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OF THE MYCOLOGICAL SOCIETY OF AMERICA

The Society is very grateful for the support of its Sustaining Members. These organizations are listed below in alphabetical order. Patronize them and let their representatives know of our appreciation whenever possible.

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MYCOLOGICAL SOCIETY OF AMERICA NEWSLETTER

Volume 8, No. 1, June 1987

Iris Charvat, Editor

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

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To MSA Members,
I became the instant editor of this Newsletter when I learned how ill Rick Koske has been. We all wish him a quick recovery. I want
to thank both Walt Sundberg and Rick Koske for their help. Because the
Newsletter has had three editors this year, I have been dealing with two
different formats and three different word processing packages. The
layout of Rick's Newsletter was excellent: unfortunately, I could not use it because of the large abstract section.

I am sure I have left out some items that you have sent one of the
MSA editors in the past year. Please drop me a note and I will add to
the December, 1987 issue. Two sections, the membership application form
and list of affiliated societies, had to be deleted from this volume
because I needed to include the articles Rick has intended to put in
Vol. 37, No. 2.

I suggested to Paul Szaniszlo that the announcement concerning the
1988 MSA Meeting at the University of California, Davis, CA be inserted
in the Newsletter sent to our International Membership. Previously, the
announcement was sent in the fall, which did not provide enough time for
some of the international members to plan to attend these meetings. I
also suggested changes in the form to insure an official letter of
invitation is sent early to those wishing to attend these meeting
and/or to present a paper.

I want to thank all individuals in my lab who have helped me put
together this Newsletter in a short time. Special thanks to Sheri
DeCora, who became the assistant to the Editor, Tony Taylor, Connie
Corcoran, Rose Meier and two excellent secretaries, Michele Watrin and
Brenda Murphy.

Sincerely, Iris Charvat, Editor MSA
Dear MSA members:

I have resigned the editorship of the MSA Newsletter because health problems have made it impossible for me to properly execute the duties of the job. Since October, I have been increasingly bothered by a toxic substance present in the building in which the Botany department is housed. My sensitivity to the compound increased, and by January, I was unable to enter the building for more than a few minutes without becoming ill. The effects persisted for days or weeks after a single exposure and resulted from a general depression of the central nervous system and included headache, dizziness, confusion, abdominal pain, and muscular difficulties. It has taken several months to find the cause of these problems (and as yet I'm not certain that the source has been eliminated completely). Even now, some of the symptoms persist.

Because of these problems, the December, 1986, issue of the Newsletter was greatly delayed, and I was unable to manage much correspondence with contributors. The questionnaires for the June Newsletter were to be included in the December issue. However, when the printer missed the promised deadline by two months, it was necessary to mail the questionnaires without the Newsletter. I regret not having been able to continue with the Newsletter and having the opportunity to change the format and content of that publication. On very short notice, Iris Charvat kindly agreed to take over the editorship. For this decision I am extremely grateful.

Sincerely,

R.E. Koske

23 May 1987
GENERAL ANNOUNCEMENTS

Annual Reviews, Inc. publishes the Annual Review of Phytopathology, Annual Review of Microbiology and 25 other Annual Reviews. By ordering any of these Reviews through the Mycological Society of America, members will receive a 15% discount. In addition, the Society will receive 15% of the purchase price. Anyone interested in ordering any of the ARI volumes is encouraged to do so. This is not a one time offer, but will be continued in the foreseeable future. If interested in seeing a prospectus of the available ARI reviews, request it from: ARI - Attn. M. B. Hamilton; 4139 El Camino Way; Palo Alto, CA 94306. ORDER the volumes by sending the order and purchase price minus 15% to: Meredith Blackwell, Dept. of Botany, Louisiana State University, Baton Rouge, LA 70803.

APS Press, the publishing arm of The American Phytopathological Society announces the publication of a new journal—Molecular Plant-Microbe Interactions (MPMI), available in November 1987. MPMI is a monthly publication devoted to significant research on the molecular genetics and molecular biology of pathological, symbiotic and associative interactions of microbes with plants, as well as the properties of plants or microbes that effect such interactions. MPMI will publish papers on the genetic, biochemical, and biophysical mechanisms of interactions of plants with viroids, viruses, procaryotes, fungi, and nematodes. Individual subscribers: $65.00/year U.S.A. and $90.00 outside. Institutional subscriptions: $225.00/year in the U.S.A., and $250.00 outside. To subscribe, contact APS Press, 3340 Pilot Knob Road, St. Paul, MN 55121, U.S.A. Telephone (612) 454-7250, or call toll-free in the U.S.A. 1-800-328-7560. Telex 6502439657 (via Western Union International). Answerback: 6502439657 MCI UW.

BioBusiness is a unique database which covers the economic implications and business application of biological and biomedical research. BIOSIS monitors a broad spectrum of life science, business and management publications for inclusion in the BioBusiness databases. To register for BIOSIS' free, half-day training seminar on BioBusiness, contact the BIOSIS Education and Training Group by calling toll free (800) 523-4806 (USA except AK, HI, PA) or (215) 587-4800, worldwide. Contact: Renee L. Rosenfeld, BIOSIS, Product Planning & Promotion, 2100 Arch Street, Philadelphia, PA 19103-1399.

Wm. Bridge Cooke reminds us that foray lists are needed for completion of the Foray reports for the Colorado, 1984, the Florida, 1985, and the Massachusetts, 1986, forays. Any length of list is acceptable from one species to 100 or more. Please submit lists to Wm. Bridge Cooke, 1135 Wilshire Ct., Cincinnati, Ohio 45230.

Dr. C. Lakshminarasimhan of A.V.V.M. Sri Pushpam College, India informs us that the 14th Annual Meeting of Mycological Society of India was held on the 26th and 27th of December, 1986, at A.V.V.M. Sri Pushpam College on behalf of the Bharathidasan University, Tiruchirapalli, India. Along with this a seminar on "Applied Mycology" was conducted covering the subjects Agriculture, Veterinary, Medicine, and Industry. Dr. C. Rajendran, Assistant Director, Centre for Communicable Diseases, New Delhi, spoken on "Mycosis a growing concern." About 150 participants attended the meeting.

Lynferd J. Wickerham warns us to be on the lookout for people using his name and credits. Some forgery in his studies have been noticed.
CALENDAR OF MEETINGS, FORAYS, COURSES AND WORKSHOPS

August 1987

2-6 Colloquium entitled "Recent Molecular Approaches to the Systematics of Plant Pathogenic Fungi," to be held at the 1987 American Phytopathological Society Meeting, Cincinnati, OH; sponsored by the APS Mycology Committee (T. Gottwald, Chairman). Participants include J.B. Anderson, T.D. Bruns, J.W. McCain, S.A. Miller, S.W. Peterson, R. Vilgalys, with M.E. Palm, Moderator.

20-23 1987 NORTHEASTERN MYCOLOGICAL FORAY, Paul Smith's College, Paul Smiths, NY 12970. 12th Annual Northeastern Mycological Foray. The thirteen sponsoring clubs of the Northeastern Mycological Foray invite you to collect fungi in the Adirondack Mountains this summer. The region possesses a fascinating profile of forest types including conifer, northern hardwood, wetland and subalpine. Paul Smith's College offers 14,000 acres for field trips; and we will collect (with approval of the New York State Department of Environmental Conservation) at many excellent Adirondack Wilderness sites. Several collecting areas contain first-growth conifer and hardwood. Registration must be paid in full at time of application. Checks payable to Northeastern Mycological Foray. Deadline for registration without late fee, July 15th. Mail to: Northeastern Mycological Foray, Mr. & Mrs. James Kronick, Post Office Box 533, Merrick, NY 11566. Phone: (516) 867-0826.

September 1987

14-16 INTRODUCTION TO THE EDIBLE AND POISONOUS MUSHROOMS OF MICHIGAN'S UPPER PENINSULA. Contact Dr. Johann N. Bruhn, School of Forestry and Wood Products, Michigan Technological University, Houghton, MI 49931. Phone: (906) 487-2454.


24-25 A program at OMS initiating plans for a conference on Mushroom Ecology, with focus of the effects of mushroom harvesting on their long-term survival. The conference will be held in Portland, Oregon; tentative date is September 24-25, 1988. If interested in planning or participating, contact Preston Alexander, Route 1, Box 158, Forest Grove, OR 97116, USA.

October 1987

FIRST WORKSHOP IN MARINE BIOTECHNOLOGY. Contact Dr. V. Cuomo, Ciba-Geigy, I-80058 Torre Ann.ta Via Provinciale Schito 131, Naples.

November 1987

12-14 ANNUAL MEETING of the Southeastern, Florida, Kentucky and Tennessee branches of ASM to be held in Orlando, FL. Contact Henry Aldrich, 1059 McCarty Hall, University of Florida, Gainesville, FL 32611.

29 - Dec. 4 SYMPOSIUM ON FOREST SOIL MICROBIOLOGY to be held at the 1987 Annual Meeting of the Soil Science Society of America in Atlanta, GA. Contact Dr. Mary K. Firestone for further information. Phone: (415) 642-3677 or (415) 642-2210.

April 88

2 11TH NEW ENGLAND MYCOLOGY CONFERENCE will be at the College of the Atlantic, at Bar Harbor, Maine on April 2, 1988. Further information may be obtained from Walter Litten, R.F.D. #2, Box 261, Lamoine, Maine 04605-9624.

May 88

8-18 EILAT SYMPOSIUM ON BIOLOGY AND ECOLOGY OF STRESS IN TROPICAL MARINE SYSTEMS to be held in Eilat, Israel. Tzell Travel and Tours has been designated the official United States Travel agent for this conference. We are a full service, computerized agency able to handle all your needs for the symposium as well as pre-or post-conference tours. Contact Ellen Fisher, Tzell Travel and Tours, Inc., 70 West 36th Street, New York, NY 10018. Phone: (212) 279-3700.

Summer 1988

CLADISTIC SYMPOSIUM (Willi Hennig Society) is scheduled for the summer of 1988 in Stockholm. Anders Tehler would like to get in contact with mycologists working with cladistic methods. Contact Anders Tehler, Department of Botany, University of Stockholm, S-106 91 Stockholm, Sweden.

August 1988

1-5 GIAM VIII meeting in Hong Kong will hold a one-half day session on "Utilization of Solid Lignocellulosics by the Shiitake Mushroom (Lentinula edodes)." Contact Gary F. Leatham, USDA - Forest Service, One Gifford Pinchot Drive, Madison, WI 53705-2398.
NEW MYCOLOGICAL RESEARCH

Levetin, Estelle: Airborne basidiospores in Tulsa. This study, funded by NIH, involves both atmospheric sampling and field studies to determine the most abundant basidiospores in the area.

Marshall, Margaret: Trying to raise monoclonal antibodies against cell walls of root-infecting fungi.

Miller, Tony: Ultrastructure of VAM Fungal Spores.

McGee, Miki: Fungi of: Bovidae; Cervidae; Leporidae ("host" specificity, local fauna).

ASCOMYCETES

Rossman, Amy: Members of the hypocreales, especially Gibberella.

BASIDIOMYCETES

Alexander, Preston: Cultures of local Pleurotus spp, Morchella spp, variety of edible mushroom cultures.

Jenkins, David T.: Identification members of genus Amanita.

MYXOMYCETES

Keller, Harold: Specimens from living trees and vines especially the genera Licea, Perichaena and Clastoderma.

FUNGI WANTED

ASCOMYCETES

Harrington, F. A. (Mimi): Cultures and material of sarcoscyphaceae.

Rossman, A. Y.: Specimens and cultures of Gibberella.
Sigler, L.: Cultures or herbarium specimens of Onygenalies by Randy Currah.

Walla, J.: Cultures, specimens, or records of occurrence of Lirula (Lophoderinium F. 1849) macrospora.

**BASIDIOMYCETES**


Desjardin, Dennis E.: Specimens of species of Marasmius, Marasmiellus, and Micromphale from the eastern USA.

Jenkins, David T.: Cultures or dried specimens of genus Amanita.

Kerrigan, R. W.: Cultures of Agaricus section Hortenses; or of any rufescent Agaricus.

Sundberg, W. J.: Specimens of Leptota sensu Lato (notes and/or photographs helpful.

Tseng, Hsi-Yen: Specimens and cultures of Exidia and closely related genera.

Tulloss, Rodham E.: Specimens with supporting field notes and photos of Amanita volvata, A. peckiana, A. cylindrispora or other members of Amanita section Amidella. For use in preparation of a monograph on that section.

Wright, Jorge E.: Cultures and/or specimens of species of Hymenochaete S of the Tropic of Capricorn. Also of Hydnochaeta.

**DEUTEROMYCETES**

Shearer, Carol A.: Specimens and cultures of Leptosphaeria.


Quinn, J. A.: Virulent Pseudocercosporaella herpotrichoides and a good laboratory method for infecting wheat or barley with it.

**MYXOMYCETES**

Braun, K. L., Jr.: Myxomycetes specimens from Mexico.

Keller, H. W.: Specimens of myxomycetes from living tress and vines especially from the countries of Guatemala and Mexico.

**MISCELLANEOUS**

Jeffries, Peter: Permanent mounts of Glomus monosporum spores. Slides of any other VAM Fungal spores.

McGee, Miki: Exchange material, slides, photos, etc. with anyone doing microscopy and photomicroscopy on Fungi of Dung.
Conant, N.F.: Mrs. Conant has the late Dr. N.F. Conant's library of scientific journals and reference texts, if interested, contact Mrs. Conant at 5622 Garret Road, Durham, NC 27705.

Quinn, J. A.: Program give-away: EPICALC predicts disease progress of powdery mildews based on morphological features. Such as germination, hyphal branching and elongation and sporulation.

Rhoades, Fred: For sale a micro-computerized synoptic askataxa key to 60 genera of gilled mushrooms suitable for beginning mushroom classes. $5.00 for IBM 5 1/4 floppy. Other keys are available.

Sigler, L. has a copy of the Catalogue of the University of Alberta Microfungus Collection for sale. Second edition, published 1986. Price $8.00 + $2.00 postage for North America and international by surface mail, + $5.00 by international airmail.


Sundberg, Walter J.: Copies of Sundberg and Richardson, Mushrooms and Other Fluffy Fungi of Land Between the Lakes (64 pgs., 96 color photos, 1980). Prepay $3.75 (includes handling, postage, and padded mailing envelope).

Talley, Michael: For sale Mycologia, 1969 to 1985, $6.00 per volume, plus postage. Also for sale Human Mycoses (Scope monograph 1974) - best offer.

Volbracht, Christian: For sale or exchange Lloyd Mycological writings and other rare old books (ask for list).

Weintraub, A.: Simplified methods for isolation, cultivation of fungi and media. No autoclave needed/no transfer cabinet. Free from contamination. Large Growing Area (Growth Chamber), decontamination (simple chemical sterilization). Contact A. Weintraub, 2034 E. 21st Street, Brooklyn, NY 11229.

West, Andrew K: has for sale several popular and scientific works (book and reprints) mostly fleshy fungi. Contact Walt Sundberg for list.


Kerrigan, R. W.: Would like old literature on Agaricus, including commercial and technical works.

Sundberg, Walter J.: Copies of pre-1960 reprints on systematics of fleshy fungi, especially Basidiomycetes.

Volbracht, Christian: Farlow: Kones and other old and rare mycological books.


NEW BOOKS BY MSA MEMBERS


Fuller, M.S. and A. Jawarski (Eds.). 1987. ZOOSPONIC FUNGI IN TEACHING AND RESEARCH. Southeastern Publishing Company, Newton Bridge Road, Athens, GA. $35.00 plus shipping and handling ($2.00 US) $3.00 all other countries.


Thorn, Greg R. 1986. MUSHROOMS OF ALGONQUIN PROVINCIAL PARK. The Friends of Algonquin Park, P.O. Box 248, Whitney, Ontario, CANADA, KOJ 2M0. $3.25 Canadian, includes postage. 32 pages, illustrations.

FUNDS AVAILABLE FOR RESEARCH

The International Society of Arboriculture has several small grants available. Funds can be used to assist in the purchase of equipment, obtaining technical or student help, or otherwise contribute to research. Fifteen grants of approximately $1,500.00 each will be awarded in 1988. The required two-page proposals are due December 1, 1987 and awardees will be notified in March, 1988. For guidelines and more data write to: Dr. Frances Helmes, Director, Shade Tree Laboratories, University of Massachusetts, Amherst, Massachusetts 01003.

New York State Museum anticipates the continuation of its research residency program which is designed to fund research on the biota of New York State. Awards vary from $500 - $3000 and require at least one weeks residency at the State Museum in Albany. Contact John Haines, Room 3132 C.E.C., New York State Museum, Albany, NY 12230. Phone: (518) 474-5809.

ASSISTANTSHIPS OR FELLOWSHIPS AVAILABLE

Duke University: Graduate teaching/research assistantships to study Evolutionary biology and molecular evolution in fungi. If interested, contact Rytas J. Vilgalys, Department of Botany, Duke University, Durham, NC 27706.

Southern Illinois University: Doctoral Fellowship, for 1988-89, with $10,500 stipend plus tuition waiver for each of 3 years (University wide competition, 5 available). Also Teaching Assistantship (available on a Departmental competitive basis--competition keen) for M.A. or Ph.D. aspirant in Mycology (research emphasis in systematics, developmental cytology and histochemistry, and/or ultrastructure). Duties in General Biology, General Botany and/or Forest Pathology. Write W.J. Sundberg, Dept. of Botany, SIU, Carbondale, IL 62901.

University of Illinois-Champaign: M.S. or Ph.D. student to work on molecular taxonomy of pyrenomycetes. Contact D. A. Glawe, Department of Plant Pathology, University of Illinois, Urbana, IL 61801.

University of Illinois, Urbana: Research and teaching assistantships available for students interested in fungal systematics or ecology. Contact Carol A. Shearer, Department of Plant Biology, Room 289, Morrill Hall, 505 S. Goodwin, University of Illinois, Urbana, IL 61801. Phone: (217) 333-2796.

Michigan Technological University: Graduate Research Assistantship (Ph.D.) available November 1, 1987, to study mycorrhizae of red pine on converted northern hardwood sites. Contact Dr. Johann N. Bruhn, School of Forestry and Wood Products, Michigan Technological University, Houghton, MI 49931. Phone: (906) 487-2454.

University of Texas, Austin: Graduate Research Assistantships. Contact: Garry T. Cole, Department of Botany, University of Texas, Austin, TX 78713.

University of Vermont: Graduate student interested in classical or molecular genetics of Basidiomycetes. Stipend and full tuition. Contact Dr. Robert C. Ullrich, Department of Botany, Life Science Building, University of Vermont, Burlington, VT 05405. (802) 656-0432.
Lists of opening for mycologists on sabbatical

University of Texas: Fungal-host interactions: ultrastructural, biochemical and immunological aspects. Contact Garry T. Cole, Department of Botany, University of Texas, Austin, TX 78713.

Forest Products Laboratory: Biochemistry of Shiitake development and Enzymology of solid lignocellulosic decay by fungi. Contact Gary F. Leatham, USDA - Forest Service, Forest Products Laboratory, One Gifford Pinchot Drive, Madison, WI 53705-2398.

VACANCIES FOR MYCOLOGISTS

I. B. Heath may have an opening for a Post-doctoral fellowship to study rumen fungi. The position is potentially available as of Fall, 1987, pending grant support. Contact Dr. I. Brent Heath, Department of Biology, York University, 4700 Keele Street, North York, Ontario, CANADA M3J 1P3.

A. Y. Rossman has a one year opening to work on fungal nomenclature. Contact Dr. Amy Y. Rossman, Systematic Botany Mycology and Nematology Laboratory, Beltsville, MD 20705. Phone: (301) 344-3366.

Oregon State University: Postdoctoral Research Associate. Plant pathologist or mycologist to participate in investigations concerning the disease cycle of the Eastern Filbert blight fungus. Ph.D. required. Experience in culturing fungi, inoculation and fungus epidemiology. Initial appointment will be for one year with expected renewal up to a total of three years. Start-date of September 1 or September 16, 1987 preferred. Salary: $20,808. Send curriculum vitae, reprints or research papers, three letters of recommendation, transcripts, and any other information considered pertinent by the applicant to: Dr. H. Ronald Cameron, Department of Botany and Plant Pathology, Oregon State University, Corvallis, OR 97331. Application deadline: August 1, 1987. Oregon State University is an AA/EOE and complies with Section 504 of the Rehabilitation Act of 1973.

POSITIONS WANTED

CHEN, ALICE W. seeks a teaching, research position in industry, agriculture or governmental agency. Obtained Ph.D. with D.M. Griffin. Specialties are soil fungi, ecology, physiology and fungal products. Experienced in microbiology.

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. The coordinators of the Placement Service, Gareth Morgan-Jones and Melvin S. Fuller, welcome any suggestions that will better enable them to bring potential employers and qualified mycologists together.
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: ___________


Return to: Dr. M. S. Fuller. MSA Placement. Dept. of Botany.
University of Georgia. Athens, GA 30602.
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 completed form to:

Dr. Melvin S. Fuller  
MSA Placement Service  
Department of Botany  
University of Georgia  
Athens, GA, 30602 USA

TRAVELS AND VISITS

GARRY T. COLE was provided a Latin American Visiting Professorship (LAPP - American Society of Microbiology) from April 4-24, 1987, to conduct a course on Fungal Antigen Purification and Characterization at Escola Paulista de Medicina, Sao Paulo, Brazil. Dr. L. R. Travassop was the host, and 27 students participated in the course. Dr. Cole also gave lectures at the medical schools at Botucatu and Rio de Janeiro.

WALTER J. SUNDBERG visited and worked at the labs of Marcia Wicklow (Boise State University), David Hosford (Central Washington University), Joseph Ammirati (University of Washington), James Trappe (USDA Forest Service-Corvallis), David Largent (Humboldt State University), Kenneth Wells (University of California/Davis), and Harry D. Thiers (San Francisco State University) during the 1986-1987 academic year on a sabbatical leave research-collecting trip. He ended the trip with a brief visit with Richard Benjamin and Michael Doyle (Rancho Santa Ana Botanic Garden).

DR. JEAN D. SCHOKNECHT, Associate Professor in the Department of Life Sciences at Indiana State University is spending her sabbatical, the spring semester and summer of 1987 working with Harold W. Keller and Howard J. Arnott at the University of Texas at Arlington on the peridial calcification process in the Myxomycetes.
The zoospores of *Allomyces macrostomus* possess a flagellar apparatus (FA) which consists of the flagellum, basal body (BB), and flagellar rootlet (FR). The FR is located near the proximal end of the BB, and connects the basal mitochondrion with the BB. Associated with the FA are thin (7nm diameter) filaments. The precise relationships of these microfilaments to the FR and BB is difficult to visualize with transmission electron microscopy (TEM) due to their poor preservation. Several preservative methods have been used to determine the organization of these microfilaments with the FA, and to ascertain their composition. Zoospores for TEM were incubated with tropomyosin or the toxin phallotoxin prior to fixation with gluteraldehyde in an attempt to stabilize microfilament structure. Zoospores were additionally treated with either heavy meromyosin (HMM) or a fluorescently labeled phallactin probe, rhodamine-phallactin, in order to map the intracellular distribution of actin in the zoospores.

**P. V. ALOE**, Microbiology Department, University of Iwe, Ile-Ife, Oyo State, Nigeria. B. vitamins, orchid root mycorrhiza and mycelial growth.

Effects of thiamine, pantothenic acid, pyridoxin and riboflavin on orchid mycorrhiza, *Rhizoctonia repens* and *Rhizoctonia mucoroides* were studied. Some of the vitamins enhanced early formation of mycelium in the cultures of both fungi while others delayed it. **Pathogenic** acid retarded hyphal elongation in the cultures of *Rhizoctonia repens* whereas it enhanced hyphal elongation in the cultures of *Rhizoctonia mucoroides*.

The optimum concentrations of thiamine, pyridoxin and riboflavin for mycelial yield were 10.00, 0.50 and 1.00 ug/ml respectively in the cultures of *Rhizoctonia repens* while 2.00, 0.50 and 0.50 ug/ml were the optimal concentrations of thiamine, pantothenic acid and riboflavin respectively for mycelial yield in the cultures of *Rhizoctonia mucoroides*.

Thiamine was the most effective vitamin for mycelial yield by *Rhizoctonia mucoroides* with the thiamine-supplemented cultures producing mycelial yields ranging from 6.54 to 9.86 mg/5m.

A. Ammirati, J.F., see Ammirati, S., et. al.

Ammirati, J.F., see Traquair, J.A., et. al.

Ammirati, J.F., see Rahner, S.A.

S. AMMIRATI*, J.F. AMMIRATI* and C. BLEDSOE*, aDepartment of Botany and bCollege of Forest Resources, University of Washington, Seattle, WA 98195, USA. Spatial and temporal distribution patterns of ectomycorrhizal fungi in an even-aged stand of Douglas-Fir.

A microenvironmentally heterogeneous stand of 12 year old Douglas-Fir, located in the University of Washington's Charles Lathrup Park Experimental Forest, near Mt. Rainier National Park, is the site of a study to determine spatial and temporal distribution patterns of fungi associated with Douglas-Fir. A 32 x 64 m plot, divided into 128, 4 m² subplots, is monitored weekly throughout the "fruiting" season. The location of the individual sporocarps is determined by measuring the distance between a sporocarp and any two adjacent corners of a subplot. Cartesian coordinates are calculated to produce maps of each species on the plot. Ectomycorrhizal fungi on the plot include several species of *Inocybe*, as well as species of *Hebeloma*, *Gomphidius*, *Boletus*, *Lactarius*, *Russula*, *Suillus*, *Cortinarius* and *Hyphophorus*. Preliminary results show that the fungus species express several different spatial and temporal distribution patterns.

Anderson, J.B., see Hintz, W.F., et. al.

Anderson, J.R., see Smith, M.L.

Andrews, J.H., see Young, C.S., et. al.

Ansel, M., see Thibaut, M., et. al.

Aravavili, V., see Silver, J.C., et. al.

V. N. ARNAVILI and J.C. SILVER. Microbiology Department, University of Toronto, Toronto, Ontario M5A-1A6. A comparison of hsp70 related sequences in the *Achlya* and *Saccharomyces* genome using Southern hybridization.

In *Achlya*, heat shock causes the increased synthesis of a number of specific heat shock proteins. As in most cell types studied to date, the *Achlya* hsp70 is a major heat shock protein group observed in vegetative mycelia upon temperature elevation.

In *Saccharomyces* and in *Drosophila* the hsp70 proteins have been shown to be encoded by multigene families. We have used a number of cloned DNA probes encoding different hsp70 genes from *Saccharomyces* to investigate the number of hsp70 related sequences in the *Achlya* genome and to investigate their homology with hsp70 related sequences in *Saccharomyces*.

The results observed to date indicate that there are at least 5 to 8 hsp70 related sequences in the *Achlya* genome which show 60% to 80% homology with the *Saccha-

nyces* probes used. These probes will now be used to screen an *Achlya* genomic library in order to isolate and characterize the *Achlya* hsp70 genes.

(Supported by NSERC Canada)

G.R.W. ARNOLD. Pilzkulturensammlung, Friedrich-Schiller-Universität Jena, Weimar, GDR. Mycology in GDR.

Mycology in Germany and GDR has a long history and a rich tradition. The roots are found, for example, in the works of Tode, Batsch, Nees von Esenbeck, Schaeffer, Link, Bonorden, Fukei, de Bary and Breitfeld. These were followed in the first half of the 20th century by T. Fischer, Klebahn, the Sydows and Appel and Wollenweber. These and several others were pioneers in various ways and made significant contributions.

Three current aspects of mycology in GDR will also be discussed: 'pure' mycology, applied mycology and hobby mycology pursued by amateur mycologists whose culinary interests in fungi are paramount in a country of mycophagists.

P. T. ARNOLD and L. A. KAPUSTKA. Botany Department, Miami University, Oxford, OH 45056. EDX/SEM analysis of VAM associations after amendment with metals.

Energy dispersive X-ray (EDX) analysis was performed on the roots and foliar material of...
Plants were grown for three months in the presence or absence of the VAM fungus in a sand media. In the last three weeks of growth, plants were amended with one of the following metal solutions at a rate of 5 ml/2 days: 0-, 5-, or 10 mM Cd; 0-, 1-, 5-, or 10 mM Cu; 0-, 10-, 50-, or 100 mM Zn. Shoot and root material was excised upon harvest and dehydrated with 2,2-dimethoxypropane. The material was then mounted and carbon-coated. Spectra were gathered from the roots, associated fungal material, and shoots. Spectral data showed that some differences in metal concentration occurred between roots and their associated fungal material. Evaluation of this technique for metal analysis in mycorrhizal systems is discussed.

Atrzadeh, F., see Ross, I.K., et. al.

Auger, P., see Poirier, S., et. al.

D.E. BABEL, A.L. ROGERS, and E.S. BENEFICE. Department of Dermatology, Henry Ford Hospital, Detroit, Mich. 48202 and Department of Botany, Michigan State University, East Lansing, Mich. 48824, U.S.A.

A multiparameter study of the pathogenicity of Trichophyton tonsurans, an anthropophilic dermatophyte.

Juveniles with tinea capitis caused by T. tonsurans demonstrated either an acute, inflammatory process or a chronic, non-inflammatory mycosis. The differences in host response were examined relative to in vitro pathogen characteristics. Each isolate was tested for urease activity and hair perforation ability. No correlation was found between these results and clinical presentation of disease.

Patient cellular immune reactivity to T. tonsurans was also assessed. Measurement of patient lymphocyte subpopulations were performed by labeling host cells with monoclonal antibodies and then analyzing them by flow cytometry.

No differences were found between patients with non-inflammatory disease and noninfected control subjects However, a statistically significant difference was noted between these two groups and those patients with inflammatory disease.

It was concluded that those children with non-inflammatory ringworm were unable to stimulate their T-helper lymphocyte subpopulation to any major degree in the presence of fungal antigen.

G.W. RACON, D.W. HINTON and W.P. NORMER. Toxicology and Biological Constituents Research Unit, Richard B. Russell Research Center, USDA/ARS, P. O. Box 5677, Athens, GA 30613.

