ascomycetes, Hypocreales). A little over half of these names, sensu Saccardo, are species with superficial perithecia and single celled ascospores. The others, as...
Nectriella Nitschke ex Fuckel (1870) with N. fuckelii as the type species, are fungi that are immersed-erumpent in largely herbaceous substrates, are usually saprophytic, and possess one-septate ascospores. During a monographic study of Nectriella Nits. most of the names are 'lost' belonging in other Hypocrean genera: Pronectria, Pseudonectria, Nectria sensu lato, and Schizoparme; several species are distributed into other orders. About 18 species are 'saved' in the genus Nectriella Nits. These species and their anamorphs, where known, and the relationship of Nectriella to other genera of the Hypocreales will be discussed.


During a monographic study of the genus Nectriella Nitschke, several problems involving world situations were encountered. These included the WWII bombings of Berlin, Germany, and Dunkirk, France, where important mycological herbaria were located. This is a story of how seemingly unobtainable types needed for the study were found and how the practice of mycological taxonomy is not conducted in the isolation of an herbarium corner but is a participation in worldwide relationships.

H. S. LU & D. J. MCLAUGHLIN. Dept. of Plant Biology, Univ. of Minn., St. Paul, MN 55108. Nuclear division and septation in Auricularia auricula.

Nuclear behavior and division in the clamp connection of Auricularia auricula (Hook.) Underw. were studied live with phase-contrast microscopy and after fixation, with fluorescence and electron microscopy to clarify the processes of nuclear division in Auriculariales sensu stricto for phylogenetic analysis. Interphase nuclei usually move slowly back and forth along the hyphae. However, when the clamp reaches about 5 to 10 mm long, the speed of nuclei gradually increases. During interphase nuclei continuously change shape and may divide but remain near the front of the moving nuclei. Usually the apical nucleus moves into the clamp and the other remains near its base. Mitotic division lasts about 3 to 6 minutes. At late prophase nuclei were no longer evident. The two nuclei do not divide simultaneously. Septa begin to form near the site of nuclear division about 5 minutes after mitosis. Early prophase to late metaphase nuclei have been examined ultrastructurally. At prophase the spindle pole body (SPB) consists of subglobular elements connected by a middle piece. An intranuclear element is present adjacent to the enlarged late prophase SPB. Spindles come to lie parallel to each other during metaphase and the SPB is situated in a gap in the nuclear envelope. An ER cap is absent. Results will be compared with those in other basidiomycetes and ascomycetes.

ROBERT F. MACHOL, F.A.N., Washington, DC 20591 and WOLF SINCER, Field Museum, Roosevelt Rd. at Lake Shore Drive, Chicago, IL 60605. Assigning a Taxon to One of Competing Higher-Level Taxa.

When a genus (e.g. Phaeomarasius) shows relationships to two different families (e.g. Continariaceae and Strophariaceae), this quantitative technique measures the relative affinity of the lower-level taxon to the higher-level taxa. It is a quantitative model of what a competent taxonomist normally does intuitively, it is strictly phenetic, it is objective, and it uses all available characters. It utilizes a statistical formula called "Bayes' Rule", and is most successful at higher taxonomic levels (e.g. assigning genera to families) precisely where usual "numerical taxonomy" techniques, which employ a statistical method called "cluster analysis", fail, and fails at those lower taxonomic levels (such as assigning subspecies to species) where those other methods are most successful. We discuss a number of questions relevant to numerical analysis in systematics, including independence of characters, sphericity of taxa in multidimensional parameter space, the appropriate use of judgment, and the robustness of the statistical procedures. The method is intuitively appealing; in the final printout it is easy to see which characters influence the final result.

Melloch, D. W., see Thorn, R. G.
Melloch, D., see Blackwell, M.
Melloch, D., see Blackwell, M.

MARISSA A. MANINGAS and T. M. HAMMILL. Department of Biology, SUNY College at Oswego, Oswego, NY 13126. Electron microscopy of conidiogenesis in the hymenial hyphomycete, Doratomyces microsporus.

Doratomyces microsporus (Sacc.) Morton & Smith is a dematiaceous soil hyphomycete with conidiogenous cells arranged in cylindrical to ellipsoid heads. Light microscopy (LM) reveals that conidia of D. microsporus are formed in dry chains which may be several conidia in length. However, because of the minute size of the conidiogenic apparatus, little else can be said from LM about conidiogenesis in that species. Previous research showed that conidiogenesis in D. nanus (Ehrenb.) Morton & Smith was anellidic, and this study with scanning and transmission EM was done for comparison. The tips of elongate conidiogenous cells enlarged and formed conidial initials. Numerous vesicles and several ring cinsernae were present in young conidial initials. Centripetal growth of a septum at the base of conidial initials delimited conidia, which then matured by an increase in the thickness of the cell wall and an increase in the electron-opacity of conidal contents. The process was repeated several times, resulting in the formation of conidial chains. Each time a septum delimited a conidium, it formed at a slightly more distal point. As a result, conidiogenous cells increased in length slightly each time a conidium was formed. Conidial secession resulted in a series of circumscissile scars (annellations) around the neck of conidiogenous cells. Therefore, conidiogenesis in D. microsporus was identical to that in D. nanus and several other anellidic fungi examined in past studies.
Epidemics of poisoning from moldy bread may have been more frequent and more serious in the past than previously realized. Their occurrence may explain two kinds of historical mysteries.

The first mystery is the rise of population in Europe and America in the eighteenth and nineteenth centuries. It occurred before there were improvements in medical care. It occurred when the common people were mainly dependent on starches for food.

But there were dietary changes: wheat bread replaced rye bread; potatoes replaced all starches. These changes probably reduced the incidence of mold poisoning, which was most often caused by contaminated rye bread and rarely caused by potatoes.

The second mystery is the sporadic outbreaks of bizarre behavior in Europe and America since the Middle Ages. The symptoms included hallucinations, twitching, spasms, and "fits." Such behavior was labelled "bewitchment" in some cases and in others was considered divinely inspired. These outbreaks may have had a biochemical basis. They may in fact have been episodes of communal food poisoning caused by contaminated rye bread.

M. McCormick, S. P., see Desjardins, A. E., et al.

McLaughlin, D. J., see Batadehen, L. O.

McLaughlin, D. J., see Lu, H. S.


In nature Asterophora lycoerpoides (bull.) Bidger: Fr. (Syn: Nycstallis asterophora Fr.) is a parasite that forms its basidio carps on the fruiting body of Russula and other Basidiomycete species. On a potato dextrose agar medium (PDA) after 10 days mature fruiting bodies form at the inoculation point on the medium, and 3 days later a 0.5 cm diameter ring of basidio carps (fairly large), concentric with the inoculation point develops. The presence of a fairy ring is correlated with sugar concentration. A PDA medium plus 0.0 or 0.2% dextrose promotes the formation of a ring of approximately 1 cm high basidio carps, but increased dextrose concentrations (1.0, 1.5 and 2.0%) favor the formation of chlamydo sporcs and numerous 1–2 mm high basidio carps over the entire colony. A. lycoerpoides fruiting bodies with a cap form only when light is present; dark grown cultures form a ring of stipes either with or without a rudimentary cap.


Spores of two Glomus species (G. mosseae and G. cal- edonum) have been reported to be multinucleate, but neither the methodology used to obtain these results nor the photographic documentation of this condition have been published. By using two nuclear fluorochromes, DAPI and mithramycin, the multinuclear status of Glomus mosseae spores has been verified. A brighter fluorescence resulted with the DAPI than with the mithramycin. However, DAPI will also stain polyphosphates and organellar DNA, and was therefore not the only nuclear stain used. These results have been corroborated with the non-fluorescent nuclear stain, aceto-orcein. The nuclei are similar in size to those reported in inter- and intracellular hyphae, arbuscules and vesicles of a Glomus E3 isolate (1 to 1.5 um: Bonfante-Fasolo, et. al. 1987. Trans. Br. Mycol. Soc. 88: 263). In earlier TEM studies, the wall of Glomus mosseae was described as consisting of two layers: a thin outer and a thick inner one, with a total thickness of 2 to 7 um. However, the peridium was not included in either study. SEM has revealed the fine structure of the peridium and the spore wall. The latter contains "fissures", small tubules that are apparently part of the inner thickened wall. The outer (thin) layer appears to slough off together with the peridium.

Meier, S., see Grand, L. F.


The oak forest mycota of Columbia and alder forest mycota of Ecuador remain largely unsurveyed. Inadequately explored, these tropical forests support an interesting mycota that can provide new and supportive data on fungal distribution. Field work by the junior author in Columbia and Ecuador over the past two years yielded several interesting collections of the ectomycorrhizal genus Lactarius. Although this treatment of Lactarius from the oak forests of Columbia and alder forests of Ecuador is considered a preliminary one, several new taxa will be described and additional taxa discussed with reference to biogeography.

Milgroom, C., see Giasson, K., et al.

J.D. Miller. Plant Research Centre, Agriculture Canada, Ontario, Canada, K1A 0G6 (613-995-3700). Physiology of Mycotoxin production with emphasis on Fusarium.

The production of mycotoxins by various molds such as Aspergillus and Fusarium species growing on food or feed crops causes considerable economic and public health problems in the developed and undeveloped world. The results of animal feeding trials have shown that there are many toxins in crops infected by toxigenic molds. This arises from the fact that more than one species can co-occur and from the fact that some species are prolific in the number and kind of metabolites produced. For example, F. graminearum was known to produce ≤10 compounds a decade ago. It is now known to produce over 50, including many trichotheccenes (sesquiterpenes), zearalenone (polyketide), butenolide (amino acid derived), and fusarind (amino acid/polyketide). Recent studies on the sclerotia of one of the most studied molds, A. flavus, have identified new toxins.

The study of the genetic potential of toxigenic fungi depends on physiological understanding of the biosynthesis of the various toxins produced by a given mold. This relates to controlling the nutrient and physical conditions of cells in the correct physiological state. This can be done in a rational way through consideration of the biogenic origin of the metabolites of interest and through the use of various empirical "tricks" used in antibiotic production. Recent work has shown that the
The persistence of ectomycorrhizal fungi in undisturbed coniferous forest ecosystems is assumed by the renewed appearance of their sporocarps each year. Little information is available, however, on whether sporocarp production is a reliable indicator of persistence of ectomycorrhizal fungi in severely disturbed areas. In this study, gaps were formed in the canopy of a 95-year-old lodgepole pine forest by felling and removing replicates of 1, 5, 15 and 30 contiguous trees early in the spring. One eight-square-meter plot was established at the center of each of the gaps. Control plots were established in undisturbed forest nearby. Shade structures were erected on half of each large gap to prevent high temperatures until snowfall, and identified and classified into ectomycorrhizal hypogeous fungi were collected throughout the summer and fall.

Results indicated that more ectomycorrhizal species and sporocarps occurred in the 15- and 30-tree gaps than in the 1- and 5-tree gaps and controls. No significant difference was noted in sporocarp abundance between the plots in the 1- and 5-tree gaps and the controls, or between the shaded and open portions of the large gaps. Sporocarps of ectomycorrhizal species in the larger gaps were never observed to occur further than 1 m from the nearest living tree. From these data, it appears that either the ectomycorrhizal species in the 15- and 30-tree gaps were stimulated to fruit from the dying root systems of the cut trees, or that altered physical and biological conditions in the gap stimulated fruiting from the surrounding live trees. Ectomycorrhizal count data to be taken in the spring should indicate whether root gaps had formed corresponding to the canopy gaps.

A survey was conducted to obtain data regarding introductory mycology courses taught in North America. Topics emphasized in the survey included enrollment trends, types of students enrolled, teaching approaches, and thoughts regarding the future of such courses. Sixty percent of those responding reported that enrollments for the past 5-10 years had been fairly stable, 30% reported declines, and 10% reported increases. Nearly 70% felt that enrollments would remain steady for the next 5-10 years. However, many respondents lamented the absence of mycology courses at many institutions while others indicated that enrollments in mycology were significantly lower than they should be and that certain types of students in need of mycological training were simply not taking our courses. This latter concern was commonly expressed for microbiology and ecology majors. Concern was also expressed that shrinking enrollments in plant pathology would eventually jeopardize mycology courses at some institutions. While most instructors described their courses as morphology-taxonomy based, most reported that they were now including more information on the biology of fungi. Many felt that this was the only way to ensure survival of their courses. Results from the survey also revealed a widespread feeling that we as mycologists have not done an adequate job of promoting our field either with the general public or our colleagues. Those of this persuasion tended to feel that quality teaching alone would not insure a bright future for our courses.
The genus *Basidiobolus* is a widespread taxon, that includes strains associated with human zygomycoses, as well as nonpathogenic ones that are saprobic in reptiles and amphibians. Based upon morphological criteria, the existence of four species (*B. haptosporus*, *B. meristosporus*, *B. microsporus*, and *B. ranarum*) has been proposed; however, the validity of this classification has been questioned. We have cloned 9 kb of ribosomal DNA from *B. ranarum* and employed it as a probe to analyze restriction patterns from pathogenic and saprobic isolates. Patterns observed were highly heterogeneous, and indicate the existence of extensive rDNA polymorphism within isolates. Most pathogenic isolates, previously grouped into three species, are indistinguishable. *B. microsporus* is clearly distinct from this group, as are two saprobic isolates. Thus, we can group the genus into three monophyletic groups. Digestion of DNA with some enzymes reveals probe-specific fragments that may prove useful in diagnostic applications. These results, combined with others involving immunological and allozyme analyses, suggest that existing taxonomies based on morphological criteria may overestimate the taxonomic diversity among pathogenic isolates and underestimate the extent of genetic diversity in the genus as a whole.
Ng, T. J., see Beam, G. A., et al.

L. A. NOVAK and L. M. KOHN. Department of Botany, University of Toronto, Erindale Campus, Mississauga, Ontario, Canada, L5L 1C6.

Developmental sclerotial proteins in Aspergillus.

Developmental storage proteins in sclerotia have been reported in the Sclerotiniaceae and in some Basidiomycetes, but may be ubiquitous among sclerotial fungi. As a possible outgroup for our comparative studies of sclerotinous, sclerotial storage proteins, we investigated 5 sclerotic species of Aspergillus, A. alliaceus, A. auricoma, A. parasiticus, A. flavus, and A. nominius, for the presence of proteins unique to the sclerotial anamorph. Total protein was extracted from mycelia, sclerotial initials, sclerotia, and conidia. One-dimensional SDS-PAGE of sclerotial extracts revealed complex protein banding patterns, in a wider mol. wt. range than in the Sclerotiniaceae, which were unique for each species. There were two classes of sclerotial proteins, a narrow range (13-18 kDa) of low mol. wt. proteins with some bands shared by pairs of species, and a wider range (30-70 kDa) of higher mol. wt. proteins which were unique for each species. In conidial extracts, developmental proteins in a wide mol. wt. range were also observed. A few bands were shared among extracts from mycelia, sclerotial initials, and sclerotia, with increased staining intensity that suggested amplification in the sclerotial initial extracts. Histological staining was performed to determine whether proteins were localized within sclerotial and conidial cells. Comparison of these proteins with sclerotial storage proteins of other fungi could prove to be taxonomically and phylogenetically important, as well as useful in developmental studies.

Novotny, C. P., see Giasson, K., et al.


D. J. O'KANE. Department of Biochemistry, University of Georgia, Athens, GA 30602 USA. Is a flavin the in vivo bioluminescence emitter in fungi?

The in vivo emitter of bioluminescence in Lactotermomyces japonicus was recently suggested to be a flavin [Isobe et al. (1987) J. Biol. Chem. 262, 181; Isobe et al. (1988) Tetra. Lett. 6, 1169]. Since the uncorrected in vivo bioluminescence emission spectrum from gills of L. japonicus closely corresponds to the uncorrected fluorescence emission spectrum of two flavin derivatives present in the gills. The correspondence between the bioluminescence and fluorescence emission of flavin is coincidental. The bioluminescence emission maximum from L. japonicus shifts from 524 nm (typical of fungal bioluminescence) in young white mycelium, to 535 nm in older lightly pigmented hyphae, to 542 nm in old deeply orange pigmented mycelium. Only the bioluminescence emission with a maximum at 535 nm is similar to that of flavin fluorescence. The bioluminescence emission characteristics of L. japonicus are similar to those of Omphalotus illudens, which also shows a similar shift in the bioluminescence emission that is correlated with orange pigmentation. This is in contrast to the bioluminescence emissions from Panellus, Dietyopus and Armillariae (525 nm). There presently is insufficient evidence to invoke an excited state flavin as the emitter of fungal bioluminescence.