Fusarin C, a mutagen produced by Fusarium moniliforme, grown on cereal grain.

Fusarium moniliforme Sheldon isolated from corn grown in 21 counties of Georgia was screened for the ability to produce a mutagenic compound, fusarin C. The potential of isolates to produce fusarin C was determined initially in a liquid medium where the levels of fusarin C produced ranged from 7.4 to 90 ng/ml. The level of the mutagen produced by an isolate in liquid culture appears to correspond with the ability to synthesize an orange pigment, neurosporaxanthin, in the dark. Several isolates established as high and low producers of fusarin C on the liquid medium were cultured on corn where it was determined that comparable levels were also produced. In addition to corn, several fungal isolates were tested for their ability to produce fusarin C on rye, oats, wheat, barley, rice and soybeans.

RALPH BAKER. Department of Plant Pathology and Weed Science, Colorado State University, Fort Collins, 80523.

MYCOPARASITISM: PHYSIOLOGY AND ECOLOGY

Interfungal relationships exist ranging from facultative to obligate and highly specialized parasitism just as in pathogen-higher plant systems. In mycoparasitic systems studied in detail, there appears to be directional stimulus before contact which is mediated by diffusible substances. Lectins are apparently involved in recognition. This feature and the structure of the host cell wall may explain host ranges of mycoparasites. Upon contact, they may either coil around host hyphae or form appressorium-like bodies. Parasitism eventually culminates in the death of host cells. Mycoparasitism has been exploited in biological control and can substantially reduce the inoculum density of plant pathogenic fungi. Some may increase their biomass exclusively by mycoparasitism while others appear to antagonize hosts only during competition for substrates. Therefore, cognizant management of host, substrate, and pathogen interactions can enhance the activity and biocontrol potential of mycoparasites.

Bartnicki-Garcia, S., see Lending, C.R., et. al.

Bartnicki-Garcia, S., see Kamada, T., et. al.

Benoko, E.S., see Babel, D.E., et. al.

Benoko, E.S., see Kennedy, M.J., et. al.

Benhamou, N., see Grandaismon, J., et. al.

Banhamou, N., see Ouelletto, C.B., et. al.

G.L. Bennie and S.R. Khan* Department of Botany, University of Florida, Gainesville FL 32611, and Department of Pathology, Box J373, J. Hillis Miller Health Center, University of Florida, Gainesville FL 32610. Role of calcium oxalate crystal morphology in classification of Zygomycetes.

It is well known that calcium oxalate crystals can occur on any portion, especially the aerial structures, of the zygomycete thallus. Calcium oxalate bearing structures can be specialized morphologically and not show evidence of the typical crystal shape (e.g., sporangiiar spines of Cunninghameella spp. and Hesseltinella vesiculosa), or can have typical crystal morphology (e.g., sporangioles and aerial hyphae).

It has been suggested that the morphology of calcium oxalate crystals and the ontogenetic stage of a sporangium where they occur might prove to be of taxonomic value at or above the genus level. A survey of selected Zygomycetes indicates that the value of calcium oxalate crystal morphology is usually at the species and, less commonly, at the genus level. In some cases, when the crystal type varies between related taxa (e.g., sporangiiar appendages of Hesseltinella and Rhizomycetes) this correlates with other morphological differences that these genera exhibit and, therefore, crystal morphology only supports other criteria. It is possible that growth conditions affect crystal
morphology and distribution, thereby affecting the
taxonomic value of these characteristics.

G.L. Benny, Department of Botany, University of
Florida, Gainesville FL 32611. The kickxellalean-
trichomycete septon.

Members of the following orders of the Zygomycotina:
Asellariales, Harpellales (Trichomycetes), and
Kickxellales (Zygomycetes) produce a similar septum-
seven-septate plug or septal sex. In these fungi, the
plug is regularly septate, and the septa produce a more
or less median, lenticular cavity that contains a plug.
Members of a fourth order, Dimargaritales
(Zygomycetes), also produce similar septa. The
dimargaritalean plug dissolves in dilute alkali
and has polar protuberances. The septal plug in
the other three orders does not dissolve in dilute
alkali and lacks protuberances. The Eccrinales
(Trichomycetes) produce a completely closed septon
without a plug, but this order is a supposed
relative of the Asellariales and the Harpellales.
Members of the other three orders produce
either a multiperforate or completely closed septon.
The importance of the kickxellalean-trichomycete
septon, when compared with other morphological
characters, is discussed.

Berbee, J., see MacFall, J.S., et. al.

Berbee, M.L., see Wells, K.

Bills, G.F., see Chamuris, C.P., et. al.

G.N. BISHT, Biology Department, Drew University,
Madison, NJ 07940. Bioassay and partial charac-
terization of the trichogyne attractant of
Neospora crassa.

One function of the mating-type locus in this
heterothallic fungus is to determine the structure of
a pheromone used out by male trichogyne elements.
**Because there are two mating-type alleles, there are two phenotypes.**

In developing a bioassy for the trichogyne attract-
ants I took advantage of the fact that particles of
activated charcoal will not only absorb the
attractant from an aqueous filtrate of potential
fertilizing elements (macroconidia for example) but
will attract trichogyne of opposite mating-type when
subsequently placed near them. The test is quantitative
as the filtrate can be diluted and an end point determined.

This double function of the charcoal particles has
been exploited to characterize partially the
attractant produced by A fertilizing elements. The
attractant will pass through a cellophane membrane
and in aqueous solution is both heat stable and
stabilized by heat. Activity levels in such solu-
tions fall with time unless they are autoclaved.
Activity in such heat-stabilized solutions is
however eliminated by the addition of any one of
three proteases (prochase, trypsin, and
chymotrypsin). These properties together suggest
that the pheromone is a polypeptide.

M. BLACKWELL and D. MALLOCH, Department of Botany,
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Toronto, Ontario M5S 1A1

Taxonomy of the Laboulbeniales.

Recent discussions of the importance of
"alternative phenotypes" to speciation and
macroevolution, have led us to hypothesize a new
ancestry for the Laboulbeniales. The presence of
several morphs in the life cycle of an ancestor
might allow for rapid morphological change
without genetic change. Existing information on
laboulbenialean ultrastructure, spore morphology,
and habitat, is suggestive of an ancestor similar to
Pyxidiophora and its Thaxteriola anamorph.

Evolutionary changes would include loss of
ascospore germ tube and mycelium formation, direct
germination of the ascospore to produce conidia in
the manner of Thaxteriola, loss of conidium
germination, and additional reduction of the life
cycle so that the basal cell of the ascospore
produces a peritheciurn superposed on the anamorph.
Conidia are thought to have assumed spermatial
function in the Laboulbeniales, but this is not
documented. In other change necessary to the
hypothesis is the early development of a haustorial
system at the holdfast cell of the Thaxteriola type
morp. Thaxter, the great student of the
Laboulbeniales, reluctantly proposed a hypocrealean
ancestor for the group on the basis of peritheciurn
characters. This idea has not been popularized;
h owever, it is of special interest to us that
Pyxidiophora presently is classified in the
Hypocreales.

Blackwell, W.H., see Roychoudhury, S., et. al.
Blackwell, W.H., see Vincent, M.A.

Bledsoe, C., see Ammirati, S., et. al.
S.N. BLUMENFELD, Facultad de Ciencias Agrarias,
Universidad Nacional del Comahue, Cinco Saltos, R.M.
8303, Argentina.

Basidiozymes that decay Nothofagus pumilio forests:
dynamics of fungal degradation of wood.

The main objectives of the project are the knowledge
of xylophilous fungi succession on wood logs, rate
of fungal degradation of stacked wood logs and colon-
ization and rate of fungal degradation of wood
blocks of Nothofagus pumilio (Poeppe, et Endl.)Krasser
lying on soil.

Samples were periodically taken, every two months,
the first in February 1986. In each sampling all fun-
gal fruitbodies and wood samples with increment borers
were taken from stacked wood logs, and bags with wood
blocks lying on soil were also taken.

The results obtained in the first year of the study
are given. The following parameters were measured:
Frequency of xylophilous fungi on stacked wood logs.
Frequency of fungal isolates from wood logs and
blocks. Specific gravity of stacked wood logs, which
decreased 39.11% in a year. Weight loss of wood
blocks lying on soil reached 13% in a year. Weight
loss of wood blocks "in vitro" was variable for 12
strains tested. Humidity of wood logs and blocks was
also variable. Interactions between main xylophilous
fungi were tested "in vitro". Climatic records were
taken for characterizing the microclimate and
comparing the fungal succession under different con-
ditions.

EWA. BOEHM and D.J. McLAUGHLIN. Department of
Botany, University of Minnesota, St. Paul, MN.,
55108. Basidial development and nuclear division
in Eocronartium muscicola.

The Auriculariales sensu lato assume a pivotal
position in several recent phylogenies of the
basidiomycetes. The simple-septate species have
been excluded from this order (Auriculariales
Schroeter emend Bandoni) but their disposition
remains uncertain. An ultrastructural analysis of
the probasidium, metabasidium, sternal
initiation and aspects of the nuclear cycles
will be presented for Eocronartium muscicola (Fr.)
 Fitz., a simple-septate auricularioid moss
parasite. Field collected basidioarps of E.
muscicola were chemically fixed and examined with
epifluorescence microscopy or processed for
scanning and transmission electron microscopy.
Nuclear characters seem especially promising in
resolving phylogenetic relationships. Comparisons will be made with studies on the Uredinales, Auriculariales emended and another simple-septate auralioid species.

T. BOOTH, S. GORRIE and T. MURSIN. Dept. of Botany, University of Manitoba, Winnipeg, Manitoba, R3T 2N2. Life strategies among fungal assemblages on Salicornia europaea agg. along a conductivity gradient.

Frequencies of isolation and occurrence over three media of 24 fungal taxa on washed root and shoot pieces of Salicornia europaea, collected from four halomorphic sites in western Manitoba and central Saskatchewan, were determined. Dominance: a chi-square derived coefficient of association between sites: ordination of percent stress, disturbance and competition contributed by taxa in life strategy spectra; sum of squares agglomerative clustering of an Ochiai index distance matrix; concentration analysis of site and species scattergrams and environmental data across the sites were utilized to recognize three rhizoplane and two cauloplane assemblages.

Among rhizoplane fungi stress tolerant ruderals, indicating a high stress/high disturbance environment, and ruderals (low stress/high disturbance) characterized the assemblages from the two sites (respectively Strap and Indy lakes) at the low end of the conductivity gradient. Stress tolerant competitors (high stress/low disturbance) represented the principal fungal life strategy from sites (Shoal and Muskiki lakes) at the higher end of the gradient. Cauloplane fungi were generally competitors (low stress/low disturbance) across the sites with the Shoal assemblage possessing additional stress tolerant competitive elements.

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

Bracker, C.E., see Kamada, T., et. al.

Bracker, C.E., see Landing, C.R., et. al.

Brown, G.C., see Hubner, R.A.

Brown, J.N., see Richter, D.L.

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

SHELLEY A. BRUNT and JULIE C. SILVER. Microbiology Department, University of Toronto, Scarborough, Ontario, Canada, M1C 1A4. Antheridiol-induced alterations in specific translatable mRNAs in Achlya.

We have demonstrated that the addition of the steroid hormone antheridiol to cultures of Achlya ambisexualis results in changes in up to 29 specific proteins and glycoproteins which can be localized to one or more specific intracellular compartments or are secreted into the medium. One of the most prominent antheridiol-regulated intracellular proteins exhibits a molecular weight of 24,300 and is found in both the cytoplasmic and cell wall/cell membrane fractions of the mycelium. In vitro translation of RNA isolated from hormone-induced and control cells indicates that mRNA encoding the 24.3 KD protein is not present at 45 minutes but is very abundant by 90 minutes of hormone treatment.

Another major cytoplasmic and nuclear protein induced by antheridiol treatment has a relative molecular weight of 85,000. The electrophoretic behaviour on two dimensional gels of this 85 KD protein appeared to be identical to the Achlya 85 KD heat shock protein.

Analysis of in vitro translation products of RNA isolated from control, heat-shocked or hormone-treated cells has shown that there is an increased accumulation of mRNA encoding a similar 85 KD protein in both heat-shocked and hormone-treated cells. These results are of particular interest since the 85 KD hormone-induced protein and heat shock-induced protein appears to be antigenically related to the non-hormone binding component of the Achlya steroid receptor. These observations indicate that the 85 KD protein is independently regulated by antheridiol and heat shock.

(Based on grants from NSERC Canada).

Burdeall, H.H., see Young, C.S., et. al.

Bush, L., see Stiegler, M., et. al.

T.M. BUTT and R.A. HUMBER. USDA-ARS Plant Protection Research Unit, Boyce Thompson Institute, Tower Road, Ithaca, NY 14853, USA. A comparative study of spindle pole bodies and mitosis in entomogenous members of the Entomophthorales.

Three distinct types of mitosis have been observed in the Entomophthorales and are represented by the following genera: Basidioibula, Erynia, and Neozygites. All three of these genera have large nuclei and prominent nucleoli in comparison to nuclei in other fungal orders and classes. Among these genera, only Erynia has an obvious spindle pole body, a saucepan-like extranuclear component with a plate-like intranuclear component. During interphase, nuclei of Erynia species contain large quantities of condensed chromatin occurring in a granular reticulum. Mitosis in Catenularia is in detail similar to that in Erynia, but there are fundamental differences in the morphology of the chromosomes. Interphase nuclei of Neozygites and Basidioibula contain little condensed chromatin which stains poorly (if at all) with aceto-carmine or aceto-orcein.

The nuclear envelope (NE) remains intact throughout mitosis in all entomophthoralean fungi examined to date except for Basidioibula. In that genus, the NE breaks down during mitosis but the nuclear volume remains isolated from the cytoplasm by a layer of NE fragments and endoplasmic reticulum. The metaphase spindle of all entomophthoralean fungi except for Neozygites and Basidioibula lies to the side of the nucleus and usually occupies only a small portion of the nuclear volume. In Neozygites and Basidioibula, the metaphase spindle occupies the whole nucleus and the chromosomes are organized into a centrally located metaphase plate. The mitotic chromosomes of Erynia species are large and veriform; those of Neozygites species are veriform but much less massive. The mitotic chromosomes of Basidioibula species are apparently very tiny and compact and have never been clearly resolved by either light or electron microscopy.

Caldwell, J.H., see Harold, F.M.

B. E. CALLAN and J. D. ROGERS. Department of Plant Pathology, Washington State University, Pullman, WA 99164. Cultural and anamorphic features of Xylaria anisopleura and Xylaria scruposa.

Xylaria scruposa and X. anisopleura are subtrebiculous to tropical members of the X. polymorpha complex. These fungi are usually separable on stromatal and ascospore characters, although overlapping characteristics create difficulties of identification.

Examination of telemorphs and cultures of a number of South American collections allowed detailed comparisons of these species. Colonies of X. anisopleura are distinct in producing lobed, plumose margins and stromata bearing amber to orange droplets. Colonies of X. scruposa are more regular with few stromata which lack colored droplets. These cultural characters are particularly useful in identifying kretzschmaroid forms of these fungi.

Carpenter, E.E., see Crawford, R.H.

A 200-YEAR ECOLOGICAL STUDY OF LOG DECOMPOSITION HAS BEEN ESTABLISHED AT THE ANDREWS EXPERIMENTAL FOREST IN THE CASCADE RANGE OF OREGON. LOGS ARE EXTREMELY IMPORTANT MODULATORS OF BIOTIC DEVELOPMENT IN THE FOREST. UNDERSTANDING HETEROTROPHIC INTERACTIONS IN LOGS IS A KEY TO UNLOCK REGULATORY PROCESSES OF FORESTS. IN 1985 WE PLACED 530 NEWLY FELLED LOGS OF FOUR CONIFER SPECIES IN SIX SITES: TREATMENTS INCLUDE LOGS COVERED BY FINE NYLON MESH TO EXCLUDE BORING INSECTS, STICKY AND WINDOW TRAPS WERE PLACED IN EACH SITE TO CAPTURE FAUNA WITHIN 6 MOS OF FELLING, AND DESTRUCTIVE SAMPLING OF WOOD OCCURRED 1 YEAR AFTER FELLING. PHYSICAL PARAMETERS WERE EXTENSIVELY RECORDED.

AMBROSIA AND BARK BEETLES COMPRISED 90% OF INSECTS, WITH ATTACK DENSITIES UP TO 320/M², AND MASS LOSS DUE TO CHANNELIZATION AT 1%. OVER 6000 FUNGAL ISOLATES WERE MADE FROM TRAPPED INSECTS AND CHANNELED WOOD. FUNGI ISOLATED FROM WOOD AND FLying AMBROSIA BEETLES WERE ALMOST EXCLUSIVELY ASCOMYCETES, WITH <1% BASIDIOMYCETES. THE MOST COMMON FUNGI IN SAPWOOD WERE CERATOCYSTIS spp., PERICILLIUM spp. AND ASCOMYCETOUS YEASTS. FUNGI IN GALLERIES INCLUDED WOOD WD OF PROTONOTUM, NEMATODE AND MITE GRASSERS AND THEIR PREDATORS.

STEVEN E. CARPENTER and C.V. LI., Department of Botany & Plant Pathology, Oregon State University and Pacific NW Forest and Range Experiment Station, USDA Forest Service, Corvallis, Oregon. 97331.

HETEROTROPH EFFECTS ON LOG DECOMPOSITION:
FUNGI AND FREE-LIVING NITROGEN FIXING BACTERIA IN AMBROSIA BEETLE GALLERIES

As part of a 200 year study of heterotroph effects on log decomposition, a number of 130 year-old Pseudotsuga menziesii logs were placed on the floor of an old-growth conifer forest. After one year, some logs were destructively sampled. Nitrogenase activity, measured by acetylene reduction, was detected in sapwood colonized with galleries of Ambrosia beetles, and in unchanneled sapwood colonized by the fungi carried by Ambrosia beetles. Free-living, microaerophilic, nitrogen-fixing bacteria were isolated from the beetle galleries and from unchanneled sapwood. Results of a spring 1987 survey for nitrogen-fixing bacteria on ambrosia beetles captured in flight will be presented. The bacterial growth is stimulated by the presence of as yet undetermined fungal metabolites, indicating that the interactions between these bacteria and fungi may be mutually beneficial. The presence of nitrogen-fixing bacteria in early stages of decomposition may play an important role in enabling decomposition of sapwood by subsequent communities of heterotrophic colonizers.


During a study on the blueberry stem canker fungus (Botryosphaeria corticis) in New Jersey, an apparently the species of Corynespora frequently was found associated with cankered stem areas on high-bush blueberry (Vaccinium corymbosum) cultivars. The conidiophores of this fungus commonly grow directly on pycnidia and pseudocicia of B. corticis, but may also form dense colonies on stems devoid of canker. This fungus is widespread in blueberry fields in southern New Jersey. The species is characterized by the formation of a phialidic state similar to the smut mold fungus, Censophilohora. The pale brown conidiophores typically form from the apical cell of the dark, primordial conidia and, less frequently, from the conidiophore apices. The small (2-4 µm) secondary conidia have not been observed to germinate. This is the first report of a secondary conidial state in Corynespora.

K.M.T. CASON, R.W. ROBERSON*, and E.S. LUTTRELL. Dept. of Plant Pathology and *Botany Dept., University of Georgia, Athens, GA 30602. Development of the mulberry popcorn disease caused by Fungal egg-parasites of gypsy moth: potential agents of biocontrol?

Parasites of terrestrial insect-eggs have seldom been reported. During a recent gypsy moth infestation in Lane Co., Oregon mycetized egg-masses were collected and incubated under moist conditions in the laboratory. 20 species of fungi were isolated, including several well-known insect-pathogens (Beauveria bassiana, Paecilomyces farinosus, and Verticillium lecanii). The pathogenicity of all 20 isolates was tested against fresh gypsy moth egg-masses under cool humid conditions. Such tests showed that egg-mass hairs strongly inhibit fungal attack. Beauveria bassiana, Paecilomyces farinosus, Spiliera coccospora, and Verticillium lecanii proved consistently pathogenic even against intact egg-masses.

In vitro substrate utilization tests revealed that virtually all of these fungi could degrade lipids, chitin, and proteins. Evidence about half could utilize cellulose and xylan. This latter group may constitute facultative parasites which persist on substrates of plant origin in the absence of insects or their remains. Preliminary tests indicate that a few of these fungi can colonize bark and attack subsequently affixed gypsy moth egg-masses. These fungi might provide the basis for a form of localized biological control in which tree trunks and branches are inoculated with fungal spores. After colonizing the bark the fungi would form persistent infections with long-term activity against gypsy-moth eggs deposited there.

K.M.T. CASON and R.T. HANLIN. Dept. of Plant Pathology, University of Georgia, Athens, GA 30602. Characterization of monoclonal antibodies to conidia of Erysiphe graminis f. sp. hordei.

Monoclonal antibodies were produced for use in enzyme-linked immunosorbent assays (ELISAs) to differentiate formae speciales or races of Erysiphe graminis conidial states. Ten-week old female BALB/c mice were immunized by intraperitoneal injections of whole E. graminis f. sp. hordei CR3 (EGH) conidia. Hyridomas were produced by fusing immunized mouse spleen cells and Sp2/O myeloma cells in polyethylene glycol followed by HAT selection and cloning. Monoclonal antibodies specific for conidal surface antigens were selected by means of a modified indirect ELISA. Whole conidia were bound to 96-well vinyl microtiter plates by pretreatment of plates with 0.002% polylysine. Of over 500 hybridomas that were screened by the modified ELISA, six positive cell lines were selected for further evaluation. All specific monoclonal antibodies were isotype IgM. Antibody 6C6 had highest affinity; 12D3, 8C1, and 5D12 had a slightly lower affinity; and 7A8 and 5B10 had moderate affinity for EGH conidia. The six antibodies were further characterized by immunofluorescent assays and Western blot analysis. At least three different epitopes may be detected with the set of monoclonal antibodies that were produced, which suggests that they might be useful to distinguish cereal powdery mildew.
Light and transmission electron microscopy were used to examine the disease cycle and morphology of *Ciboria carunculoides* (Stiegl & Jenkins) Whetzel, the cause of pumpkin disease in mulberry drupelets (*Morus alba*). Samples representative of different stages of the disease were collected and studied over a two-year period. Overwintering sclerotia began to germinate in late February and produced stalked apothecia concurrently with anthesis in the host from late March through April. By late April, microconidia in a waxy matrix extruded from the stroma region of hypertrophied infected drupelets. Microconidium production ceased by July when sclerotia fell to the ground. Sclerotia remained in a dormant state at least until the following spring but were viable for a minimum of 2 years. Microconidia produced from a layer of branched phialides on the stromal surface initially had numerous lipid droplets that coalesced into a single large droplet in the mature form. A fibrillar mucilage covered the thick-walled mature microconidia. The unilamellar perispor ornament of ascospores became encased in a gelatinous sheath in the ascus. A bilayered electron-dense caruncle formed on the concave side of the ascospore prior to development of the sheath. The caruncle might have a role in production of sheath material.

J.R. CASTILLO and S.E. Gochenaur. Biology Department, University of Virginia, Charlottesville, Va. 22903, Biology Department, Adelphi University, Garden City, N.Y. 11530

Isolating nitrate assimilation mutants in *Penicillium daleae* to demonstrate heterokaryosis.

Nitrate assimilation mutants of *Penicillium daleae* were isolated using chlorate as a selective agent. On a basal medium with 1.5% potassium chlorate and nitrate as the sole source of nitrogen, wild-type was inhibited and mutant strains formed resistant sectors. Wild type was not inhibited with other nitrogen sources. The mutants isolated were grouped according to their nutritional requirements and physiology. The three groups, Types I, II and III, apparently lack the nitrate reductase apoenzyme, the nitrate/nitrite sensitive inducer and the molybdenum-containing cofactor of nitrate reductase, respectively. These mutants are similar to existing mutants of *Neurospora crassa* and *Aspergillus nidulans*. Complementation and heterokaryosis were demonstrated by pairing deficient strains on nitrate medium. At least three loci and seven complementation groups of the assimilatory nitrate reductase pathway were discovered in *P. daleae*. Further investigations of this organism may now be carried out using nitrate assimilatory mutants.

G.P. CHMERITS, G.F. HILLS and D.F. FARR. Systematic Botany, Mycology & Nematology Laboratory, USDA, Beltsville, MD 20705

Fungi on Plants and Plant Products in the United States.

This Laboratory is currently building a database entitled "Fungi on Plants and Plant Products in the United States," which will be used to produce a book with the same title. The book will be divided into three parts. Part 1 is a Host Index, comparable in format to USDA Handbook 165, "Index of Plant Diseases." Part 2 is a Fungus List, and includes listings of synonyms, hosts and literature. Part 3 lists the literature cited in Part 1.

This presentation will address two themes: 1) a summary and progress report; and 2) descriptive statistics which reveal economic, taxonomic, ecological and geographical trends based on the literature surveyed.

Charest, P.M., see Jabaji-Hare, S.H., et al.

T.E. Chast and R.C. WILKIN. Plant Pathology Department, University of Nebraska-Lincoln, and Botany Department, University of Vermont. Genetic complementation in the *Heterobasidion annosum* species complex in relation to intersterility and homothallism.

Intersterility and intersterility of heterothallic biological species in this Basidiomycete are regulated by five IS (intersterility) genes, each with two alternate alleles, designated V1/V1, V2/V2, V3/V3, S+/S-, P+/P-. Intersterility occurs only if two homokaryons are homoallelic for *S* alleles at any one or more of the five loci. The distribution of alleles in the worldwide population has led to the recognition of two biological species. In addition, all isolates of *H. annosum* collected from Australia have proven to be homothallic. Complementation studies utilizing auxotrophs and developmental mutants were conducted to assess the mode of action of IS genes at the cellular level and to assess the relatedness of homothallic forms. Pairings of intersterile auxotrophs gave rise to prototrophic heterokaryons. Particular intersterile pairings between heterothallic auxotrophs, and between homothallic and heterothallic auxotrophs, also gave prototrophs. Some intersterile pairings and homothallic heterothallic combinations gave no conidia or prototrophs. These results suggest that IS genes may regulate heterokaryosis and also suggest possible evolutionary relationships between homothallic and heterothallic populations.

Choi, H.T., see Ross, I.K., et al.

Choi, G.H., see Richey, R.O., et al.

C.H. Choi, C. L. SCHARDL and D. A. SMITH. Plant Pathology Department, University of Kentucky, Lexington, KY, 40546-0091.

Induction of kievitone hydrolase and changes in translatable mRNAs in *Fusarium oxysporum* f. sp. *cucumerinum* when exposed to bean phytoalexins.

*Fusarium oxysporum* f. sp. *cucumerinum*, which is a cucumber pathogen but not pathogenic to bean, was examined for its ability to produce an enzyme, kievitone hydrolase (KHaS), which detoxifies a bean isoflavonoid phytoalexin, kievitone, to kievitone hydrate. Constitutive enzyme activity was detected in mycelial sonicates, but the level was increased by pretreatment of mycelium in culture flasks with kievitone or another bean phytoalexin, phaeosalinosifran (PIF). PIF was a more efficient inducer of KHaS than was kievitone, even though it is not a substrate for this enzyme. Since cucumber is not known to produce isoflavonoids, it is interesting to find, from the viewpoint of plant-microorganism coevolution, that *F. oxysporum* f. sp. *cucumerinum* has the ability to transform kievitone by, apparently, the same mechanism as that employed by *Fusarium solani*, f. sp. *pseudosolanum*, a bean pathogen. The response of *F. oxysporum* f. sp. *cucumerinum* to bean phytoalexins was examined at the level of translatable mRNAs. At least three new or augmented polypeptide bands, above 66KD, were identified among the translation products by autoradiography. These changes were common to kievitone and PIF treatments. The results demonstrate the ability of *F. oxysporum* f. sp. *cucumerinum* to respond to phytoalexins produced by a 'non-host'.
Mutants of The rice blast fungus, Magnaporthe grisea, normally produces a dark gray pigment. Mutants of the fungus blocked in pigment biosynthesis fail to infect intact plants, but cause normal disease symptoms when spores are placed in a wound. Thus, fungal melanin must play a role in penetration through the plant’s outer defensive barriers.

The addition of scytalone (a melanin produced by these fungi may help the unknown causes of mortality in the spruce trees are toxic to spruce diets containing hyphae of isolate #53 resulted in development for the surviving larvae. Ingestion of diet containing hyphae of isolate #53 resulted in reduced larval development. Thus, some endophytic fungi from New Brunswick balsam fir and red spruce trees are toxic to spruce budworm larvae and toxins produced by these fungi may be a contributing factor to the unknown causes of mortality in the spruce budworm population.

Clay, K., see Leuchtmann, A.
Clay, K., see Stovall, M.E.
Clay, K., see Rijkenberg, F.H.J.
Cook, B.D., see Miller, R.M., et al.
Cooper, C.E., see Szansizlo, P.J., et al.
CHESTER R. COOPER, JR. and PAUL J. SZANISZLO. Department of Microbiology, University of Texas, Austin, TX 78712. Genetic Evidence for Cell-Division-Cycle (CDC) Control of Multicellular Development in Myxococcus xanthus strain E1.

The human pathogenic, dermatiticide fungus Wangiella dermatitidis exhibits a well-defined and readily-
controllable polymorphic nature. Previous studies employing temperature-sensitive mutant strains (Mc2 and Mc3) have shown a cell-division-cycle (CDC) control of the conversion of yeasts to a multicellular, multinucleate phenotype. In the present study, protoplasts of albino auxotrophs derived from Mc2 and Mc3 were fused and then allowed to regenerate at the restrictive temperature. The fusion products were melanized prototrophs that grew as yeasts. Albino segregants that spontaneously arose from the fusion products upon incubation at the permissive temperature were genetically analyzed. Some expressed temperature sensitivity resulting in multicellular development that had conversion kinetics similar to those of the parental strains.

We propose that the genetic lesions in Mc2 and Mc3, previously shown to be complementary and therefore designated 
\textit{mc2} and \textit{mc3}, respectively, are actually lesions in separate CDC genes. These lesions lead to the inhibition of bud emergence during the yeast phase cell cycle of \textit{W. dermatisidis} and, hence, are analogous to \textit{cdc}24 and \textit{cdc}42 in \textit{Saccharomyces cerevisiae}. In this regard, we have renamed these lesion \textit{cdc}6\emdash(\textit{mc2}) and \textit{cdc}3\emdash(\textit{mc3}). To our knowledge, this is the first genetic evidence for CDC genes in a fungus pathogenic for humans.


Genetic diversity in \textit{F. oxysporum} can be measured using characteristics such as virulence and vegetative compatibility (Puhalla; \textit{Can. J. Bot.} 63:179-182). Strains of \textit{F. oxysporum} \textit{f. sp. cubense} from Taiwan, the Philippines, Honduras, and Australia had previously been differentiated into races 1, 2 and 4 based on virulence. Complementary nitrate nonutilizing (\textit{nic}) mutants in three phenotypic classes were recovered from each isolate; these classes presumably reflect mutations at a nitrate reductase structural locus, a pathway-specific regulatory locus, and loci controlling the production of a Mo-containing cofactor. These mutations were used to force heterokaryons and thereby determine the vegetative compatibility of the isolates with one another. The isolates examined were divided into five vegetative compatibility groups (\textit{VCGs}). All race 4 isolates from Taiwan were in the same \textit{VCG} (\textit{VCG} 0121), but were vegetatively incompatible with race 4 isolates from the Philippines, which were all in a second \textit{VCG} (\textit{VCG} 0122). A race 2 isolate from the Philippines also belonged to \textit{VCG} 0122 suggesting that members of this \textit{VCG} are both genetically and pathologically diverse. Other race 2 isolates from the Philippines and Honduras, as well as a race 1 isolate from Australia were vegetatively incompatible with one another as well as with the other isolates (\textit{VCG} 0123, 0124 & 0120, respectively). The data suggest that strains of the same race, from different geographic locations, are genetically distinct and that mutations which confer virulence may occur independently in different strains.

Cotter, D., see Franek, K., et. al.
Cotter, D., see Gupta, J.
Cottrell, E.Z., see Hammill, T.M.

RALPH H. CRAWFORD and STEVEN E. CARPENTER Pacific NW Forest and Range Experiment Station, USDA Forest Service, and Dept. Botany & Plant Pathology, Oregon State University, Corvallis, Oregon 97331.

THE FAVORITION COMMUNITY

Filamentous fungi in rotten logs

Decomposing coarse woody debris of conifers is important to nutrient cycling and biotic habitat of forests. Large logs may serve as a bed for mycorrhizal conifer seedlings. Coarse woody debris in a \textit{Pseudotsuga-Thuja} forest contributes about 50% of litter on a long term basis. Removing or burning of this debris is a general post-harvest practice. Current studies focus on the long-term effects of logs on forest dynamics, with an aim toward prescriptive changes in forest management practices. As a result of recent studies, a classification of five physical deterioration states of rotting logs has been devised. The greatest observed differences occur between Class III and IV logs. The object of this research was to establish whether filamentous fungal community structure reflects observed differences between those decay classes. We isolated filamentous fungi from transects of \textit{P. menziesii} logs in class III and IV logs, including samples from portions of logs both inhabited and uninhabited by roots of potentially mycorrhizal conifer seedlings. We found the filamentous fungal community structure supports the establishment of Class III and IV logs, and is part of a biota unique to each decay class. No community differences were found between logs with or without rooted conifers.

Crowley, D.E., see Szamislo, P.J., et. al.

A new species of \textit{Spiromastix} is described and illustrated based on a culture obtained from antelope dung collected in Africa. The species is similar to the type of \textit{Spiromastix}, \textit{S. warcupii}, in having thick-walled, coiled appendages, a rudimentary peridium, and minute, oblate ascospores with punctate walls. The new species differs from the type in having larger ascospores, and more elaborate coils and appendages. In culture, the ascocarps of \textit{S. warcupii} are yellowish brown; those of the new species are gray. Neither species has an anamorph.

Coiled appendages are also found in \textit{Ajellomyces}, \textit{Kuehniella}, and \textit{Shanorella}. In these genera, conidia are formed regularly, and coiled appendages are thin-walled rather than thick-walled. Both \textit{Ajellomyces} and \textit{Kuehniella} have spherical rather than oblate ascospores. \textit{Shanorella} has oblate ascospores and a distinctive peridium composed of disarticulating cells.

Y. DALPÉ, Biosystematics Research Centre, Central Experimental Farm, Wm Saunder's Building, Agriculture Canada, Ottawa, K1A 0C6. Eriocid mycorrhizal status of \textit{Gidiodendron} and \textit{Myxotrichum}.

Fungi producing ericoid mycorrhizae belong to \textit{Ascomycetes} and \textit{Hyphomycetes}; the mycorrhizal status of certain \textit{Basidimycetes} is confirmed but the fungal entities have not yet been identified.

The \textit{Discomycete} \textit{Hymenoscyphus (Perizella) ericae} (Helotiales) and four \textit{Hyphomycetes}, \textit{Gidiodendron eicinum}, \textit{O. cerealis}, \textit{O. rhodoerum} and \textit{O. lutnae}-
Lentinus regularly produce intracellular hyphal coils, characteristics of a typical ericoid mycorrhizal root colonization; the same has been synthesized between Vaccinium angustifolium and two other species of Oidiodendron. Oidiodendron anamorphs have been described for some species of Myxotrichum, fungi which show the same high cellulolytic activities and similar habitats. Accordingly intensive tests of inoculation of axenic seedlings of Vaccinium angustifolium with some species of Myxotrichum were carried out. Typical ericoid mycorrhizae were obtained so that members of Gymno-Sporangia can be added to the list of symbiotic fungi.

Blaize Darveau. 350 Blick Hall, State University of New York, Environmental Science and Forestry, Syracuse, NY 13210. The amazing Macintosh: a demonstration.

The Apple Macintosh is considered, by many, to be the easiest microcomputer to learn and use. Not only is it easy to learn from the first time one works with it, but because all Macintosh programs use nearly identical formats, learning new programs becomes easier and easier. The resizeable "windows", the pull-down menus, the high resolution bit-mapped display, and the "mouse" driven cursor all make for a very friendly computer to use.

When attached to the Apple Laserwriter the Mac produces startling results. Publication-quality graphics and block-set-like text (like this) are obtained in a fraction of the time and cost it would normally take. I will be demonstrating word processing, database management, graph and chart making, drawing, and painting on a Macintosh Plus computer. Through my demonstrations and the examples that I will have on display, you will see how easy it is to obtain top-quality output.

De Repentigny. L., see Mathieu, L.O., et. al.

D. E. De Beerjin, Department of Botany, University of Tennessee, Knoxville, TN 37996-1100. Two undescribed species of Marasmius from the southern Appalachian Mountains with tropical affinities.

During the preparation of a monograph of the genus Marasmius from the southern Appalachian Mountains, several undescribed species were discovered. One new species is closely allied with Marasmius porphyreticus Petch from Sri Lanka, and is the only North American representative of sect. Androsacei with the following combination of characters: anamorphs amelanized, eccentric to lateral and rudimentary stipe, black rhizomorphs and ligulate habit. A second new species represents the only North American member of sect. Neosessilea and is allied with M. polycystis Singer from Bolivia. The presence of these taxa indicates further support for the hypothesis that the southern Appalachian Mountains are a refugium for tropical Basidiomycetes.

Joseph J. Digangi, Linda Fredrick, and Rajiv Kulkarni Department of Microbiology, M.P.I., 417 Wakara Way, Salt Lake City, UT 84108. Canavanine and 5-fluorocytosine resistant mutants of Lentinus edodes.

Resistant mutants of the edible fungus Lentinus edodes have been isolated that grow on normally lethal concentrations of the cytosine analogue, 5-fluorocytosine (40 μM), and the arginine analogue, canavanine (180 μM). These mutants are the first analogue resistant mutants that have been isolated in this organism. Wild-type growth was severely limited at very low concentrations of these analogues, while growth of the mutants was slightly inhibited or unaffected. The inhibition of wild-type growth by canavanine can be reversed by including excess arginine in the media.

The mutations leading to canavanine and 5-fluorocytosine resistance are recessive. Dictyotons comprised of mutant and wild-type nuclei fail to grow on media containing the appropriate metabolic analogue. The mutations resulting in the analogue resistant phenotypes will be useful as easily scored genetic markers.

S. Diggy and K. Wels. Botany Department, University of California, Davis, CA 95616. Ustilago cynodontis: compatibility and host/path parasite interaction.

Ustilago cynodontis, an obligate parasite of Cynodon dactylon, is distributed throughout the temperate and tropical areas of the world. Compatibility studies are being undertaken using collections from California and as many other sites as possible. The broad distribution of this species makes it an ideal subject for compatibility studies, as does the ability to inoculate the host to obtain an in vivo comparison with the results of in vitro pairings.

Pairings are made on Potato Dextrose Agar, supplemented with 0.4% activated charcoal. Minute amounts of inocula are placed side by side. In 3-5 days, pairings can be read. A macroscopically visible line of hyphae between the yeast cells (Baush reaction) is considered a positive pairing. Haematoxylin staining has shown paired nuclei in all crosses producing lines of hyphae. Infections are delayed by exposing seedlings to isolates of U. cynodontis for 2 or more days. The infection is considered successful and the pairing positive if viable teleomorphs are formed.

Dove. M., see Dowhanick, T.M., et. al.


Biochemical and immunological techniques were used to observe different levels of glucoamylase synthesis and expression in Schizosaccharomyces castellii strain 1802 when shifted from growth on glucose to either glucose, maltose, or soluble starch medium. Most striking was the rapid induction of glucoamylase when transferred to maltose medium. A highly induced (at least 100 fold) 110KDa protein band was immunodetected within the first 30 min. of transfer from glucose to maltose media.

In an attempt to better understand maltose induction in Schiz. castellii, a cDNA library was constructed into M13 mp19 using maltose-induced mRNA. The library was screened by differential plaque hybridization. One clone hybridized exclusively to cDNA from mRNA of maltose-grown cells. This clone also hybridized to 23s rRNA mRNA from maltose but not glucose-grown cells. Experiments are underway to characterize this induction-specific sequence.

Drummond. B.D., see Ullrich, R.C., et. al.

Paul H. Dunn and Mark E. Fenn. Pacific Southwest Forest and Range Experiment Station, USDA Forest Service, 4955 Canyon Crest Drive, Riverside, CA 92507. Effects of O3 and SO2 on Valandra orange leaf-surface fungi.

3 2
The percent DNA estimates in several smut fungi and sporidia and diploid teliospores of *Sordaria fimicola* increased from 33% in the filtered air exposure to 55% in the SO2 exposure.

The ambient air results show the importance of chronic exposures to atmospheric pollutants. Removal of ambient O3 via charcoal filtration with the corresponding increase in phylloplane fungi indicates that substances present in the atmosphere do not affect microbial phylloplane communities. Present levels of air pollutants can cause a shift in microbial communities on plant surfaces.

Constant exposure to 10 ppm SO2 caused greater reductions in phylloplane fungi than exposure to ambient air. SO2 would appear to be more disruptive to the phylloplane fungal community than O3.

Durall, D.M., see Carpenter, S.B., et al.

R. DUHAN, Department of Plant Pathology, Washington State University, Pullman, WA 99164-6430.

Estimates of nuclear DNA in several smut fungi. Epifluorescence of Feulgen-stained nuclei was used to calculate C-values of several smut fungi and angiosperms. Nuclear deoxyribonucleic acid (DNA) amounts were proportional to ploidy levels, as calculated from fluorescence intensities. Haploid sporidia and diploid teliospores of *Ustilago zeae* averaged 19,500 and 41,300 kbp of DNA, respectively, those of *Ustilago segetum* var. segetum 28,800 and 56,200 kbp, respectively. *Trityum aestivum*, on the other hand, averaged 42.3 X 10^3 kbp. These extremes in genome size did not exceed the limits of proportionality between fluorescence and DNA content. Since fungal nuclei contain minuscule quantities of DNA, proportionality in terms of its limitations is unlikely to be an impediment in estimating C-values of other fungi. C-values of haploid and diploid cultures of *Saccharomyces cerevisiae* used as internal standards averaged 15,100 and 32,300 kbp. DNA estimates of the standards were very similar to those of other researchers who used biochemical methods to determine DNA.

M.J. DUKSTRA, J.F. LEVINE, E.J. NOGA and D.T. STRAKE*. School of Veterinary Medicine, North Carolina State University, Raleigh, NC 27606,*Department of Microbiology and Immunology, University of North Carolina, Chapel Hill, NC 27514 and "New York State Department of Health, Albany, NY 12201. A comparison of the medically important fungi *Scedosporium apiospermum*, *S. inflatum*, and *Scopulariopsis brumptii*.

The genus *Scedosporium* contains the species *S. inflatum* and *S. apiospermum* which are capable of causing a broad spectrum of infections in man and other animals. These two taxa are frequently difficult to differentiate from a third opportunistic zoopathogen, *Scopulariopsis brumptii*. All three are resistant to clinically achievable levels of the most commonly used antifungal agents, amphotericin B and ketoconazole. All three species characteristically produce anelloconidia that bear 1-celled conidia. Members of the genus *Scedosporium* produce their conidia solitary along the hyphae and in clumps at anelliode apices. In contrast, *S. brumptii* produces anelloconidia that are catenulate. The bases of the conidigenous cells of *S. inflatum* and *S. brumptii* are swollen or inflated while those of *S. apiospermum* are not. Experimental fluorescent antibody conjugates have been developed for the specific identification of *S. apiospermum* and *S. inflatum* either in vivo or in vitro.

K.M. EGGEP and J.A. FORTIN. CRBF, Faculté de Forêsterie, Université de Laval, G1K 7P4 DNA restriction fragment polymorphisms among taxa of "E-strain" ectendomycorrhizal fungi.

"E-strain" ectendomycorrhizae are common in disturbed foresthabitats. Morphotogically they are characterized by a typical Hartig-net, but are differentiated from ectomycorrhizae by their thin mantles and extensive penetration of cortical cells by the hyphae. The fungal symbionts have been linked to the Pezizales with telomorphs in the genus *Wilcoxina* and chlamydosporic anamorphs in the genus *Complexipes*. Although morphological features of the mycorrhizae are similar, axenic culture the fungal symbionts show much variation in growth rate, colony morphology, color, and presence or absence of chlamydospores. Because telomorphs are not produced in culture, DNA restriction fragment length polymorphisms were used to compare isolates of *Wilcoxina* and "E-strain" fungi isolated from axilects. The primary objective was to determine how many taxa form "E-strain" mycorrhizae. A secondary objective was to identify other potential telomorphs and speculate on their phylogenetic relationships.
Four strains of Fusarium species in the Section Liseola gave data confirming the high complexity within the group. The data help explain why workers had always had difficulty defining species and give evidence for a dual-species, multi-varietal relationship of the strains investigated.

Thirteen strains were examined. Four strains of Fusarium moniliforme showed at least 95% inter-relatedness with one another. Three strains of F. intermedia that gave near 100% interrelatedness with one another exhibited 82-87% with F. fujikuroi. Two strains of F. subglutinans gave only 46-56% relatedness whereas two other strains of F. subglutinans showed 82 and 92% relatedness when interacted with a F. subglutinans "tester strain"; the former gave 77 and 91% relatedness and the latter gave 71 and 73% relatedness with F. fujikuroi. The four strains of F. moniliforme gave 44 to 63% relatedness with the other nine strains.

Eveleigh, E.S., see Strongman, D.B.
Fannin, N., see Siegel, M., et. al.
Farr, D.F., see Chamuris, C.P., et. al.
Fenn, M.E., see Dunn, P.H.
Fortin, J.A., see McAfee, B.J
Fortin, J.A., see Gardeus, M., et. al.
Fortin, J.A., see Egger, K.N.
Fortin, J.A., see Jabaji-Hare, S.H., et. al.
Fortin, J.A., see Sanoma, J
K. FRANEK, M. SHAH, P. WOODALL and D. COTTER. Department of Biological Sciences, University of Windsor, Windsor, Ontario, Canada N9B 3P4. The secretion of acid phosphatase by vegetative cells of Dictyostelium discoideum.
Glycosidases such as trehalase, β-glucosidase, and N-acetylglucosaminidase are efficiently secreted with sigmoidal kinetics when vegetative cells are placed in phosphate starvation buffer at 23.5°C for six hours. Under the same conditions, acid phosphatase is secreted with linear kinetics and only one-third of the cellular activity is secreted during the six hour time period at 23.5°C.
Addition of 0.1 M sucrose to the starvation buffer drastically alters the secretion pattern of acid phosphatase as follows: (1) a lag period is observed before secretion accelerates, (2) the secretion of the enzyme follows sigmoidal kinetics, and (3) a majority of the cellular acid phosphatase activity is secreted during the six hour time period.

The secretion pattern of acid phosphatase is not altered significantly when the temperature of the starvation buffer is raised to 30°C; at this higher temperature, cells produce stress proteins and gradually lose viability during the six hour incubation. The addition of 0.1 M sucrose to cells maintained at 30°C results in the altered secretion pattern discussed above. It would appear that the induction of stress proteins does not interfere with the response of D. discoideum cells to external and internal secretion signals.

Fredrick, L., see Digangi, J.J., et. al.
Froeilger, E., see Ulrich, R.C., et. al.
M. S. FULLER and R. ROBERSON. Department of Botany, University of Georgia, Athens, GA 30602. The effect of sterol biosynthesis inhibitors on cleavage in zoospores of fungi.

The effects of sterol biosynthesis inhibitors (SBI's) on zoospore cleavage in Allomyces macrogynous were studied with bright field, fluorescent and transmission electron microscopy (TEM). All SBI's used were known to inhibit C14-demethylation in sterol biosynthesis at a step mediated by cytochrome P450. The result is accumulation of 14-methyl sterols and a deficiency of functional sterols. In A. macrogynous, the functional sterol is cholesterol and we set out to determine whether its deficiency in membranes would interfere with zoosporangium cleavage to zoospores, a membrane mediated process. Tests of the effects of fungicides on cleavage were made using zoospores that had been grown in liquid culture or on agar (YPSe/4 in both cases) at EC50 concentrations of the fungicide. Microscopic observations revealed that normal zoospore cleavage was disrupted when A. macrogynous was grown in the presence of cytochrome P450 and related fungicides. The sporangia produced multinucleate and multiflagellate zoospores. At concentrations above the EC50 values of the fungicides, cleavage often did not occur and the sporangia discharged one multinucleate protoplast. Cleavage of sporangia formed on media lacking fungicides was not affected by addition of the fungicides to the discharge medium. Evidence as to how the process of cleavage is interfered with will be presented and discussed.

Furlan, V., see Grandmason, J., et. al.
Gadbois, T., see Mathieu, L.G., et. al.
M. GARDES, K. KROPP, J.A. FORTIN and M. LALUMEE. Centre de Recherche en Biologie Forestière, Faculté de Foresterie et Géodésie, Université Laval, Ste-Foy, Québec, Canada, G1K 7P4. Protein and isozyme patterns of Laccaria bicolor (Maire) Orton.

Monocaryotic and dicaryotic L. bicolor isolates from two biological species and from two geographical areas were tested for their soluble protein patterns and isozymes. Among these isolates, some were non-mycorrhizal. Differentials of isozymic profiles and a deficiency of functional sterols. Among these isolates, some were non-mycorrhizal. Differences between monocaryotic and reconstituted dicaryons could be separated by some protein bands and by certain isozymic patterns. However, no differences were detected between mycorrhizal and non-mycorrhizal isolates. The usefulness of these techniques to fingerprint selected cultures will be discussed.

R.V. GESSNER, M.A. ROMANO, R.W. SCHULZ, and C.S. YOON. Department of Biological Sciences, Western Illinois University, Macomb, IL 61455. Allelic variation and segregation in the Morchella esculenta complex.

Electrophoretic data were obtained for single ascospore isolates of Morchella deliciosa and M.
esculenta from individual ascocarps. The loci studied exhibited allelic differences between ascospore isolates, indicating that genes from different paternal genomes exist in individual offspring from a single ascospore. Less genetic variation was found in M. esculenta but ascospore isolates also exhibited allelic differences. The occurrence of only two electrophoretic types was observed among isolates of M. esculenta and may indicate the existence of linkage or pseudolinkage. The presence of polymorphisms, the possibility of mating types and production of ascospores demonstrate that M. delicosa and M. esculenta exist as Mendelian populations. The occurrence of gene exchange among sexually reproducing individuals enables a biological basis for determining taxa. Our data also indicate that local populations of M. delicosa and M. esculenta can be reproducibly isolated and exist as separate gene pools.

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

J.L. GIBSON. Department of Botany, University of Florida, Gainesville, FL 32611.

Light and electron microscopy of a Glomus versiforme ascocarp from Florida.

A fresh sporocarp of Glomus versiforme, which contained spores of various developmental stages as well as abundant hyphae, provided an opportunity for a transmission electron microscope (TEM) examination of these structures. TEM showed the mature spores to have a single outer wall with a more or less parallel microfibrillar arrangement. However, the inner wall was laminated with numerous apparent microfibrillar arcs shown previously for the laminated walls of other Glomus species. A young spore first develops as an inflated, clavate hyphal terminus. Initially, the wall of the young spore is ultrastructurally identical to the wall of the subtending hypha and to typical sporocarp hyphae. The young spore, however, becomes inflated to its final, more or less spherical shape before the first layer of the inner laminated wall is laid down. Subsequently, numerous layers of inner wall are laid down and are separated from the outer wall by a peculiar electron-dense zone. The young spores contain perhaps over 100 nuclei, typical organelles such as mitochondria, endoplasmic reticulum, vesicles, etc. In addition, bacterialike organelles, previously reported in the spores of other Glomus spp., are present in the young spores in very large numbers and are also present in the spore subtending and global hyphae, along with other, typical organelles. Cytoplasm of mature spores is more condensed, with less distinct organelles and abundant lipid globules.

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

Sporo, ascus tip, and septa ultrastructure of Geopyxis carbonaria (Pezizales).

Ultrastructural observations were made on ascospores, ascus tips, and septa of apothecia tissues of two fresh field collections of Geopyxis carbonaria. Various stages in ascospore ontogeny were observed, from the delimitation of haploid ascospore nuclei by the ascospore delimiting membranes to the development of the secondary wall layer. Particular emphasis was focused on spore wall ultrastructure, but cytological details of the surrounding epiplasm and sporoplasm, as they relate to spore development, also were observed. Septal ultrastructure was contrasted in ascogenous, excipular, and paraphysis hyphae. Ascus tip ultrastructure was observed, especially changes in ascus tip wall structure and features of the apical cytoplasm in relation to the age of the ascus, as indicated by the stage in development of the enclosed spores. All ultrastructural observations on G. carbonaria are compared with similar data in the literature for other taxa of Pezizales.

G.S. GILBERT and J.L. PARKE. Department of Plant Pathology, University of Wisconsin-Madison, Madison, WI 53706.

Effect of ionic solutions on the motility of Phytophthora cactorum zoospores.

Although many organic and inorganic chemicals are known to affect the motility of Phytophthora zoospores, the role of specific cations in concentrations and ratios that would occur in soil solutions has not been determined.

A series of solutions was prepared using Cl⁻ and Na⁺ salts of Ca²⁺, Mg²⁺, Na⁺, and K⁺ to approximate the ionic composition of natural soil solutions. Total ionic strength and individual ion balances were systematically altered, and the effect on motility of P. cactorum zoospores was determined using a quantitative in vitro assay. The percentage of zoospores remaining motile after twenty minutes was inversely proportional to calcium ion concentration. Total ionic strength and concentrations of other ions within the range of typical soil solutions did not significantly affect zoospore motility.

These results suggest that calcium concentrations in soil solutions may affect the longevity of zoospores.

Ginn, J., see Redhead, S.A., et al.

Glawe, D.A., see Heddick, J.M., et al.


D.A. CLAWE. Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801. Teleomorph ontogeny and Pyrenomycete phylogeny.

Although recent classifications of Pyrenomycetes emphasize the importance of perithecial centrum types in separating major groups, less attention has been paid to the processes by which different centrum types have evolved. It is hypothesized that different centrum types have evolved, at least in part, as a result of selection pressures favoring different types of ascospore discharge, allowing exploitation of new ecological niches. Evolution of different types of perithecial peridia and ascii occurred in conjunction with other morphological changes in centrum types became differentiated. Parallel changes in ascospore morphology and numbers of ascospores per ascus occurred following divergence of lineages with different centrum types. Ontogenetic changes in various teleomorph structures can be shown to recapitulate phylogenetic developments, and ontogenetic heterochrony seems to have been a major mechanism of Pyrenomycete evolution. These concepts will be discussed in relation to the morphology of various members of the orders Sphaeriaceae, Diaporthales, and Hypocreales.

Gochenaur, M.E., see Castillo, J.R.

S.E. GOCHENAU. Biology Department, Adelphi University, Garden City, N.Y. 11530.

Heterokaryon incompatibility in Penicillium daleae and its possible ecological consequences.

Penicillium daleae Zaleski is the most widespread and abundant deuteromycete in the A horizon of a
Long Island oak-birch ecosystem; occurring in over 95% of the samples collected at one time and exhibiting a mean density in excess of 150,000 propagules per gram of soil. The presence of vegetative incompatibility among *P. daeae* isolates from the forest as well as other geographic locations was studied using mutants unable to assimilate nitrate. Mutants were obtained on nitrate agar using 1.5% chlorate as the selective agent. They were characterized and then paired against white, smooth-spored, non-allelic tester strains. Mixed heads of white and green spores was the criterion used to confirm heterokaryosis. The possible ecological importance of heterokaryosis among a natural population of isolates will be discussed.

Corrie, S., see Booth, T., et al.

**J. GRANDAZON**, N. BENIAMOU, V. FURLAN, S. VISSER. Département de phylogie, Faculté des sciences de l'agriculture et de l'alimentation, Université Laval, Québec, GIK 7P4. Ultrastructural localization of polygalacturonic acids in the cell wall of *Mortierella* species by means of pectinesterase-gold films. Ultrastructural analysis of mycorrhizal structures in mycorrhizal mycelium, Newborn spores, mature resting spores, germinating tubes and auxiliary mycelial cells. Within a same stage, gold particles were concentrated mainly over the outer thick wall layers whereas a light labelling was noted over the more inner layers. In parallel, comparative studies including statistical analyses were performed in order to evaluate the level of occurrence of this sugar in parietal structures during fungus development. Results of this study indicate that the presence of pectic substances in *M. margarita* is most probably related to specific biological functions. Such conclusions will be discussed.

Gray, L.E., see Jacobs, K.A., et al.

**J. GUPTA** and D. COTTRELL. Department of Biological Sciences, University of Windsor, Windsor, Ontario Canada N9B 3P4. The effect of altered glycosylation on the characteristics of trehalases in *Dictyostelium discoideum.*

Vegetative trehalases I of *Dictyostelium discoideum* exhibits characteristics of a typical lysosomal enzyme. The enzyme is glycosylated and carries a number of negatively charged components which render it a very acidic protein with pl's of 4.0 and less than 2.5. Strain M31, bears a recessive mutation *Mod A,* which alters the post-translational modification of several lysosomal enzymes, including trehalase. A direct consequence of this mutation is the reduction of negatively charged components on lysosomal enzymes. This is seen in the altered chromatographic and electrophoretic behaviour of strain M31 trehalase. The cellular trehalase of M31 is less than 66 kDa and its charge characteristics are different from the secreted enzyme. Trehalase I is synthesized during spore germination. Tunicamycin prevents the formation of recoverable trehalase from germinating spores but does not interfere with the germination process. These results indicate that the trehalase synthesized during spore germination is not required for the successful completion of spore germination. Minor modification in the glycosylation, as seen in strain M7, does not affect the overall activity. However, in the total absence of glycosylation the enzyme is inactive.

R. E. Halling and C. L. Ovrebo. The New York Botanical Garden, Bronx, NY 10458, and Department of Biology, Tulane University, New Orleans, LA 70118. Some agarics and boletes of Colombian oak forests. Field work over one month's time (November 1986) in forests of *Quercus* located in the Colombian central cordillera yielded many collections of ectomycorrhizal fungi in the families Amanitaceae, Boletaceae, Cortinariaceae, Russulaceae, and Tricholomataceae.

Known for its ability to form mycorrhizae with a large variety of fungi, *Quercus* reaches its southernmost limits in the western hemisphere as *Quercus humboldtii,* s.l. in Colombia. Presently, these forests form islands of various sizes among pasturelands at altitudes typically above 2000 m elevation. Essentially mycologically unexplored, these tropical forests support an interesting mycoflora that can provide new and supportive data on fungal distribution. Selected taxa are discussed with reference to biogeography.

Hamer, J.E., see Howard, R.J., et al.


Hydrated conidia of the rice pathogen *Magnaporthe oryzae* synchronously produce germ tubes in the absence of exogenous nutrients. If germinating conidia are in contact with a hydrophobic surface, the elongating germ tubes differentiate to form an infection structure termed an appressorium. We have found that Teflon™ films provide an ideal surface for conidial attachment and subsequent appressorium formation, and we have used Teflon™ films to enrich for mutants of *M. oryzae* that are defective in these processes. In addition we have screened a stored collection of mutagenized individuals for defects in appressorium formation. Utilizing both protocols we isolated a similar class of mutants. The distinguishing feature of these mutants is their abnormal appressorium morphology (Smo). Smo mutants also show abnormalities in appressorium formation, conidial cell number, and adhesion. A genetic analysis of the Smo mutants and a description of their phenotypes will be presented.

**T. M. HAMMILL** and E. K. COTTRELL. Biology Department, SUNY College at Oswego, Oswego, N.Y. 13126. Light and electron microscopy of *Umbrellopsis vinacea* and U. nana (Zygonycetes; Mucorales).