Clark L. Ovrebo. Department of Biology, Central State University, Edmond, OK 73034.

Some interesting agarics from the lowland tropics of Costa Rica.

Collections were made in the winter and summer months of 1986 in a lowland tropical rainforest of Costa Rica. The site is in the La Selva Biological Station and Reserve located in the NE portion of the country. The site is very wet, receiving about 4000 mm of rainfall annually. The bulk of the fieldwork was done in June and July, the wettest time of the year. The reserve consists of both undisturbed forest and secondary forests.

The agarics collected belong to genera known to be saprophytic; agarics known or suspected of forming ectotrophic associations were not found. The greatest diversity of genera and species collected belong to the Tricholomataceae. Species of Marasmiellus, Xylosmis and Hydopus were common. Other genera of the family in which species were found include Chetcalathus, Clitocybula, Gtragenia, Hohenbuehelia, Mycena, Oudemansiella, Panellus and Tragoa. Also fairly abundant were Leptota and Agaricus of the Agaricaeae and occasionally found were taxa of the Strophariaceae, Pluteaceae, Cortinariaceae and Entolomataceae. A number of collections from these groups likely represent undescribed species. Some of the more interesting taxa will be discussed.

Padhye, A., see Sigler, L., et al.

Palmiappan, C., see Murugandam, A., et al.

Parnon, W. F. J., see Miller, S. L., et al.

Petersen, R. H. Botany Department, University of Tennessee, Knoxville, TN 37916. Clavarioid and cantharelloid fungi as cases in mycogeographic distribution patterns.

Fungal groups of relatively small size (i.e. the clavarioid and cantharelloid fungi ca. 1500 species worldwide), if intimately known, can be used to develop concepts of mycogeographic distribution patterns. Several such patterns are delineate. In such work, care must be taken to separate mycorrhizal from non-mycorrhizal groups, to deal only with well-documented species, and to cite examined specimens diligently. The roles of inventorying and monography in this process are discussed.


A class of 16 students in the Harvard University Division of Continuing Education collected and identified lichens from the Boston Metropolitan area during the late winter and spring of 1989. They compared their collections with those reported by Kneippe and Sherwood, still unpublished, from extensive collecting in 1978-1979. Kneippe and Sherwood had investigated the historical records of the Boston area lichens using collections dating from as early as 1838 made by Edward Tucker. Details of the 1989 survey will be discussed and compared with the 1978 report and the historical records. Some comments on the organization of the course and its use as an introduction to urban natural history studies will be made.
DONALD H. PFISTER. Harvard University Herbaria, 22 Divinity Avenue, Cambridge, MA 02138. On the genus Ascosparassis (Peronosporales), with comments on its distribution.

A collection of Ascosparassis heinricherii, the only species placed in the genus Ascosparassis, is reported from Venezuela based on a collection made by Roy Halling. Previously all known collections were from Asia. The morphology of A. heinricherii will be discussed as well as its systematic position in the Peronosporales. The distributional patterns of some other Asian-American operculate Oomycetes will be discussed, particularly in the genus Wynnea.

D. PORTER. Department of Botany, University of Georgia, Athens, GA 30602. Teaching an Experimental Mycology Course.

As the emphasis of mycological research moves from being primarily a study of comparative fungal structure and life histories it is important that mycological curriculum offerings reflect this changing status of the discipline in our present climate of science. The successful training of graduate students for a competitive market requires that they be familiar with more than just morphology and taxonomy of fungi. At the University of Georgia, declining enrollment in the upper division mycology courses in Basidiomycetes and Phycomycetes led us to offer an alternative course in Experimental Mycology that is topic or problem oriented rather than a taxonomic survey. The class is designed to serve students in the mycology program, but also to attract students from Ecology, Genetics and Biochemistry who are interested in the activities of fungi. The class is a combination lecture/laboratory with lecture or discussion topics ranging from the rationale for fungal phylogeny to genetics of mating types to fungal-insect symbioses. Most laboratory exercises are carried out in research laboratories and involve cultivation, cytology, genetics, and development of various fungi including axenic cultures of Basidiomycetes. Students are also expected to carry out an independent research project, to write their results in the form of a journal paper and to write an NSF style grant proposal and review those of the other students. The class gratefully receive the strong Mycology research effort at Georgia with guest lectures and the use of existing research facilities.

D. PORTER and L.K. MUEHLSCH. Department of Botany, University of Georgia, Athens, GA 30602. A species of Labyrinthula is the prime suspect as the cause of a massive die off of the sea grass, Thalassia testudinum in Florida Bay.

A die off of turtle grass, Thalassia testudinum, in Florida Bay, which was first noticed during the summer of 1987, has grown in the last year to include more than 10,000 ha of seagrass meadows. In the regions where the die off is most severe, the once continuous meadows of turtle grass are either completely lost or are interspersed at frequent intervals by irregular patches of bare sediment. The live plants that are near the die off areas have many blackened streaks and spots on their leaves. These necrotic regions appear to be the only obvious morphological symptoms that could be the primary indication of disease. Planting leaf pieces reveals an undescribed species of the marine slime mold genus Labyrinthula as the only euakaryote present. It has an axially blackened, necrotic center, and thallus pieces at a much higher frequency than from green leaf pieces. The relationship between seagrass disease and Labyrinthula is not unexpected. A different species of Labyrinthula has been demonstrated to be the cause of the wasting disease of eelgrass, Zostera marina (Muehlstein et al., 1988, Mar. Biol. 99:465). Cleidochytrium replicatum is associated with most of the turtle grass leaf pieces, but is found with equal frequency from both necrotic and green leaf pieces. The role of this polycentric chytrid in the turtle grass die off or subsequent leaf decomposition has not yet been determined.

M. J. POWELL. Botany Department, Miami University, Oxford, OH 45056. Encystment of secondary-type zoospores: A prelude to hyphal (direct) germination in Oomycetes.

Zoospores of Oomycetes carry inside their cells preformed organelles which, with the induction of encystment, attach spores to substrates and produce a cell coat. If conditions are proper after encystment, new vesicles are produced, become polarized in one region of the cyst, and a hyphal germ tube emerges. The process of encystment has been studied in the greatest detail in Phytophthora, Pythium (Peronosporales), Saprolegnia (Saprolegniales), and Oospora (Oomycetes). These investigations, differing in their interpretations of organelles involved in cell surface modifications, will be reviewed. A case is made for the possibility that zoospores of Oomycetes respond differently to different types of environmental triggers of encystment.

Pretusky, D. B., see Trenholm, H. L.


The 40 species of Polyporaceae so far recognized in the Nothofagus forests in southern South America are summarized. They may be clustered in 5 different distributional patterns, viz., cosmopolitan, endemic, paleoaustral (gondwanic and subantarctic), bipolar and pantropical. Fifteen taxa, representing 37% of the total, produce a brown-rot in wood. This is a relatively high value when compared with that found in other floras. The brown wood-rotting species are concentrated in the groups with paleoaustral and bipolar distribution (viz., 12 out of 15 species), a fact that may be correlated with the primitiveness of these groups. Brown wood-rotting fungi in the area show less specificity for gymnopterid substrates than those in temperate areas. The existence of a high morphological conservatism and of 'sister' species will be discussed. Some of the more distinct species in the area will be shown and their features discussed.

Ramann, M. A. see Gesner, R. V., et al.

M.V. RAO and J.P. TEWARI. Department of Plant Science, University of Alberta, Edmonton, Alberta, Canada T6G 2P5. Effect of light and temperature on lesion formation by strains of Myzecia citricolor on coffee.

The traditional cultivation of coffee in Costa Rica has been under highly shaded conditions where there is a high incidence of tan-colored American leaf spot caused by Myzecia citricolor. The new fields, however, are being established in open or little shade and often show low incidence of this disease. Concurrent with this change, new strains of M. citricolor causing black and red lesions had been observed. This study reports on lesion formation by tan, black and red lesion-causing strains of M. citricolor under temperature and light regimes that may prevail under open and shaded cultivation of coffee.
All strains caused significantly larger lesions at lower light and temperature regimes. This has dispelled concerns that black and red strains may be natural variants more virulent under open cultivation of coffee.

Raper, C. A., see Horton, J. S., et. al.

N.D. READ and K.M. LORD. Department of Botany. University of Edinburgh, King's Buildings, Mayfield Road, Edinburgh EH9 3JH, U.K.

Mutants of Sordaria macrospora impaired in perithecial development

Peritheciom morphogenesis in Sordaria macrospora was studied using developmental mutants. Nine mutants were characterized in detail and compared with wild type strains. Each mutant possessed a single point mutation at a single gene locus. Some of the mutant phenotypes were: c (mycelium completely barren); spd (aberrant ascogonia and protoperithecia); pl (ascogonia and clumps of small protoperithecia); f (ascogonia and large protoperithecia of irregular form distorted by uncontrolled internal tissue differentiation); p (perithecia with asci which abort just prior to spore delimitation); ire (perithecia with asci containing a non-linear arrangement of spores); m (perithecia with very short necks and lacking periphyses and ostioles); r (rose-coloured perithecia with non-phototropic necks and rose-coloured spores); and l (dark brown perithecia with yellow ascospores). The wild type produced dark brown perithecia with necks and ascii containing linearly arranged dark brown spores. All the mutants exhibited pleiotropy but to widely differing degrees. Pleiotropy occurred in relation to fruitbody morphogenesis, mycellial morphology, pigmentation and growth rate. The primary phenotypic defect caused by each mutation is unknown. Preliminary evidence indicates that the mutants c and spd possess altered cell wall chemistries. Overall it is clear that perithetium morphogenesis cannot, as previously described, be viewed as a single linear developmental pathway involving the serial expression of the genes examined in this mutant analysis. Instead, not surprisingly, it is a complex process in which different genes are expressed serially, simultaneously and interactively.

Read, N. D., see Robertson, S. J., et. al.

Reaves, J., see Mohan, N., et. al.


Conventional bleaching of kraft pulp with chlorine generates chlorinated organic compounds whose discharge is increasingly restricted. The white-rot fungus Coriolus versicolor can degrade and solubilise the residual lignin in kraft pulps, increasing their brightness directly and also making them more susceptible to subsequent chemical bleaching. Biological bleaching might reduce or eliminate the need for chlorine bleaching in the future.

Like lignin degradation, the bleaching effect of C. versicolor is enhanced by increased glucose supply and restricted nitrogen supply. However, bleaching is not restricted to a post-growth secondary metabolic phase. Increased O2 supply also stimulates bleaching. C. versicolor converts some of the lignin in the pulp to CO2, but much larger fractions are converted to water-soluble and alkali-soluble forms.

K. RICHARDSON and R.S. CURRAN. Department of Botany, University of Alberta, Edmonton, Alberta, Canada T6G 2E9.

A scanning electron microscopy study of keratin degradation by species of Onygenaceae (Ascomycetes).

Several fungi (Arthrodereumaceae) and species in the Onygenaceae are known for their ability to grow on and degrade keratinous structures (hair, horn, hoof, feathers, etc.). This ability is so pronounced that fungi in these families can be obtained selectively from soil by baiting soil samples with small amounts of keratinous material. Isolates so obtained generally are considered to be using keratin as a carbon source but our knowledge of the exact relationship between fungus and substrate, especially for Onygenaceae, is incomplete. In this study scanning electron microscopy was used to examine the physical aspects of fungal degradation of five hard keratins: wool, hair, horn, feathers and human hair, using isolates of Aphanascus spp., A. canadensis, Brunneospora reticulata, Phaeosclerotina ceratinophila, Keratinophyton durum and K. terreum. Fungi were grown at 22°C on dextrose salts agar, a minimal medium, with each type of keratin provided as the sole carbon source. After 68 days most keratins had been degraded, but there was little evidence that breakdown had been aided by mechanical means. There was no evidence of the formation of specialized hyphal structures (such as fronds, boring hyphae, penetrating bodies) involved in the degradation of hard keratins.

B. W. ROBERSON and M. S. FULLER. Department of Botany, University of Georgia, Athens, GA 30602. Effects of the sterol biosynthesis inhibitor, cyproconazole, on the microtubule and actin cytoskeletons in hyphal tip cells of Sclerotium rolfsii.

The microtubule and actin cytoskeletons of hyphal tip cells of Sclerotium rolfsii Sacc. were examined with transmission electron microscopy (TEM) using freeze substitution and with light microscopy using immunofluorescence techniques after treatment with the sterol biosynthesis inhibitor, cyproconazole, at fungistic concentrations. Cyproconazole is a triazole derivative which is known to inhibit C14-demethylation in sterol biosynthesis. The result is the accumulation of 14-methyl sterols and a decrease in the functional sterol which is ergosterol in S. rolfsii. Many microtubules were visible in control and treated hyphal tip cells. In control hyphae, the microtubules were mostly oriented parallel to the longitudinal axis of the hypha and were present in the apical and subapical regions of the cell. Bundling of microtubules was more apparent in those cells treated with cyproconazole than in control cells. Microtubule bundling occurred as soon as 30 min after hyphal cells were exposed to 0.75 μg/ml of fungicide, a concentration that produces approximately 60% growth inhibition. Microtubule polarity was generally maintained, with the orientation being mostly parallel to the longitudinal axis in treated hyphal cells. However, disruption of polarity was noted in both the subapical and apical regions of the cell. Immunofluorescence staining for actin revealed an accumulation of peripheral plaques in apical regions of control hyphal cells. These plaques are most likely the equivalent of filasomes that are shown to be rich in actin after immunocytochemical staining at the ultrastructural level. The number of peripheral plaques observed in the tip region was reduced after exposure to 0.75 μg/ml cyproconazole. TEM observations showed an accumulation of filasomes in regions of excessive cell wall deposition in cells grown in the continual presence of cyproconazole. The mechanism by which altered sterol biosynthesis produces abnormalities in the microtubule and actin cytoskeletons is not known.
B. G. Roberts. USDA-ARS, Tree Fruit Research Laboratory, 1104 N. Western Avenue, Wenatchee, WA 98801. Biological control of Botrytis cinerea on Golden Delicious apple fruit by Cryptococcus lauritzenii.

More than 100 strains of epiphytic bacteria and yeasts isolated from leaf and twig surfaces of apple and pear were screened in vivo for antagonism against postharvest diseases of apple fruit caused by Alternaria alternata, Penicillium expansum, P. verideum, Botrytis cinerea and Macrophomina sp. From a strain of Cryptococcus lauritzenii (Kuffelath) Skinner from apple leaf showed significant inhibition of Botrytis lesion development and was studied further. Complete inhibition of lesion development was observed for up to 11 days at 20°C when 10 μl of a 50% T suspension of washed C. lauritzenii cells were introduced into wounded pre-climacteric apple fruit one hour before introduction of 10 μl of a 2 X 10⁶ conidia/ml suspension of Botrytis cinerea. Pathogen control fruit did not develop lesions at 5°C. Cell-free culture filtrates had no effect on lesion development when compared to pathogen controls. When wounds on post-climacteric apple fruit were treated similarly, inhibition of lesion development was not observed. Populations of C. lauritzenii cells were followed for 72 hours at 20°C after introduction into wounds. Fruit were wounded, then inoculated with C. lauritzenii as described. The entire wound and surrounding tissue from three replicate fruit were harvested with a cork borer, ground in buffer, serially diluted and plated onto nutrient agar at 0, 24, 48 and 72 hours after inoculation. Populations of C. lauritzenii in wounds increased nearly 3 log units in 48 hours, then did not increase further. These data suggest either wound site or pathogen control or successful competition for nutrients, alone or in combination, as a possible mode of action for this biocontrol agent.

S. J. ROBERTSON† N. D. READ and D. J. BOND
Department of Botany, †Department of Genetics, University of Edinburgh, King's Buildings, Mayfield Road, Edinburgh EH9 3JH, U.K.