The genus *Umbrellopsis,* originally was described in 1966 as belonging to the Fungi Imperfecti. Amos and Barnett interpreted the reproductive propagules to be conidia; v. Arx considered them to be unisporangia, and in 1982, placed *Umbrellopsis* in the Mucoraceae. The genus *Mortierella* produces multisporangia, and belongs in the family, Mortierellaceae. However, some species of *Mortierella* appear to be atypical, and may be allied more closely with the Mucoraceae.
Hyphal septa in both species examined during this study were multiperforate, and no Woronin bodies were observed. Thus, it appears that U. nana is not a member of the Fungi Imperfecti, but is instead a member of the Zygomycetes as suggested by von Arx. Sporangiial development in U. vinacea appeared similar to that shown in Gibberella fujikuroi (Edy) Hesler by Bragg in 1962, and in Mucor mucor L.:Fr. by Hammil in 1981. Sporangiospores of U. vinacea were ornamented with a series of connecting ridges which gave them a conspicuously angular appearance under the light microscope.

Hanlin, R.T., see Cason, K.M.T.

R.T. HANLIN and O. Tortolero, Dept. of Plant Pathology, University of Georgia, Athens, GA 30602, and Posgrado en Fitopatologia, Universidad Centro Occidental "Lindsay Arvalado", Barquisimeto, Venezuela.

Studies on Sclerotium roselula is a foliar pathogen of forest trees in the western hemisphere tropics, where it occurs in areas of high humidity and moisture. It was recently collected for the first time in Venezuela, where it causes a leaf spot disease of coffee, which is characterized by the formation of large, brown, sooty lesions. The fungus is dispersed by erect, terete, propagules composed of bundles of hyphae produced on the underside of the lesions. In culture it forms rapidly-growing, white mycelia on which are formed large, orange sclerotia. Young sclerotia are composed of interwoven hyphae, the cells of which become swollen as they mature. Large, raised, circular areas composed of pseudoparenchyma cells form on the surface of developing sclerotia; these appear to secrete droplets of a clear liquid that occur on the surface of the sclerotia. Young sclerotia are globose and pure white, but they become pulvinate, with a concave base, as they mature. The outer cells of the sclerotia are enlarged and pigmented, and the entire sclerotium is covered by a double layer of amorphous material. This study was supported in part by grants from NSF (INT-8501713) and CONICIT (SI-1435) of Venezuela.

Harman, C.E., see Stasz, T.E., et. al.

Harman, M.E., see Carpenter, S.E., et. al.

SHARAH HARNEY and PAUL WIDDEN, Biology Department, Concordia University, 1455 de Maisonneuve Blvd. W., Montreal, Quebec, H3G 1M8, Canada.

Occurrence of Paecilomyces farinosus on Balsam Fir litter and disease incidence in Spruce Budworms.

The abundance of microfungi was monitored during the summer at two balsam fir forest sites in Quebec. The fungi were isolated from L layer needles collected from 1 m² boxes set into the forest floor, within which the disease incidence of leaf-feeding uninfected spruce-budworms, that had been allowed to crawl within the boxes, was being monitored. The needles were washed in 10 changes of sterile water, cut into 1 mm pieces and plated onto Czapek-Dox agar (pH 4.5), thus ensuring that fungi present as loosely associated spores would have a low probability of isolation.

Paecilomyces farinosus was isolated regularly from the litter at both sites during the entire period of the study. The frequency of isolation of varied from 0, in a few cases, up to 40% for individual boxes, with a mean of approximately 10% of the needles being colonized with little variation.

either between sites, or on a seasonal basis. Rates of infection of the budworms with P. farinosus reached levels of approximately 12%.

These data suggest a correlation between the incidence of fungal infection in the spruce budworm and the abundance of the fungus in the litter. They also suggest that the fungus may be present in the litter as an active saprophyte, which may act as an infective pool that can attack the insect.

Harold, F.M., see Schaid, J., et. al.

Harold, F.M., see Schreurs, W.J.A., et. al.

F.M. HAROLD and J.H. CALDWELL. Department of Molecular and Cellular Biology, National Jewish Center, Denver, CO 80206. Transcellular ion currents and polarized growth.

Eukaryotic cells and organisms commonly drive electric currents through themselves. This mystifying phenomenon reflects a transcellular flow of ions that can be monitored with the ultrasensitive vibrating probe. Our objective is to determine the mechanism by which fungal hyphae generate such ion currents, and to explore their relationship to polarized extension of the hyphal apex.

In Achlya, the transcellular electric current reflects the flow of protons. These are expelled directly by the H⁺-ATPase and enter the apical region by symport with amino acids. Does this current confer polarity upon hyphal extension, or define the site of apical exocytosis? We have recently found that the intensity and spatial pattern of the electric current depends on the composition of the growth medium: in media lacking amino acids the electric current is minimal yet extension proceeds normally. The findings suggest that the electric current reflects nutrition and bears no obligatory relationship to the mode of extension. However, in media that support extension there is a substantial flux of protons into the apical region. Proton uptake is not confined to the tip itself, suggesting that it does not localize the site of vesicle exocytosis but plays a more global role in the physiology of extension. The signals that define the tip itself may become accessible through the study of chemotropic growth.

Harold, R.L., see Schreurs, W.J.A., et. al.

Harrington, T.C., see Worrall, J.J.

T. G. HARRINGTON, J. J. WORRALL, and D. M. RIZZO. Dept. of Botany and Plant Pathology, Univ. of New Hampshire, Durham, NH 03824.

Interfertility of host-specialized isolates of Fomes annosus from California with 'S' and 'P' testers from Europe.

Host specialization of isolates of Fomes annosus (Heterobasidion annosus) from California was previously demonstrated by inoculating Pinus ponderosa and Abies concolor seedlings (Phytopathology 73:304). In our study, 18 of these isolates were tested for interfertility with six 'S' (spruce) and four 'P' (pine) tester strains of F. annosus from Europe. Di-mon and mon-mon pairings were evaluated by subculturing from mated tester strains and examining for clamp connections. Each host specialized isolate was interfertile with either 'S' or 'P' testers, but some 'P'-interfertile isolates rarely mated with 'S' testers. The nine isolates specialized to Abies were interfertile with only 'S' testers. Conversely, the nine isolates specialized to Pinus were interfertile with 'P' testers.
Another 18 isolates from Pacific Coast states also fell into the 'S' and 'P' groups based on matings. Two isolates from diseased pine trees were interfertile with 'P' testers, whereas nine isolates from diseased trees of other genera were interfertile with 'S' testers. Of the three isolates from pine stumps (which may have been saprophytically colonized), one was interfertile with 'P' testers and two with 'S' testers. Four isolates from stumps of other coniferous genera were interfertile with 'S' testers.

Harrington, T.C., see Zambino, P.J.
J. M. HEADBURY, D. A. CLAWNE, and J. K. PATAKY. Dept. of Plant Pathology, Univ. of Illinois, Urbana, IL 61801. Ascospore pleomorphism in Gibberella anamorphs.

Biweekly collections of perithecia of Gibberella zeae on Zea mays were made at Champaign, IL, from November 1986 through February 1987. A range in ascospore maturity and morphology was observed. In general, the basic ascospore condition appeared to be a spore with four, approximately equal-sized uninucleate cells. In two-celled ascospores one cell remained to be twice the size of the others, and uninucleate. In two-celled ascospores both cells tended to be binucleate, and single-celled ascospores were binucleate. Ascospores of all four classes germinated on water agar with no change in septation. Germination of three- and four-celled ascospores was almost exclusively from one or both end cells, while two-celled spores germinated from one or both cells. Anamorphs of single-ascospore isolates of each class appeared to be identical. Taxonomic and evolutionary implications of these findings will be discussed.

T.S. HEATH. Biology Department, York University, Toronto, Ontario M3J 1P3, Canada. The organization and functions of actin in Saprolegnia.

The distribution of actin in growing hyphae of Saprolegnia and other oomycetes was investigated with rhodamine-labelled phalloidin applied to formaldehyde fixed cells. Most of the actin is concentrated in the apical cell periphery where it forms a finely fibrillar meshwork enclosing the hyphal apex. This meshwork gradually changes to a more widely spaced array of peripheral fibrils associated with actin rich spots which occur at approximately uniform concentrations throughout the sub-apical regions of the hyphae. The apical cap is highly labile to diverse perturbations including buffers and detergents such that considerable care is needed in handling cells prior to fixation. Selected detergents can alter the organization of actin without altering the most prominent organelle movements thus suggesting that the actin is not directly involved in organelle motility. The obligatory correlation between the apical network and active tip growth supports a direct involvement in this process but the ability to alter the actin pattern without altering ascospore germination indicates that other components are also important in tip morphogenesis. Sub-peripheral cytoplasm is typically devoid of discernable staining patterns. However, induction of cytoplasmic contraction produces condensed clumps of cytoplasm with enriched diffuse staining, consistent with the idea that the cytoplasm is permeated by a contractile but uniformly dispersed actin-rich network which may be involved in cytoplasmic movements. An integration of these results will be attempted.

MICHELE C. HEATH. Botany Department, University of Toronto, Toronto, Ontario M5S 1A1, Canada. Evolution of plant resistance and susceptibility to fungal invaders.

For the lack of any good evidence to the contrary, it seems reasonable to assume that fungi currently exhibiting symbiotic (mutualistic or parasitic) interactions with higher plants evolved from saprophytic ancestors and that resistance, rather than susceptibility, to invasion is the general rule in living plant parts. Recent evidence suggests that some saprophytes are "pre-adapted" to a parasitic way of life by the possession of attributes necessary for plant invasion and colonization; however certain key attributes are lacking. Nonhost plants respond to both parasitic and saprophytic fungi, but not necessarily in the same way. These results have important implications with respect to the evolution of biotrophy and the ubiquity of fungal "elicitors" of defense reactions.

JAMES W. HENDRICK, KEITH JONES, and WILLIAM C. KEMP. Department of Plant Pathology, University of Kentucky, Lexington 40546. Control of the mycorrhizal fungus Glomus macrocarpum as the basis for the maintenance by crop rotation of productivity of soil for tobacco.

Burley tobacco in Kentucky must be rotated with sod crops to maintain productivity of the soil. We examined the hypothesis that tobacco stunt disease is involved in the crop rotation effect. Glomus macrocarpum has been implicated as the cause of this disease (Phytopathology 76:688). Stunt is readily controlled by fumigation of soil with methyl bromide-chloropicrin.

A 3-yr rotation experiment was established on land on which tobacco was severely stunted the year prior. Black root rot was not a factor in this field. Rotation treatments were continuous tobacco (TTT), 2 yr in fescue then in tobacco (FFT), and 1 yr each in tobacco and fescue before tobacco the final yr (TFT).

After 23 da, differences in height were not yet measurable, but root length/kg soil was reduced in all plots except FFT. At harvest, height, yield, and root length were severely reduced in the TTT and TFT plots but not in the FFT plots. Mycorrhizal colonization of roots and the increase in population of spores of G. macrocarpum in the rhizospheres of plants in the TTT and TFT plots indicate that the rotation effect on soil productivity for tobacco involves control of G. macrocarpum.

Minton, D.M., see Bacon, C.U., et al.
W.F. HINTZ, S.B. Anderson and P.A. Horgan, Department of Botany, University of Toronto, Erindale Campus, Mississauga, Ont. L5L 1C6. Manipulations of the mitochondrial genome of Agaricus bitorquis.

The mitochondrial (mt) DNA of the basidioymcetes Agaricus bitorquis is highly variable between isolates. This has allowed the use of mt DNA restriction fragment length polymorphisms (RFLPs) as genotypic markers for examinina mt inheritance. In other basidioymscetes bilateral nuclear migration occurs when a nuclear donating strain (8-1) is paired with a nuclear recipient strain (21-2). Dikaryotic mycelium recovered from over the nuclear recipient mate (and spore progeny of this dikaryon) carried the 34-2 mt type. Dikaryotic mycelium recovered from the zone of contact initially contained both mt types but after fruiting...
the spore progeny all carried the 8-1 mt type. Thus spore progeny carrying recombinant nuclei and either parental mt type can be recovered. In a mushroom breeding program it could be advantageous to switch the mt component of a homokaryotic strain without altering its nuclear component. We recovered homokaryons from dikaryons before sexual recombination had occurred by protoplasting the hyphae and identifying those protoplasts which contained a single nuclear type by use of nuclear DNA RFLPs. We have recovered homokaryons carrying the original 8-1 nuclear type and the 34-2 mt type. Applications of this technology will be discussed.

Homola, R., see Stubbs, C.S., et. al.

Horgen, P.A., see Hintz, W.E., et. al.

Horgen, P.A., see Horton, J.S.

Horgen, P.A., see Robison, M.

P.A. HORGEN, Dept. of Botany, University of Toronto, Mississauga, Ontario, Canada, L5L 1C6.

Biotechnology and Mushrooms

Cultivation of the edible mushroom, *Agaricus brunnescens* (bisporus) is a multimillion dollar industry in North America and elsewhere in the world. Available information suggests that the strains of *A. brunnescens* grown commercially are genetically very uniform. Classical genetic approaches for strain improvement in *Agaricus* have for the most part been unsuccessful. We have been utilizing biotechnological approaches to introduce genetic diversity into the cultivated mushroom. Homokaryotic strains of *Agaricus* have been isolated by protoplast regeneration of heterokaryons. Hybrid crosses between homokaryotic regenerates from strains isolated from the wild and homokaryotic isolates from successful commercial strains are presently being assessed. Restriction fragment length polymorphisms have been developed as genetic markers in *Agaricus*. In addition, we have been examining the mitochondrial genome and mitochondrial inheritance in *Agaricus*.

J.S. HORTON and P.A. Horgen, Dept. of Botany, University of Toronto, Erindale Campus, Mississauga, Ont. L5L 1C6.

Molecular cloning of antheridiol-regulated genes in *Achlya*.

The steroid hormone antheridiol regulates the synthesis of a number of polypeptides during male sexual differentiation in *Achlya ambisexualis*. Previous results indicated that at least some of these polypeptides are under transcriptional control. To study the molecular basis of this control we decided to construct a cDNA library from mRNA isolated from antheridiol-induced cultures. This library was then screened for antheridiol-regulated sequences by differential plaque hybridization with cDNA probes made from antheridiol-induced and control total mRNA. After sequential screenings, a small number of regulated cDNA clones were isolated. Northern blot experiments using these clones as probes revealed that mRNA levels for these cDNAs increased markedly as a result of antheridiol treatment. Southern blot experiments using DNA isolated from four different *Achlya* strains of differing sexual characteristics indicated that the DNA sequences for these genes is always present, but that they are regulated at the transcriptional level.

Using these regulated cDNA clones as "male" probes, the nature of sexuality in *Achlya* can be examined on the molecular level. Taxonomic relatedness can also be looked at by comparing genomic organizations between strains and species.

D.J. Hose, D.S. Shumard, and M.R.S. Hudspeth, Plant Molecular Biology Center, Department of Biological Sciences, Northern Illinois Univ., DeKalb, Illinois 60115-2861

Fine mapping and DNA sequence analysis of the mitochondrial encoded subunits of the *Phytophthora* cytochrome oxidase genes.

We have localized and cloned the three mitochondrial encoded cytochrome oxidase subunits (COI, COII, COIII) of *P. megasperma* 6957 by heterologous southern hybridization with genomic regions from *S. cerevisiae* petes. COI and COII are tightly linked within a 3.3kb Hind III fragment. A 2.2kb Bam HI subclone contains only COII. COIII is located 58kb from COII and has been cloned in a 6.4kb Hind III fragment. We present here 1) a fine structure analysis of the 3.3kb Hind III clone with respect to both COII and COII; and 2) DNA sequence analysis of the COII homology region and its open reading frames.


The preparation of Amphotericin B-encapsulated liposomes coated with anti-candidal antibodies.

Amphotericin B is currently the drug of choice for most systemic fungal infections. Its acute and chronic toxicity has previously limited its effectiveness in clinical use. Recently, Liposome-encapsulated Amphotericin B has been shown to be less toxic than free Amphotericin B. Targeting of liposome-bound compounds by the attachment of antibodies has been reported in the delivery of other macromolecules but not Amphotericin B.

Palmitic acid residues were covalently bound to anti-candidal antibodies. These antibodies were then incorporated into the surface of Amphotericin B containing liposomes by means of the palmitic acid hydrophilic interaction with the phospholipid of the liposomes. The resulting liposomes were evaluated for Amphotericin B by spectroscopy and for external antibody expression and anti-candidal binding by secondary immunolabeling with electron and fluorescent microscopy.

Liposomes containing Amphotericin B and bearing anti-candidal antibodies on their surfaces were produced. These phospholipid vesicles were shown to bind to *Candida albicans* and also retain the reduced toxicity of liposomal Amphotericin B and the efficacy of this and the free drug.

Howard, R.J., see Hamer, J.E., et. al.

R. J. HOWARD, T. M. BOURETT and J. E. Hamer, Du Pont Co., Experimental Station, Central Research & Development Dept., Wilmington, DE 19890.

Key events in the very early stages of pathogenesis.

The cytology of infection-related morphogenesis of the rice pathogen *Magnaporthe grisea* has been characterized. By using freeze substitution as a fixation protocol we have been able to examine thin
sections of unhydrated fungal conidia for the first time. This has allowed us to discover a new organelle, apparently unique to conidia, that may function in attachment to the host surface. The organelle consists of a relatively large deposit of material in the apical periplasmic space. It is believed to give rise to the extracellular patch of "spore tip mucilage" that suddenly appears upon hydration (Jeh, unpublished). A number of other dramatic changes occur during hydration, for example the rapid dispersal of ribosomes and assembly of polysomes. Subsequent morphogenetic events, including germ tube emergence, appressorium differentiation and penetration, were also analyzed using freeze substitution protocols. Additional new information concerning the mechanism of host penetration will be discussed.

Humber, R.A., see Butt, T.M.

R. A. HUMBER. USDA-ARS Plant Protection Research Unit, Boyce Thompson Institute, Tower Road, Ithaca, New York 14853.

Revised familial and generic criteria for a phylogenetic classification of the Entomophthorales.

The description of the Neozygitesaceae (Ben-Zeev et al., 1987, Mycotaxon 28:313-326) based entirely on nuclear characters (to the exclusion of useful characters unique to that family) suggests that a new review of taxonomic criteria used to circumscribe the families and genera of the Entomophthorales (Zygomycetes) is in order. Nuclear cytological criteria (general state of condensation of chromatin during interphase; stainability of chromatin; mitotic mechanisms) proposed earlier by Humber continue to be the major criteria for distinguishing families in this order, but the modes of formation and of germination of resting spores, and of the organization of vegetative cells also deserve full recognition. The set of criteria to be considered when defining genera now includes (1) the mode of formation, shape, and number of primary conidia, (2) the mode of discharge of primary conidia, (3) the shape and decoration of resting spores, (4) the presence/absence and morphology of cystidia and of rhizoids, (5) the presence of absence of a wall on vegetative cells, and (6) the pathobiology and natural host spectrum.

The application of these new criteria resolves the order into six families: Entomophthoraceae (which may be further subdivisible into two subfamilies), Comeliotaceae, Ancylistaceae, Meristacraceae, Neocyriaceae, and Entomophthoraceae. Neozygites, Entomophaga, and Erysia are segregated under these revised generic criteria. Lists of included genera and species are given for each genus.

R. A. HUMBER and C. C. BROWN. USDA-ARS Plant Protection Research Unit, Boyce Thompson Institute, Tower Road, Ithaca, NY 14853, and Dept. of Veterinary Pathology, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803.

The first report of Conidiobolus lampragues from a vertebrate rhinoconidiobolomycosis.

Necropsy of a 15-year-old Arabian mare euthanized following recurrent bleating from the nose and severe wasting revealed an 8 cm nodule incorporated within and projecting dorsally from the posterior aspect of the soft palate and encroaching on the pharyngeal openings of the guttural pouches and contained numerous yellow, coral-like concretions ("kunkers") ca. 0.5 cm in length. Several of these concretions were washed repeatedly in sterile saline and embedded in Sabouraud dextrose agar; fungal growth was evident within 24 hours, and numerous spores were formed within 7 days.

This fungus was identified as Conidiobolus lampragues, a fungus known previously only from plant derris. This species has not been reported previously from any vertebrate mycosis, and is only the third Conidiobolus species implicated as an etiologic agent of vertebrate mycoses. C. coronata is widely distributed in plant derris, causes rhinoconidiobolomycosis of humans, equines, and other vertebrates, and is weakly entomopathogenic. C. incongruus was described from plant derris and reported once from a human.

Histological examination of the affected tissues show the presence of extensive eosinophilic precipitation around the fungal cells. The presence of this precipitate (Splendore-Hoeppli phenomenon) has been noted from all entomophthorales of homeothermic vertebrates, but not, apparently, from polikolothemic invertebrates.

The identification of entomophthorales causing vertebrate mycoses is discussed from the context of the substantial revisions of systematics within this order.

L. J. HUCHISON. Department of Botany, University of Toronto, Toronto, Ontario, Canada MSS 1A1. Cultural taxonomy of ectomycorrhizal fungi.

Of the many groups of fungi which form ectomycorhizae with temperate woody plant species, the Agaricales are undoubtedly the single most important group. Current concepts of agarical taxonomy are based almost exclusively on micro- and macroscopic features of basidiomata. However, it is now recognized that supplementing studies of the morphological characteristics of these fungi with cultural studies can be useful as they have been with ana-morphs of certain groups of Ascomycetes. Past studies on the Agaricales in culture have revealed that ectomycorrhizal species produce only sterile mycelia while many saprophytic species produce conidia.

Cultures of ectomycorrhizal agarics were obtained from basidiomata collected in coniferous and deciduous forests of eastern Canada. These cultures were analyzed using traditional characters such as growth rates and colony macro- and micromorphologies. In addition, physiological tests developed primarily by yeast taxonomists and bacteriologists were utilized.

Results have shown that separation of cultures into recognizable taxonomic groups is possible. Such cultural studies help to confirm our present classification system of the Agaricales. As well, the possibility exists to develop a system for identification of ectomycorrhizal strains isolated from field-collected mycorrhizae.

Ingham, E.R., see Carpenter, S.E., et. al.

S.H. JABAHI-HARE, M.F. TREMBLAY, S. PARENT AND J. A. FORTIN. Foresty Department, Laval University, Ste. Foy, Quebe, Canada, GK 7P4. The effect of culture age on fatty acid composition, protein and nitrogen content and phosphatase activity of mycelia of Endogone pisiformis (Endogonaceae, Zygomycetes).

Cellular fatty acids, soluble proteins, nitrogen and phosphatase (acid/alcaline) activity were analysed from mycelia of Endogone pisiformis after 4, 7, 14 and 25 days of growth in liquid culture. A high accumulation of all these compounds was observed during the exponential phase (4-7 days). The concentration of total fatty acids, proteins, and phosphatase activity (alkaline) significantly decreased during the lag phase (7-25 days), while that of nitrogen increased. The electrophoretic pattern for soluble proteins did not vary with culture growth. Major bands were observed at 41KD, 35 KD, 17KD and 12KD at all incubation times. The concentration of total fatty acids varied at all incubation times in the following lipid fractions: (i) phospholipids, (ii) digalactosyl diglycerides, mono-, di and triglycerides, (iii) free fatty acids and (iv) sterol esters. The proportion of total fatty acids (when averaged across time) in the neutral and polar lipid fractions represented 85.5% and 14.2% respectively. The profiles of fatty acids in both lipid fractions were not identical. Fatty acids ranged from 14:0 to 24:0 in the neutral fraction and from 14:0 to 20:0 in the polar
2. In Xylariaceae may have had elongate conidial nuclei. Nuclei are similar to the highly coiled, elongate nuclei reported in xylariaceous fungi, suggesting that hypothesis that they function as spermatia. However, Joly, the common ancestor of the families Diatrypaceae and Kahn, S.R., see Benny, G.L. Jastrow, the function of diatrypaceous conidia. The conidial volume of the conidia, and the apparent inability of Jagels, R., see Stubbs, C.S., et. al. diamidino-2-phenylindole clci morph of Cryptosphaeria populina. were stained with various DNA-specific stains, including the fluorochromes mithramycin and 4',6-diamidino-2-phenylindole (DAPI), and with Giemsa stain. Conidial nuclei were elongate to ribbon-like in the translucent regions of the cytoplasm of all fungal structures. The significant occurrence and role of these compounds in various structures of Glomus clarum will be discussed.


Cryptosphaeria populina (Pyrenomycetes, Diatrypaceae) was cultured on potato-dextrose agar under fluorescent lighting with a 10-hr daylength at 15 C to induce production of conidia. Conidial and hyphal nuclei were stained with various DNA-specific stains, including the fluorochromes mithramycin and 4',6-diamidino-2-phenylindole (DAPI), and with Giemsa stain. Conidial nuclei were elongate to ribbon-like and occupied most of the cell volume. Hyphal nuclei ranged from elongate to ovoid. The large nuclear volume of the conidia, and the apparent inability of these spores to germinate, is consistent with the hypothesis that they function as spermatia. However, further studies are needed to determine unequivocally the function of diatrypaceous conidia. The conidial nuclei are similar to the highly coiled, elongate nuclei reported in xylariaceous fungi, suggesting that the common ancestor of the families Diatrypaceae and Xylariaceae may have had elongate conidial nuclei.

Jagels, R., see Stubbs, C.S., et. al.

Jastrow, J.D., see Miller, R.M., et. al.

Joly, J., see Poirier, S., et. al.

Jones, K., see Hendrix, J.W., et. al.

Kahn, S.R., see Benny, G.L.

T. Kamada, C.E. Bracker and S. Bartnicki-Garcia, Dept. of Plant Pathology, University of California, Riverside, CA, 92521 & Dept. of Botany and Plant Pathology, Purdue Univ., West Lafayette, IN, 47907. Destruction of chitin synthetase by proteases during chitosomal isolation by high speed centrifugation. Because of their intrinsic low buoyant density, chitosomes can be conveniently separated from other subcellular structures by isopycnic sedimentation in sucrose density gradients. The process may be accelerated by ultrahigh speed centrifugation in a fixed-angle rotor (at forces up to 500,000 g) but the time of centrifugation is critical. Gradients must be centrifuged for sufficient time to allow chitosomes to reach their buoyant density and the rest of subcellular particles to sediment past the chitosome peak. However, the prolonged centrifugation needed to completely remove contaminating particles brought about a severe distortion of the chitin synthetase profile in the gradient and resulted in the near disappearance of the peak of chitosomal chitin synthetase. We have traced the problem to a soluble protease(s) that on protracted centrifugation reaches the chitosome band and destroys its chitin synthetase activity. The interfering protease is a soluble protein with a sedimentation coefficient of 5 S and a pH optimum of 7 - 7.5. Inhibitor studies suggest is a serine protease. Contrary to other proteases, it destroys chitin synthetase but can not activate the chitin synthetase zymogen.

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

J. Kane and R.C. Summerbell, Mycology Laboratory, Laboratory Services Branch, Ontario Ministry of Health, Box 9000, Terminal "A", Toronto, Ont. M5W 1R5

Bromocresol purple casein dextrose medium (BCPCD) was introduced by Fischer and Kane in 1971 to differentiate Trichophyton rubrum and T. mentagrophytes, and to permit detection of contamination in dermatothye cultures. T. rubrum was characterized by restricted growth causing no pH change detectable with the indicator. T. mentagrophytes was characterized by profuse growth with a pronounced alkaline pH at 7 d. Subsequently, the BCPCD test was used to differentiate T. mentagrophytes (profuse, alkaline) from T. rubrum; Microsporum persicolor (profuse, non-alkaline) from T. mentagrophytes; M. canis (profuse, yellow pigment, non-alkaline) from H. audouiniai (scant growth, alkaline). T. verrucosum is distinguished from all other dermatophytes by the presence of chitosomal chitin synthetase activity. The common dermatophytes fall into 4 physiological groups on BCPCD: profusely growing species producing alkalinity (T. mentagrophytes, T. tonsurans), profusely growing species producing alkalinity (T. rubrum, T. rubrum, T. raubitschekii, T. fischeri, T. kanei, and species causing widespread hydrolysis of solids (T. verrucosum). In the case of T. rubrum and allies, exhaustion of the dextrose in the medium at 10-14 d appears to permit conversion to a vigorous, alkalinity-producing growth form. The inhibitory action of glucose on the T. rubrum group may indicate a different and unusual metabolic pathway.

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

Kapustak, L.A., see Arnold, P.T.

Kapustak, L.A., see Parker, S.W., et. al.
Kim, J.W., see Gibson, J.L.

J. W. KIMBROUGH, Botany Department, University of Florida, Gainesville, FL 32611. Ascomycetes septa.

One of the striking discoveries in the early study of fungal ultrastructure was that characteristic types of septa occur in higher fungi, most basidio-
mycetes with dolipores and pore caps, and ascomycetes with simple pores normally associated with Woronin bodies. While the latter type of septum has become more or less the trademark of most ascomycetes, a number of variations have been found, especially in the nature and structure of Woronin bodies and in the types of organelles involved in septal pore plug-
ging. Multiperforate, flared, and simple uniperforate septa have been found among yeastslike ascomycetes and is perhaps suggestive of their polyphyletic ori-
gin. Pore plugging and organelles associated with septa of vegetative cells vary considerably among ascomycetes. Many Pyrenomycetes, Loculoascomycetes, and their anamorphs possess septa in which an elec-
tron-opaque, central band enters the pore and is bordered by electron-translucent, fingerlike pro-
jections. In the Pezizales two series of short, par-
allel electron-opaque bands emanate from the rim of 
the pore and contain darker striations perpendicular 
to the plane of the septum. A distinction can also 
be made between septa of somatic cells and those of 
the ascogenous hypae and asci. In the latter, organ-
elles involved in pore plugging are often distinct 
and very characteristic of respective taxa. Similar-
ly, microbes give rise to spherical Woronin 

bodies in some taxa, but prismatic or rectangular 
ones in others. It is felt that these and other pore 
characters can be useful in exploring ascomycete phylogeny and should be explored further.

G.R. KLASSEN and S.A. McNabb. Dept. of Microbiology, University of Manitoba, Winnipeg, Manitoba R3T 2M2. The use of physical maps of rDNA repeating units in the taxonomy of zoosporic fungi.