Pathways of multicellular development in Sordaria brevicollis and their orchestration by light

Two pathways of multicellular development involving hyphal aggregation occur in Sordaria brevicollis. One pathway leads via protoperithecia to perithecia; the other, which was previously unknown, results in vegetative hyphal aggregate (VHA) formation. VHAs differ from protoperithecia in being larger, less regular in form, lacking trichogynes and ascogonia, and having a different anatomy. The function of VHAs is unknown. The choice of developmental pathway is determined by specific environmental factors. Light plays an important role in orchestrating the two pathways. Light induces VHAs but not protoperithecial formation. Growth of protoperithecial and/or spermatal parent(s) in continuous light significantly reduces perithecial number after they have been crossed. Typically, the site of perithecial neck formation and direction of neck growth are positive phototropisms. Although S. brevicollis is normally regarded as heterothallic, uncrossed cultures will undergo homokaryotic fruiting but this process is inhibited by light.


Mitochondrial plasmid of Agaricus bisporus and related mitochondrial sequence of Agaricus brunnescens.

An internal region of the linear autonomously-replicating mitochondrial plasmid (pEM) isolated from Agaricus bisporus strain Ag4, hybridizes to a fragment of the mitochondrial genome of the non-plasmid-containing, commercially-cultivated mushroom, Agaricus brunnescens strain Ag50. The nucleotide sequences of pEM and the pEM-related Ag50 mtDNA were determined. Two open reading frames were found on pEM that possess homology to either DNA-directed DNA polymerases or RNA polymerases that are uniquely-associated with certain bacteriophages and mitochondrial-associated sequences, particularly linear mitochondrial plasmids such as the S plasmids of maize and the kalilo plasmid of Neurospora. The homologous Ag50 fragment is a continuous internal portion of the putative RNA polymerase of pEM and may represent an integrated pseudogene remnant. pEM may be a "mitophage" or foreign (non-mitochondrial) DNA related to other linear molecules that encode products required for their own replication.

R. A. Rooper, G. S. Keller and M. D. Fine. Department of Biology, Alma College, Alma, MI 48801. Nutritional relationships between the primary mutualistic symbionts of the ambrosia beetle Corhytus punctatissimus.

Ambrosiella xylobori and a Pichia sp. have been isolated from the ambrosia beetle C. punctatissimus. Both fungi were consistently isolated from the mycangia and found in egg cradles in the presence of feeding larvae. This cultural study of growth requirements and enzymatic capabilities of the fungi were directed at the hypothesis that the two fungi nutritionally interact and form a synergistic unit for the beetle-fungal mutualism. A. xylobori appears to lack vitamin requirements while the Pichia sp. needs thiamine and pyridoxine for growth. The Pichia sp. can utilize ammonium nitrogen and organic nitrogen while A. xylobori grew only in the presence of organic nitrogen. In contrast, A. xylobori could produce amylase and pectinase which the Pichia sp. could not. Both fungi grew well on hexose sugars, but lacked the ability to utilize xylose and cellulose. These data suggest the fungi complement each other for growth in the woody habitat of the gallery system of C. punctatissimus.

IAN K. ROSS. Biological Sciences, University of California, Santa Barbara, CA 93106. Impact of Biotechnology and Molecular Biology on course content in Mycology.

Because fungi have become increasingly important in both experimental and industrial areas involving biotechnology and molecular biology, the traditional content of mycology courses, although already quite varied, is being challenged. Virtually every molecular biologist today either uses or is aware of the use of Saccharomyces cerevisiae and other fungi in molecular biology. Fungi are used as new and interesting model systems for molecular studies and industry is increasingly using its use of fungi as producers and transducers. Knowledge of fungi has increased with the advent of molecular biology. How many industrial molecular biologists have a course in mycology? and how many mycology students feel able to enter the area of molecular biology? What is the role of the mycology course in this era of increasing dependence on molecular aspects to unravel the mysteries of life? Fungi are still among the most mysterious of living organisms and it could be said that they need for us to use all possible tools to uncover their unique attributes. Does the content of our mycology courses reflect this need?
ANJALI ROY, Department of Botany, Visva-Bharati University, Santiniketan 731235, W. Bengal, India.

A reevaluation of Oxyporus and Rigidoporus (Aphyllophorales, Polyporaceae).

The genus Oxyporus Donk is recognised as a monomitic genus as is the genus Rigidoporus Murr., though there are workers who included some dimitic species along with monomitic ones in the latter genus. They have some other common characters in that both include species usually producing encrusted cystidia and developing basidiospores that are hyaline, thin-walled, and globose to ellipsoidal. But from a study on several species of the genera Oxyporus and Rigidoporus it is apparent that the taxonomic status of these two genera needs reevaluation. From the observations it is concluded that while the genus Oxyporus is regarded as a monomitic genus, the genus Rigidoporus is to be characterized as a dimitic genus. The observations will be discussed in detail.

JC ROYER, M. HUBBES and P.A. HORGEN. Centre for Plant Biotechnology, University of Toronto, Erindale Campus, Mississauga, Ontario, Canada, L5L 1C6 and The Faculty of Forestry, University of Toronto, St. George Campus, Toronto, Ontario, Canada, M5S 1A1.

Development of a gene transfer system for Ophiostoma ulmi.

Ophiostoma ulmi (formerly Ceratocystis ulmi) is the causal agent of Dutch elm disease. The factors involved in the variability of pathogenicity found in different strains of the fungus are uncertain and could be resolved using modern techniques in molecular biology. A system for gene transfer is essential for such research. Preliminary studies showed that early log phase yeast cells of O. ulmi could be protoplasted efficiently using the commercial hydrolytic enzyme preparation Novozyme 234 when MgSO4 (0.5 M) was used as osmoticum. A comparison of several osmotic stabilizers revealed that sucrose (0.5 M) allowed highest rates of protoplast regeneration (~80%). Efforts at transforming the fungal protoplasts with pSV5 (which encodes for a mutant tubulin gene of Neurospora crassa) using several established transformation procedures proved unsuccessful. More recently, several plasmids containing fusions between fungal promoters and a bacterial gene for hygromycin phosphotransferase successfully transformed O. ulmi to hygromycin resistance. One of these vectors (pPS57, which contains a promoter for the N. crassa gene for tubulin and an N. crassa transformant from Penicillium chrysogenum) consistently conferred greatest resistance to hygromycin. Southern hybridization has confirmed the presence of pPS57 in the fungal genome.

Royer, J. C., see Robison, M. M., et al.

In VAM status between 10 and 15 month old nursery seedlings and 6 year old plantation trees. The study was carried out at Wanagama I Research Forest, Gadjah Mada University, Yogyakarta, Indonesia. The forest is located on marginal, calcareous soils poor in macronutrients. Mycorrhizal plants are known to outgrow nonmycorrhizal plants under nutrient poor conditions and the purpose of this study is to determine the difference in VAM status between 10 month old nursery seedlings and 6 year old plantation trees. The study was carried out at Wanagama I Research Forest, Gadjah Mada University, Yogyakarta, Indonesia. The forest is located on marginal, calcareous soils poor in macronutrients. Mycorrhizal plants are known to outgrow nonmycorrhizal plants under nutrient poor conditions and...
The hyphae are highly colonized than field stock.

Sangan, P., see Ike, J., et al.
Sangan, P., see Muruganandan, A., et al.


Several candidates for the biological control of sapstain on unseasoned timber were identified in our previous work. The predominant metabolite of a lignicolous isolate of *Bysschlamys nivea* grown in Czapek broth was patulin. This mycotoxin was also produced on blocks of *Pinus banksiana*. Patulin is inhibitory to some sapstaining fungi at high concentrations, and may be responsible for the biological control capabilities of *B. nivea*. Because patulin is dangerous to humans, *B. nivea* is probably unacceptable as a biological control agent. Several metabolites are present in culture filtrates of *Nectria cinnabarina*. Mellein has been identified as one component. This compound is known to be toxic to plants, and may play a role in the opportunistic pathogenicity of *N. cinnabarina*. Mellein displays conidiation on azosporecs. Mellein does not appear to inhibit the growth of sapstaining fungi, however, and the antibiotic activity of *N. cinnabarina* is probably attributable to some other metabolite.

SEITLER, R. L., see Dykstra, M. J.

E. C. SETLIF, and M. HAZENBERG. School of Forestry, Lakehead University, Thunder Bay, Ontario, Canada, P7B SE1. Nuclear behavior in the basidiomycete *Rigidoporus vivus.*

The nuclear life cycle of the amphihallic fungus *R. vinctus* is unusual in that clamped hyphae form only in the leading margin of growth. The hyphae are multinucleate and variable numbers of nuclei (>2) participate in conjugate division. Staining of hyphal cells with Giemsa or DAPI revealed cells that contained typical nuclei as well as DNA particles of variable sizes. Other cells contained only DNA particles and no nuclei. The fluorescent wave length of the DAPI stained nuclei was pale blue; whereas the smaller DNA entities were bright yellow. The walls of cells void of cytoplasmic organelles fluoresced yellow. Both terminal and intercalary cells were observed with DNA particles. DNAse effectively eliminated all staining with Giemsa and DAPI. These phenomena may result from a process of some kind that results in nuclear disintegration, DNA transformation, and irregular nuclear division and regulation.

Sedliff, E. C., see De-Wei, L.
Sedliff, E. C., see Yan, Z. H.

SEWALL, T. H., ADAMS, C. W. MIMS, and W. E. TIMBERLAKE. Departments of Plant Pathology and Genetics, University of Georgia, Athens, GA 30602. Cytological effects of precocious expression of the *brlA* gene in *Aspergillus nidulans.*

The sporulation-specific *brlA* gene is expressed early during conidiogenesis in *A. nidulans*. The *brlA* mutants produce indeterminate conidiophore stalks and never form vesicles, metulae, phialides, or conidia. The *brlA* gene has been cloned and sequenced and appears to encode a DNA-binding regulatory protein. To study the effect of this gene outside its normal developmental control, a construct was made by fusing the threonine-inducible alcohol dehydrogenase promoter to the structural region of the *brlA* gene. This construct was inserted into a strain of *A. nidulans* that undergoes wild-type conidiophore development. Expression of *brlA* was induced in the transformed strain using vegetative hyphae not yet competent to undergo conidiogenesis. Precocious expression of *brlA* in liquid tyrosine medium caused cessation of vegetative growth, formation of numerous thickened septa, and initiated spore production. Hyphal apices and short lateral extensions near thickened septa differentiated into phialide-like structures that produced spores. In both cases, spores were uninucleate and about the same size as conidia produced on normal conidiophores except their walls lacked an external rodlet layer. The transformed strain produced short chains of viable spores that were capable of germination and normal growth when transferred to glucose medium.

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T. C. SEWALL, C. W. MIMS, and W. E. TIMBERLAKE. Departments of Plant Pathology and Genetics, University of Georgia, Athens, GA 30602. Cytological effects of precocious expression of the *brlA* gene in *Aspergillus nidulans.*

Phialides of wild-type strains of *A. nidulans* bud repeatedly to produce conidia which, upon maturation, become pigmented and highly hydrophobic. The *wet6* mutant strain produces conidia that undergo lysis rather than normal maturation. Ultrastructural changes associated with conidiogenesis in the wild-type strain and lysis in the mutant have not been examined. In this study the Thiery strain for carbohydrates was used to differentiate wall layers and demonstrate cytological changes associated with conidiogenesis. The wild-type conidium initial wall had a thin, outer rodlet layer and a thick, homogenous inner layer. After a septum delimited the conidium from its phialide, an electron-opaque layer formed between the inner and outer wall layers. By the time a maturing conidium had been displaced from its phialide by four subsequently formed conidia, this Thiery-positive middle layer was complete and the plasma membrane contained extensive furrows. Conidium initials of the *wet6* strain appeared similar to those of the wild-type. However, in the mutant, the middle wall layer and plasma membrane furrows never formed, the inner wall layer eventually became thinner, and the rodlet layer separated from the conidium. Maturing conidia became increasingly more vacuolated until lysis occurred.
Cytoplasmic debris and inner wall remnants from lysed conidia were enclosed by fused rodot layer from adjacent conidia to form the "wet vesicle" characteristic of this mutant.

C. A. SHEarer and J. WEBSTER, Department of Plant Biology, University of Illinois, 505 S. Goodwin St., Urbana, IL 61801 and Department of Biological Sciences, University of Exeter, Exeter, England. Aquatic hyphomycete communities on twigs in the River Teign, England.

Corticated and decorticated twigs of alder and oak were placed at five sites along a gradient of stream order and pH in the River Teign, Devon, England. Twigs were submersed in August and retrieved the following October and February. Upon retrieval, twigs were examined for fungi immediately and then placed in distilled water in twig bubblers to simulate stream conditions. After 48 hr of incubation in twig bubblers, twigs were placed in moist chambers for long term incubation and subsequent microscopic examination. Water from twig bubblers was filtered with membrane filters and conidia on filters were identified and quantified.

Aquatic hyphomycete species diversity, H' diversity, and spor production per twig increased in a downstream direction. Relative importance of species differed among sites, and only two species, Heliscus lugdunensis and Tricladium splendens, occurred in significant numbers at all sites. Changes in species diversity and relative importance values of species occurred over time. Aquatic hyphomycete conidial production was greater on decorticated than corticated wood, but differences decreased with time. Communities on oak and alder did not differ significantly in species composition.

Shearer, C. A., see Asthana, A.

Shearer, C. A., see Crane, J. L.

R.V. SHUKLA, Department of Botany, G.M.D. College, Silaspur, M.P. India, 495001. Antibiosis in relation to vegetative activity of thermophilic fungi.

The phenomenon of antibiosis plays an important role in colonization and competition of saprophytic microorganisms in each other for space and nutrition. The toxic volatile emanations in the atmosphere where microorganisms live, create a limiting factor(s) for the growth and survival of other microorganisms where they live. In present investigation the sensitivity of eight volatile substances have been evaluated against the mycelial yield of three thermophilic fungi i.e. Sargac - Papulaspora sp., Chrysosporium amplexiformis, and Scytalidium sp.. Inhibition in vegetative growth was determined by growing the test organisms in the atmosphere saturated with different volatile substances. The data showed that different volatiles have varied effect and ethyl propionate vapours caused maximum growth inhibition in all the test fungi. During study one of the thermophilic actinomycetes Streptomyces sp. obtained important for not allowing the above test fungi to grow in its surrounding.

Shukla, R. V., see Agarwal, R.

L. Sigler, J. Harris, A. Padhye, D. Dixon, I. Salkin, M. Kemna. Univ. of Alberta Microfungus Collection, Edmonton, Canada T6G 2E1; Texas Dept. of Health, Austin, TX 78756 -3199; Center for Disease Control, Atlanta, GA 30333; N.Y. State Dept. of Health, Albany, NY 12201. Sporothrix cyanescens, an incidental contaminant or emerging pathogen?

Sporothrix cyanescens was first described in 1973 when it was encountered in studies of fungus isolates from human skin and air samples. Interest in its pathogenic potential was stimulated by its isolation from blood culture in two cases of malignant lymphoma. A report on these cases was presented to the American Society for Microbiology annual meeting in 1987. Since then, S. cyanescens has been isolated from blood culture on several occasions and from other clinical material. The isolates have occurred in geographically widely separated areas of the United States. While there has not, as yet, been any evidence of tissue invasion by this fungus, or any implication of a role in patient mortality, its occurrence in specimens from normally sterile body sites and its thermotolerance suggest that S. cyanescens has the potential to be an opportunistic pathogen of the compromised patient. In this report, we present information on the new cases and describe this potential new pathogen.

J.C. SILVER, S.A. BRUNT and V. ARMARVIL. University of Toronto, Scarborough Campus, Scarborough, Ontario, Canada, M1A 1A4. Steroid hormone-regulated expression of certain Achlya heat shock genes

In Achlya ambisexualis, as in all other cell types, heat shock causes the increased synthesis of a number of specific heat shock proteins. Among these are members of both the "hsp70" and "hsp90" heat shock protein families. These proteins are thought to protect cells from the toxic effects of heat and certain other stresses. An Achlya genomic library was screened with heterologous probes for both hsp70 and hsp90 genes and a number of positive clones obtained. Northern blot analyses using these clones suggest that at least one member of the Achlya hsp70 family is expressed constitutively i.e. at normal temperatures, while a second hsp70 gene is inducible by both heat shock and by the Achlya steroid hormone antheridiol. In Achlya, this hormone regulates the development of gametangia in male strains. A putative Achlya hsp95 ("hsp90") genomic clone was also isolated. Northern blot analyses using this clone indicate that an mRNA species of about 2.8Kb is markedly enriched in Achlya mycelia by either heat shock or antheridiol. It is known from our previous studies that at least some proportion of hsp95 is found in a complex with the Achlya steroid hormone receptor. However, the role of hsp70 in the response to steroid hormone in Achlya is not understood at present.

(Supported by NSERC Canada)

Silver, J.C., see Walsh, S. R. A., et al.

Silver, J.C., see Brunt, S.A.

Strasbaugh, D. B., see Ambus, R. K., et al.
K. T. SMITH, Northeastern Forest Experiment Station, P.O. Box 690, Durham, NH 03828. Ecological strategy of Ceratocystis coeruleus and the sapstreak disease of sugar maple (Acer saccharum).

The sapstreak disease results from the infection of living sapwood by C. coeruleus and Sphacelotheca. The present confusion stems from the infection of living sapwood by C. coeruleus and Sphacelotheca. The sapstreak fungus appears to employ three primary strategies for fungal survival that are part of a current paradigm of fungal ecology: the ruderal, the stress-tolerant, and the competitive-combative strategies. In the month of May at locations in NH (1987) and VT (1988), sugar maple trees (2.5-6.0 cm DBH) were inoculated with a mixture of the sapstreak fungus or a sterile grain control added to a drill hole made at the base of each tree. Periodic dissections indicated that all stems inoculated with the fungus developed symptomatic sapstreak discolored within 60 days, indicating an ability to colonize ruderal sites in the presence of large amounts of inoculum. All control trees developed typical columns of wound-initiated discolored extending 2-4 cm above the wound, consistent with concepts of compartmentalization of decay. Sapstreak discolored was compartmentalized, frequently extending 25-30 cm above the wound, indicating rapid fungal movement and tolerance of high moisture stress. At each harvest, 1-cm-thick stem disks of inoculated and control trees were placed in individual moisture chambers. Successive dissection of the two genera was indicated by the overgrowth of the disk by the heavy greyish mycelium of the Chalara anamorph of the sapstreak fungus, indicating the competitive-combative ability of the fungus. The sapstreak fungus was recovered only from all those disks showing symptoms.

M. L. SMITH, L. C. DUCHESNE and J. B. ANDERSON. Department of Botany, University of Toronto, Erindale College, Mississauga, Ontario, L5L 1C6. Distribution of nuclear and mitochondrial genotypes of ARILLARIA in a Michigan forest.

Previous studies have shown that nuclear migration in Homobasidiomycetes is not accompanied by mitochondrial migration when haploid, homokaryotic mycelia are mated under laboratory conditions. Because Armillaria species are able to colonize adjacent root systems in the forest by vegetative growth, they provide an unique opportunity to compare the distribution and transmission of nuclear and mitochondrial genotypes in nature. The multiple mating-type alleles can be used as nuclear markers and the many variants in mtDNA restriction fragment patterns can be used as mitochondrial markers. We first mapped the distribution of mating-type alleles in 34 fruit-bodies collected from a 200 X 70 m site in a clear-cut hardwood forest replanted with red pine. Several clones (groups of fruit-bodies sharing identical mating-type alleles) representing two species are present on the site. We are now examining mtDNA restriction fragment patterns in each of the collections. Preliminary results suggest that the largest clone on the site (25 fruit-bodies from an area ca. 120 x 30 m) consists of two sectors differing in mitochondrial type. Our hypothesis is that this clone arose through a mating event, rather than the introduction of diploid inoculum, and that the two mtDNA types were transmitted from the original mates.


Morphology and development of the two systematic smut fungi that infect Andropogon gerardii Vio. were compared. Early stages of fungal development were similar. Host vascular tissue elongated with the sori and became surrounded by pockets of developing telosporae that were free at maturity in Sphacelotheca, but adhered in balls in Sorosporium invasion of different primordia by perennial mycelium produced distinct symptoms in the two diseases. Sphacelotheca occidentalis (Sym.) Clint. formed sori in florets, while Sorosporium provinciale (Eil. and Gall.) Clint. smutted entire flowering culms.

Sphacelotheca and Sorosporium were established to accommodate certain smut species that occur on dicotyledons and differ from Ustilago in details of sorus and teliospore morphology. Expansion of these genera is required by species infecting grasses was based on the principle of similarity, but recent evidence from developmental studies indicates that some features may not be analogous. Taxonomic revision of the graminicolous species of the two genera has begun. The present confusion underscores the importance of accurate information about sorus development and sporogenesis in formulating generic concepts for these smuts on Poaceae. The aim of this work is to contribute such information.

Solfirizzo, M. see Logueco, A., et. al.

C. A. SPECHT, L. GIASSON, M. M. STANKIS, C. P. NOVOTNY and R. C. ULLRICH. Departments of Botany and Microbiology, University of Vermont, Burlington, Vermont 05405. Analysis of Ag mating-type alleles of Schizophyllum commune.

Heterokaryosis and sexual development in Schizophyllum are regulated by four multiallelic mating-type genes: Aa, Aa, Bo and Bg. Three of the nine Ag alleles known worldwide have been cloned from cosmid libraries; each constructed with DNA from a different Ag strain. The Aa4 allele was isolated by walking the chromosome from the closely linked PAB1 gene. The insert of an Aa4 cosmid was used to isolate Aa1 and Aa3 from the other cosmid libraries by colony hybridization. DNA from the isolated cosmids activates A-regulated development when transformed into a homokaryotic recipient bearing a different Ag allele. Mating tests and genetic analyses are consistent with transformants having two Ag alleles. Aa1 and Aa4, subcloned to 2.8 and 1.2 kb, respectively are active in transformation, when integrated in trans or cis to the Ag allele of the recipient. Aa1 and Aa4 DNA were hybridized to DNA from the nine Ag strains. The Ag gene resides within 4-6 kb of DNA that is homologous only to DNA from strains sharing the same allele. Ag DNA does not hybridize to DNA from the Ag, Bo or Bg loci. The DNA sequence and allele structure of Aa1, Aa3 and Aa4 will be discussed.

Specht, C. A. see Giasson, K., et. al.

F.W. SPIEGEL. Department of Botany and Microbiology, University of Arkansas, Fayetteville, AR 72701. Phylogenetic analysis of the flagellate protostelids.

Several previous studies have presented phylogenetic schemes for the protostelids based upon the intuition of the authors with little discussion of the significance of the
characters used to defend the phylogenies. In those cases where the significance of characters has been discussed, the number of characters have been quite limited or associated with only one aspect of the life history, or ontogenesis were also analyzed. Over the last several years considerable data have been gathered on the morphology of all the stages of the life history of the seven genera of flagellate protostelids. Using these data, 35 characters with dual or multiple states, it has been possible to reconstruct a phylogeny of the flagellate protostelids and myxomycetes using parsimony analysis (PAUP). By rooting the tree with the myxomycetes as an outgroup, one finds two major clades, one containing the genera Clastostelium, Protopsorangiun, Ceratiomyxa, and the myxomycetes, including Echinostelium bisporum, and the other the genera Ceratiomyxa, Cavostellum, and Planoprotostelium. This tree is very useful as a starting point for testing a number of phylogenetic hypotheses about the protostelids.

W.C. SKEENSON. Division of Respiratory Disease Studies, National Institute for Occupational Safety and Health, 444 Chestnut Ridge Road, Morgantown, WV 26505.

Fungi and mycotoxins in indoor air

Exposure to fungi is common in the home and in a wide variety of occupational settings. At the present time, a large number of mycotoxins are known and it is now known that mycotoxins can occur in significant concentrations in airborne spores. Thus it can be expected that mycotoxins are inhaled when workers and others are exposed to airborne fungus spores, whether in the home, the office, or in a silo, grain elevator, or barn. Furthermore, recent data demonstrate that certain mycotoxins are acutely toxic to pulmonary alveolar macrophages. Although further studies are needed, data currently available suggest that pulmonary exposure to mycotoxins could have deleterious effects on health either directly or in combination with other components of that exposure.

P.D. STAHL and M. CHRISTENSEN. Department of Botany, University of Wyoming, Laramie, WY 82071.

Ecological analysis in 3 isolates of Glomus mosseae.

The common vesicular-arbuscular mycorrhizal fungus, Glomus mosseae is known to be distributed throughout the world in widely disparate habitats. In contrast, there is also evidence that this fungus may have narrow limits of tolerance to environmental factors. We conducted experiments to test the hypothesis that populations of G. mosseae have wide ranges of tolerance to environmental conditions.

Isolates of this fungus, obtained from dissimilar habitats, were compared under different sets of environmental conditions. Behavior of the populations was examined in three different soils, at three moisture levels and under three temperature regimes. Both direct observations of the fungi and their effects on host plant growth and physiology were used to assess variation among the populations.

The results of our experiments demonstrate that the ranges of tolerance among the three G. mosseae populations vary substantially. The isolates had different responses to the tested environmental factors and one isolate had much wider ranges of tolerance than the other two. However, our results were interpreted as an indication that these populations, in general do not have wide ranges of tolerance to environmental conditions.

Stankis, M. M., see Glasson, K., et al.


Stretch, A. W., see Carris, L. M.

G. STICKO 1 R.S. CURRAN2 and K. EGER 3
1 Department of Botany, and 2 Department of Forest Science, University of Alberta, Edmonton, Alberta, Canada T6G 2E9.

Identification of ericoid mycorrhizal fungi from the Alberta Rockies.

This paper summarizes our progress in classifying a series of mycorrhizal endophytes from alpine ericaceous plants. In July 1986 root samples from an alpine tundra community at 2010 m a.s.l. in the Alberta Rockies were taken from the dominant ericads Cassiope mertensiana, Phyllodoce empetrifolia, P. glaukilifer and Vaccinium scoparium. For comparative purposes three non-ericaceous herbs (Rubus pedatus, Ledosca pectinata and Antemaria lanata) were also sampled. After surface sterilization the samples were plated and a series of 168 isolates were obtained in pure culture. The majority of these were sterile black fungi which could be grouped on the basis of vegetative and colonial characteristics into 34 cultural groups. Endophytes with hyaline sterile mycelium comprised a seventh of the total number of isolates. The majority of these groups appear to be host specific but the data are inconclusive until more extensive sampling is undertaken. Restriction fragment length polymorphism techniques are being applied to determine the level of homogeneity among and/or between the cultural groups. Data from these techniques will be discussed and compared with respect to groups described on the basis of cultural and morphological characters.

R.C. SUMMERBELL and J. KANE. Ont. Min. of Health, Box 9000, Terminal "A", Toronto, Ont., Canada, MSV 1B5

The human toenail is subject to being invaded by dermatophytic fungi and by a variety of non-dermatophytic fungi. In addition, it may be associated with a remarkable range of environmental fungi. Since 1986, we have attempted to determine which of the many species associated with nails in our geographic area actually cause infections. Cases of suspected non-dermatophytic onychomycosis were authenticated by establishing the presence of diagnostic, non-dermatophytic microscopic structures in vivo, or by documenting repeated, consistent isolation from the infected nail. Additional "suspected" cases were recorded when fungi from nails were associated with clinical material showing microscopic structures atypical of dermatophytes, but not absolutely excluding the possibility of dermatophyte invasion. Scopulariopsis brevicaulis was the most common etiologic agent, with 42 demonstrated cases and 39 more suspected over three years. Also recorded were Hendersomomula toruloides (19 cases), Scytalidium hyalinum (3 cases), Fusarium spp. (2 cases, 6 susp.), Aspergillus flavus (3 cases), A. terreus (2 cases) and Gymmacella dankaniensis (1 case). N. toruloides and S. hyalinum are recorded for the first time from authenticated Canadian cases. The use of Littman's oxgall medium in primary isolations was found to greatly aid in the recovery of non-dermatophytic agents of onychomycosis.
Ultrastructure of appressorium development and mitosis in the rust fungus *Arthtrobionyma peckianus*.

Aeciospores of *A. peckianus* collected in the spring from naturally infected Rubus plants were dusted onto small pieces of dialysis membrane supported on moist filter paper or 3% water agar. Aeciospores germinated readily on these membranes and could be processed conveniently for ultrastructural study using freeze-substitution or conventional chemical fixation. A single germ tube emerged from each spore and elongated until it contacted the dialysis membrane. The tip of the germ tube expanded to form an infection structure known as an appressorium. An electron opaque extracellular material appeared to be involved in the adhesion of the appressorium to the membrane. Most of the contents of the binucleate aeciospore eventually moved into the appressorium. Large vacuoles formed in the spore behind the migrating cytoplasm. A septum developed in the germ tube near the appressorium and the nuclei divided once in a synchronous mitotic division. The excellent preservation of cell ultrastructure afforded by freeze-substitution fixation permitted observation of various details of mitosis. Astral microtubules, SPBs, the nuclear envelope and elements of the spindle apparatus were clearly visible. Bundles of ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ® ©
species of Corticium, Aleurodiscus, Dendrotheca, Punctaria and related genera in an attempt to define the core of the Corticiaceae.

Tiffany, L. H., see Sneath, K. M.

Timberlake, W. E., see Sewall, T. C., et al.

Timberlake, W. E., see Sewall, T. C., et al.

A. P. TORZILLI and J. D. ISBISTER, Biology Department
George Mason University, Fairfax, Va 22030. Fungal
solubilization of low-rank coal.

Several fungal isolates tested positive for coal-
solubilizing activity when an oxidized form of
lignite coal (leonardite) was placed in direct
contact with mycelia grown on solid media. When
filtrates from liquid cultures of these fungi were
incubated with leonardite, water-soluble product(s)
was released which exhibited a broad range of
absorbance starting at 400 nm and peaking at about
210 nm. The solubilizing factor(s) in these culture
filtrates exhibited 1) relatively high thermostability, requiring >30 min. of autoclaving for
inactivation, 2) a pH optimum of 8.0-8.5, with
more acidic hydrogen ion concentrations resulting
in a loss of solubilizing activity, 3) a molecular
weight of <6000-8000. These results suggest
that the fungi investigated produce a low molecular
weight, basic metabolite capable of effecting a
non-enzymatic solubilization of low-rank coal.

J. A. TRAQUAIR, Agriculture Canada, Research
Station, Harrow, Ontario, Canada N0R 1G0. 
Cauloplane fungi of Prunus persica.

Perennial canker of Prunus persica (L.) Batsch is
cured by Leucostoma cinctum (Pers.: Fr) Hohn and L.
persoonii (Nits.) Hohn. Wounded bark is susceptible
to these facultative parasites before, during or
just after the winter dormancy period when there is
minimal physiological activity in cambial cells.
The encouragement of indigenous fungal antagonists
on peach bark is being investigated as a means of
biological control for Leucostoma spp. during these
periods. In order to determine population levels of
fungal epiphytes and their interactions, healthy
and diseased bark was sampled at monthly intervals
from the scaffold branches of peach trees in six Essex
County orchards from fall to early spring. L.
persoonii was found to be the predominant
canker-causing agent. Seventeen fungi were observed
in addition to the two Leucostoma spp. Species in
the form genera Aureobasidium, Epicoccum, Alternaria
and Cladosporium were isolated most frequently. A7T
population levels dropped during winter months and
increased rapidly in the spring. Interactions and
associations between Leucostoma spp. and other
fungal epiphytes differed when healthy bark samples
were compared with diseased bark samples. The four
frequently isolated fungi have been identified as
potential biocontrol agents.

H. L. TRENHOLM and D. B. PREULISKY, Animal Research
Centre, Agriculture Canada, Ottawa, Ontario, Canada
K1A 0C6.

Effects of Fusarium mycotoxins on animal health and
economic consequences.

Worldwide, Fusarium mycotoxins are causing major
economic losses to the agricultural and food
industries. Reduced crop yields, down-grading and rejec-
tion of moldy grain, poor growth and reproductive
performance, illness and death have been associated with Fusarium contaminated grain. Because fungal and toxin contamination can affect all aspects of farm production, it has been difficult to place a dollar figure on the overall impact, however, losses in Canada alone have been conservatively estimated in the hundreds of millions of dollars annually. Compared to other countries, however, the mycotoxin situation in Canada is minor. While there have been several promising advances to detoxifying mycotoxins, prevention of mycotoxin contamination of grain crops must be encouraged.