A very prominent satellite band in CsCl-bisbenzimide 
density gradients of Pythium diclinum DNA was found to consist of ribosomal DNA (rDNA) repeating units with a complexity of 10.3 kb. Similar satellite 

bands were also obtained from a morphologically 
diverse selection of species from the Pythiaceae: 

Pythium torulosum (10.4 kb), Pythium ananum (10.6 

kb), Pythium padiicum (10.6 kb), Pythium irregulare 

(10.8 kb), and Pythium pyrifera (11.2 kb). Similar 

physical maps were constructed using seven restrict-

ion enzymes and the maps were aligned on the basis 
of nine conserved restriction sites in a 6 kb region 

which was shown to be homologous to a DNA plasmid 

probe containing ribosomal genes from Neurospora 

crasa. A map of the ribosomal region of Apodachyla 

pyrifera (Leptomitus). was constructed to serve 

as a taxonomic reference. Since A. pyrifera does not 

have the prominent satellite band, mapping was 

done by hybridization of the N. crassa probe to 

single and double digestions of chromosomal DNA.

Percentage sequence divergence values indicate that the Pythiaceae and Phytophthora 
form a cluster with an average divergence within the group of 5%. The 

averages for the members of this group is 15.5. P. 
diclinum and P. torulosum are very 

closely related to each other as are P. irregulare 

and P. ananum. P. padiicum and Phytophthora 

are equally distant from the other members of the group.

Klein, M.B., see Lucarotti, G.J.

M.A. KLIC and E.J. MULLANEY. USDA/ARS, Southern 

Regional Research Center, P.O. Box 19687, New Orleans,
Utilization of DNA technologies in Aspergillus systematics.

Several molecular DNA techniques have been developed that have potential as tools in hyphomycete taxonomy. We have used two such techniques to study Aspergillus.

Southern blot hybridization analysis was used to examine the degree of DNA homology of isolates from different sections of the genus to cloned A. nidulans developmental genes. DNA sequences analogous to those of the A. nidulans developmental genes were found in all sections of the genus examined. Species with morphological features similar to A. nidulans had a higher degree of homology to the A. nidulans genes than those that were morphologically dissimilar.

A second technique utilized a restriction endonuclease, Smal, to distinguish between the closely related species, A. flavus and A. oryzae. When total DNA from isolates of each species was digested with Smal, and then subjected to gel electrophoresis, a distinct, consistent fractionation pattern was observed for each species. This procedure provides an additional method for differentiation of these two morphologically similar species.

M.A. KLICH and J.I. PITU, USDA/ARS, Southern Regional Research Center, P.O. Box 19687, New Orleans, LA 70179, and CSIRO Division of Food Research, P.O. Box 52, North Ryde, NSW 2113, Australia.

A computer-assisted synoptic key to common Penicillium species and their teleomorphs.

PENKEY, a computer-assisted synoptic key, has been developed to enable nonspecialists to identify common Penicillium species and related teleomorphs. The user may input any combination of macroscopic or microscopic characters; PENKEY will identify which of the 68 common species possess all of these characters. The program takes into account the morphological variability inherent in the genus. An option in the program lists species which differ by one character from the input data; this aids the user in eliminating identification errors resulting from variability of a specific isolate or an error in assessing a character. PENKEY is an IBM-PC compatible program.

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

L.H. KUHN. Department of Botany, University of Toronto, Erindale College, Mississauga, Ontario, Canada, L5L 1C5.

Comparative studies of storage products and cellular organization in sclerotial/stromatal anamorphs of the Sclerotiniaceae.

Using light and electron microscopy, we examined mature sclerotia of Sclerotium cepivorum, Sclerotinia spp., Botrytis spp., Dymortinia, Ciborinia, Myroslcerotinia spp., Moniliella, and Stromatina as well as stromata of Lamberella, Lancea, Pseudula, Stromatina, Oculina, Sclerotinia homoeocarpa, Scleromitrula, and Choria.

Sclerotial anamorphs all produce a definite dorsi-ventral, melanized and a medulla with an extensive extra-cellular matrix. Protein bodies crowd the cytoplasm of the medulla and cortex, representing a major storage reserve. The matrix and cell wall contain carbohydrates, probably also serving a storage as well as a structural function. Sclerotium cepivorum produces sclerotia most similar to those of Sclerotinia spp. Stromatal anamorphs mostly produce a more amorphous melanized rind zone and a loose medulla with little or no extra-cellular matrix. Protein is amorphous with few protein bodies in cytoplasm. Carbohydrate is primarily in walls. Lrids are important storage products. The unusual stroma of S. homoeocarpa shows complex cellular organization with parietal, cytoplasmic protein bodies. Stromata of Scleromitrula shiratana and Ciboria are anatomically and histochimically closer to sclerotia than to the other stromatal anamorphs.

Koo, C.D., see Miller, S.L., et. al.

Kropp, B., see Gardes, M., et. al.

BRADLEY R. KROPP. Centre de Kecherche en Biologie Forestière. Faculté de Forestale et des Écoles de Génie, Université Laval, Ste-Foy, Québec, Canada G1K 7P4.

The incompatibility system and related ectomycorrhizal performance of monokaryons and reconstituted dikaryons of Laccaria bicolor.

The incompatibility system of four Laccaria bicolor collections was studied and found to be bifactorial with multiallelic mating type factors. One of the collections studied was a biological species of L. bicolor being intersterile, but morphologically identical, with the others.

Growth parameters and ectomycorrhiza formation on Pinus banksiana seedlings were measured after inoculation with: 1) Four sibing mating type monokaryons of a collection from Canada and from Sweden 2) Four dikaryons formed by crossing the two compatible mating type pairs within each of these collections 3) Sixteen dikaryons formed by crossing each mating type monokaryon from Canada and Sweden in all possible combinations.

Each seedling growth parameter showed significant differences resulting from inoculation with different cultures. Ectomycorrhizal formation was also shown to differ significantly depending on the culture used as inoculum.

Possibilities for using the differences between cultures in studies of the genetics, physiology, and morphogenesis of the ectomycorrhizal symbiosis are discussed. The possibility of creating improved strains of ectomycorrhizal fungi for use in forest development.

Koupal, T., see Taylor, J.W., et. al.

K.A. KUHN and R.D. KOEHN. Biology Department, Southwest Texas State University, San Marcos, TX 78666-4616.

The role of fungi within an artesian community of the Edwards Aquifer in Central Texas.

A one-year study of an artesian well associated with the Edwards Aquifer was conducted to establish the fungal flora within this subterranean community. The Edwards Aquifer is a highly cavernous groundwater system that extends throughout central Texas. Fungi were identified from groundwater samples, introduced organic baits and emerging phreatic organisms. The fungal flora includes 14 genera of Hyphomycetes, 5 Coelomycetes, 1 Ascomycetes, 4 Zygomycetes, and 2 Oomycetes. Species of Cladosporium, Alternaria, Drechslera, Penicillium, and Fusarium are most abundant. The constant physical conditions and species richness observed within this community may
be indicative of a stable environment. The presence of these saprophytic organisms and their subsequent heterotrophic activities may provide answers as to the energy conversions and the recycling of matter within this cavernous groundwater ecosystem. This fungal activity may also support the troglobitic animal populations of the aquifer.

Kulkarni, R., see Digangi, J. J., et al.
Kurtzman, C. P., see Peterson, S. W.
Kuter, G., see Stasz, T. E., et al.
Kuyper, Th. W., see Redhead, S. A.
Lalonde, M., see Cardes, M., et al.
Lattin, J. D., see Carpenter, S. E., et al.

J. Y. Lee, P. J. Park* and Y. OTANI** Chonju Teacher’s College, Chonju, *Suwon Girl’s High School Korea and **National Science Museum, Tokyo Japan. Taxonomical Studies on Discomycetes in Korea(1).

Two hundred fifty specimens of Discomycetes were collected, for the most part, at Cwanmeung, Mt. Deokyu, Mt. Sungsu, Mt. Paldal, from March, 1982 to July, 1984. These Discomycetes were identified and classified into 2 orders, 9 families, 18 genera and 23 species.

Among them, Helvella pesizoides Pr., Periza celtica Moser, Humaria hemisphaerica Puckel, Trichophaea gregaria Boud., Trichoglossum valtori Durand, Spathularia flavida Pr., Arachnospiza aurelia (Pr.) Puckel, Rutstroemia americana White, Rutstroemia macrospora Kanouse apud Wehmeier forma gigaspora Korf, Ascomyces culchinnion Korf, Bisporaella citrina (Pr.) Korf et Carpenter, Chlorosplenium chlora Curtis, Chlorociboria aeruginascens Korf et Bara subsp. aeruginascens, Hymenoscyphus aculeus Phillips, and Cyathicula cystoides de Thuenen were new records in Korea. These species are described.


Secondary zoospores serve as the major means of dispersal in the oomycete Saprolegnia. Previous work suggests that the kinetosome associated organelle (K-body) functions in adhesion of secondary zoospores to a substrate during encystment. It is known that the tubule filled cavity of the K-body is composed of carbohydrate. In this study we document the adhesion process and use FITC-labeled lectins to verify the carbohydrate composition of the attachment.

Encystment is induced by the addition of a protein rich medium to the zoospore suspension. As encystment begins the zoospores make intimate contact with the substrate, attach, and simultaneously round up and form the cyst wall. Substances to which zoospores attach include polyethylene membranes, polystyrene, polymerized epoxy resin, and glass. Cysts remain firmly attached after encystment and hyphal germination.

Observations of specific binding of FITC-lectins to this region of attachment are reported. Additional observations of lectin binding to primary zoospores, primary cysts, secondary zoospores and secondary cysts are presented and apparent discrepancies with the current literature are discussed.

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

C. R. LENDING, C. E. BRACKER, and S. BARTNICKI-GARCIA. Dept. of Plant Pathology, University of California, Riverside, CA, 92521 & Dept. of Botany and Plant Pathology, Purdue Univ., W. Lafayette, IN, 47907. Isolation of highly purified chitosomes from Mucor rouxii by dual isopycnic centrifugation.

Chitin synthetase, a key enzyme in fungal cell wall biosynthesis, is located in microvesicles termed chitosomes. To produce large quantities of chitosomes for immunohistochemical and biochemical characterization, we developed a two-step isopycnic procedure that utilized sucrose density gradients centrifuged at ultra high gravitational forces (fixed-angle rotor at 500,000 g) max.

1) Isopycnic sedimentation. After cell walls had been removed, cell-free extracts from yeast cells of Mucor rouxii were layered onto 20-46% linear sucrose gradients and centrifuged for 1.5 h. Chitosomal peak fractions (d = 1.12 to 1.16) containing most of the chitin synthetase activity were pooled. 2) Isopycnic flotation. The pooled fractions were adjusted to 50% sucrose, over- laded with a 20-46% linear sucrose gradient and centrifuged for 10 h. This process of accelerated flotation effectively removed contaminating particles of higher buoyant density (larger vesicles, rhabdemes, and other microorganelles) and yielded an exceptionally homogeneous population of microvesicles. The microvesicles contained zymogen chitin synthetase of high specific activity. This streamlined method is much simpler and faster than the earlier isolation procedures and gives a high yield of functional chitosomes, and lends itself to the large scale isolation of these organelles.

LESLEY J. F., Department of Plant Pathology, Kansas State University, Manhattan, Kansas 66506. Heterokaryon incompatibility haplotypes on linkage group VII of Neurospora crassa.

Strains of Neurospora crassa which differ at any of the ten known heterokaryon incompatibility (het) loci are unable to form heterokaryons with one another. If different alleles are combined in the same nucleus of a partially disomic strain, then these disomics grow poorly. Partial disomics which are homozygous for a particular allele grow normally but are barren. Approximately 25-30% of the progeny of crosses between normal sequence wild type strains and strains carrying chromosome rearrangements have been examined for partial disomics of most of the left arm of linkage group V. The het-8 locus is located in this duplicated interval. Forty wild-collected isolates from 17 locations in North and Central America were examined for their het haplotype on VII. Based on the phenotypes of the disomics, at least three different haplotypes have been identified; these haplotypes may represent different alleles at het-8 locus. One haplotype is present at least five of the sites.
A. LEUCHTMANN and K. CLAY. Department of Biology, Indiana University, Bloomington, IN 47405, U.S.A. Atkinsonella hypoxylon and Balansa cyperi, epiphytic species of Balansiae.

A. hypoxylon and B. cyperi are known as systemic pathogens of two grass genera or one sedge species respectively. They belong to the tribe Balansaieae (Clavicipitaceae), whose species are usually termed endophytes.

Microscopic studies of Danthonia spicata, infected by A. hypoxylon, and Cypersus viridis, infected by B. cyperi, have demonstrated that the fungal mycelium is located in young shoots only on the surface of the meristem and the leaf primordia, and does not penetrate the host tissue. When flowering culms are formed, the mycelium proliferates and surrounds the immature inflorescences, causing them to abort. Fruiting structures then develop from the stomatic tissue surrounding the inflorescences.

In culture trials neither fungus could be grown out of surface sterilized tissues of any part of the host plant. In contrast, B. epiophloeo and B. hemingiana readily grew out of surface sterilized tissues of their host. Several non-Balansiae endophytes were grown out of all host plants. These data provide further evidence for the endophytic rather than endophytic mode of life of A. hypoxylon and B. cyperi.

Artificial inoculations of host plants with epiphytic species; such inoculations are being attempted. Several non-Balansiae endophytes were found in their host. Several non-Balansiae endophytes were spores as well as pollen.

The University of Tulsa, Tulsa, has been monitored for the presence of rust, smut, and other basidiomycete spores. Spores of Alternaria, Cladosporium, Helminthosporium, Epichloë, Nigrospora, Curvularia, and Pithophora are the most common, however, rust, smut, and other basidiomycetes are also present. These works have implicated basisporis in both asthma and rhinitis. In order to accurately assess the basidiospore content of the atmosphere, Burkard volumetric spore traps are now being utilized. Field studies have indicated that the most abundant basidiospore in the Tulsa area include species of Amanita, Armillaria, Calvatia, Chloroclyium, Citronella, Coprinus, Ganoderma, Lycoperdon, Marasmius, Piptoporus, and Polyporus. Spores from many of these basidiomycetes have been collected from the atmosphere, but their allergenic status and clinical significance have not yet been determined.

Levine, J.F., see Dykstra, M.J., et al.

Li, C.Y., see Carpenter, S.E.

DAVIS II and D. A. SMITH. Department of Plant Pathology, University of Kentucky, Lexington, KY 40546-0091. Apparent metabolism of the phytoalexin, kievitone, by Rhizoctonia solani.

Phytoalexin solani is a pathogen of Phaseolus vulgaris (French bean); concave, brown, necrotic lesions appear two to three days following infection. The bean plants are a good source of the phytoalexin, kievitone, which inhibits mycelial growth of R. solani (Smith, VanEtten and Bateman, 1975. Physiol. Plant Pathol. 5:51-64). Repent assays indicate that kievitone (20 μg ml⁻¹) disappeared from liquid cultures of R. solani by 8 hr after its addition. Loss of kievitone, monitored by TLC through silica gel (CH₃OH: CH₃Cl, 1:8; Rf=0.55) was accompanied by the production of two compounds, designated K₁ (Rf=0.25) and K₂ (Rf=0.18). Both compounds gave yellow-crime spots with diazotized p-nitroaniline (DNP), suggesting their probable phenolic nature. Ultraviolet absorption indicated the existence of a single peak around 285 nm for each compound. Based on the time-course experiments and DNP reactions, K₁ appeared to be predominant in the 8 hr assay. Twelve hr later, neither K₁, nor K₂ could be detected. Kievitone remained unaffected in cell-free culture filtrates of R. solani for at least 6 hr.

Analysis of R. solani-infected beans indicated that K₁ appeared three days following inoculation, increased for two days, but declined by the fifth day. These findings are suggestive of R. solani's ability to metabolize kievitone, whether any reactions involved accomplish detoxification of the phytoalexin remains to be established.

L. J. LITTLEFIELD. Plant Pathology Department, Oklahoma State University, Stillwater, OK 74078-0285. Ultrastructure of Telosporium-like Septa.

Uredinales, N and HN stages, have a simple septum, typically with a central pore often plugged with a variably electron opaque, pulley-wheel shaped occlusion. Crosswall thickness decreases in a narrow ring surrounding the pore. Often cytoplasm surrounding the pore zone is organelle free, and is delimited by a spherical array of microbodies on each side of the crosswall. Ustilaginales, but not Tilletiales (the latter having complex spore-type septa), have a central pore with a slight flaring of the cross wall around the pore. Few examples have been studied ultrastructurally. Septobasidiiales (4 species studied) have crosswall structure similar to ruts, but with a somewhat thickened ring of crosswall surrounding the narrow ring of very thin crosswall immediately around the pore. A dumbbell shaped, electron opaque pore occlusion occurs, but the organelle-free zone of cytoplasm and delimiting microbodies are absent. Exobasidium sp. (particular Auriculariales) has septal morphology similar to Uredinales and Septobasidiiales, possessing some features of both. Exobasidium sp. (Exobasidiales) has a very simple pore, with uniformly thick crosswalls, lacking any variations in thickness around the pore. The electron opaque occlusion is similar to that of Uredinales. Based on septum morphology and other characters, Khan and Kimbrough (Mycotaxon 15:103-170, 1982) propose a significant rearrangement of basidiomycete orders.

Locquin-Linard, M., see Currah, R.S.


Roz Lowen, PhD candidate at CUNY, spent two years (1984-1986) at CAB International Mycological Institute (CMI), Kew, Surrey, England, working on a revision of the genus Nectria. Slides of CMI, of mycological forays made in the UK and beyond with the British Mycological Society, and of visits to some European herbaria will be shared.
It has been shown that the ectomycorrhizal fungus *Hemethia arenosa* colonizes and may promote growth of red pines. *H. arenosa* was tested on commercial containerized red pines. Styrobloks were filled with a commercial potting mix (Ball Seed Co., Chicago, Ill.) with or without *H. arenosa* inoculum. They were seeded and placed in a production greenhouse. Trees were randomly sampled at 10, 15 and 20 weeks from seeding. *H. arenosa* significantly increased shoot dry weight at 15 and 20 weeks from seeding, 32% and 46% respectively. Root dry weight significantly increased at 10, 15 and 20 weeks from seeding, 17%, 34% and 20% respectively. In fall, 1985, remaining seedlings were transplanted to a site near Wisconsin Rapids, Wl. Survival was measured and 10 trees per replicate (5 reps/ttr) were removed in fall, 1986. *H. arenosa* inoculated trees had increased survival (96%) compared to controls (86%). *H. arenosa*-type mantles were observed on 40% of the inoculated trees; however, all trees sampled at this time were mycorrhizal.

Mallon, D., see Blackwell, M.

D. Malloch. Department of Botany, University of Toronto, Toronto, Ontario. MSS 1A1 The influence of mycorrhizal fungi on the evolution of vascular plants.

The direction of evolution in biotrophic fungi (ie biotroph to saprotroph or vice versa) is unclear and controversial. Although no direct or fossil evidence in support of either of these alternatives is available there are a number of indications, especially among the Oomycota, that the trend is toward increasing biotrophy. Using this as a premise, mycorrhizal fungi may be viewed as derived from saprotrophs that became increasingly interdependent with the roots they inhabited. Another model proposes mycorrhizal fungi to represent initially non-symbiotic biotrophs (parasites) that by exchanging the selfish advantage of parasitism for the more compromising but less rewarding state of symbiosis became transparent to their hosts, thus eliminating mechanisms of immunity costly to both host and fungus.

Once accepted and ultimately required, mycorrhizal fungi probably influenced the evolution of vascular plants in a number of ways. The physiological capabilities of newly-symbiotic plants would have allowed them to tolerate physical and competitive stresses that non-mycorrhizal plants did not. In addition, the requirement for commensal dispersal of akepycs of plant root fungus required drastic changes in reproductive mechanisms of both symbionts. Evolutionary influences brought about by the evolution of the first mycorrhizae were probably at least equalled by the advent of each new mycorrhizal type. Thus the appearance of vesicular-arbuscular, ectotrophic, ericoid and arbutoid mycorrhizae each caused a new group of plants with unique characteristics to flourish.

E. T. MARX, C. L. SCHARDL AND D. A. SMITH. Department of Plant Pathology, University of Kentucky, Lexington, KY, 40546-0091. Molecular transformation of *Fusarium solani* with an antibiotic resistance marker.

Isoflavonoid phytoalexins produced by *Phaseolus vulgaris* following infection are believed to contribute to disease resistance. Further investigations on phytoalexin detoxification by *Fusarium solani* F. sp. phaseoli (FSP), a pathogen of *P. vulgaris*, are critically dependent upon establishing an appropriate fungal transformation system. The wild-type isolate of FSP, upon which the detoxification studies have been largely based, is sensitive to low levels of the aminoglycosides, G418 and hygromycin B. A laboratory variant,
likewise sensitive to these antibiotics, was transformed to G418 resistance. To construct a selectable marker for transformation, the bacterial aminglycoside-3'-phosphotransferase II gene (APH3I) from transposon Tn5 was modified by replacing the bacterial promoter with the strong eukaryotic promoter 

Southern-blot analysis of DNA isolated from independent transformants revealed that plasmid sequences were integrated into fungal DNA in all cases, 12 having a single copy, one having multiple copies tandemly repeated and one having multiple copies in more than one location. The transformants were stable and spores retained the ability to grow in the presence of G418.

Margalith, P., see Ross, I.K., et al.

C. MARBOIS, S. MOUSSEAU, S. MONTPLAISIR and M. PELLETIER, Dept. of Microbiology and Immunology and of Pathology, Université de Montréal. Influence of the beige mutation on the susceptibility of mice to infection by opportunistic yeast pathogens.

The beige mutation, a homologue of the Chediak-Higashi syndrome in man, is characterized by color coat dilution and abnormally large granules in many tissue cells. We investigated the influence of the 


When differences in mean survival time for beige and nonbeige mice were examined, the bg1 mutation in the C57BL/6J strain had a greater impact on survival (CA, 36.5 days; CN, 5.5 days) than the bg1 mutation in the C3H/HeJ strain (CA, 5 days; CN, 1.4 days). The mean survival times of nonbeige C3H/HeJ and C57BL/6J mice infected with CA were markedly apart (13.9 and 55.7 days) as opposed to when infected with CN (19.7 and 22.2 days). C57BL/6 beige-J had significantly higher colony counts per organ and per unit of weight than C57BL/6+/+ littermates. In addition, the granulomatous response to CA was impaired in beige mice; a predominance of polymorphs over mononuclear cells was consistently observed. It is suggested that (1) H-2 and non-H-2 regulatory influences modulate the expression of the beige mutant genes, (2) accrued susceptibility to CN could result from failure to recruit T cells into granulomas (3) innate resistance genes which control host resistance to CA are differentially expressed in mice of C57BL/6 lineages.

Martin, S., see Traquair, J.A., et al.

L.G. MATTTHO, T. GABOIS and L. DE REPENTIGNY, Dept. of Microbiology and Immunology, Univ. of Montreal and Ste-Justine Hospital, Montréal, Quebec, Canada H3T 1C3. Persistence and systemic spread of Candida albicans (CA) and Candida tropicalis (CT) after intragastric inoculation of infant mice.

The infant mouse model was used to compare CA and CT for their ability to persistently colonize the gastrointestinal tract and to invade deep organs in the absence of compromising procedures. Four-day-old CFW mice were inoculated by the intragastric route with 25 ml of two CA and two CT strains isolated from the blood of patients with acute leukemia, and with CA strain 4910 and its cercine-resistant mutant 4910-10. Colonization of the small and large intestine by two CA blood isolates and strains 4910 and 4910-10 was similar over a period of 28 days. However, these four CA strains were found in numbers exceeding those of the two CT strains. CA and CT spread to the lungs, liver and kidneys within 30 min postinoculation, and organ counts of the two species did not differ significantly after 3, 24 and 72 h. Infant mice inoculated with CA blood isolates gained weight less rapidly than controls or mice inoculated with CT. The infant mouse model is useful for the sequential study of persistent intestinal colonization by CA and CT and of factors (intestinal flora, drugs) which may favor dissemination of CT from the digestive tract.

B.J. McAFEE and J.A. FORTIN. Centre de recherches en biologie forestière, Faculté de foresterie et de géodésie, Université Laval, Ste-Foy, Québec, Canada G1K 7P4. Comparative effects of fine soil suspensions on single and mixed ectomycorrhizal inocula for conifer seedlings.

The effects of vegetative inoculum of Laccaria bicolor (Maire) Orton, Pisolithus tinctorius (Pers.) Coker and Couch and Hebeloma cylindrosporum (Kuy. and St. Am.) Quél. with the addition of fine soil suspensions was studied on jack pine and American larch seedlings in control led environmental conditions. Mixed inocula, composed of 1) equal proportion of the above three mycobionts or 2) equal proportion of Laccaria and Hebeloma were also tested.

The single L. bicolor inoculum resulted in a significantly greater mycorrhizal formation on larch seedlings. Untreated pine seedlings showed similar mycorrhizal development with L. bicolor and demixed inocula. On pine seedlings that received a fine soil suspension, L. bicolor formed significantly more mycorrhizae than the other inocula.

The addition of fine soil suspensions, containing biological propagules less than 45µ, enhanced mycorrhizal formation and influenced shoot length and dry wt with some of the tested inocula, depending on the tree species. The competitiveness of the mycobionts in mixed inoculum was also affected by the soil extracts.

That P. tinctorius was not competitive in mixed inoculum was attributed to its slower growth rate under the experimental conditions.

McIntire, M.R., see Dykstra, M. J., et al.

D.F. MCIERNENY and E.L. SCHMIDT. Department of Forest Products, University of Minnesota, St. Paul, MN 55108. Interaction studies between Lentinula edodes and fungal contaminants isolated from shiitake bed logs.

Fungal interaction experiments were conducted on 2% malt extract agar and on autoclaved wooden strips from paper birch (Betula papayfira Marsh.) using dual culture techniques. Three shiitake strains (Lentinula edodes [Berk.] Pegler) were individually paired against two or more isolates of the six most common conifer wood contaminants, Trichoderma sp., Coriolus versicolor, Schizophyllum commune, Stecccherinum ochraceum, Stereum complicatum, and Bjerkandera adusta, collected from a shiitake cultivation project or taken from storage cultures.

Results varied by shiitake strain, fungal isolate, and by substrate, but the two most common interactions noted were either mutual inhibition expressed by a barrage zone or the mycelium of one fungus overgrowing the mycelium of the other fungus. Mycelial coiling was usually evident near the contact zone of
Restriction fragment length polymorphisms as taxonomic characters in the genus *Trichoderma*.

Members of the genus *Trichoderma* have been used for biological control of various soilborne pathogens. Development of improved strains for biological control will require correct identification of the strains used as sources of desirable genetic characters. Identification is complicated by the fact that each species of *Trichoderma* is actually an aggregate of very similar morphs that are not truly members of the same taxonomic species. For example, *T. viride* has been reported to be the anamorph of at least seven species of *Hypocrea*. Clearly this *"T. viride"* morph may actually be at least seven different species. No morphological characters have been identified that can separate the *Trichoderma* species aggregates into groups that correspond to the teleomorphic species. DNA restriction fragment length polymorphisms (RFLPs) will be used in an attempt to resolve the natural groups within the species aggregates. Initial studies have focused on *T. viride* and a close relative, *Gliocladium virens*. Progress thus far includes the isolation of total cellular DNA and mitochondrial DNA DNA samples that are digested with restriction endonucleases produce DNA banding patterns following agarose gel electrophoresis. The variation in the banding patterns among the different strains examined indicates that RFLPs should be useful taxonomic characters in these fungi.

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

* Work supported by the U.S. Department of Energy, Office of Health and Environmental Research, under Contract W-31-109-ENG

R.M. Miller, J.D. JASTROW, and R.D. COOK, Environmental Research Division, Argonne National Laboratory, Argonne, IL 60439. Relationship between root morphology and mycorrhizal fungus colonization in a grassland community. *

Studies of a chronosequence of tallgrass prairie restorations indicate that the information obtained from measurements of the mycorrhizal association based solely on percent colonization and spore numbers are by themselves rather cryptic and qualitative. However, when these measures are used in conjunction with other measures — such as above-ground measures of species composition and biomass, and belowground measures of root biomass, total root length, length of colonized root, and root radius (R_R) — they can be more informative as to the roles played by this association. Measurement of these parameters are necessary because mycorrhizal colonization is an integration of many different growth characteristics of both host and fungus.

We found that mycorrhizal fungus colonization was correlated with the quality of aboveground biomass, where infection was positively associated with composite biomass but not with graminoid biomass. Colonization was also positively correlated with R_R. Similarly, R_R was negatively correlated with total root length and positively correlated with composite biomass. In this system, it appears that the mycorrhizal fungus has a greater affinity for coarser-rooted than finer-rooted plants. These findings support Noye's view of mycorrhizae being associated with root morphology.

S. L. MILLER, C. D. KOO and R. J. MOLINA, Forest Science Department, Oregon State University, Corvallis, Oregon 97331. An oxidative blue-bruising reaction in *Alpova diplapheloeus* + *Alnus rubra* ectomycorrhizas.
Asexual reproduction in the genus Exobasidium has been observed to occur by "budding" of basidiospores, or conidia. The object of this study was to make null mutations of the corresponding genes using reverse genetics. The resulting strains will be examined microscopically to determine the effects on conidiation. Events occurring within mutants will be compared to those described here for a wild-type strain. Data presented here were obtained using both SEM and TEM. Porcine substitution fixation was superior to chemical fixation.

A conidiophore developed as a hyphal branch that grew to a length of about 100 μm and then swelled at its tip to produce a thin-walled, multinucleate vesicle. Metulæ developed synchronously over the vesicle surface. Considerable vesicular activity occurred within developing metulæ. Mature metulæ were uninucleate and about 5 μm long. A septum delimited each metula from the vesicle. Phialide initials developed as small outgrowths at the distal end of a metula. The metula nucleus divided mitotically, with one daughter nucleus entering the phialide. A septum then developed at the base of the phialide. Mature phialides were about 5 μm long and gave rise to chains of uninucleate conidia 3-4 μm in dia.