Tyrrell, D., see Walsh, S. R. A., et al.
Ulrich, R. C., see Giasson, K., et al.
Ulrich, R. C., see Specht, C. A., et al.

Rytas Vilgalys. Department of Botany, Duke University, Durham, NC 27706. Introduction to Numerical Analysis in Fungal Systematics.

Organisinal diversity in the Eumycota is rivaled only by the number of mycological classification schemes aimed at explaining that diversity. Critical studies on phylogeny and systematics of fungi are still largely intuitive in nature, and may often yield classification schemes with limited information content. In contrast, experimental approaches based on analysis of multiple discrete characters are more likely to yield reproducible results (whether or not they are correct). Two approaches widely employed by experimental systematists also have much potential value for use in fungal systematics. The first approach, numerical taxonomy, groups taxa based on their overall similarity (or dissimilarity) using a variety of arithmetic and multivariate algorithms. In contrast, cladistic methods are available which equate character state changes with nodes in an evolutionary tree. The manner by which various phenetic and cladistic methods treat data is fundamentally different, and should not be taken lightly by systematists interested in developing phylogenetically meaningful classifications. I will introduce and discuss the assumptions and limitations of several widely employed analytical methods, using morphological and molecular data.


The oyster mushroom Pleurotus ostreatus occurs widely on woody substrates worldwide, and is valued as a food source in many countries. We are developing genetic markers in Pleurotus for future use in studies on systematics and molecular evolution, as well as crop improvement. A plasmid library from a North American strain of Pleurotus (D261) was obtained by cloning random DNA fragments produced by the restriction enzyme PstI into the multiple cloning site of the plasmid pUC 118. Southern blots containing restriction digests of genomic DNA from 26 wild and cultivated strains were hybridized against different plasmid clones from the library. Each plasmid probe detected restriction fragment length polymorphisms (RFLPs) among the 26 isolates. Most of the RFLPs are due to length mutations or other rearrangements within the cloned region, revealed by a shift in the mobility of a single restriction fragment. Several RFLPs were also due to point mutations, as evidenced by the loss or gain of restriction sites within the cloned region. Similar patterns of polymorphism were observed using other restriction enzymes (e.g., EcoRI) for cloning and surveying. Screening of southern blots with cloned fragments from Pleurotus D261 produced strong hybridization signals in only 15 of the 26 isolates. The same pattern of differential hybridization was observed for each plasmid clone used as a probe, whereby cloned sequences from one group of strains hybridized poorly with DNA from other groups. Mating compatibility data indicate that the inability of plasmid clones from D261 to cross-hybridize with other strains is probably due to genetic divergence associated with speciation in these fungi.

Vilgalys, R., see Gonzalez, D.
Vilgalys, R., see Gowen, S. P.


Insects such as spruce budworm, gypsy moth and hemlock looper are among the most destructive forest pests. Fungi in the genus Entomophaqa, are known to be important pathogens of these and other insect pests. We are currently using heterologous DNA probes, as well as developing Entomophaqa probes, for the identification of Entomophaqa isolates. Initially we have used a heterologous ribosomal DNA probe from Entomophaqa strains to identify restriction fragment length polymorphisms (RFLPs) in the genomic DNAs of E. aulicae, E. mammagna and E. crytii. These DNAs were found to exhibit significant polymorphisms with a number of different restriction enzymes including Hind III, Dra I and Eco R5. On the other hand, no differences have been observed in the digest patterns of DNAs from a wide number of different E. aulicae strains with any restriction enzyme used to date (which includes the three above plus Xba I, Sst I, Msp I, Bam HI, Pst I, Taq I, Eco RI and Rsa I ). We are currently using cloned DNA fragments from an E. aulicae genomic library which we have constructed, to develop probes which can further differentiate individual isolates of Entomophaqa. The availability of rapid and unequivocal methods for the identification of isolates, will aid in providing accurate data on the effectiveness of specific fungal isolates in controlling pest populations.

C. J. K. WANG and R. A. ZABEL. Faculty of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, NY 13210. Fungi from Utility Poles.

A cultural identification manual for fungi from southern yellow pine and Douglas-fir utility poles is in preparation for publication. Fungi isolated in the past ten years primarily from eastern United States are included: 33 species of basidiomycetes, and nearly 100 species of ascomycetes, ascomy- cetes, and Deuteromycetes. There are synoptic and dichotomous keys to subdivisions, genera, and species. Cultural and microscopic characteristics, photomicrographs or line drawings, and decay type of each fungus are provided.

Wang, C. J. K., see LoBuglio, K. F.
Wang, H., see Haeu, R.
It is generally accepted that secondary plant metabolites act as chemical defenses against herbivory; however, chemical ecologists have been slow to recognize that some secondary fungal metabolites perform an analogous function. In the wild, as well as in agricultural systems, a fungus that successfully infects and rots seeds or fruits has a stake in protecting itself and the resource it has colonized from larger seed or fruit eaters (e.g., rodents, birds, insects, etc.). At the same time, the successful fungal colonist should not prevent relevant arthropod vectors from dispersing fungal spores or other forms of infective inoculum to new resources. Some of the selective factors that have guided the evolution of fungal chemical defense systems will be examined in this paper. Also, how maize cultivation practices contribute to the buildup of fungal populations with substantial toxicity to vertebrates will be discussed. In addition to the mycotoxigenic fungi that rot seeds, relevant players in this drama include vertebrate seed eaters, herbivorous insect pests of maize and the fungal and arthropod detritivores active in the comminution and mineralization of agricultural residues. This is the first synthesis of its kind attempted at the ecosystem level.


A multitude of colored pigments are produced as secondary metabolic products by microorganisms during their growth cycle. A few of these characterisric pigments are used by microbiologists as taxonomic characters for identification purposes, but little work has been done on investigating the possibility of using these pigments as dyes for textiles. Our objective is to produce pigments from microbial sources and investigate the use of these as dyes for camouflage clothing systems. Selective microorganisms such as Penicillium herquei, Chlorociboria aeruginascens, and Pisolithus tinctorius are being screened for their ability to produce pigments in the required spectral reflectance color ranges. Fermentation studies, including batch systems, scale-up batch, and continuous systems are under investigation. Environmental parameters such as growth medium, incubation period, pH, carbon, nitrogen, and phosphate sources are being evaluated. These organisms will be manipulated, using either optimization of environmental and nutritional factors in fermentation/bioprocessing systems or genetic engineering techniques, in order to enhance the production and isolation of the appropriate pigments.

Wilson, G. W. T., see Hetrick, B. A. D., et al.

Cytological studies of the root rot fungi *I. tomentosus* revealed an atypical nuclear life cycle. Hyphae were simple-septate and uninucleate. Chlamydospores were multinucleate and most basidiospores were uninucleate. Orientation of meiotic division in basidia was oblique. Small DAPI positive particles (DNA) that fluoresced yellow were observed along with typical fluorescent blue nuclei. Similar observations of yellow particles were found in bacteria that were melanized.

Program for MSA Meeting, 1989

Room numbers not yet available.

The Mycological Society of America was founded in 1931 to promote and advance the study of fungi in all their aspects—morphology and development, cytology, physiology, biochemistry, genetics, ecology, taxonomy, distribution and uses. Primary interests of some Society members include the applied areas of industrial mycology, medical mycology, and plant pathology. The Society collaborates with the New York Botanical Garden in publishing the journal *Mycologia*. It also publishes *Mycologia Memoirs*, a series of monographs, and the *MSA Newsletter*. The Society honors eminent mycologists through the Distinguished Mycologist Award, through its annual lectureship, and recognizes pedagogical achievement through the W. M. Weston Award for outstanding mycology teaching. Younger Society members may be awarded the Alexopolous Prize for outstanding research. Student awards include Graduate Fellowships in Mycology for doctoral students showing high promise for a career in mycological research and teaching, and graduate student prizes awarded to the students judged as presenting the best papers (two awards made) and the best poster (two awards made) at the annual meeting. Workshops and/or symposia are held in conjunction with each annual meeting. Membership is approximately 1,300.

President: HAROLD H. BURDALL, JR., Forest Products Laboratory, Forest Service, USDA, Madison, WI 53705, USA, (414) 234-5834.

President Elect: CHARLES W. HUNS, Department of Plant Pathology, University of Georgia, Athens, GA 30602, USA, (404) 542-1291.

Vice Presidents: DONALD BARR, Research Branch, Agriculture Canada, Biosystematics Research Center, Ottawa, ON K1A 0C6, Canada, (613) 990-1865.

Secretary: DONALD H. FFISHER, Harvard Herbaria, 20 Divinity Drive, Harvard University, Cambridge, MA 02138, USA, (617) 495-2651.

Treasurer: MARTHA FOWELL, Department of Botany, Miami University, Oxford, OH 45056, USA, (513) 529-3812.
Fungus-Host assemblages.

2:45 DAVID PORTER and LISA K. MUEHLSTEIN, Department of Botany, University of Georgia, Athens, GA. A species of Fimicium is the prime suspect as the cause of a massive die off of the sea grass, Halodule wrightii; in Florida Bay. RECESS

3:15 PAUL BAYMAN and PETER J. COTTY, Southern Regional Research Center, USDA/ARS, New Orleans, LA. Genetic variation in Aspergillus flavus; in an Arizona cotton field is contributing to the problem. RECESS

3:30 P.B. ROBERTS, USDA/ARS, Tree Fruit Research Lab., Wintersville, OH. Biological control of Botrytis cinerea; on Golden Delicious apple fruit by the parasite, Diplocarpon laevigatum. KEVEN T. SMITH, Northeastern Forest Experiment Station, Durham, NH. Development of a strategy for Cercospora coerulea; in and the sapstreak disease of sugar maple (Acer saccharum). RECESS

4:00 R.J. SHAHRA, Department of Botany, College, Bilaspur, MP, India. Antioxidin in relation to vegetative activity of thermophilic fungi. A.K. JAITLY and NISHI JAITLY, Department of Plant Science, Rohilkhand University, Bareilly, India. Fungi isolated from Indian mangrove wood and their degradation capability.


4:15 GLEN R. KLASSEN, Microbiology Department, University of Manitoba, Winnipeg, MB. DNA sequence analysis of ribosomal RNA genes from Pythium ultimum. M.M. ROBINSON, J. B. ANDERSON, and P.A. HORGAN, Mushroom Research Group, Erindale College, University of Toronto, Mississauga, ON. Mitochondrial plasmid of Agaricus bitorquatus; and related mitochondrial sequence of Agaricus brunnescens. DOLORES GONZALES and RYTAS VILGALYS, Botany Department, Duke University, Durham, NC. DNA sequence restriction of mitochondrial DNA genes from Pristocena solanii. RECESS

4:30 RYTAS VILGALYS and ERIC KAY, Botany Department, Duke University, Durham, NC. Development of DNA restriction polymorphisms as genetic markers in the Oyster mushroom (Pleurotus ostreatus). PAULA T. DEPREIST, Botany Department, Duke University, Durham, NC. Molecular-genetic survey of the (Giadonella hydnellum Xichrom; -forming) Ascomycotina from Mt. Rogers, Virginia. RECESS

4:45 M.L. SMITH, L.C. DUCHESNE, and J.B. ANDERSON, Erindale College, University of Toronto, Mississauga, ON. Distribution of nuclear and mitochondrial genotypes of Practaria; in a Mistletoe in Trent. SHARON P. GOHAN and RYTAS VILGALYS, Botany Department, Duke University, Durham, NC. Restriction patterns of Pristocena solanii in ribosomal DNA of Xylaria magnoliae.

Sess 5. [CONTRIBUTED PAPERS] Cytology and Ultrastructure of Fungi. I.B. HEATH, Biology Department, York University, Toronto, ON. NG2, ICP, Canada, I.B. HEATH, Biology Department, York University, Toronto, ON. I.B. HEATH and S.W. KAMINSKYJ, Biology Department, York University, Toronto, ON. Cell skeleton involvement in tip growth of Saprolegnia; hypoxia. RECESS

5:15 R. MEIER and INIS CHARVAT, Botany Department, University of Minnesota, St Paul, MN. Characterization of the nuclear condition and wall structure of Dictymus messeus. R.E. EDELMANN, R.T. H.Y. LIN, and R.J. KLOPPERMANN, Plant Pathology Department, University of Georgia, Athens, GA and Botany and Plant Pathology Department, Michigan State University, East Lansing, MI. The ultrastructural development of homothallic Zygospor;e formation in Zygorhynchus heteromysis; (Mucorales). E.C. SWAN and C.W. MIMS, Plant Pathology Department, University of Georgia, Athens, GA. Ultrastructure of appressorium development and mitosis in the rust fungus, Ampelomyces earlii. R.W. ROBERSON and M.S. FULLER, Botany Department, University of Georgia, Athens, GA. Effects of the sterol biosynthesis inhibitor, cyproconazole, on the microtubule and actin cytoskeleton in hypoxia-lip cell tips of Sclerotium rolfsii. S.W. KAMINSKvJ, E.S. YOON, and I.B. HEATH, Biology Department, York University, Toronto, ON and Microbiology Department, Kangwon University, Chuncheon, South Korea. Post-mitotic nuclear migration in freeze-dried and drug-treated hypoxia of Pleurotus ostreatus. RECESS

5:30 JINLIONG LI, I.B. HEATH, Biology Department, York University, Toronto, ON. Ultrastructural studies of anaerobic gut fungi. S.L. JACKSON and I.B. HEATH, Biology Department, York University, Toronto, ON. The role of actin in apical growth of hypoxia of Saprolegnia ferax. JHONG H. YANG, and E.C. SETLIFF, SUNY College of Environmental Science and Forestry, Syracuse, NY. Nuclear and cell division in plants. Dyer, Thunder Bay, ON. Observations of nuclei in hypoxia of Laminaria hyperborea. J. TAYLOR and C.W. MIMS, Plant Pathology Department, University of Georgia, Athens, GA. Effect of host resistance on growth of the rust fungus Puccinia substauata; var. indiana; within pear millet leaf tissue. E.C. SETLIFF and M. MASON, College of Forestry, Lakehead University, Thunder Bay, ON. Nuclear behavior in the basidiosmycete Rigidospor;us vinaceus. T.C. SEWALL, C.W. MIMS, and W.E. TIMBERLAKE, Plant Pathology and Genetics Department, University of Georgia, Athens, GA. Conidium maturation in wild-type and meta-A mutant strains of Aspergillus nidulans. TIMOTHY M. COUPERT and RICHARD J. HOWARD, DuPont Experimental Station, Wilmington, DE. Penetration peg ultrastructure in the rice blast pathogen is highly specialized.
Session 1: [SYMPOSIUM]: Molecular Biology of Fungal Development. JULIE C. SILVER, Microbiology Department, University of Toronto, Scarborough Campus, Scarborough, ON MIC IA4, Canada, (416/287-5251).
7:10 JULIE C. SILVER, Introduction.

Session 2: [SYMPOSIUM]: Teaching Mycology in the 1990's. C.W. MIMS, Plant Pathology Department, University of Georgia, Athens, GA 30602, USA (404/542-1291).
8:00 JAMES W. KIMBROUGH, Plant Pathology Department, University of Florida, Gainesville, FL.
8:10 PAUL J. SZANIJSZKO, Microbiology Department, University of Texas, Austin, TX. One approach to teaching mycology in a microbiology department.
8:25 DEAN A. BLAME, Plant Pathology Department, University of Illinois, Urbana, IL. Teaching mycology to plant pathologists.
9:05 DAVID PORTER, Botany Department, University of Georgia, Athens, GA. Teaching an Experimental Mycology course.
9:25 RECESS

Session 3: [SYMPOSIUM]: Biological Sciences Department, University of Michigan, Ann Arbor, MI. Impact of biotechnology and molecular biology on course content in mycology.

Session 4: Biological Sciences Department, University of Michigan, Ann Arbor, MI. Impact of biotechnology and molecular biology on course content in mycology.

Session 5: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 6: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 7: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 8: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 9: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 10: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.

Session 11: [SYMPOSIUM]: Impact of biotechnology and molecular biology on course content in mycology.
Session 18 (Poster Session, 8 August)

I. All posters will be available for viewing from 12:30 p.m. until 5:00 p.m. Authors will be available to discuss their presentations from 3:30 p.m., and refreshments will be served.

Tuesday Evening, 8 August

14. [CONTRIBUTED PAPERS] Fungal Genetics. BRADLEY KROPP, CRPF Forestry Science Department, University of Laval, Ste-Foy, PQ, Canada, and J. M. MILLER, CRPF Forestry Science Department, University of Laval, Ste-Foy, PQ. Recovery of mycorrhizal nuclei from a dedifferentiated mycorrhizal culture of *Sclerocarya bicolor*.


16. [CONTRIBUTED PAPERS] Fungal Genetics. RONALD H. PETERSEN, Botany Department, University of Vermont, Burlington, VT. Preliminary characterization of the genotypes which encode Hsp85, a component of the *Saccharomyces cerevisiae* sterol receptor.

BRADLEY KROPP, CRPF Forestry Science Department, University of Laval, Ste-Foy, PQ. Recovery of mycorrhizal nuclei from a dedifferentiated mycorrhizal culture of *Sclerocarya bicolor*.


18. [CONTRIBUTED PAPERS] Fungal Genetics. RONALD H. PETERSEN, Botany Department, University of Vermont, Burlington, VT. Preliminary characterization of the genotypes which encode Hsp85, a component of the *Saccharomyces cerevisiae* sterol receptor.
Session 18. (SYMPOSIUM): Mycology of Mycorrhizae. J. DAVID MILLER and MICHEL J. DWIGHT, Plant Research Center, Agriculture Canada, Research Branch, Ottawa, ON K1A 0C6, Canada (613/995-3700), and Neeve Department, School of Veterinary Medicine, North Carolina State University, Raleigh, NC 27695, U.S.A. (919/567-6200).

1130 J. DAVID MILLER, Plant Research Center, Agriculture Canada, Research Branch, Ottawa, ON. Taxonomic issues relating to mycorrhizae.

[TUESDAY AFTERNOON, 10 AUGUST]

Concurrent Sessions 18, 19

Session 18. (SYMPOSIUM): Mycology of Mycorrhizae. J. DAVID MILLER and MICHEL J. DWIGHT, Plant Research Center, Agriculture Canada, Research Branch, Ottawa, ON K1A 0C6, Canada (613/995-3700), and Neeve Department, School of Veterinary Medicine, North Carolina State University, Raleigh, NC 27695, U.S.A. (919/567-6200).

1130 J. DAVID MILLER, Plant Research Center, Agriculture Canada, Research Branch, Ottawa, ON. Taxonomic issues relating to mycorrhizae.

[TUESDAY AFTERNOON, 10 AUGUST]

1135 JOHN APSIMON, Ottawa-Carleton Chemistry Institute, Carleton Campus, Ottawa, ON. Chemistry of mycorrhizae.

2125 J. DAVID MILLER, Plant Research Center, Agriculture Canada, Research Branch, Ottawa, ON. Tobacco mycorrhizal production.

3140 A.E. DEJARDINS, R.N. BEREMAND, Y.P. SALCH, TIM MOHDI, and S.P. MCDERMID, USDA/ARS, Northern Regional Research Center, Peoria, IL. Genetics of trichothecene toxins produced in Fusarium.

4120 GEORGE A. BEAN, JOSEPH O. KUI, and TIMOTHY J. NG, Botany Department, University of Maryland, College Park, MD, College of Agriculture, Texas A&M, Kingsville, TX, and Horticulture Department, University of Maryland, College Park, MD. Plant-microbe interaction in toxicogenic fungi.

5110 DONALD T. WICKLOW, Northern Regional Research Center, USDA/ARS, Peoria, IL. Mycorrhizal ecology: Maize cultivation and selection for mycorrhizal-producing ability among kernel rotting fungi.

Session 19. (PARTICIPATORY PAPERS): Mycorrhizae. SHANNON BERCH, Soil Science Department, University of British Columbia, Vancouver, BC V6T 1Z4, Canada, 604/822-3716, presiding.

1130 GARRY A. HUNT, Biological Research Centre Ltd., Kamloops, BC. Effect of cultural practices on occurrence of mycorrhizal fungi in container-grown nurseries.

1145 R.K. ANIBUS, D.B. SINSABAUGH, and A.E. LINKINS, Biology Department, Clarkson University, Potsdam, NY. Characterization of extracellular acid phosphatases from an ectomycorrhizal (Entoloma) mycelium.

2100 LEONARD J. HUTCHISON, Soil Science Department, University of Toronto, Toronto, ON. The taxonomic significance of polyphenol oxidase production in pure cultures of ectomycorrhizal Basidiozymetes.

2115 Y. DALPE, Biosystematics Research Center, Agriculture Canada Central Region, Ottawa ON. Morphology and growth requirements of two [endo+ mycorrhizal truffle] species of the genus Pisolithus in culture.

2130 M. GARDNER, W. HARRIS, K. WURTE, FORT J. BRUN, and J. TAYLOR, CRFB, Forestry Faculty, University of Laval, Ste-Foy, PO. and Botany Department of California, Berkeley, CA. Identification of indigenous and introduced mycorrhizal fungi by amplification of ribosomal RNA genes.

2145 SHANNON BERCH, Soil Science Department, University of British Columbia, Vancouver, BC. Distribution of vesicular-arbuscular mycorrhizal (VAM) fungi with land use.

3100 RECESS

3115 DE-WEI LI, and E.C. SETLIFE, School of Forestry, Lakehead University, Thunder Bay, ON. Effects of ectomycorrhiza and fibrous pulp wastes on the growth of container-grown jack pine seedlings.

3130 B.A.D. METTRICK, G.W.T. WILSON, and D.C. MARTIN, Plant Pathology and Botany Departments, Kansas State University, Manhattan KS. Relationship between mycorrhizal dependence and plant competition.

3145 STEVEN L. MILLER, WILLIAM F.J. PARSONS, and DENNIS H. KNIGHT, Forest Science Department, Oregon State University, Corvallis, OR. Fruiting of ectomycorrhizal fungi as an indication of root-cap formation in a lodgepole pine forest.

Papers 2

Posters 2

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Session 20. (SYMPOSIUM): Mycorrhizae. SHANNON BERCH, Soil Science Department, University of British Columbia, Vancouver, BC V6T 1Z4, Canada, 604/822-3716, presiding.

1130 GARRY A. HUNT, Biological Research Centre Ltd., Kamloops, BC. Effect of cultural practices on occurrence of mycorrhizal fungi in container-grown nurseries.

1145 R.K. ANIBUS, D.B. SINSABAUGH, and A.E. LINKINS, Biology Department, Clarkson University, Potsdam, NY. Characterization of extracellular acid phosphatases from an ectomycorrhizal (Entoloma) mycelium.

2100 LEONARD J. HUTCHISON, Soil Science Department, University of Toronto, Toronto, ON. The taxonomic significance of polyphenol oxidase production in pure cultures of ectomycorrhizal Basidiozymetes.

2115 Y. DALPE, Biosystematics Research Center, Agriculture Canada Central Region, Ottawa ON. Morphology and growth requirements of two [endo+ mycorrhizal truffle] species of the genus Pisolithus in culture.

Session 21. (SYMPOSIUM): Mycorrhizae. SHANNON BERCH, Soil Science Department, University of British Columbia, Vancouver, BC V6T 1Z4, Canada, 604/822-3716, presiding.

1130 GARRY A. HUNT, Biological Research Centre Ltd., Kamloops, BC. Effect of cultural practices on occurrence of mycorrhizal fungi in container-grown nurseries.

1145 R.K. ANIBUS, D.B. SINSABAUGH, and A.E. LINKINS, Biology Department, Clarkson University, Potsdam, NY. Characterization of extracellular acid phosphatases from an ectomycorrhizal (Entoloma) mycelium.

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2115 Y. DALPE, Biosystematics Research Center, Agriculture Canada Central Region, Ottawa ON. Morphology and growth requirements of two [endo+ mycorrhizal truffle] species of the genus Pisolithus in culture.
A. LOGRIECO* and A. DOTTALICO*, Institute of 
Tessine and Microtessine, Bari, Italy.
Alternative species of cereal grains from 
Mediterranean countries and their ability to 
produce avocetosins.

D.V. ROO*, and J.P. TOWARII, Plant Science 
Department, University of Alberta, Edmonton, AB. 
Effect of light and temperature on lesion 
formation by strains of Pythium citricolor on 
coffee.

CAROL A. SHEARER*, and J. WEBER, Plant Biology 
Department, University of Illinois, Urbana, IL, 
and Biological Sciences Department, University of 
Edinburgh, Edinburgh, Scotland, Aquatic Hymenomycete 
communities on twigs in the River Teign, 
England.

JAMES A. TRAQUAIR, Agriculture Canada Research 
Station, Harrow, ON. Cauliopane fungus of 
Pirus communis L.,

J.J. MORRILL, College of Environmental Science 
and Forestry, Syracuse, NY. Distribution and host relations of 
Armillaria spp. in New York.

Posters 4. ECOTOLOGY AND ULTRASTRUCTURE OF FUNGI

YOUNG H. KHON*, and HARVEY C. HOD*, Plant 
Pathology Department, New York State 
Agricultural Experiment Station, Cornell 
University, Geneva, NY. Nuclear DNA synthesis 
time course during appressorium formation in 
Fusarium.

MARICLA F. HAMMOND*, and T.M. HAMMILL, Biology 
Department, SUNY College at Oswego, NY. Electron 
microscopy of conidia formation in the synnemal 
hymenomycete, Didymascaria microspora.

T.M. BUTT, and R.A. HUMBER*, USDA-ARS Plant 
Soil, and Nutrition Laboratory, Ithaca, NY. 
Are mitotic spindle polar bodies really 
conservative and significant indicators of 
phylogenetic relatedness.

E.J. ROBERTSON, N.D. PEND*, and D.J. BUNN, 
Pathology Department, University of Edinburgh, 
Edinburgh, England. Pathways of multicellular 
development in Didymascaria microspora and its 
orchestration by light.

H.B. LUM*, and D.J. MCCLAUGHLIN, Plant Biology 
Department, University of Minnesota, St. Paul, 
MN. Nuclear division and septation in 
Ipomoea mauritiana and I. tricolor.

K.J. CORMIER*, and T.M. HAMMILL, Biology 
Department, SUNY College at Oswego, NY. 
Electron microscopy of eusporogenesis in the 
sexual yeast, Sclerotiaceae. 

J.L. GIBSON*, and J.W. KIMBROUGH, Biology 
Department, Stetson University, DeLand, FL. 
and Plant Pathology Department, University of 
Florida, Gainesville, FL. Necrospore development and 
wall formation of the truffle, Tuber recurvus.

G. B. OUELLETTE, N. R. MACHO, and J. P. LAVOINE, Laurentian Forestry 
Centre, Ste-Foy, PQ, and Biology Department, 
University of Laval, Ste-Foy, PQ. Irregular, 
plate-like growth of Spinifer fusiformis on 
millipede filters.

POSTERS 5. PHYSIOLOGY AND BIOCHEMISTRY OF FUNGI

WALT. H. LILLY, Biology Department, Southeast 
Missouri State University, Cape Girardeau, MO. 
Electrophoretic detection of multiple 
proteolytic activities in control and nitrogen 
starved colonies of Schizophyllum commune.

L.A. NOVA*, and L.M. KELLEY, Botany Department, 
University of Toronto, Erindale Campus, 
Mississauga, ON. Developmental sclerotial 
proteins in Trichoderma.

D.J. D'YANIE, Biochemistry Department, Universit  
of Georgia, Athens, GA. A flavin in the 
Y. viscosus: bioluminescence emitter in fungi.

IAN D. REID*, HEIL KIRKPATRICK*, and EDMUND 
ZEMKE. Biotechnology Research Institute, 
National Research Council of Canada, Montreal, 
QC. Physiological lignin degradation during 
Biological bleaching of Kraft pulp with 
Coriolus versicolor.

B.J. WILEY*, and D.L. KAPLAN, U.S. Army 
Biological and Chemical Research, Development and Engineering Center, 
Natick, MA. Microbial pigment production as a 
Source of dyes for camouflage clothing.

T. FOSTER*, A. BILLIN, K. KAZAK, and J. ROSS, 
Biological Sciences, University of California, 
Santa Barbara, CA. Unusual chemical and 
physiological properties of Gigaspora 
congregatissima: phenoloxidase.

R. RICHARDSON*, and R.S. CURRIE, Botany 
Department, University of Alberta, Edmonton, AB. 
A scanning electron microscope study of keratin 
degradation by species of Drosophila 
MELANOCYTES.

Interior of unexpanded Geastrum sp. 
(Gasteromycetes, Lycoperdales).

August 30 1981 Houston County, Michigan, Hoghton, north of bridge 
in forested wooded area, near a beech underbrush 
- birch, cherry
- species of Quercus and Quercus nortis. 
Illustrated by Susan Andres.
Fungi Wanted

BASIDIOMYCETES

Ammirati, Joe: Dried specimens of *Dermocybe* and *Cortinarius* species with notes and/or color photograph.

Desjardins, Dennis E.: Specimens of *Marasmius* from North America; minimal notes on color and substrate desired but not necessary.

Kerrigan, Richard W.: Living material (cultures, spore prints, or fresh, sound basidiomata) of wild *Agaricus bisporus, subperonatus, subfloccosus*, and *vaporarius* with notes and vouchers.

Prusso, Don C.: Species of *Tulostoma* found under species of *Juniperus*. I need reports of their occurrence and availability of specimens for study.

Wright, Jorge E.: South American specimens of *Bovista* and allied genera. (not *Mycenastrum* nor *Lanopila*). South American specimens of *Arachnion*.

DEUTEROMYCETES

Baerlocker, F.: Please send cultures of the following with information of when and where they were isolated. See Change of Address for current address.

- *Articulospora tetradadia*
- *Alatospora spp.*
- *Clarariopsis aquatica*
- *Dendrospora tenella*
- *Margaritospora aquatica*
- *Meliscus lunddunensis*
- *Tetracladium setigerum*
- *Tetracladium marchalianum*
- *Vanocosporium elodeae*

Wicklow, D. T.: Sclerotium forming fungi from tropical-subtropical habitats (but not *Asperillus flavus, A. parasiticis* or *A. ochraceus*).

MYXOMYCETES

Keller, Harold W.: Specimens from Arkansas

ZYGOMYCETES

Humber, Richard A.: Cultures, specimens of entomopathogenic fungi.
FUNDS AVAILABLE FOR RESEARCH

GRANTS FOR SHADE TREE RESEARCH AND EDUCATIONAL PROJECTS. Each year since 1975, the International Society of Arboriculture has awarded grants to encourage scientific and educational research on shade trees. Horticulturists, plant pathologists, entomologists, soil specialists, and others, are invited to submit a brief outline of a proposed project for which a grant might assist in purchase of equipment, technical or student help, or otherwise contribute to the work. For 1987, the Trustees voted 12 grants @ $1500; for 1988, 10 grants @ $2000; The deadline for 1990 is Dec. 1, 1989.

Individuals self-supported or privately or publically employed are eligible. There are no restrictions based on religion, race, sex, age, or nationality of the applicant. The grants are not expected to cover all research costs but to aid, stimulate and encourage scientific studies of shade trees. The ISA requires that administrative overhead not be deducted from grants it awards. Recipients will be requested to publish their results in ISA's "Journal of Arboriculture," editor Dr. Dan Neely, Ill. Nat. Hist. Surv., 607 East Peabody, Champaign, IL 61820, telephone 217-244-2168.

Interested researchers should prepare not more than 2 pages in English, outlining: (1) Name, address and telephone number of Principal Investigator. (2) Institutions(s) and date(s) of Investigator's college and/or graduate degree(s). (3) Title and purpose of the project. (4) Intended use of the grant money. (NO "overhead" allowed) (5) Individuals involved in the research. (6) Citations to two relevant publications by the researcher. (Don't send reprints.) (7) Most important: How would the results help all arborists in their daily work? (Bear in mind: 6 reviewers are arborists, 5 are scientists.) (8) What is the anticipated total cost of the entire project, regardless of whether or not you get an ISA grant and regardless of the amount of the grant? (9) What is the anticipated total duration of the entire project, regardless of whether or not you get an ISA grant?