Molenda, A.R., see Carpenter, S.E., et. al.

Molina, R.J., see Miller, S.L., et. al.

Montplassir, S., see Marquis, G., et. al.

GARETH MORGAN-JONES and JAMBS F. WHITE, JR. Department of Plant Pathology, Auburn University, Alabama 36849 and Department of Botany, University of Texas at Austin, Texas 78713. Pyenidial wall anatomy as a taxonomic criterion in the genus Phoma Sacc.

The bluing reaction of the trama in some boletes is well known to mycologists who study larger Basidiomycetes. The blue coloration results from an enzymatic oxidation of a yellow pigment in the presence of oxygen. Compounds responsible for the bluing have now been largely identified and examination of their distribution among the Basidiomycetes has produced some interesting and baffling evidence for fungal evolution.

Genera of boletes, such as Boletus, Suillus, and Leccinum, and certain genera of hypogeous fungi including Rhizopogon, Truncocolvemella, Gastroboletus, Chamonixia, and Gauteria have been phylogenetically linked together in a "Gastroboletus Series." Evidence for this relationship is derived not only from morphological and ecological similarity, but also from biochemical analysis of pigmentation.

Recently, while characterizing types of ectomycorrhizas in Alnus rubra, an unusual type was encountered that became distinctly blue when bruised. This particular ectomycorrhizal type was composed of thin-walled, whole soil from various ecological habitats. Laboratory syntheses with known isolates of ectomycorrhizal fungi revealed that the blue-bruising ectomycorrhizal type was produced by Alpova diplophloeus. Although A. diplophloeus + Alnus spp. ectomycorrhizas have been described in detail, the bluing reaction has not been previously reported. Observations on the bruising reaction and production of sporocarps by A. diplophloeus are presented. The formation of sclerotia by A. nauseosus + Betula lenta is also discussed.

C.W. MIWS and W. E. TIMBERLAKE. Departments of Plant Pathology and Genetics, University of Georgia, Athens, GA 30602. Ultrastructure of conidiation in Aspergillus nidulans.

This report is part of a project examining the effects of various mutations on conidiation in A. nidulans. In the project cDNA clones corresponding to mRNAs accumulating specifically during conidiophore and conidiium development will be used to make null mutations of the corresponding genes using reverse genetics. The resulting strains will be examined microscopically to determine the effects on conidiation. Events occurring within mutants will be compared to those described here for a wild-type strain. Data presented here were obtained using both SEM and TEM. Porcine substitution fixation was superior to chemical fixation.

A conidiophore developed as a hyphal branch that grew to a length of about 100 μm and then swelled at its tip to produce a thin-walled, multinucleate vesicle. Metulæ developed synchronously over the vesicle surface. Considerable vesicular activity occurred within developing metulæ. Mature metulæ were uninucleate and about 5 μm long. A septum delimited each metula from the vesicle. Phialide initials developed as small outgrowths at the distal end of a metula. The metula nucleus divided mitotically, with one daughter nucleus entering the phialide. A septum then developed at the base of the phialide. Mature phialides were about 5 μm long and gave rise to chains of uninucleate conidia 3-4 μm in dia.

Molenda, A.R., see Carpenter, S.E., et. al.

Molina, R.J., see Miller, S.L., et. al.

Montplassir, S., see Marquis, G., et. al.

GARETH MORGAN-JONES and JAMBS F. WHITE, JR. Department of Plant Pathology, Auburn University, Alabama 36849 and Department of Botany, University of Texas at Austin, Texas 78713. Pyenidial wall anatomy as a taxonomic criterion in the genus Phoma Sacc.

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This report is part of a project examining the effects of various mutations on conidiation in A. nidulans. In the project cDNA clones corresponding
Labyrinthula produces the symptoms of wasting disease in Zostera marina (eelgrass).

Zostera marina (eelgrass) is a widely distributed coastal seagrass which was decimated in the 1930's by an epidemic wasting disease. Although never satisfactorily explained, a species of the marine slime mold, Labyrinthula was one suggested causative agent (Renn, 1936, Biol. Bull. 70:148). Recently, a new outbreak of the wasting disease has been documented in New England (Short et al, 1986, Mar. Ecol. Prog. Ser. 29:89). The symptoms of the disease are blackened, necrotic streaks and patches on the leaves which enlarge and coalesce causing the leaves to detach. The most frequent microorganism that is isolated from diseased leaf tissue is a Labyrinthula similar to L. wittlinii. Healthy eelgrass plants with no visible symptoms of the disease are maintained in sea water aquariums. When individual healthy plants grown at 36 ppt salinity are inoculated with a pure culture of Labyrinthula, originally isolated from diseased leaves, the leaves exhibit the symptomatic blackened streaks of the wasting disease within 24 hours. Koch's postulates are completed by subsequently reisolating the same Labyrinthula from leaves with the induced disease symptoms. Similar isolates of Labyrinthula from New Hampshire, North Carolina and Washington State are able to cause the disease symptoms in healthy plants, but not all isolates of Labyrinthula cause the disease symptoms in these controlled laboratory conditions.

G.M. MUELLER, Dept. of Botany, Field Museum, Chicago, IL, 60605; K.F. LOBUGLIO, CESP, SUNY, Syracuse, NY 13210; P.A. KAISER, Biological Sciences, U. of Illinois at Chicago, Chicago, IL, 60680; F. AMMIRATI, Dept. of Botany, U. of Washington, Seattle, WA 98195.

Morphology of mycorrhizae formed by Laccaria and western N.A. conifers.

Mycorrhizae were synthesized using the growth pouch technique between each of the following fungi (Laccaria amethyste-occidentalis, L. bicolor, L. glabripes, L. laccata, L. proxima) and three species (Pilzis gilbrihne, Pilsner ponderosa, Pseudotusca menziesi). The micromorphology of the mycorrhizae formed by all of the tested Laccaria species with P. ponderosa and P. menziesi was similar. A well defined, 15-25 um thick, tightly interwoven mantle of clamped, undifferentiated hyphae was formed. No cystidia-like elements were observed. All infected short roots had a well developed Hartig net that extended through 70-100 % of the cortex. Attempts at quantifying possible interspecific differences are underway.

Muhain, T., see Booth, T., et. al.

Mullaney, E.J., see Kitch, N.A.

J.T. MULLINS and C. NESMITH, Botany Department, University of Florida, Gainesville, FL 32611.

Morphogenetic patterns in Achlya.

The water mold Achlya and related genera exhibit three major morphogenetic patterns during their life cycle. These are: a strongly polarized mycelial growth; asexual reproduction with zoosporangia or gametangia; and sexual reproduction via antheridial and oogonial formation. A unique pattern of sexual differentiation was described by John Couch (1926) in Dictyuchus as heterothallism. John Raper (1939) deciphered the hormonal coordinating mechanism, utilizing an elegant system of microaquaria. Alma Barkdalea (1960) rekindled interest in the interthallic sexual reactions, and this ultimately resulted in a chemical structure for two hormones. Thus providing many opportunities for the study of underlying mechanisms of hormone action. Interest in the asexual zoosporangia was given new life by David Griffin’s (1966) data on a Ca2+ requirement. Recently some clues have been obtained about the mechanism of sporogenesis and its relationship to vegetative growth and nutrient starvation. The demonstration of an electric current, which enters the apical zone of growing hyphae and exits distally, has added another chapter to the classic problem of apical growth. Understanding the role of a spatial separation of transport processes along the hypha should provide new insight into hyphal morphogenesis.

Munk, K.A., see Samuels, G.J.

Munoiz-Rivas, A.R., see Ulrich, R.C., et. al.

Novotny, C.F., see Ulrich, R.C., et. al.

Olson, L.W., see Pommerelle, J.C.

J. ORMENO-NUNEZ, R. D. REELEDER, and A. K. WATSON. Department of Plant Science, Macdonald College, McGill University, Ste-Anne-de-Bellevue, Que., H9X 1C0.

Phomopsis convolvulus, a new species isolated from field bindweed (Convolvulus arvensis).

Isolates of a Phomopsis recovered from foliage of Convolvulus arvensis possessing
symptoms of a previously undescribed leaf spot were morphologically distinct from other species of Phomopsis. Alpha-conidia were oblong to fusiform-ellipsoid, usually blunt at both ends, with two guttules. Dimensions were: length (10)11-12(15) μm, width 3-4(5) μm, with a length/width ratio of mostly 2.8-3.1. Beta-conidia (17-33 x 0.5-1.5 μm) were found only in culture. Stroma developed as small, superficial masses of aggregated mycelium, later becoming pulvinate, and dark brown to black in color. Stroma's were scattered throughout the colony, seldomly aggregated. Pycnidia were uni-or multiostiolate, usually arising from the stromatic bodies. Leaf spot and anthracnose symptoms were reproduced on inoculated bindweed plants. Other members of the Convolvulaceae also developed leaf spots, although damage was less severe. In most cases, members of other families tested failed to develop symptoms when inoculated. The binomial Phomopsis convolvulus is proposed for this taxon.

Otani, Y., see Lee, J.Y., et. al.

G.B. OUELLETTE1, NICOLE BENAHOUG2 and NATHALIE METHO3
Laurentian Forestry Centre, C.P. 3800, Sainte-Foy, Quebec G1V 4C7, Département de Physiologie, and 3 Former graduate student. Département de biologie, Université Laval, Quebec.

Ultrastructure and cytochemistry of microhyphae produced by Ophiostoma ulmi, the Dutch elm disease pathogen.

Formation of microhyphae in diseased elm has been shown previously at the light microscope level. At the ultrastructural level these microhyphae were observed to be abundant in diseased elm tissues certain years of infection, associated with pronounced host cell wall breakdown, and likely with pathogen spread from preceding to new growth rings.

Development of microhyphae and their penetration into host walls were followed by examining in TEM incubated diseased tissues or inoculated sterilized wood sections at various intervals after beginning of incubation. The lowest diameter of microhyphae observed was 0.15 μm. Treating this material with a number of gold-complexed lectins, enzymes, or antibodies has allowed to visualize better the fungal host wall interfaces and to localize several of both host and pathogen constituents. Thus, by using antibodies that had a high affinity for fungal plasmalemma constituents, and not for the fungal wall such microhyphae in host walls appeared to be devoid of a wall.

Ovrebo, C.L., see Halling, R.E.

Parent, S., see Jabaji-Hare, S.H., et. al.

Park, J., see Te Strake, D., et. al.

Park, P.J., see Lee, J.Y., et. al.

Parke, J.L., see Gilbert, G.S.

S.W. PARKER, L.A. KAPUSTKA, and K.G. WILSON.
Botany Department, Miami University, Oxford, OH. 45065. Restriction map of the mitochondrial genome of Pycnolithus tinctorius.

Pycnolithus tinctorius, an ectomycorrhizal basidiomy-

ete of commercial value in forestry, is a cosmopolitan taxon exhibiting broad morphological, physiological, and ecological variation. We are investigating whether the mitochondrial genome (characterized as to size and restriction patterns) varies among several isolates representative of global environmental extremes. Isolate Pt471 has been used as a model system. Restriction fragments (CfoI, EcoRI, PstI, PvuII, andMspI) sum to 30.71-52.8 kb. Double digest and chromosome walking techniques are being used to generate an unambiguous map of the Pt471 genome. Putative loci for SrRNA, LrFNA, and Cytochrome Oxidase II genes have been established.

Parlier, R.D., see Roeper, R.A.

Parsons, G.L., see Carpenter, S.E., et. al.

Parsons, K.A., see Chunley, F.G., et. al.

Parsons, K.A., see Valant, B., et. al

Pataky, J.K., see Headrick, J.M., et. al.

Pelletier, M., see Marquis, G., et. al.

S. W. PETERSON and C. P. KURTMAN. Northern Regional Research Center, ARS, U.S. Department of Agriculture, Peoria, IL 61604.

Isolation of intact ribosomal RNA from Ascomycetous yeasts.

Intact ribosomal RNA can often be obtained by breakage of cells in the presence of phenol, followed by additional phenol extractions. Some species have been found in which phenol extractions rarely yield intact ribosomal RNA. We have developed a technique for obtaining intact, undegraded RNA from these species. To date this technique has been unacceptably successful. The principal departure of this technique from other methods is the treatment of the cells with reducing agent (5-mercaptoethanol (5-mel)) and chelator (EDTA) prior to cell breakage. The cells are extracted with phenol after mechanical breakage in a Braun homogenizer. Nucleic acids are precipitated from the aqueous phase and dissolved in Tris-NaCl: 8-mel: SDS and digested for 2 hours with protease K, extracted with phenol, precipitated, and dissolved in Dnase I buffer. DNA is digested with RNase-free Dnase I, 5-mel and SDS are added, and the preparation is again digested with protease K at 50 C. Protein is extracted with phenol and the RNA is precipitated with 2 volumes of ethanol. RNA for sequencing can be stored at -20 C in aqueous buffers containing 50-100 ml 8-mercaptoethanol, which is compatible with reverse transcriptase sequencing reactions.

Pitt, J.I., see Klitch, M.A.


Yeast vaginitis is a frequent infection and recurrences are a major problem. For the time being, two principal biotyping schemes for the most frequently isolated yeast, Candida albicans, were developed to determine if the strains found in recurrent cases of vaginitis are similar to those recovered from patients with sporadic infection. Twenty-one biochemical and biological tests based on physiological characteristics, resistance to chemical and antifungal agents, assimilation of hydrocarbons, susceptibility to the killer effect of selected yeasts and
serotyping were adapted from the methods described by Odds, Warrack and Polonelli.

This method seems to have a high level of reproducibility and is easy to perform even with a large number of isolates. With such a high level, it would be possible for us to better understand the physiopathology of this frequent yeast infection.

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

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

J.C. POMERILVE1 and L.W. OLSON2. Department of Biology, Texas A&M University. College Station, TX 77843 and 2 Institute for Sporeplanter, University of Copenhagen, Copenhagen, Denmark.

Negative chemotaxis of motile cells of *Allomyces*

Gametes and zoospores of *Allomyces marcomnus* and *A. arbuscula* were repelled by the monovalent cations H⁺, K⁺, NH₄⁺, and Na⁺. This negative chemotaxis was monitored with a chemotactic bioassay which demonstrated that repulsion occurs no matter what anionic counter-ion is used. The use of a swim-out assay showed that repulsion consisted of a band of zoospores that migrated farther into the microslide. The nature of the repulsion was further examined by determining if there were areas of interaction. Zoospores allowed to adapt to various concentrations of KCl were challenged with 10 mM HCl. These experiments demonstrated that the higher the concentration of KCl with the cells, the less repulsion occurred. In addition, zoospores were incubated in 10 mM of one repellent (i.e., KCl, NH₄Cl, or NaCl) and then challenged with 10 mM of another repellent (i.e., KCl, HCl, or NH₄Cl) to determine if all the sites of interaction are common or different. The results showed that the sites were the same. The repulsion mechanism was further examined by mixing 10 mM KCl and the male attractant sirenin. These experiments showed that in a mixed population of male gametes and zoospores, the male cells were attracted to the source of the sirenin while all the zoospores were repulsed. Thus it appears that the mechanism for attraction is different from repulsion or that the attraction mechanism can overcome the repulsion behavior.

Pontet, J., see Thibaut, M., et al.

Porter, D., see Huselstein, L.K., et al.

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

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

M. J. POWELL, Botany Department, Miami University, Oxford, OH 45056.

Multiporous septa In fungi.

Septa with plasmodesmata or micropores are found in representatives of a variety of fungi including *Chytridiomycetes, Zygomycetes*, and *Hemiascomycetces*. Unlike plasmodesmata of higher plants and algae, these structures appear during centripetal ingrowth of septa instead of cell plate formation. In *Chytridiomycetes* septum formation is not necessarily associated with mitosis. The mechanism of micropore formation, however, is similar in that vesicles carrying wall precursors fuse around endoplasmic reticulum which templates the location of plasmodesmata in septa. Structures resembling desmotubules are found in some plasmodesmata but are not in others. Much is to be resolved of the structure of micropores in fungi, their role in transport, and value as a taxonomic character.

F.J. PUKKILA. Department of Biology and Curriculum in Genetics, U. North Carolina, Chapel Hill, N.C. 27514.

Molecular genetics of *Coprinus cinereus*.

We have exploited the remarkably synchronous meiotic process and favorable cytological properties of *Coprinus cinereus* to isolate and characterize meiotic mutants in this fungus. The rad 3 mutation confers sensitivity to ionizing radiation and blocks chromosome pairing. We developed a method to obtain fruiting bodies that were genetic mosaics, and concluded that the RAD 3 product does not diffuse freely from cell to cell.

The utility of *Coprinus* for molecular analyses of the meiotic process has been greatly enhanced by the simple and efficient DNA-mediated transformation system that we developed. Protoplasts harboring mutations in the structural gene for trytophan synthetase can be stably transformed using the cloned Coprinus gene at a frequency of 1 in 10⁴ viable cells. Several types of events lead to stable transformation, including insertion of the transforming DNA at the homologous locus.

T.C. RAND and N.J. WHITNEY. Department of Biology, University of New Brunswick, Fredericton, New Brunswick, Canada, E3B 6E1. Observations on the ultrastructure of *Ichyhoophonus* sp. from North Western Atlantic yellowtail flounder, *Limanda ferruginea*.

The fine structure of the resting spores and hyphal bodies of *Ichyhoophonus* sp. is described with emphasis on the cell wall. The resting spores and hyphal bodies have cell walls with compact fibrous outer layers in situ, but lack them in vitro, and an amorphous, finely granular inner layer which is closely apposed to an undulating plasmalemma. Small lipid-like bodies and apparently dictyosome-derived membrane-bound vesicles are often associated with the plasmalemma. The paramural endoplasm has a tubular system and numerous membrane-bound vesicles. The rest of the endoplasm contains free ribosomes, large lipid bodies, vesicles containing amorphous material and small lipid bodies. Tubular mitochondria are common. Resting spores and hyphal bodies are coenocytic. The nuclei usually have nucleoli and are associated with their own dictyosomes that are usually directed toward the cell wall. Often in the hyphal bodies, nuclei are associated with their own centrioles. The significance of these and other ultrastructural observations is discussed in relation to the proposed taxonomic affinities of *Ichyhoophonus*.

S.A. REDHEAD, J. GIBBE and R.A. SHEDWATER. Biosystematics Research Centre, Agriculture Canada, Ottawa, Ontario K1A 0C6. The Xerula (Collybia) radicata complex in eastern North America.

Three species, grouped under the name *X. radicata*, have a sympatric distribution. A conspicuous feature of one species is the presence of a distinct orange necrocipment in the hymenium. After about one year in the herbarium specimens have developed a distinct reddish orange and the color persists nearly 50 years. Each species has several macroscopic and microscopic features which are distinctive. The taxonomically important characters are spore size, shape and wall ornamentation, shape of the chelizcostidia and pleurocostidia, and bruising reaction of the fresh basidioma. In addition, *X. radicata* is unique in having the stipe typically furfuraceous, lamellae which secede easily and no odor.
The genus of seven species

Therefore, Antimicrobial activity for

Group Leader,

However, Yeast extract was a better nitrogen source than

The genus Omphalina, typified by

As part of ongoing evolutionary studies in the
genus Agrocybe (Family Bolbitiaceae, Agaricales) the repetitive nuclear sequences encoding the rRNA genes are being surveyed for their potential as phylogenetically informative data sources. Preliminary data from this research will be presented and will include a description of the molecular cloning of the rDNA repeat from A. pediades (Fr.) Fayod and its restriction site and genetic map. These data will be compared to restriction site maps of A. retigera Spegazzini and A. setulosa Moreno & Barrass, which are closely related species, and to published rDNA restriction maps of other basidiomycetes. The extent and localization of restriction site differences among these taxa also will be discussed.

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S.A. REHNER and J.F. AMMIRATI. Department of Botany, University of Washington, Seattle, WA 98195

DNA variation in Agrocybe, sect. Pediiadeae

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S.A. REHNER and J.F. AMMIRATI. Department of Botany, University of Washington, Seattle, WA 98195

Biological speciation and character variation in

Agrocybe, section Pediiadeae

Agrocybe pediades (Fr.) Fayod, sect. Pediiadeae

Fayod, is a cosmopolitan species that exhibits considerable variability in its macro morphology, cystidial characteristics, basidiospore size and number of sterigmata per basidium. Interfertility studies were undertaken to assess the limits of variation in these characters among potentially interbreeding isolates or biological species. Intra-isolate matings reveal a pattern of sexual compatibility consistent with a bipolar heterothallic mating system. Of approximately 150 isolates surveyed, inter-isolate matings demonstrate the existence of one bisporic and two tetrasporic intersterility groups. Data concerning character variation within and between intersterility groups will be presented and discussed. Summary remarks will be made concerning the usefulness and limitations of applying biological species concepts in the analysis of taxonomic entities and characters.

Reid, C.P.P., see Szamszlo, P.D., et. al.

J.D. REID. Biotechnology Research Institute, National Research Council, 6100 Ave. Royalmount, Montréal, Qué. H4P 2R2. Early events in lignin degradation by Phlebia tremellosus.

White-rot fungi, such as Phlebia tremellosus, can degrade polymeric lignin all the way to CO₂. Little is known about the early steps in lignin degradation, or about the enzymes that are released from the lignin polymer and taken up by the hyphae. These early steps, and the enzymes that catalyse them, are of biotechnological interest because they may allow controlled modification of polymeric lignin.

The products of ¹⁴C-lignin metabolism by P. tremellosus for periods up to 17 days were separated into water-soluble, dioxane-soluble, alkali-soluble, and mycelium-bound fractions, and the molecular weight distributions of the soluble fractions were determined. The dioxane-soluble fraction disappeared gradually. Alkali-soluble and mycelium-bound radioactive materials were formed within the first few days. Little low molecular weight, water-soluble radioactivity could be detected. Yeast extract was a better nitrogen source than glutamate for lignin modification. Lignin degradation proceeded better in shaking cultures than in static cultures. Detergent (Tweens 80) had little effect.


Quaternary ammonium compounds are used as equipment sanitizers prior to cosmetic or pharmaceutical product manufacturing and as preservatives in cosmetic and pharmaceutical products. One of the most widely used as a preservative agent is Quaternium-15 (trade name: DOWICIL 200). Antimicrobial activity for these materials has been assumed to be primarily the result of cytolytic damage and resultant loss of cytosolic integrity.

During a Minimum Biocidal Concentration test the observation was made that at the Quaternium-15 concentration just below the biocidal concentration, Candida albicans continued to form buds. However, the buds did not separate from the mother cells. This resulted in large cell clusters. Therefore, the resultant "plate counts" were actually deceptive and inaccurate as an index of true cell death.

This observation has been confirmed using light microscopy, Scanning Electron Microscopy and Transmission Electron Microscopy. The phenomenon
is concentration dependent. No effect is observed at 500ppm Quaternium-15. At 1000ppm and 1500ppm the effect is pronounced. 2000ppm is biocidal.

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

M. G. RITCHIE, G. H. CHOI, C. L. SCHRDL, and D. A. SMITH. Department of Plant Pathology, University of Kentucky, Lexington, KY. 40546-0091, U.S.A. Investigations on the gene encoding kievitone hydatrase in Fusarium solani f. sp. phaseoli.

Fusarium solani f. sp. phaseoli (Fsp) strain FB1-S is a pathogen of French bean, Phaselus vulgaris. This fungus produces an extracellular enzyme, kievitone hydatrase (KHas), which metabolizes and consequently detoxifies a major bean phytoalexin, kievitone. This enzyme can be induced in F1-S cultures by isoflavonoid treatment. It is thought that this enzyme is associated with Fsp's pathogenicity on bean. Efforts are currently underway to isolate the gene coding for KHas in FB1-S. A genomic clone bank of FB1-S was constructed in the cosmld pBZ2. Restriction digest of cosmld DNA from 12 randomly selected ampicillin-resistant bacterial colonies indicated that each cosmld contained a different insert. The average size of an insert was estimated to be 30-40 kilo-base pairs. In order to have a 0.98 probability of having a particular sequence in the cosmld bank, 3,000 clones needed to be screened. The bank of FB1-S that was constructed contained 12,000 clones. Induction-specific FB1-S cDNA sequences were used to screen the genomic bank. A preliminary screening employed a cDNA hybridization system. Putative clones of isoflavonoid-induced genes will be introduced into Aspergillus nidulans, and transformants will be screened for production of KHas. Cloned genes identified in this manner will be studied with regard to their regulation and their roles in fungal virulence.

D.L. RICHTER and J.N. BRUHN. School of Forestry and Wood Products, Michigan Technological University, Houghton, MI 49931. Scleroderma spp. have potential value to northern Lake States forest industries as mycobionts for improved seedling establishment on harsh inoculum of Populus and Quercus for synthesized in pure culture with resinosa =, their roles in fungal virulence. The ectomycorrhizal gasteromycete genus Scleroderma be introduced into Aspergillus nidulans, and transformants will be screened for production of KHas. Cloned genes identified in this manner will be studied with regard to their regulation and their roles in fungal virulence.

The ectomycorrhizal gasteromycete genus Scleroderma appears to be suitable for use in both greenhouse and nursery production of conifer seedlings in the northern Lake States. Among the Scleroderma spp. we have collected across the northern Lake States, S. cepa, S. macrorrhizon and S. polyrhizus were found on sandy, xeric sites; S. citrinum and S. verrucosum were found on mesic to xeric sites. Associated forest tree genera were: Pinus and Tsuga for S. citrinum; Betula; Picea, Populus and Quercus for S. cepa and S. polyrhizus; and Betula, Picea, Pinus, Populus and Quercus for S. macrorrhizon and S. verrucosum. Pinus resinosa mycorrhizae have been synthesized in pure culture with S. cepa, S. citrinum, S. macrorrhizon and S. polyrhizus. To date, successful greenhouse inoculations of P. resinosa have been conducted with vegetative inoculum of S. citrinum, S. macrorrhizon and S. verrucosum. Results suggest that several Scleroderma spp. have potential value to the northern Lake States forest industries as mycobionts for improved seedling establishment on harsh outplanting sites. Nursery trials using basidioboles of S. citrinum and S. macrorrhizon to inoculate P. resinosa and P. banksiana are underway.

P.H.J. RIKENBERG and M.D. COFFEY. Plant Pathology Department, University of Natal, Pietermaritzburg, R.S.A. and Plant Pathology Department, University of California, Riverside, C.A. 92521, respectively. Early stages of tobacco root infection by Phytophthora parasitica var. nicotianae.

Roots of seedlings of tobacco line 46-8, after inoculation with a zoospore suspension of virulent race 1 were fixed, dehydrated and embedded in E.M. bed 812 resin. Semithin and ultrathin sections were prepared, stained and examined.

One hour after inoculation many zoospores had encysted germinated and penetrated. The encysted zoospore contains a nucleolus nucleus, finger print vacuoles with dense inclusions, dictyosomes, lipid droplets, mitochondria, ER, centrioles and microbodies. Where the cyst touches the host, many vesicles are formed in the cytoplasm, marking the site of germ tube emergence. During germination the dense contents of the fingerprint vacuoles become more diffuse. No appressorium is formed. Germ tube penetration of anticoll wall is much more common than direct penetration. A septum cuts off the penetrating hypha from the cyst remnants.

Penetration of a host cell is usually subterminal to the hypal apex. At the point of incipient penetration, vesicles of the type seen in the germ tube are present, as are one or two lamosome-like structures. In the fungal cytoplasma at this point there is considerable proliferation of rough ER and dictyosomes. Hautoria are anucleate, where they develop into transcellular hyphae. A nucleus usually lies in the intercellular hypha where it subtends a haustorium.


In July 1985, a patient was diagnosed with acute non-lymphocytic leukemia (ANLL). Induction therapy with ara-C and daunorubicin was attempted. There was relapse of ANLL in spite of repeat induction therapy. Stormy hospital course continued until November 1986. Patient developed multiple erythematous macules with necrotic centers up to 3 cm in diameter on all body surfaces. Biopsy revealed embolization of vasculature by a septate mycelial fungus. Fusarium oxysporum was cultured. Septicemia with Candida albicans and J.K. diptheroids was also present. At autopsy multiple myotic lesions were noted in lungs, spleen, kidney, brain and liver.

Since 1948, twenty-five disseminated Fusarium infections have been noted; about twenty of these since 1980. The predisposing factors, sites of infections, species involved and treatment results are reviewed.

Rizzo, D.M., see Harrington, T.C., et al. Roberson, R., see Fuller, M.S. Roberson, R.W., see Cason, K.M.T., et al.

M. ROBISON and P.A. Morgen, Dept. of Botany, University of Toronto, Erindale Campus, Mississauga, Ont. L5L 1C6.

DNA sequence analysis of pEM, a mitochondrial plasmid in Agaricus bitorquis, and homologous genomic sequences in Agaricus brunnescens.

A 7.4 kb linear plasmid (pEM) associated with the mitochondria of a few strains of the wild field mushroom, Agaricus bitorquis, has been isolated and previously partially characterized by our group.
Three Eco RI fragments constituting most of the interior length of the plasmid have been cloned into the bacterial vector pUC 18. Regions of strong homology were revealed in the total DNA of both non-plasmid-containing *A. bitorquis* strains and strains of the commercial mushroom, *A. brunneescens*, when two of the pEH fragments were used as probes in Southern hybridizations. DNA sequences for both the 2.1 kb region of the plasmid and homologous regions of the *A. brunneescens* genome were determined using the dideoxy method of Sanger. Evolutionary relationships both within species (*A. bitorquis*) and between species (*A. brunneescens*) can be examined further by looking at degrees of DNA sequence homology to pEM.

R.A. ROFFER and R.D. PARLIER. Department of Biology, Alma College, Alma, MI 48801.

The mutualistic fungi associated with the pitted ambrosia beetle, *Corhybus punctatissimus* (Coleoptera: Scolytidae).

*Ambrosiella xylobori* Brader ex vonArx & Henneb. and an undetermined yeast with hat-shaped ascospores were isolated from the mycangia and larval niches of *C. punctatissimus* infesting maple saplings. The mycangia were filled with a pair of tubular structures about four millimeters in length within the prothorax of males. Mycangia were carefully dissected and divided in small sections. Portions of a mycangium were streaked and spotted on dilute malt agar, yeast extract-malt agar and potato dextrose agar. Mycangial isolations from overwintering beetles were dominated by the yeast and rarely yielded *A. xylobori*. Upon the onset of the beetle's emergence from parental galleries and infestation of new host saplings in late June, *A. xylobori* dominated the mycangial isolates. The data suggests a change within the mycangia caused the proliferation of *A. xylobori*. The yeast once again was the principle isolate taken from the mycangia following the construction of the gallery by the male beetles. Both fungi could be isolated from the walls of niches in the presence of feeding larvae, but *A. xylobori* was far more evident. The fungi formed only small patches of growth on the walls of the niche as the progeny adult beetles developed. Need fungi were only rarely observed or isolated in niches of inactive and hibernating progeny adult beetles.

Rogers, A.L., see Babel, D.E., et. al.

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

Rogers, A.L., see Kennedy, M.J., et. al.

Rogers, A.L., see Sandin, R.S.

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

Rogers, J.D., see Wilson, A.D.

Romano, M.A., see Gesnner, R.V., et. al.

I.K. ROSS, H.T. CHOI, R.L. WILKS, P. MARGLITH and F. ARRAZADEH. Department of Biological Sciences, University of California, Santa Barbara, CA 93106.

Preliminary studies on the phenoloxidase complex of *Coprinus*.

Many higher fungi synthesize tyrosinases, laccases and catechol oxidases, enzymes generally grouped as phenoloxidases if their actual specificity is not clearly known. In the Agaricales, phenoloxidases are produced as both extracellular and cell associated enzymes. Often different phenoloxidases are produced by the same species in different developmental stages and many varieties of phenoloxidases are produced among different species. With few exceptions, the roles and functions of these enzymes are not known and the reasons for the plethora of such enzymes produced by these fungi are not understood. We have been studying developmental regulation in 4 species of *Coprinus* and have found that these species also produce a large variety of phenoloxidases that differ in isozymic pattern, time of appearance, physiological regulation, and probable function. Intra-species variation is common and homokaryons derived from wild dikaryons display many different isozyme patterns. The developmental regulation of some and the physiological regulation of others suggests that these enzymes play important roles in the differentiation, growth, and behavior of these fungi. Mutational analysis of phenoloxidase deficient strains indicates that these enzymes are themselves modified by mutationally labile post-translation modifying enzymes that also affect, in wild type strains, nuclear migration and apORIZATION.

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

Rowan, D., see Siegel, M., et. al.


Polyphagus euglenae Nowakowski, an epiparasite of Euglena species, produces an elongate sporangium from a spherical single nucleate prosporangium. Because certain ultrastructural features of *P. euglenae* zoosporae resemble those of zoosporae of *Monoblepharella* sp. Sparrow, a member of another order, this genus may represent a link between the Chytridiales and Monoblepharidales. The purpose of this study is to identify additional ultrastructural characters which, by positive or negative correlation, may support or question this proposed phylogenetic relationship. Fine structures of septa and the mitotic apparatus were examined. In addition the sequence of events in rhizoplast formation, microbody-lipid globule complex organization and zoospore cleavage were studied. The significance of comparative ultrastructure for systematic analysis will be discussed.

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

JULIE SAMSON and J. A. FORTIN. Centre de Recherche en Biologie Forestière, Faculté de Foresterie, Université Laval, Québec, Canada G1K 7P4. Morphological and structural characterization of synthesized ectomycorrhizae of *Fuscoberolus* and *Suillus* species.

Structural and morphological characteristics of ectomycorrhizae formed on *Larix laricina*, are presented for *Fuscoberolus aruginascens*, *F. glandulosus*, *F. ochraceoroseus*, *F. paluster*, *F. spectabilis*, *Suillus caepes*, and *S. grevillei*. The results confirm that some ectomycorrhizal fungi can be clearly identified by the means of ectomycorrhizal structures. Ectomycorrhizal characterization permits the division of these bolete spp. in two major groups, differentiated primarily by their extramatrical phase, and the form, texture and type of tissue of the fungal components of the ectomycorrhizae. This division based on the ectomycorrhizal structures disagrees somehow with the usual taxonomic classification of the *Fuscoberolus* and *Suillus* spp. The study reveals the importance of the extramatrical phase in the ectomycorrhizal characterization, and demonstrates the structural similarity that exists between the ectomycorrhiza and its corresponding mycelial strands.

G.J. SAMUELS and K.A. MUNK*. * The New York Botanical Garden, Bronx, N.Y. 10458; Computer Department, P.O.
Isolation of fungi from guts and faeces of grasshoppers of eastern, equatorial rain forests.

In southeastern Malaysia and Indonesia several grasshopper species were collected in, and along the edges of rain forest. Feeding habits of the grasshoppers were observed; general diet composition was determined by faecal and gut analysis, and categorized into gross plant types. Grasshoppers found in clearings within the forest and in more open habitats surrounded by forest feed mainly on monocots. Forest-associated species, either living along the edges of, or within forest, select both monocots and dicots. Gut contents and faecal pellets were macerated and plated-out on agar media. Although no fungi grew out of most samples, fungi were recovered from many. There were neither qualitative nor quantitative differences between fungi recovered from the two types of grasshoppers. The fungi that were isolated could be broadly classified as 'folicious'. Some may be endophytes (e.g. Nodulisporium, Geniculosporium); others are possibly plant pathogens (e.g. Colletotrichum, Pestalotiopsis); others may be toxigonic (e.g. Fusarium, Penicillium).

Because of the relatively low number of samples that yielded fungi, we do not believe that the grasshoppers were attracted to fungi as food. At the very least, though, grasshoppers can distribute fungi within rain forests. These fungi may be endophytes, litter degraders, plant parasites or toxin producers and therefore significant in the forest ecosystem.


The influence of varying the mucosal cell's anatomical site of origin, cell donor and date of collection on adhesion of Candida albicans to human epithelial cells was examined with an in vitro adherence assay. Cellular characteristics that might influence adhesion were evaluated microscopically. Adherence varied significantly using buccal cells from different subjects or collected on different dates but sex of the donor did not influence adhesion significantly, adhesion to buccal cells was highest, lowest using urinary tract cells, while vaginal epithelium was intermediate.

Individual mucosal cells vary significantly in size and in number of yeast adhered. Mucosal cell surface area is not a key determine of adhesion but viability status is. Cells of intermediate size (36-70 μm) and non-viable cells adhered more yeasts per cell than live cells or those of any other size. Very large mucosal cells manifest the lowest per cell adherence. Subpopulations of highly and lowly adhesive mucosal cells were identified. A minority (12%) of mucosal cells adheres more than one half of all the yeasts, whereas a majority (88%) of buccal cells adhere zero or very few yeasts. In subjects who manifest large adherence values this minority increases, whereas there is a large drop in the number of buccal cells that adhere zero yeasts.

Schardl, C.L., see Choi, G.H., et. al.
Schardl, C.L., see Marek, E.T., et. al.
Schardl, C.L., see Richey, M.G., et. al.


Neurospora crassa, like other fungi, drives an electric current through itself, such that positive charges enter the apical zone and exit distally. Calcium ions apparently contribute to this current and may function as signals in tip formation. Two lines of evidence support the idea that an intracellular [Ca2+] gradient, created by local apical Ca2+ influx, may be involved in the regulation of apical extension in Neurospora.

Calcium is required for hyphal extension. If the calcium concentration in the medium is lowered below 1 μM by EGTA, extension is severely inhibited. The increase of biomass, on the other hand, is only slightly affected. The cells become bulbous and increase in diameter, rather than in length. Reagents thought to block Ca2+ channels have similar effects, suggesting that Ca2+ must enter the cells to support extension.

Intracellular calcium ions can be visualized by chlorotetracycline (CTC) fluorescence. Fluorescent granules are distributed in the form of an apical gradient with maximal fluorescence about 6 μm behind the tip. The gradient is seen only in growing hyphae. It is dissipated when growth is stopped by various treatments, including azide and cycloheximide, in low extracellular calcium and upon addition of the calcium ionophore A23187.

Schmid, E.L., see McInerney, D.F.
Schowalter, T.D., see Carpenter, S.E., et. al.
W.I.A. SCHEFFERS, R.L. HAROLD and F.M. HAROLD, Department of Molecular and Cellular Biology, National Jewish Center, Denver, CO 80206. Signals for chemotropism and branching in Achlya bisexualis: are they related?

Amino acids are important sources of nitrogen and sulfur for Achlya bisexualis. They are normally required for extension of the tip, enhance the frequency of branching, and elicit chemotropic growth. We are examining these phenomena in order to gain insight into polarized hyphal growth.

Among the compounds that allow hyphae to extend are several non-metabolizable analogs including methionine sulfone and α-methioninobutyric acid. These supply neither nitrogen nor sulfur, but seem to constitute a kind of signal. Remarkably, individual hyphae grew chemotropically towards capillaries filled with solutions of these compounds, and they also enhanced branching when added to hyphae growing in a lean medium. In general, substances that did not allow extension also did not elicit branching or chemotropic growth.

The close correspondence between the effects of different compounds suggests an underlying mechanism common to tip extension, chemotropism, and the localization of the site of branching. It is tempting to suggest that the mechanism controlling these three apparently different phenomena involves localization of the site of exocytosis of precursor vesicles.

Schulz, R.W., see Gessner, R.V., et. al.
Seligy, V.L., see Dowhanick, T.M., et. al.
The dolipore/parenthesome septum or septal pore apparatus has been described by R.T. Moore as the "hallmark" of the Homobasidiomycetes and, as such, has attracted a great deal of attention. Rarely have so many features of potential taxonomic and other importance been found within such a small entity in the fungi. An overview will be presented on the occurrence of the dolipore septum in holobasidial fungi and essential information on the basic nature of this septum complex will be reviewed. Some emphasis will be placed on the morphological changes of the dolipore as they relate to various fixation methods viz. KMnO₄, acrolein, glu-De₄₀, and freeze substitution.

T.C. Sewall and J.C. Pomerillie. Dept. of Biology, Texas A&M University, College Station, TX 77843. Biochemical characterization of the endomembrane system of Holomyces.

Holomyces macrognynus lacks a typical Golgi complex (GC) composed of stacked cisternae although certain individual smooth cisternae in vegetative hyphae are cytochemically stained for the GC-specific enzyme, thionine pyrophosphatase. Treatment of A. macrognynus gametangia during gametogenesis with monensin, an ionophore which selectively affects trans GC cisternae, disrupts cytoplasmic cleavage resulting in the release of multinucleate gametes. To further characterize GC function in A. macrognynus, subcellular components of vegetative hyphae (gametothalli), gametangia, and gametes were separated by ultracentrifugation on linear sucrose density gradients. Sequential fractions were assayed for enzymatic markers of mitochondria, endoplasmic reticulum (ER), and GC cisternae and also characterized by transmission electron microscopy. The peak activity of GC markers coincides with microsome fractions of densities similar to those reported for GC cisternae but distinctly different from the fractions containing ER and mitochondria. Because the GC is responsible for late stages of glycoprotein modification, proteins from these fractions were separated by polyacrylamide gel electrophoresis, transferred to nitrocellulose, and stained for glycoproteins. Several bands were stained in all membrane fractions indicating that A. macrognynus has glycoproteins which can be isolated from different portions of the endomembrane system to analyze their stages of carbohydrate modification.

Shah, M., see Franek, K., et. al.

N.J.H. SHARP. School of Veterinary Medicine, North Carolina State University, Raleigh, N.C. 27695; N. SULLIVAN, Glasgow Veterinary School, Scotland; C.E. HARVEY, Veterinary Hospital of the University of Pennsylvania; T. WAMB, Veterinary Hospital, Liverpool University, England. Treatment of canine nasal aspergillosis.

Existing medical or surgical therapy for canine nasal aspergillosis is disappointing. The aim of this study was to evaluate the imidazole compounds ketoconazole, fluconazole, and enilconazole for treatment of this condition. For each drug, the same standard protocol was used. To enter the study, each case had to satisfy certain criteria. Clinical signs were graded 1 to 4. A grade of between 2 and 4, radiologic and rhinoscopic features of aspergillosis and positive culture and serological findings were required for entry. Treatment consisted of oral ketoconazole at 10 mg/kg for six to ten weeks. Oral fluconazole at 2.5-5.0 mg/kg for eight weeks, or topical enilconazole at 15-20 mg/kg for one to two weeks.

Following treatment, reevaluation using the previous criteria was performed. A clinical grade of 1, no progression of radiologic signs, and negative rhinoscopic and culture findings, together with a minimum follow-up period of six months were necessary for classification as cured. Of 15 dogs treated with ketoconazole, 7 were cured. Of seven dogs treated with fluconazole, five were cured. Of 15 dogs treated with enilconazole, 14 were cured. Topical enilconazole is the treatment of choice for canine nasal aspergillosis.

Shearer, C.A., see Zare-Maivan, H.

Shemachuk, J.A., see Whitsler, H.C.

Shoemaker, R.A., see Redhead, S.A., et. al.

Short, F.T., see Muhlestein, L.K., et. al.

R.V. SHUKLA. Department of Botany C.M.D. College Bilaspur, M.P. INDIA 495 001. Thermophilic fungi: Lignin and cellulose degradation.

During course of studies on Thermophilic fungi some of the new fungi Perguaspapulosa Sp. (from forest litter) Chrysosporium ampulliformis Sp. Nov. (from decomposing jute fibres) Scytalidium alabense Sp. Nov. (from leaf litter) obtained from different habitats were tested for their ability to degrade lignin and cellulose substances in-vitro. Native cellulosic materials like cotton fibres, filter paper, jute and cloth were used to assess the capability of test fungi to degrade cellulosic. All 3 fungi tested were found to possess good cellulytic properties. Lignin like substances i.e. p-hydroxybenzaldehyde, fenolic acid and vanillin were used in the medium to study the lignin utilization. Except S. alabense other above two fungi showed good vegetative growth indicating wood deteriorating capabilities. Some interesting observations were also made in connection with luxurient mycelial growth of Cynamus sepedon on bamboo chips and Penicillium citrinum mutant alba Mut. Nov. on agar medium containing .01% vanillin.

R.V. SHUKLA. Department of Botany C.M.D. College Bilaspur, M.P. INDIA 495 001. Thermophilic/ Thermotolerant fungi and Actinomycetes from India.

Thermophilic fungi are inhabiting such habitats where temperature remains most of the time higher. Present report is a part of an extensive survey of Thermophilic fungi from the above nature of habitats in India. During survey 45 species belonging to 23 genera were recorded from different habitats i.e. bird's nests, compost, soil, storages and veterinary feeds. Achatomium Sp. Acramenium saugarensis Sp. Nov. Cladosporium oxyxyporum, Humicola stellata Penicillium citrinum mutant alba Mut. Nov. P. sorghina and Scytalidium thermophilum Var. P. thermophilum var. Nov. showing thermophilic tendency recorded Thermotolerant. Whereas, Absidia Sp. Porga- Papulosa Sp. Chaetomium Sp. Chrysosporium ampulliformis Sp. Nov. Scytalidium alabensem Sp. Nov. and Thielavia Sp. are thermo-philic fungi. In addition to many above new fungi: stellata pathogenic to animal due to hardened
angular spores is a new record for Indian mycoflora. An antagonistic thermophilic actinomycete Streptomyces sp. isolated from geothermal coal mine soil of central India showed significant inhibitory effect against the mycelial growth of some thermophilic fungi and mesophilic keratinophilic fungi eg. Chrysosporium tropicum Nannizzia gyipseum (+) N. gyroceum (-) Trichophyton equinum.

Shumard, D.S., see Hase, D.J.

W. STROBEL, H. PANNIN, L. BUSH, and D. ROWAN. Department of Plant Pathology, University of Kentucky, Lexington, KY 40546-0091. Synthesis of peramine and loline alkaloids in fungal endophyte-infected grasses.

Fungal endophyte-infected grasses produce chemicals which are beneficial for the plants' growth and survival. Two such chemicals, peramine and loline alkaloids, have insecticidal properties. The synthesis of these compounds in infected grasses was determined by chemical analysis and antibiotic assays using Rhopalosiphum padi and Schizaphis graminum aphids. Festuca and Lolium species of grasses were naturally or artificially infected with Acremonium coenophialum, A. lollii, or Epichloe typhina. Loline alkaloids, which are of plant origin, were synthesized in A. coenophialum-infected Festuca arundinacea (tall fescue - host) and Lolium perene (perennial ryegrass - non-host). Peramine, which is of fungal origin, was synthesized in A. coenophialum, E. typhina or A. lollii-infected perennial ryegrass (host) and tall fescue (non-host). Epichloe typhina-infected F. longifolia (hard fescue-host) produced neither alkaloid, while E. typhina-infected F. rubra sub sp. commutata (Chevings fescue-host) produced only peramine. The highest concentration of specific alkaloids was always associated with the naturally infected host grasses. The kind and amount of alkaloid synthesis appears to be dependent upon specific combinations of species of grass and species or isolate of the endophyte.


Scytalidium, characterized by schizolytically-dehiscent demaeteous arthroconidia, accommodates fourteen species of importance to forestry, medicine and biotechnology. S. acidophilum, which grows under acidic conditions (pH 4.3-6.9) is inhibitory to most microorganisms, has been investigated for production of single cell protein from whey and pulp mill waste products. S. ureidinica, a hyperparasite of the rusts Cronartium fusiforme and Endocronartium harknessii, and S. lonicola, which grows on wood and wood products of pine, spruce and birch, have potential as biocontrol agents. However, the potential application of S. lonicola as a biocontrol agent may be restricted by a recent report of its pathogenicity for humans. Several species have been linked to human or animal infection. The Scytalidium genomes of Hendersonia, Epichloe and two Endocronartium species, a plant pathogen, and S. scytalidum are agents of dermatomycosis in humans. S. japonicus was obtained from cattle with fungal bronchiolitis, and S. lonicola was recently identified as the etiologic agent of subcutaneous pheohyphomycosis. In recent years, the genus Scytalidium has become diverse because the characters on which the species are based are not comparable. This discussion will consider some of the problems in the circumscription of the genus with particular reference to the pathogenic species.

Silver, J.C., see Armavil, V.N.

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

Julie C. Silver, Shelley A. Brunt and Vigen Armavil. Microbiology Department and Division of Life Sciences University of Toronto, Scarborough, Ontario, Canada M1C 1A4. Discrimination of transcriptional and post-transcriptional changes induced by antheridiol or heat shock in Achlya.

Of primary interest in our laboratory are the changes in gene expression which occur in response to physiological stimuli such as steroid hormone and heat shock in Achlya ambisexualis. We have used in vitro translation to investigate whether the numerous changes induced by each of these stimuli result from alterations at the transcriptional or post-transcriptional level. The results of these studies indicate that the changes in the synthesis of many but not all heat shock and hormone-induced proteins results from the altered synthesis and/or accumulation of translatable mRNA. However, notable exceptions exist. For example, the Achlya 96KD heat shock protein is not present in the in vitro translation products of RNA from heat shocked cells. Conversely, mRNAs encoding proteins normally seen in control cells are present during heat shock and maintain their capacity to be translated in vitro but not in vivo. The in-vitro translation studies indicate also that the shift in pI of Achlya actin seen in vivo in heat shocked-cells, is due to post-translational modification. Finally, results of both in-vivo and in-vitro translation studies suggest that certain Achlya proteins can be independently regulated by heat shock and by the steroid hormone antheridiol.

(Supported by NSERC)


My laboratory has investigated several aspects of the molecular and cell biology of the interesting insect parasite Entomophaga. Chromatin in Entomophaga aulicae was found to have a nucleosomal DNA repeat size (200bp) and a histone H1 complement similar to that of animals but quite different than that of the comycete Achlya, another organism studied in my laboratory, or of the ascomycete Saccharomyces. The histone H1 proteins from E. aulicae E. grylii and Massospora were similar but not identical to one another. Unlike DNA in Saccharomyces, the DNA of E. aulicae was found to be highly methylated (10% 5 mc). At least part of this methylation was in CCGG sequences as in many higher eukaryotes. Preparations of nuclear matrix proteins from E. aulicae crossreacted with monoclonal antibodies prepared against similar preparations from mammalian lymphocytes, suggesting an evolutionary conservation of these proteins. The response of E. aulicae protoplasts to physiological stress such as heat-shock, has also been investigated. Heat-shock proteins induced in E. aulicae are similar to the stress proteins of Achlya and other cell types. At least one group of E. aulicae heat-shock proteins becomes
associated with the nuclear matrix
(Supported by NSERC Canada).

Slack, S., see MacFall, J.S., et al.

Smith, D.A., see Choi, C.H., et al.

Smith, D.A., see Marek, E.T., et al.

Smith, D.A., see Daoxin, L.

Smith, D.A., see Richey, M.C., et al.

M.L. SMITH and J.B. ANDERSON. Dept. of Botany, Erindale College, University of Toronto, Mississauga, Ontario, Canada, L5L 1C6.

Studies on mitochondrial DNAs from North American biological species of Armillaria.

The root pathogen, Armillaria mellea (broad sense) is comprised of several reproducibly isolated groups or biological species in North America. This study examined variation in mitochondrial DNA restriction fragments within and between these groups. Mitochondrial DNA from one isolate was separated from nuclear DNA by bisbenzimide-CsCl, buoyant-density ultracentrifugation. The mitochondrial DNA was first used as a probe in Southern hybridizations with EcoRI, BamHI and HindIII digested whole-cell DNAs from 16 isolates of 8 biological species. As was reported last year for EcoRI, the pattern fragments for BamHI and HindIII digested mitochondrial DNAs are similar, although not identical, within the groups, and highly divergent between groups. The mitochondrial DNA was then used to screen a whole-cell DNA library constructed in the bacteriophage Lambda vector EMBL3. Current work is concentrated on utilizing the cloned mitochondrial fragments to identify homologous sequences and quantify variation among and between the biological species.

Specht, C.A., see Ullrich, R.C., et al.


Allozyme analysis of the genus Trichoderma.

The taxonomy of the genus Trichoderma is based on morphological features. In this study, a molecular approach based on allozyme analysis was used. Seventy-three strains from diverse geographic sources and representing five Trichoderma and one Gliocladium spp. were included. Sixteen enzyme loci were assayed by horizontal starch gel electrophoresis. All phenotypes consisted of single allozymes indicating that all strains were homoygous and presumably were homokaryotic and haploid. Numerous alleles were detected among strains for each locus but none characterized species. Because strains were monomorphic for each locus, phylogenetic analysis using parasimony (PAUP) could be used. Analysis of 118 alleles at the 16 loci resulted in at least 20 equally parsimonious, shortest cladograms. In a strict consensus tree derived from these and rooted in G. virens as an outgroup, there appeared to be three major groups of Trichoderma. The majority of strains of T. harzianum and T. pseudokoningii formed one group. A second group contained the majority of T. hamatum strains. A third group contained all T. viride strains and some strains of T. hamatum, T. harzianum, and T. pseudokoningii. T. hamatum and T. harzianum appeared to be more problematic and heterogeneous than the other species studied. Lack of isozymic discreteness of established species could be due to heterogeneity within species but could also be due to hybridization among species.

Stewart, G. C., see Dowhanick, T.M., et al.


Effect of Balansia cyperi on purple nutsedge and its herbivores.

Some clavicipitaceous fungi occur as systemic infections in grasses. These fungi have been linked to toxicoses of herbivorous mammals. It has been suggested that infection may increase host vigor. Balansia cyperi Edg. recently has been discovered on Cyperus rotundus L. (purple nutsedge, PNS). Balansia cyperi is a systemic infection in Cyperus spp. However, in C. rotundus the fungus only causes a superficial infection of meristematic tissue. In this study field-collected tubers of PNS infected with B. cyperi were smaller than uninfected tubers, but produced higher tiller numbers, lower inflorescence numbers, and more tubers and basal bulbs per pot compared to uninfected PNS. Feeding studies were conducted with the fall army worm (Spodoptera frugiperda (J.E. Smith), FAW) which feeds naturally on PNS. Larval survival was not affected by the presence of the fungus, but larval weight gain was reduced and length of larval period was increased for larvae fed infected PNS. Pupal weight and length of pupal period were similar for the FAW on either diet; however, the total development time for the FAW raised on infected PNS was prolonged by one day. These data suggest that B. cyperi enhances vegetative growth and reproduction of PNS and negatively affects development of the FAW. These qualities may provide a selective advantage to infected PNS in natural conditions under certain conditions.

TE STRAKE, D., J. PARK, B. YANGCA*, Biology Department, University of South Florida, Tampa, FL 33620. *Division of Tropical and Infectious Diseases, College of Medicine, University of South Florida.

Antigenic studies of some isolates of Basidiobolus.

Taxa of Basidiobolus have been associated with disease in man, animals and insects. The number of species has been questioned. In this study some features of the exoantigens of isolates of Basidiobolus (B. haematosporus, ATCC 34122; B. ranarum, ATCC 24670; B. sericeusporus, ATCC 36600; B. microsorbus, ATCC 14708, and a wild isolate) were tested antigenically. One human isolate of Nucor sp. was included. Several immunological and biochemical methods including gel filtration were used to compare these test organisms. The results suggest that Nucor sp. is obviously different from Basidiobolus spp. B. microsorbus is distinct from the other isolates which are antigenically similar.

D.B. STRONCMAN AND G.N. Strunz. Canadian Forestry Service - Harlimes, P.O. Box 4000, Fredericton, N.B., E3B 5P7. Some phylloplane fungi from balsam fir with toxic effects on the spruce budworm, Choristoneura fumiferana Clem.

The phylloplane fungal community on balsam fir trees infested with spruce budworm differs from that on trees not infested. In lab assays, some of these fungi cause mortality of budworm larvae when ingested. The toxic material from one fungus, Pusa-
Six pathogenic fungi (Paecilomyces farinosus, Hirsutella nodulosa, two unidentified Hirsutella spp., Verticillium lecanii and Beauveria bassiana) were isolated from larvae and pupae of spruce budworm from two stands of balsam fir, one supporting a high budworm population and the other a lower population. The two unidentified species of Hirsutella and Paecilomyces farinosus were the most frequently isolated fungi. These fungi showed a preference for different developmental stages of the budworm. Hirsutella nodulosa represents a new report from spruce budworm. Some differences were noted in the frequency of isolation of some fungal pathogens between the two stands.

Coastal Maine may be experiencing a red spruce decline caused by acid deposition and elevated ozone levels. Acid deposition is an integral part of this ecosystem and can be influenced by the condition of three bioindicator lichen species utilising red spruce as a substrate. A study was conducted on Isle au Haut and Roque Island, the two sites differed in fog acidiity, ozone concentration, and severity of decline symptoms.

Assessment of lichen thallic color, necrotic thalli abundance, and regeneration indicates these bioindicators are more stressed on Isle au Haut than on Roque. Elemental analyses of the lichens show significant differences in P, Mn, K, Mg, and Na for the two sites.

Lichen vigor and chemistry correlate with red spruce vigor and acid deposition level. These lichens reflect the stress level of their substrate, which suggests a dynamic interaction between corticolous lichens and trees.

R.C. SUMMERBELL & J. KANE. Mycology Laboratory, Laboratory Services Branch, Ontario Ministry of Health, Box 9000, Terminal "A", Toronto, Ont. M5W 1R5. Increased recognition of indoor habitats as sources of medically important opportunistic fungi has led to the discovery of many fungi in indoor plant soils as reservoirs for fungal opportunistic pathogens of humans.

Kinetics of Plant Iron Uptake from Microbial Siderophores in Relation to Siderophore Quantities in Nature.

Prior studies have demonstrated that plants can use microbial siderophores and that siderophores occur in soils, but have only preliminarily examined iron uptake rates from naturally-occurring siderophore concentrations. Effective concentrations of siderophores were determined in experiments with excised roots and whole plants. $^{59}$Fe-uptake rates by excised roots of oat from the hydroxamate siderophores, ferrichrome, coprogen, ferrichrome B (FOB), and rhodotorulic acid (RA) indicated that FOB and RA were preferentially utilized, but that all four siderophores could supply iron to plants when provided at 5 uM concentrat-
tlor. Results were confirmed for FOB in whole plant studies with oel and sunflower. Iron uptake rates were semi-saturable over the concentration range from 0.1 to 50 μM and were enhanced 3-fold by pre-condition to iron stress.

Bioassay procedures using mutant strains of Escherichia coli were developed to determine concentrations of four different types of siderophores in water extracts of soils. Results indicate that siderophore concentrations in nature may supply significant quantities of iron than plants that can use siderophores.

Takeuchi, Y., see Schmid, J., et. al.

M.R. TANSEY. Department of Biology, Jordan Hall 142, Indiana University, Bloomington, IN 47405.

Mnemonic aids for teaching about fungi.

Students in my mycology courses welcome the challenge to create effective teaching aids, especially jokes, puns, cartoons, and humorous presentation techniques. Students even evaluate this opportunity to null over word and idea associations, and to hear and see me use their own creations as well as contributions from around the world. Humor helps my students learn and remember class material. It makes learning (and teaching!) a more enjoyable and creative experience, helps me build a sense of class cohesion and show respect for my students' intelligence, and encourages participation. Participation in this creative process causes students to look for a fungal "twist" or aspect to life outside the classroom.

Slides and a compilation of material (Mycological Teaching Humor #2) will illustrate mnemonic aids. The mechanics of presenting this creative challenge as a class assignment will be described, as will practical and philosophical problems I and others have encountered in using humor in the classroom.

J.W. TAYLOR, T. KOUPAL and S. WHITMER. Department of Botany, University of California, Berkeley, CA 94720.

Distribution of mitochondrial DNA length mutations in Neurospora crassa isolates from Florida and the Ivory Coast.

Our previous examination of length mutations in N. crassa mtDNA showed that 18 of 20 isolates (most of which were from Louisiana) were very similar, but that an isolate from Graveland, Florida and another from Adiopodoume, Ivory Coast were divergent (Taylor et al. 1986. Evolution 40:716-739). This result led us to speculate that Neurospora mtDNA might have a geographically restricted distribution.