To receive consideration, proposals must be received by December 1st. All proposals will be reviewed separately by each of the 11 members of the ISA Research Committee. Recipients of grants (and all other applicants) are notified by about mid-March. Send proposal to: Dr. Francis W. Holmes, Professor, Shade Tree Laboratories, University of Massachusetts, Amherst, MA 01003.

Out of fairness to applicants who comply with our rules, we reserve the right to forward ONLY THE FIRST 2 PAGES per application to members of our evaluating committee! For the same reason, proposals received after December 1st are considered one year later.

ALEXANDER H. AND HELEN V. SMITH RESEARCH FUND AWARDS for 1989. Proposals are invited for participation in the A.H. & H. V. Smith Research Fund Awards. The primary purpose of the fund is to study the collections of Alexander Smith and his associates that are on deposit at the University of Michigan Herbarium. The funds will cover all or a significant part of the expense involved in visiting the herbarium and working with the collections and related materials.

Grants may be made available to members of the Mycological Society of America who are working actively on the taxonomy or
floristics of the fleshy fungi. The applicant should be to a point in their investigations where having full access to Alex's material would advance the applicants work. If interested please contact Harry D. Thiers, Department of Biology, San Francisco State University, 1600 Holloway, San Francisco, CA 94132.

SINDEN SCHOLARSHIP. The James W. Siden Scholarship Committee of the American Mushroom Institute is pleased to announce the availability of a single scholarship of up to $2,500.00 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.

Applications will be accepted until May 1, 1989 after which the Committee reserves 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, Telephone: (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 Mailling 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.
Report from the MSA Representative to the Biological Stain Commission

1. The Annual Meeting of the Biological Stain Commission was held on June 9-10, 1988, at the Holiday Inn-National Airport, Washington, D.C. The Scientific Session, the General Meeting, and the President's Forum were held on June 9; the Board of Trustees met on June 10.

2. Four invitational lectures were presented during the Scientific Session:

   A. Fluorescent stains for fungi and algae (Dr. Meade Pimsler, Armed Forces Institute of Pathology, Washington, D.C.)

   B. A quantitative performance test for staining processes (Dr. James Turner, N.Y.S. Health Department, Albany, NY)

   C. New results in Romanowski-Giemsa Staining (Professor Dr. D. Wittekind, Anatomisches Institut der Universitat Frieburg)

   D. Report of the Committee on Standardization of Immunoreagents (Dr. Jules Elias, SUNY-Stony Brook).

Of those four, perhaps the first was of foremost significance to members of MSA. That presentation dealt with the use of chitin/cellulose-binding fluorescent stains to identify fungal and algal elements in histological sections. Details of the procedure were published (Koch and Pimsler, 1987. Laboratory Medicine, 18: 603-606). Dr. Pimsler stated that although there are several fluorescent stains available for identifying fungi in sections of animal tissues, he favored Uvitex-2B for its fast, easy, sensitive, and broadly specific characteristics. Ciba/Corning is to market that product in the United States.

Professor Wittekind stated during his excellent presentation of new results in Romanowski-Giemsa staining that he is in the process of preparing a monograph on the history and use of Giemsa staining (publication date??).

3. During the Business Meeting it was reported that 12,916 lbs. of biological stains were certified for chemical purity and identity during 1987, and 68,733 labels were purchased by companies marketing those stains. Also during the Business Meeting, Dr. Frederick Kastens, President of the Commission, stated that he was working on revisions of two important staining references, viz., Staining Procedures, and Conn's Biological Stains, both of which, along with History of Staining, 3rd Ed., are published by Williams and Wilkins.

4. The President's Forum consisted of a series of discussions about (a) activities in Europe relating to standardization procedures for dye manufacture and use, (b) a variety of concerns relating to standardization of immunoreagents and procedures, (c) several
stains including azure B, hematoxylin, aniline blue/methyl blue, alcian blue, and fluorochromes, (d) stability of schiff's reagent and carbofuchsin, (e) embedding media and solvents for plastics, and (f) need for a date on the certification label for fluoroisothiocyanate.

If any member of MSA has any concerns or questions about the use, purity, characteristics, etc., of any stains certified by the Biological Stain Commission, or if there are any questions that I should raise during the President's Forum at the 1989 Annual Meeting of the Commission, I would be pleased to receive them. The role of the MSA Representative to the commission is to act as a liason between the two groups.

Respectfully submitted,

Terrence M. Hammill

Editor's Note: This report from T. Hammill was accidentally left out of the last newsletter.

NEW MYCOLOGICAL RESEARCH


LoBuglio, Katherine F.: Intraspecific Variation in the Mycorrhizal Fungus Cenococcum geophilum Fr. Assessed by Restriction Fragment Length Polymorphisms in Ribosomal DNA. Supported by SUNY College of Environmental Science and Forestry and Sigma XI.


MSA Auction: The annual MSA Auction to raise money for our Endowment Fund will be held on Wednesday evening at the social. Volunteers with professional auctioneering skills are needed to help with this event. Please send items for auction to Wendy Untereiner, Department of Botany, University of Toronto, Toronto, ON M5S 1A1, Canada. Items should be sent by Post (NOT BY UPS) and valued at $10 to $38 on the customs slip.
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.

1 Part 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 1
NAMA Mushroom Poisoning Case Registry
Species Reported for 1986-7

<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>Laetiporus sulphureus</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>Amanita verna/viros</td>
<td>8</td>
<td>22</td>
</tr>
<tr>
<td>incl. definite virosa</td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td>Chlorophyllum molybdites</td>
<td>7</td>
<td>35</td>
</tr>
<tr>
<td>Omphalotus olearius</td>
<td>7</td>
<td>16</td>
</tr>
<tr>
<td>Tricholoma pardinum*</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Amanita muscaria</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>incl. var. formosa</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>Amanita pantherina</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Leccinum aurantiacum</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>Panaeolus foenisecl</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Armillaria mellea</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>Cantharellus cibarius</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Grifola frondosa</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Lepiota rachodes</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Morchella esculenta</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Ramariopsis lentofragilis</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Agaricus placomyces</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Coprinus comatus</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Gymnopilus spectabilis</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Paxillus involutus</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Suillus granulatus</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Agaricus augustus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Agaricus hondensis</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Amanita bisporigera</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Amanita frostiana</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Amanita gemmata</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Amanita smithiana</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Caloscypha fulgens</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Coprinus atramentarius</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Cortinarius violaceus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gyromitra esculenta</td>
<td>1</td>
<td>11</td>
</tr>
<tr>
<td>Lepiota seminuda</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Morchella angusticeps</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Panaeolus acuminatus</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Pleurotus ostreatus</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Psilocybe semilanceata</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>Tylopilus eximius</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>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Tricholoma pardinum</em></td>
<td>6 new cases, all with alcohol &lt;br&gt; vomiting 100% &lt;br&gt; diarrhea 17% &lt;br&gt; sweating 17% &lt;br&gt; Reported from Ontario</td>
</tr>
<tr>
<td><em>Ryamariopsis lentofragilis</em></td>
<td>3 new cases &lt;br&gt; pain, chest or abdomen 100% &lt;br&gt; weakness 100% &lt;br&gt; intestinal cramps 67% &lt;br&gt; nausea 33% &lt;br&gt; tremor 33% &lt;br&gt; Reported from Maine</td>
</tr>
<tr>
<td><em>Suillus granulatus</em></td>
<td>3 new cases; 2 by contact &lt;br&gt; dermatitis, face 67% &lt;br&gt; malaise 33% &lt;br&gt; nausea 33% &lt;br&gt; diarrhea 33% &lt;br&gt; head heavy 33% &lt;br&gt; Reported from Colorado and Massachusetts</td>
</tr>
<tr>
<td><em>Paxillus involutus</em></td>
<td>3 cases, 2 new &lt;br&gt; #1: dry mouth, blurred vision &lt;br&gt; #2: incoherent; kidney damage with thirst and polyuria &lt;br&gt; #3: weakness, muscle spasm, hemolysis, anemia, severe back pain, kidney failure, retinal necrosis, bone marrow damage, cardiac involvement &lt;br&gt; Reported from Oregon and Washington</td>
</tr>
<tr>
<td><em>Agaricus placomyces</em></td>
<td>2 new cases &lt;br&gt; #1: headache, sneezing, rhinorrhea &lt;br&gt; #2: nausea, sweating, intestinal cramps, vomiting, diarrhea &lt;br&gt; Reported from Idaho and Michigan</td>
</tr>
<tr>
<td><em>Amanita bisporigera</em></td>
<td>2 cases, 1 new &lt;br&gt; intestinal cramps (2) &lt;br&gt; nausea &lt;br&gt; vomiting &lt;br&gt; diarrhea &lt;br&gt; muscle spasm &lt;br&gt; death (1) &lt;br&gt; Reported from Michigan and Ontario</td>
</tr>
<tr>
<td><em>Tylopilus eximius</em></td>
<td>2 cases, 1 new &lt;br&gt; nausea &lt;br&gt; vomiting &lt;br&gt; intestinal cramps (2) &lt;br&gt; diarrhea (2) &lt;br&gt; sweating &lt;br&gt; chills &lt;br&gt; weakness &lt;br&gt; disoriented &lt;br&gt; drowsy &lt;br&gt; Reported from New York and Maine</td>
</tr>
</tbody>
</table>
### SPECIES AND THEIR SYMPTOMS

Cumulative Summary

<table>
<thead>
<tr>
<th>Species</th>
<th>Number of Cases</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amanita brunnescens</strong></td>
<td>5 cases</td>
<td>CA, diarrhea, intestinal cramps, liver damage, nausea, vomiting, death, liver damage, kidney failure, coma, combative failure, nausea, vomiting</td>
</tr>
<tr>
<td><strong>Amanita gemmata</strong></td>
<td>4 cases</td>
<td>OR, NE, diarrhea, dizziness, nausea, weakness, abdominal pain, drowsy, flushing, formication, hallucination, hypothermia, miosis, muscle spasm, palpitation, unconscious, visual disturbance, vomiting, salivation, sweating, Other: diarrhea, delirium, disoriented, dizzy, incoherent, intestinal cramps, weakness</td>
</tr>
<tr>
<td><strong>Amanita muscaria</strong></td>
<td>14 cases</td>
<td>MD, OR, WA, vomiting, nausea, intestinal cramps, drowsy, weakness, sweating, chill, dizzy, hallucination, disoriented, diarrhea, flushing, muscle spasm, salivation, sweating, mucus viscous, fever, headache, hypotension, palp, tachycardia, tired, tremor, Other: aching bones, cardiac arrhythmia, deep sleep, hematemesis, unconscious</td>
</tr>
<tr>
<td><strong>Amanita ocreata</strong></td>
<td>5 cases</td>
<td>(4 species, ID uncertain): CA, OR</td>
</tr>
</tbody>
</table>

2 Species with 3 or more cases; totals from all cases through 30 June 1987
<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intestinal cramps</td>
<td>69</td>
<td>AR, CA, CO, DC, FL, LA, MD, Mexico, MI, NC, SC, TX, PA, VA</td>
</tr>
<tr>
<td>Nausea</td>
<td>50</td>
<td>Vomiting 94%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>54</td>
<td>Nausea 74%</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>54</td>
<td>Diarrhea 63%</td>
</tr>
<tr>
<td>Weakness</td>
<td>34</td>
<td>Intestinal cramps 43%</td>
</tr>
<tr>
<td>Sweating</td>
<td>29</td>
<td>Nausea 20%</td>
</tr>
<tr>
<td>Chills</td>
<td>19</td>
<td>Diarrhea 19%</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>12</td>
<td>Nausea 12%</td>
</tr>
<tr>
<td>Weakness</td>
<td>12</td>
<td>Diarrhea 12%</td>
</tr>
<tr>
<td>Other: abdominal discomfort, drowsy, hypotension</td>
<td>94%</td>
<td>Vomiting 94%</td>
</tr>
</tbody>
</table>

**Amanita virosa** 17 cases: MI, NY, RI

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>94%</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Vomiting</td>
<td>71%</td>
<td>Nausea</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>47%</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>29%</td>
<td>Nausea 29%</td>
</tr>
<tr>
<td>Kidney failure</td>
<td>18%</td>
<td>Diarrhea 18%</td>
</tr>
<tr>
<td>Weakness</td>
<td>18%</td>
<td>Intestinal cramps 18%</td>
</tr>
<tr>
<td>Other: flushing, liver damage, edema, Meixner reaction</td>
<td>7 negative, 4 positive</td>
<td></td>
</tr>
</tbody>
</table>

**Amanita verna/virosa?** 3 cases: DC

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>100%</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>100%</td>
<td>Nausea 100%</td>
</tr>
<tr>
<td>Weakness</td>
<td>67%</td>
<td>Vomiting 67%</td>
</tr>
<tr>
<td>Other: vomiting, lethargy, confusion</td>
<td>3 cases: 7 negative, 4 positive</td>
<td></td>
</tr>
</tbody>
</table>

**Armillaria mellea** 17 cases: BC, CO, OR

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nausea</td>
<td>65%</td>
<td>Vomiting 65%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>63%</td>
<td>Nausea 63%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>53%</td>
<td>Vomiting 53%</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>35%</td>
<td>Nausea 35%</td>
</tr>
<tr>
<td>Weakness</td>
<td>29%</td>
<td>Vomiting 29%</td>
</tr>
<tr>
<td>Chills</td>
<td>24%</td>
<td>Nausea 24%</td>
</tr>
<tr>
<td>Intestinal cramps</td>
<td>24%</td>
<td>C. 24%</td>
</tr>
<tr>
<td>Mydriasis</td>
<td>24%</td>
<td>Vomiting 24%</td>
</tr>
<tr>
<td>Sweating</td>
<td>24%</td>
<td>Nausea 24%</td>
</tr>
</tbody>
</table>

**Armillaria ponderosa** 4 cases: WA

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vomiting</td>
<td>75%</td>
<td>Vomiting 75%</td>
</tr>
<tr>
<td>Other: dry mouth, headache</td>
<td>3 cases: 7 negative, 4 positive</td>
<td></td>
</tr>
</tbody>
</table>

**Cantharellus cibarius** 6 cases: CA, MI, OR

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal discomfort</td>
<td>50%</td>
<td>Vomiting 50%</td>
</tr>
<tr>
<td>Nausea</td>
<td>50%</td>
<td>Vomiting 50%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>33%</td>
<td>Nausea 33%</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>33%</td>
<td>Vomiting 33%</td>
</tr>
<tr>
<td>Swollen limbs</td>
<td>33%</td>
<td>Nausea 33%</td>
</tr>
<tr>
<td>Other: anorexia, chills, intestinal cramps, painful neck</td>
<td>33%</td>
<td>Vomiting 33%</td>
</tr>
</tbody>
</table>

**Chlorophyllum molybdites** 35 cases:

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other: hallucination</td>
<td>100%</td>
<td>Vomiting 100%</td>
</tr>
<tr>
<td>Drunk-feeling</td>
<td>80%</td>
<td>Nausea 80%</td>
</tr>
<tr>
<td>Dizzy</td>
<td>60%</td>
<td>Vomiting 60%</td>
</tr>
<tr>
<td>Visual disturbance</td>
<td>60%</td>
<td>Nausea 60%</td>
</tr>
<tr>
<td>Macropsia</td>
<td>40%</td>
<td>Vomiting 40%</td>
</tr>
</tbody>
</table>

**Collybia acervata** 4 cases: OR

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intestinal cramps</td>
<td>100%</td>
<td>Vomiting 100%</td>
</tr>
<tr>
<td>Other: all cases</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Cortinarius atramentarius** 5 cases: ID, MI, NY, WY

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>All with alcohol</td>
<td>40%</td>
<td>Vomiting 40%</td>
</tr>
<tr>
<td>Tachycardia</td>
<td>40%</td>
<td>Nausea 40%</td>
</tr>
<tr>
<td>Weakness</td>
<td>40%</td>
<td>Vomiting 40%</td>
</tr>
<tr>
<td>Other: burning, chills, disoriented, dizziness, dysesthesia, limbs heavy, nausea, palpitation, sense of suffocation, sweating, throbbing head</td>
<td>40%</td>
<td>Vomiting 40%</td>
</tr>
</tbody>
</table>

**Grifola frondosa** 6 cases: IN, MA, MI

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intestinal cramps</td>
<td>50%</td>
<td>Vomiting 50%</td>
</tr>
<tr>
<td>Nausea</td>
<td>50%</td>
<td>Vomiting 50%</td>
</tr>
<tr>
<td>Weakness</td>
<td>50%</td>
<td>Nausea 50%</td>
</tr>
<tr>
<td>Drowsy</td>
<td>33%</td>
<td>Vomiting 33%</td>
</tr>
<tr>
<td>Vomiting</td>
<td>33%</td>
<td>Nausea 33%</td>
</tr>
<tr>
<td>Other: severe abdominal pain, chills, confusion, dehydrated, diarrhea, drunk-feeling, flushing, sensitive to sound, sleep, slowed speech</td>
<td>33%</td>
<td>Vomiting 33%</td>
</tr>
</tbody>
</table>

**Gymnopilus spectabilis** 5 cases: MA, OR, VA

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
<th>Location(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallucination</td>
<td>100%</td>
<td>Vomiting 100%</td>
</tr>
<tr>
<td>Drunk-feeling</td>
<td>80%</td>
<td>Nausea 80%</td>
</tr>
<tr>
<td>Dizzy</td>
<td>60%</td>
<td>Vomiting 60%</td>
</tr>
<tr>
<td>Visual disturbance</td>
<td>60%</td>
<td>Nausea 60%</td>
</tr>
<tr>
<td>Macropsia</td>
<td>40%</td>
<td>Vomiting 40%</td>
</tr>
</tbody>
</table>
Micropia (20)
adverse perception 40
altered perception 40

Other: fever, flushing, fright,
full-feeling in face,
hypertension, inattentive,
insomnia, intestinal cramps,
nausea, palpitation, talkative
tingling limbs 40

Gyromitra esculenta 11 cases: IA,
MI, PQ - 7 treated with pyridoxine
vomiting 90%
nausea 82
diarrhea 27
liver damage 27
jaundice 27
delirium 18
dizzy 18
intestinal cramps 18
kidney failure 18
loss of feeling 18
pain 18
peralysis 18
swetting 18
weakness 18
Other: abdominal discomfort,
anxiety, cardiac arrhythmia,
confused, dehydrated, diplopia,
disorientated, dreams, fever,
flushing, headache, mydriasis,
olfactory changes, retching,
respiratory failure, weakness

Leotiporus sulphureus 13 cases: all
CA; 8 with alcohol
nausea 100%
vomiting 69
intestinal cramps 38
flushing 15

Other: abdominal discomfort
diarrhea

Leccinum aurantiacum 9 cases: CO
OR, WA
nausea 100%
vomiting 78
chills 56
diarrhea 44
intestinal cramps 33
swetting 33
burning/aching 22
dizzy 22
weakness 22
Other: uncoordinated

diarrhea 100%
nausea 100
vomiting 75
Other: depressed, intestinal
vomiting, 75

Leucoagaricus naucinus 4 cases: CA,
FL, NC
nausea 100%

Other: dizzy, intestinal cramps,
salivation, sweating, weakness

Morchella angusticeps 3 cases: CO,
MI: all with alcohol
vomiting, 50%
diarrhea 50
Other: dizzy, throat constricted

Morchella esculenta 10 cases: ID,
MD, MI, OE, WA, WI - 4 with alcohol
nausea 90%
vomiting 80
diarrhea 50
intestinal cramps 20
Other: abdominal discomfort,
chills, sweating, weakness

Omphalotus olearius 16 cases: IN,
WA, MI, NC, NJ, OR, VA
nausea 80
salivation 31
diarrhea 25
swetting 19
dizzy 12
intestinal cramps 12
weakness 12
Other: abdominal pain

Panaeolus foenisecii 8 cases: AK,
CA, CO, MA, OR
hallucination 38%
ausuea 38
dizzy 38
Other: altered mental state,
coma, diarrhea, drowsy, fever,
hyperactive, inattentive,
insomnia, sleep, sweating, visual

disturbance

Paxillus involutus 3 cases: OR, WA
Case 1:

incoherent, thirsty, polyuria,
kidney failure

Leucotia rachodes 4 cases: CA, WA
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
- 1 case, death (anaphylaxis)
- flushing: 67%
- muscle spasm: 57%
- 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

**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: 60%
- diarrhea: 40%
- 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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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
Notes and Suggestions On Making Paraffin-Embedded Specimens For Macroscopic Study

Dr. Walter J. Sundberg
Department of Botany
Southern Illinois University
Carbondale, Illinois 62901

Noting the value of specimens that appear very life-like and can be repeatedly handled and studied without fear of damage, Perry, et al. (1979) described the utilization of classical paraffin-embedding procedures of microtechnique for preparing macroscopic specimens of soft fleshy fungi for classroom use. Subsequently, Richter (1985) summarized the techniques, further elaborated some of the procedures, and reported their use on some plant parts, small animals, and excised animal organs. Based on experiences in our laboratory and in order to encourage more widespread use of this technique, I offer the following notes to supplement data presented in the above articles.

Both Perry, et al. (1979) and Richter (1985) suggest using an initial fixation step (FAA), but note that for some specimens fixation can be carried out directly in the early (ethanol) stages of dehydration. The fact that ethanol is a non-additive, coagulant fixative does not present a problem if the final result desired is preservation of whole specimens rather than high quality cellular detail. Our best preparations indicate that initiation of dehydration without prior fixation is effective and seems to reduce loss of at least some pigments.

As might be expected, gelatinous specimens (e.g., Pseudohydnum gelatinosum) and those with one or more very hydrated layers (e.g., Urvula craterium) do not preserve well with this technique. Excessive shrinkage of gelatinous layers and curling, folding and/or fissuring (cracking) of associated non-gelatinous or less hydrated regions all contribute to severe specimen distortion.

Although length of time in paraffin-infiltration steps reportedly causes some specimen shrinkage and darkening of dull pigments (Perry, et al. 1979; Richter 1985), several of our specimens did not appear adversely affected—even after up to 10 months in molten paraffin.

Prior to removal from the paraffin oven for solidification, specimens should be suspended over a drip-catching container in the oven so that excess superficial paraffin can drip off. This step should be a short as possible in order to reduce the loss of paraffin from within specimen tissues. Perry, et al. (1979) and Richter (1985) recommend one hour, but specimens with extensive surface relief (e.g., pits and ridges of Morchella, mushroom gills, etc.) often require a longer period to remove all of the excess paraffin from the surface spaces. On those species tested (e.g., Morchella semilibra, Pleurotus ostreatus), overnight (12-15 hours) draining of paraffin did not appear to seriously alter paraffin solidification or final rigidity of the specimen.
In order to retain the highest amounts of paraffin within the specimen during the final excess paraffin removal step, it may be helpful to control the direction of flow of paraffin. This can be achieved by developing a way to orient the specimen in various directions during this step. With the exception of very small ones, each specimen can be impaled in an inconspicuous place (e.g., near the stipe base, in a surface depression, etc.) while in molten paraffin with a small but strong dissecting needle (a strong sewing needle inserted into a dissecting handle works well). The needle with specimen attached can then be positioned over the drip container on a support (stirring rod, applicator stick, etc.) and held in place, if necessary, by taping the dissecting handle to the edge of the drip container. Occasional repositioning of the specimen by turning the dissecting needle handle during this paraffin removal step may reduce excessive loss of paraffin from within the specimen.

Histological embedding paraffin comes in several temperature grades ranging in melting point from 56 C to 62 C. Although not routinely used in some labs, use of higher melting point grades may result in production of stronger specimens.

Once prepared, most specimens can be handled and studied with little or no concern for damage. Those few specimens (e.g., some Clavaria spp.) that may still be susceptible to damage can easily be mounted in containers for display and/or storage. Inverted glass jars of various sizes with screw on lids are excellent for this purpose (we use baby food jars for small specimens!). To prepare the specimen, invert the jar lid. With a scalpel or similar tool, heat and melt some paraffin in the lid (keep away from the lid edges) and insert the specimen base while the paraffin is molten. Let the paraffin harden. The jar lid now acts as a support base for the specimen. Finally, screw the jar down over the specimen and onto the lid for storage protection and/or display.

Literature Cited


CHANGE OF AFFILIATION OR STATUS

LORI CARRIS has accepted employment beginning April 1989 as assistant professor of Plant Pathology at Washington State University in Pullman, Washington.

KEITH N. EGGER has taken the position of Research Associate in the Department of Forest Science, University of Alberta.

RICHARD HUMBER now has an adjunct appointment in the Department of Plant Pathology, Cornell University, in addition to his regular employment with the USDA-ARS.

RICHARD W. KERRIGAN has moved from Ian Ross' lab to the Mushroom Group, with Jim Anderson, in the Plant Biotechnology Center at the University of Toronto-Erindale.

CLARK ORREBO has an assistant professor position which began Fall 1988 in the Department of Biology at Central State University in Edmond, Oklahoma.

NOTES AND COMMENTS

JOSEPH AMMIRATI has a new student in his lab. Jerry Flintoff is interested in Agaric and lichen systematics and will likely work on *Cortinarius* for the research portion of his doctoral degree.

FRED RHOADES sent these notes on PC-TAXON synoptic keys: Users of PC-TAXON can greatly increase the usefulness of this program for themselves and others by sharing keys. *If you have developed a key that you would like to share, or if you are interested in keys that have been made available, contact me. For those who have keys to share, indicate the following details for each: group, name, number of taxa, .KEY size and .DES size, a brief description of the target audience and where the keys are available.*

For those using the Delta system format: *Two programs will convert between PC-TAXON and DELTA formats. One produces DELTA format from PC-TAXON format to use the more robust features (such as the construction of dichotomous, or polychotomous keys, unlimited numbers of character-states and taxa and the ability to score percentage presence of character-states among taxa) of programs using the former format. A second program produces PC-TAXON format from DELTA format (but may greatly simplify the key structure) to use PC-TAXON as an editor or "Driver" for simple DELTA keys. The programs are available from me on an IBM 5 1/4 inch floppy (send $5.00 to cover expenses.) [see also Publication and Computer Software Available]*

A. WEINTRAUB has various plant extracts (both aqueous and dehydrated) and formulations for the preparation of culture media for sale. For Mycology, Botany (plant seed germination, fungal sporulation etc.). Extracts are filtered and sterilized. Other dehydrated products also available. Available in limited quantity: chemical compounds (in sterile solution in H$_2$O), 1-10% solution. Prices upon request, postage, etc. extra. Write to 2034 East 21st St., Brooklyn, NY 11229.
HONORS, AWARDS AND PROMOTIONS

DR. TARIQ M. BUTT will be leaving the USDA-ARS in Ithaca, NY to take up the post of Higher Scientific Officer at the Rothamsted Experimental Station in the United Kingdom.

RICHARD W. KERRIGAN received his Ph.D. in March, 1989.

ANTHONY E. LIBERTA was selected by the College of Arts and Sciences at Illinois State University to deliver a campus-wide lecture on his research. Two faculty members from the College are selected each year for this honor in recognition of their professional and research activities.

J. L. LOWE received the Honorary Doctor of Science degree from the State University of New York in December 1987.

Michael McGinnis has been promoted to Vice Chairman, Department of Pathology, and is responsible for the anatomical and clinical laboratories at the University of Texas Medical Branch Hospitals.

DR. MARIO RAJCHENBERG has been awarded a J.S. Gunnenheim Latin American Fellowship.

D. T. WICKLOW was elected to Fellowship at the American Academy of Microbiology in 1988.

DR. JORGE E. WRIGHT has been made an honorary member of the Argentine Botanical Society.

TRAVEL AND VISITS

MARTHA CHRISTIANSON visited the SUNY College of Environmental Science and Forestry, Syracuse, NY in November and presented two lectures: "Soil Fungi: An Exciting New Dimension in Forest and Plant Ecology", and "Mycological Opportunities in Basic and Applied Ecology". She also discussed the identifications of Aspergillus and Penicillium species.

R. RICHARD HUMBER visited Diane TeStrake's lab at the University of South Florida from January 15-18, 1989. He presented a seminar entitled "Entomophthoralean (Fungi) Mycoses in Vertebrates".


DEATHS OF MEMBERS

Dr. Thomas Sproston (September 25, 1988)
CHANGE OF ADDRESS FOR RESPONSEENCE

Dr. F. Baerlocher, until May 1989, Dept. of Biology, Mount Allison University, Sackville, NB E0A 3C0, Canada. After June 1989, Dept. of Biological Science, Hatherly Labs, University of Exeter, Exeter, EX4 4PS, UK.

Eric W. A. Boehm, Dept. of Plant Pathology, Univ. of Minnesota, 495 Borlaug Hall, St. Paul, MN 55108 (612) 625-4204.

Dr. Tariq M. Butt, Entomology Dept., Rothamsted Experimental Stn., Harpenden, Herts, England (U.K) AL5 2JQ; Tel. 058-27-63133.

Lori M. Carris, Dept. of Plant pathology, Washington State University, Pullman, WA 99164-6430. Tel. (509) 335-9541.

Keith N. Egger, Dept. of Forest Science, University of Alberta, Edmonton, T6G 2H1, Canada. Tel. (403) 492-4020 Fax: (403) 492-4323

Richard W. Kerrigan, Dept. of Botany, Erindale College, Univ. of Toronto, Mississauga, Ontario, Canada L5L 1C6. Tel. (416) 828-3995.

Michael McGinnis, new telephone number only - (409) 761-1238

Florence Nishida, c/o Dr. Gordon Hendler, Invertebrate Zoology Section, Natural History Museum, 900 Exposition Blvd., Los Angeles, CA 90007

Clark Orrebo, Department of Biology, Central State University, Edmond, OK 73034

Dr. R. D. Reeleder, Agriculture Canada, Research Station, PO Box 186, Delhi, Ontario, N4B 2W9. Telephone: (519) 582-1950. Fax: (519) 582-4223.

Michael R. Tansey, new telephone number only - (812) 855-2914. messages: (812) 855-7322; residence: (812) 336-1612.

C. J. K. Wang, Telephone change only (315) 470-6791 or 470-6761.

CORRECTIONS

The listing for the Mycologia Memoirs Board of Editors on page 5 of the October 1988, MSA Newsletter was incorrect. Following is the corrected version.

T. M. Hammill, Chair, 1986-89.
J. H. Ginns, 1986-89
M. Blackwell, 1988-90
M. E. Barr-Bigelow, 1988-91
R. G Roberts, 1988-91
C. T. Rogerson, Managing Editor, Mycologia, ex officio
H. L. Monoson, Chair Membership Committee, ex officio
D. H. Pfister, Secretary, MSA, ex officio
LANE SCIENCE EQUIPMENT CO., Complete line of mushroom storage cabinets, especially herbarium cabinets--airtight for permanent protection, 225 West 34th Street, Suite 1412, New York, New York 10122. (212) 563-0663.

MERCK, SHARP AND DOHME RESEARCH LABORATORIES, Division of Merck & Co., Inc., Rahway, New Jersey 07065

MILES INC., Pharmaceutical 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.

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

TED PELLA INC., PELCO, Transmission & Scanning Electron Microscopy Instruments & Supplies., P.O. Box 2318, Redding, California 96099.

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, Mudelein, IL 60060.

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SCHERING CORPORATION Pharmaceutical research & development, Orange St., Bloomfield, New Jersey 07003.

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TRIARCH INCORPORATED, Quality prepared microscope slides, catalog listed or custom prepared to your specificiations, Ripon, Wisconsin 54971.

THE UPJOHN COMPANY, Pharmaceutical Research & Development, 301 Henrietta St., Kalamazoo, Michigan 49007.
ENTIRE PROGRAM FOR 1989 MSA MEETINGS IN TORONTO, CANADA
INFORMATION ON 1990 MSA MEETING IN MADISON, WISCONSIN
INFORMATION TO INTERNATIONAL MEMBERSHIP CONCERNING 1990 MEETINGS
NEW EDITOR BEGINNING IN JULY, 1989