To test this speculation, we have examined length mutations in mtDNAs of two additional Florida isolates and ten additional Ivory Coast isolates. To study these length mutations we used restriction enzyme analysis with five restriction endonucleases combined with DNA-DNA hybridization between Southern blots of the digested mtDNAs and cloned fragments of mtDNA from the laboratory wild-type, N. crassa 74A.

Preliminary analysis of the data indicates that mtDNA length mutations typical of Louisiana isolates are also found in the additional Ivory Coast isolates. In fact, some Ivory Coast isolates appear to have mtDNA that is identical to Louisiana types. This new result does not support our previous speculation that the distribution of N. crassa mtDNAs is geographically restricted.

Te Strake, D., see Dykstra, M.J., et. al.

L.L. TENS. Biology-Microbiology Department, The University of Wisconsin, Oshkosh, WI 54901.

Bacteria associated with the germinating spores of Gigaspora albid.

Spores of Gigaspora albid were obtained from the root zone of Ammophila breviligulata from a Wisconsin dune community on the shores of Lake Michigan. The incidence of germination of these spores on water is 90-100%. Bacteria associated with these spores were determined to be: Achromobacter sp., Acinetobacter lwoffii, Bacillus subtilis, B. licheniformis, B. megaterium and two species of Streptomyces. Streptomyces attacked nearly all of the spores at germination although the bacterium neither inhibited nor stimulated germination or germ tube growth. The direction of growth of the germ tube was unaffected by gravity, concentration of oxygen, light, or the presence of Streptomyces.

Therien, J., see Jabaji-Hare, S.H., et. al.

M. THIBAUT, J. FONTET and M. ANSEL. Laboratoire de Parasitologie, 15 rue de l'Ecole de Medecine, F75270 - Paris Cedex 06, France. Physiological activities of Trichothecium roseum.

Although relatively little literature is available on the enzymatic activities of Trichothecium roseum, this fungus is good producer of extracellular enzymes. The phosphatases are a broad group of enzymes which share the ability to hydrolyse various phospho- esters with the release of inorganic phosphate as a product. The alkaline phosphatases are non-specific enzymes that hydrolyse monoesters of phosphoric acid and show optimum activity in the range pH 7.6 - 9.9.

The fungus was tested for the ability to produce alkaline phosphatase activity. This production was determined in a liquid medium (Sabouraud's glucose infusion) incubated for 20 days. After incubation the dry weight of mycelium was calculated. The culture medium was filtered and centrifuged. The optical densities of the solutions were determined with an L.K.B. Ultrascop.

Alkaline phosphatase activity was determined by the modified method of Bessey and Lowry. Qualitative and quantitative estimates of enzyme production were made. Alkaline phosphatase activity was measured and was present in all the culture medium examined. No attempt was made to correlate mycelium growth with enzyme activity.

D.D. THOMAS and T.C. McMorrish. Biological Sciences, University of Windsor, Windsor, ON. N9B 3P4, and Department of Chemistry, D-006, University of California, San Diego, LaJolla, CA 92093.

Antheridiol responsiveness and the antheri- diol receptor in Achlya.

Antheridiol responsiveness of male and homothallic strains varies in the intensity of the morphological response and in the duration of the latency period between exposure to hormone and the earliest observable response. For isolates where the level of antheridiol receptor was determined, it appears that the relationship between
receptor level and responsiveness to the hormone may be a direct one. The isolate with the greatest responsiveness to antheridiol was a homothallic ATCC 52875, which contained approximately ten times the level of receptor activity found in the Achiya ambisexualis male strain EB7. Unlike EB7, in which the receptor is strongly suppressed by a rich growth medium, 52875 produces a high level of receptor on a rich medium. The receptor of 52875 appears to have a rapid turnover rate, with 25-50% of activity lost within an hour of applying cycloheximide.

In highly responsive isolates such as 52875, antheridiol inhibits alternative developmental paths leading to asexual sporulation and oogoniogenesis.

Timberlake, W. E., see Mims, C.U.

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

A.P. TORZILLI. Biology Department, George Mason University, Fairfax, VA 22030, U.S.A. Stress Protein Synthesis in Aureobasidium pullulans.

It has been demonstrated previously that a strain of Aureobasidium pullulans isolated from a Virginia salt marsh is able to grow under the combined stresses of high temperature and high salinity. Therefore, experiments were conducted to characterize the induction of stress protein synthesis in A. pullulans when it is subjected to heat stress (39°C), salinity stress (450/oo), or a simultaneous heat and salinity stress (39°C, 450/oo). When heat stressed cells were pulsed with 35S-methionine, a series of eleven radioactive proteins ranging in molecular weight from 17 to 136 kd were synthesized and visualized by SDS-PAGE. These proteins included the major heat-shock proteins as observed in other cell types and were either present in stressed cells only or present at higher levels in stressed cells compared with unstressed cells. When cells were exposed to high salinity stress, increased synthesis was observed for three proteins, corresponding to three of the eleven proteins induced by heat stress, namely the 38, 42, and 111 kd molecular weight species. Cells subjected to a simultaneous heat and salinity stress responded in an intermediate fashion by synthesizing seven proteins at an increased level. Six of these corresponded to proteins previously observed, while one (36 kd) was unique to the simultaneous heat-salinity stress situation.

J. M. TRAPPE. Department of Forest Science, Oregon State University, Corvallis, OR 97331. President's Address: Lessons from alpine fungi.

Alpine habitats have long attracted mycologists. Working conditions there can be uncomfortable and physically challenging, but rewards are great. The landscape inspires, extremely diverse habitats occur side by side, and the relatively simple biotic systems are amenable to testing hypotheses in vivo.

My studies of fungi at and above timberline in the North Cascade Range of Washington have yielded new or "rare" taxa that abound in very localized habitats. At the upper limits of vegetation or on new soils, such as recently exposed glacial outwash and moraines, vascular plant establishment and succession seem to defy traditional ecological concepts. Interpreted in terms of mycorrhizal fungus availability, however, the patterns become beautifully reasonable.

The scientist who views a sea of peaks, glaciers and canyons from the top of a mountain cannot help but gain perspectives denied in the microcosm of the laboratory. Alpine mycology teaches the importance of adaptations and interactions between microorganisms, fungi, plants, and animals in the struggle for survival. High country researchers also learn the value of adaptation achieved through knowledge, experience, careful planning, and good fellowship for success and survival. The alpine zone offers metaphors for the conduct of science: in the struggle for existence, the best long-term survival strategy for all lies in symbiosis between disciplines that strengthens all.

J.A. TRAQUAIR. Agriculture Canada, Research Station, Harrow, Ontario, Canada N0R 1G0. Calcium oxalate and oxalic acid production by Leucostoma persoonii and L. cincta.

Leucostoma persoonsii (anamorph Cytopsora leucostoma) and L. cincta (anamorph Cytopsora cincta) are the causal agents of a serious canker-causing disease of peach trees. These fungi are known to reduce the pH of culture media and of infected host tissues.

Bipyramidal and prismatiform crystals of calcium oxalate were observed with light and scanning electron microscopes in potato dextrose agar and in peach bark tissues inoculated with either L. persoonii or L. cincta. The identification was based on positive staining with the silver nitrate-dithiooxamide (Yasue) method and on their morphological similarity to calcium oxalate crystal standards. Identifications of oxalic acid in inoculated tissues were confirmed by K2Cr2O7 titration and gas chromatography using oxalic acid standards.

Greater tissue discoloration and necrosis were observed after application of oxalic acid solutions to mechanically wounded peach bark than after application of distilled water. Necrosis caused by growth of L. persoonii or L. cincta hyphae in peach bark wounds was greater than symptoms induced by oxalic acid alone. Production of oxalic acid by these pathogens is thought to promote disease development by enhancing the activity of cell wall-degrading enzymes.

J.A. TRAQUAIR, J.F. AMMIRATI, AND S. MARTIN. "Agriculture Canada, Research Station, Harrow, Ontario N0R 1G0. "Department of Botany, University of Washington, Seattle, 98115; and "22 Nickel St., Coniston, Ontario P0M 1M0. Monokaryotic and dikaryotic basidiocarps in Melanotus hartii (Strophariaceae, Agaricales).

Melanotus hartii produces both dikaryotic and monokaryotic basidiocarps. The dikaryotic basidiocarp, cultural characteristics and mating system of M. hartii have been described by Ammirati et al. 1979 (Mycologia 71:310-321). Basidiocarps produced from monokaryotic hyphae (those lacking clamp connections) take from three to ten days longer to develop than those from dikaryotic hyphae, where basidiocarps appear in about 2 weeks. Monokaryotic basidiocarps are smaller and more variable in appearance than dikaryotic basidiocarps. Also, the former produce fewer basidiospores per basidiocarp. Basidia of dikaryotic basidiocarps are primarily four-spored, with a small percentage (5%) of two-spored basidia. Those from monokaryotic basidiocarps are mainly one- (50%) or two-spored (30%), with roughly one percent being four-spored (more than two-spored). Odia are produced by both dikaryotic and monokaryotic hyphae and usually are
uninucleate. Selected cytological details will be presented for the above events.

Treadway, M. F., see Jabaji-Hare, S. H., et. al.

P. A. DECKER. Systematic Botany, Mycology and Nematology Lab, Biosystematics and Beneficial Insects Institute, ARS, BSR-C, Beltsville, MD. 20705.

Typification of Phomopsis.

A proposal for conservation of Phomopsis (Sacc.) Bubak, 1905, against Myxobolletella Hoehnel, 1903, has been before the Nomenclature Committee for several years. The conserved name would be typified by Phomopsis lactaeae (Sacc.) Bubak, 1905.

I recently compiled a comprehensive, world-wide list of published Phomopsis names. This list and the study of a few selected specimens indicate that: 1) The oldest name is Phomopsis brassicaceae Sacc. & Roum., 1884, typified by species #285 of the Regilqueae Librariotiae. 2) The type specimen bears no conidia or pyrenocytes. 3) Specimens labeled #2980 in Roumargu's fungi SELECTI GALICi EXOLUM are almost certainly part of the same collection from which the type specimen was selected. If this assertion is true, species labeled #2980 are isotypes. 4) None of the 12 available #2980 specimens bears an identifiable conidiomata. 5) From a study of the available #2980 specimens and the protologue I am unable to determine what fungus Saccardo and Roumargu had in hand or in mind when they described Phomopsis brassicaceae.

It is concluded that Phomopsis (Sacc.) Bubak, 1905, should be conserved against Phomopsis Sacc. & Roum., 1884 as well as against Myxobolletella Hoehnel, 1903.

Ulrich, R. C., see Chase, T. E.


Genetic transformation of Schizophyllum.

Transformation at high efficiency (1,000-2,000,000 transfectants/μg DNA/λviable protoplast) was achieved by systematic study of critical parameters. These frequencies made it feasible to transform auxotrophic mutants (ade2, ade5, pab1, trpl, ura1) with DNA from a mixed plasmid gene library. A total of 5 Ade5, 5 Ade5, 5 Pab1, 3 Trpl and 8 Ura1 transformants were obtained. Southern analysis revealed that putative transformants had integrated vector DNA. All five genes were recovered by rescue in E. coli. DNA from a transformant was restricted; the fragments ligated on themselves, and E. coli cells transformed to antibiotic resistance. Plasmids from E. coli antibiotic-resistant clones were used to retransform Schizophyllum for the marker in question at high efficiency. Transformation of protoplasts derived from either basidiospores (high frequency) or mycelium (low frequency) is possible. Fifty percent of protoplasts transformed with plasmid containing a selectable marker can spontaneously be cotransformed with a plasmid containing a different marker. Both linear andccc DNA transform equally well. DNA from lambda clones and circular DNA from M13 vectors transform well. The Pab1 and Ade5 genes (recovered above) are closely linked to the Ade and M15 mating-type genes and are excellent markers from which to walk the chromosome. This technology is now being used to isolate the mating-type genes and alleles from Schizophyllum.

Valent, B., see Chumley, F. C., et. al.

Valent, B., see Hamer, J. E., et. al.

B. Valen, K. A. Parsons, and F. G. Chumley.

Central Research and Development Department, E. I. du Pont de Nemours and Co., Experimental Station, Wilmington, Delaware 19898.

Molecular genetics of pathogenicity of the rice blast fungus, Magnaporthe grisea.

Strains of M. grisea infect many grasses, although particular strains of the fungus exhibit a limited host range. Strains that infect rice (Oryza sativa) are divided into races, depending on the cultivars of rice infected. Field isolates of M. grisea that infect weeping lovegrass, Erugasitrus curvula, and goosegrass, Eleusine indica, are sexually fertile, whereas field isolates that infect rice are defective in completing the sexual cycle. We have developed sexually fertile laboratory strains that retain the ability to infect rice. We have also developed methods for genetic transformation of M. grisea. These tools are allowing genetic analysis of determinants of general pathogenicity, of host species specificity, and of cultivar specificity for this important pathogen. Our genetic analysis has revealed a high degree of genetic instability at a locus involved in biosynthesis of melanin (a general pathogenicity determinant) and at one or more loci that determine cultivar specificity. We are genetically analyzing these unstable loci, which stand in sharp contrast to several other loci we have investigated.


Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) genes and proteins are well conserved across species. In most of the species that have been studied, the GAPDH gene is constitutively expressed. The goals of our research were to isolate the GAPDH gene from Cochliobolus heterostrophus, a filamentous fungal pathogen of maize, and to characterize the DNA sequences required for transcription initiation. We have isolated the GAPDH gene from C. heterostrophus ENR13 lambda library by heterologous hybridization using an Aspergillus nidulans GAPDH gene as probe. A 2200 bp fragment, which includes the gene, was subcloned into pUC18 and restriction mapped. Northern analysis of poly A+ RNA identified a 1300 nt GAPDH transcript in C. heterostrophus. The 2200 bp DNA fragment including the C. heterostrophus gene was sequenced by the method of Sanger and the sequence was compared with published GAPDH sequences from other species. The 5' and 3' borders of the GAPDH gene were mapped by S1 nuclease protection. We are currently analyzing the promoter of the C. heterostrophus GAPDH gene.

MICHAEL A. VINCENT and WILL H. BLACKWELL. Department of Botany, Miami University, Oxford, OH 45056.

Notes on the hypophysece genus Botryosporium Corda.

The genus Botryosporium Corda was erected in 1831 with Botryosporium diffusum (Albertini & Schweinitz) Corda as type. In the intervening 156 years, fourteen additional taxa have been described as belonging to the genus. A thorough study of herbarium specimens from 32 herbaria world-wide, including all available type materials, reveals that...
the genus contains five taxa: B. longibrachiatum (Oudemans) Baire, B. longibrachiatum var. macrospora Sharma, B. madrasense Raghukumar, B. pulcherum Corda, and a previously undescribed species. These taxa and their synonyms, as well as the new species, are described. The nomenclatural problems of Hyphoxysporium difforme (Albertini & Schweinits) Corda are discussed, and several solutions to these difficulties are offered.

Visser, S., see Grandmason, J., et. al.

Watson, A.R., see Ormeno-Nunez, J., et. al.

Weeden, N.F., see Stasz, T.E., et. al.

Wells, K., see Digby, S.

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Phragmobasidial septa.

When correlated with structural, physiological compatibility, and life cycle characteristics, the ultrastructural features of the septal pore apparatus (= SPA) can often provide useful taxonomic information, especially in the Heterobasidiozymes. Developmental studies utilizing serial sections of the SPA are needed in many additional taxa before the significance of many features can be accurately assessed.

The SPA of Tulasnella araneosa and Tulasnella sp., of Cerinomyces alfaciulites, Dacrymyces tillitares, Calarea cornata, and Duqiniopsis chryspomata will be illustrated and discussed. Within the Exidiaceae (Auriculariales sensu Bandoni, Trans. Mycol. Soc. Japan 25:489-530. 1984), the SPA of Exidiopsis plumbescens, E. calceae, E. effusa, Exidia glandulosa, E. candida, Basidiodendron sp., B. cineruum, and Prodocentria olivacens have been investigated. Of the Hyalariaceae (= Myxariaceae; Auriculariales), the SPA of Aporpium carvae, Heterocharetta dubia, Myxarium nuculatum, and Pseuhydrum satiogonum will be shown. The SPA of Tremellodendropsis tuberosa (Tremellodendropsidaceae) are unique. Those of Auricularia fuscocuccina are similar to those of other members of the order; those of Helmocloeas sp., H. lagerheimi, and Platygloea pustulata have a simple pore structure. The SPA of Tremella rhodopora (Tremellaceae): Tremella lilaeri are identical to those of other species of the genus; however, T. reticulata seems to possess a cap similar to those of the Auriculariales.

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Ecophysiology of Coelomomyces uratherias and C. stephoniacea.

The life-history of these two species of Coelomomyces show special features that favor their use in both laboratory and field investigations. The crustacean hosts are easily maintained in the laboratory and the mosquito hosts include important disease vectors in Canada and the U.S.A. Coordination of the transition of the parasites to host animals is under photocontrol. The resistant spermatia of C. uratherias require bright light for germination and gametogenesis in both species is induced by onset of darkness. C. uratherias has maintained itself in breeding sites of Culex tarsalis in Alberta and C. stephoniacea shows promise as a biological control agent of the Asian Tiger Mosquito, which has recently spread throughout the United States.

Tiger Mosquito, which has recently spread throughout the United States.

White, J.F., Jr., see Morgan-Jones, C

Whitmer, S., see Taylor, J.W., et. al.

Whitney, N.J., see Clark, C.L.

Whitney, N.J., see Rand, T.G.

Widden, P., see Harney, S.

Widden, P., see Svatek, K.


Nutrient utilization in relation to pululan elaboration by Aureobasidium pullulans.

In order to determine optimum growth conditions for the elaboration of extracellular pululan, preliminary studies utilized cell suspensions of nine strains of Aureobasidium pullulans. One strain, NRRL-Y 6220 A. pullulans, was selected for further study. Carbon and nitrogen sources, along with phosphorus concentration were evaluated for their effect on pululan yield and molecular weight distribution. Batch systems, scale-up batch, and continuous fermentations of one liter and 10 liters were also evaluated. Processing variables, including solvents, extraction time, etc., were also studied. Pululan with weight-average molecular weights from 100K to 4 million daltons, with a dispersity of around two, was produced. The evaluation of chemical/physical properties of defined molecular weight fractions of pululan is now under investigation.

Wilks, R.L., see Ross, I.K., et. al.

A. D. WILSON and J. D. ROGERS. Plant Pathology Department, Washington State University, Pullman, WA 99164-6430. The tetrapolar mating incompatibility system of Echinodontium tinctorum.

Echinodontium tinctorum Ell. & Everh., the Indian paint fungus, causes heartrot of true firs and hemlocks in mountainous areas throughout western North America. Basidiospores of E. tinctorum were collected from basidicarps at several locations in Idaho. Homokaryotic single-basidiospore isolates derived from a single basidicarp at each location were mated separately in all possible combinations. The nuclear condition of basidiospores and hyphae derived from basidiospores was found to be mono-

karyotic. All monokaryotic hyphae lacked clamp connections. However, compatible matings between monokaryons with uncommon A and B factors always resulted in the formation of hyphae with large numbers of clamp connections. Subsequent cytological investigations utilizing Giemsa stain indicated that heterokaryotic hyphae derived from compatible matings are dikaryotic like generative context hyphae of basidicarps. Four mating types were identified at each location. Determination of intercompatibility factors among these four mating types required a combination of microscopic and macroscopic observations. Complete intercompatibility between geographically separated isolates demonstrated that E. tinctorum has multiple alleles for incompatibility. Although this fungus is not known to fruit in culture, all evidence suggests that E. tinctorum is heterothallic and tetrarotic with sexual incompatibility controlled by multiple alleles at two loci.
After

If the vector has no

Vectors carrying either gene

Several fungi could apparently detoxify the

with a longer region

Healthy and discolored zones were excised,

of resistance to

concentrations.

ferences were found between M and NM root dry wts at

82% of the

was localized in the roots. The Al

content (μg/gm) in M and NM root tissues increased with increasing Al concentrations and decreased with decreasing pH. The Al content in the shoots also increased with increasing Al concentrations in both M and NM seedlings. The amount in M shoots was greater at pH 3 and pH 4 than at pH 5 and greater at pH 4 in NM shoots than at pH 3 or pH 5. No significant differences were found between M and NM root dry wts at all Al concentrations and pH levels. However, shoot dry wt for NM seedlings was significantly greater than M seedlings when treated at pH 3 with all Al concentrations.

WOODALL, P., see Franek, K., et. al.

Worrall, J.J., see Harrington, T.C., et. al.

J.J. Worrall* and T.C. Harrington. Department of Botany and Plant Pathology, Univ. of New Hampshire. Durham 03824. *Present address: Dept. of Environmental and Forest Biology, SUNY College of Environmental Science and Forestry, Syracuse, N.Y. 13210.

Respirometric wood decay testing.

Oxygen uptake of decay fungi was used as a measure of decay of wood from healthy vs. wounded, infected or otherwise discolored roots of Picea rubens and Abies balsamea. Healthy and discolored zones were excised, milled, sterilized, placed on water agar, and inoculated with a mycelial homogenate of the test fungus. Oxygen uptake rose rapidly on healthy samples, reached a peak at about day 10, then dropped to a steady level. Starch was depleted and degradation of structural polymers had begun by day 10. Discolored samples varied but generally supported much lower levels of oxygen uptake than did healthy samples. Several fungi could apparently detoxify the inhibitory extractives under the conditions of the test. With this technique, samples can be easily extracted or impregnated prior to inoculation, providing a rapid and versatile approach to study of resistance to root rot and other decay diseases.

Yancey, R.J., Jr., see Kennedy, M.J., et. al.

Yangco, B., see Te Strake, D., et. al.

Yangon, B., see Te Strake, D., et. al.

Yoder, O.C., see Van Wert, S.C.

O. C. Yoder. Department of Plant Pathology, Cornell University, Ithaca, NY 14853. Gene manipulations in the maize pathogen Cochliobolus heterosporus.

Two genes, selectable in wild type cells, are generally useful for transformation of plant pathogenic fungi: amdS from Aspergillus nidulans encodes acetylase, which allows growth on acetamide as the sole nitrogen source; hygB from E. coli encodes hygromycin B phosphotransferase and when fused to a fungal promoter is expressed in fungal cells, which permits growth in the presence of hygromycin B. Vectors carrying either gene integrate stably into chromosomal DNA, almost always at a single locus. If the vector has no homology with the fungal genome, integration occurs at apparently random locations; a single copy of the plasmid may integrate or there may be multiple copies arranged tandemly, head-to-tail. With a short region of homology (1 kb) between the plasmid and the genome, 50-70% of integration events occur by homologous recombination. With a longer region of homology (6 kb), virtually all integration events are at the homologous site; a single copy of the plasmid integrates by a single cross-over event which results in a nontandem duplication of the homologous region with the plasmid sequence situated between the two repeats. The latter observation suggests that it will be possible to mutate a specific gene in the genome by first disrupting a cloned copy of it in vitro and then replacing the wild type chromosomal gene with the mutant copy in vivo through transformation.

Yoon, C.S., see Gessner, R.V., et. al.

K. S. Young and Y. G. Kim. Department of Biology, Kangwon University, Chuncheon 200, South Korea. Ultrastructural study on the development of clamp in Pleurotus ostreatus.

Electron microscopic examination of developing clamp in mycelia of Pleurotus ostreatus confirmed much of the old observations made in many homobasidiomycetes by other mycologists. The pattern of clamp initiation was similar to the typical tip growth, though its cytoplasm contained fewer vesicles. When the clamp was formed approximately a half in size, two nuclei migrated toward the site of developing clamp. Migrating nuclei were accompanied by the biglobular spindle pole body at the leading apex of nuclei in association with a numerous astral microtubules and the separation of two globular elements started at this stage. Conjugate nuclear division occurred when the clamp was fully formed. Size of mitotic spindles, which was measured at anaphase, was approximately a half of that in parent hypha and both divisions were synchronous. Two spindles were obliquely parallel. Septa formed before the clamp was connected to the hypha; however, the formation of septum in clamp preceded that of hyphal one. A daughter nucleus in clamp after the completion of mitosis migrated to the distal region of the hypha through a newly formed clamp connection.

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1Department of Plant Pathology, University of Wisconsin-Madison, 53706, and 2Department of Plant Pathology, University of Wisconsin-Madison, 53706.

A new species of Athelia?
An isolate of *Athelia* (ATCC #20629), from leaf litter in a Wisconsin apple orchard, has good potential as a biological control agent for the apple scab fungus, *Venturia inaequalis* (Cooke) Wint. On the basis of the occurrence of clamp connections and the size of basidium and basidiospores, it was more similar to *A. bombacina* than any other currently described species. Specimens of this isolate were compared with the type specimen of *A. bombacina* by Link: Pers. and with two other isolates of *A. bombacina* from Michigan and Montana. For all isolates, fruiting bodies were white and pellicular. Subicular hyphae were 3-4 µm in diameter with clamp connections at every septum, and basidia were 12-15 x 3-5 um, with 4 sterigmata. However, basidiospores of *A. bombacina* ATCC #20629 were 5-8 x 3-5 um, whereas basidiospores of the type specimen and the other isolates of *A. bombacina* were 4-6 x 2.5-3 um. In addition, radial growth of *A. bombacina* ATCC #20629 on PDA was twice as fast as radial growth of the other isolates of *A. bombacina*. Further work on *A. bombacina* ATCC #20629 is in progress in order to confirm that it is a new species.

E. J. ZAMANO and T. C. HARRINGTON. Department of Botany and Plant Pathology, University of New Hampshire, Durham, NH 03824. Geographic distributions of genotypes of the conifer root pathogen, *Verticillium aggregatum*.

Starch gel electrophoresis of 76 isolates of *Verticillium aggregatum*, representing three morphologic variants pathogenic to pinyons (PV), hard pines (HP) and Douglas-fir (DF), revealed 10 polymorphic enzyme loci having from 2 to 6 functional alleles and 10 monomorphic loci. Thirteen genotypes were found and assigned to 8 groups on the basis of genotypic similarity. Each genotype was found in only one variant. Variation in genotypes within variants was largely explained by the geographic distribution of the isolates. The two PV variant genotypes had different alleles at a single locus. One genotype (15 isolates) occurred throughout the range of the variant except for an isolated area of the southern Sierra Nevada, CA, where the second genotype (4 isolates) occurred. The HP variant had 3 polymorphic loci with 4 genotypes assigned to 2 groups. The more common group (16 isolates) occurred in the coastal states and western Idaho; the second (6 isolates) was only found in the northern Rocky Mountains of Montana and British Columbia. The DF variant had 5 polymorphic loci with 7 genotypes assigned to 4 groups. Three groups occurred in different areas at the eastern fringe of this variant's range, in New Mexico, in Colorado, and near the Idaho/Montana border (2, 1 and 3 isolates, respectively). The fourth and most common group of the DF variant (29 isolates) occurred in the coastal states, Idaho, and British Columbia.

N. ZARE-MAIYAN and C.A. SHEARER. Department of Plant Biology, University of Illinois, Urbana, IL 61801. Extracellular enzyme production and cell wall degradation by freshwater lignonicolous fungi.

Little is known about the degradative abilities of fungal species which occur on wood in freshwater habitats. This study was undertaken to determine the range of extracellular enzymes and the type of cell wall degradation produced by selected freshwater Ascomycetes (10 spp.), Fungi Imperfecti (7 spp.) and a *Pythium* sp. Extracellular enzymes were assayed on solid media. Type of cell wall degradation activity was determined by growing fungi on thin sections of ash and cottonwood, and then examining sections microscopically with polarized light.

Except for *Pythium* sp., all species produced a broad array of enzymes. The greatest differences in enzyme production among species were for polygalacturonase, pectin lyase, laccase, tyrosinase, gum guaiac oxidase and chitinase. *Pyramidospora* sp. was the most strongly cellulyticyclic species and was positive for all enzymes tested. Thirteen species produced typical soft-rot cavities on wood. *Nectria haematococca*, *N. lucidum*, *N. lugdunensis* and *Pythium* sp. are early successional species on submerged wood. Inability to degrade intact cell walls may contribute to their early disappearance.

N.W. ZHANG. Department of Plant Pathology, Cornell University, Ithaca, N.Y. 14853. *Unguiculariopsis*, a fungicolous discomycete genus.

This study reveals that *Unguiculariopsis* is the correct generic name for a small group of fungicolous, inoperculate Discomycetes. The generic name has been accepted by only a few mycologists, and the species of this genus have been placed in 16 different genera in six families by the previous workers. They occur on, or are associated with other fungi, such as *Ampelospherella*, *Cucurbitaria*, *Eutypa*, *Gordonia*, as well as lichens. The fungus-fungus connections are demonstrated. Taxonomic confusion within the genus is clarified, and more than ten species are recognized. The excipular structure, hair morphology, shape of asc and of ascospores are useful characters in species identification. The species of this genus are not common, but have been collected in Asia, Australia, Europe, North America, South America and the Caribbean.
2. Extraction Solution:
MES 2-(N-morpholino) estanesulfonic acid, one of the buffers developed by N. Good 99 ml 0.1M MES, pH 6.0 2 ml bentonite solution
3. SDS solution: Sodium dodecyl sulfate, 10% in water
4. MES-EtOH: 800 ml 0.1M MES, pH 6.0 150 ml 95% ethanol
5. MES: 0.1M MES, pH 6.0
6. Suspension Solution: HEPPS (N-2-hydroxyethylpiperazine- N'-3-propane sulfonic acid), Sigma calls this "EPAPS", one of the "Good" buffers 80 ml 0.1M HEPPS, pH 8.0 20 ml glycerol filter sterilize
7. Running Buffer: 0.1M HEPPS, pH 8.0
8. when columns have stopped dripping, pour one sample into each
9. wash each column with 90 ml MES-EtOH (dsRNA sticks to the paper in the presence of the buffer-EtOH and everything else goes through the column)

DISASTER INSERT
If there is a lot of gummy stuff (mucopolysaccharide or protein) in your sample and nothing comes out at this step, dump the contents of the column into a centrifuge tube, add some MES-EtOH, mix well, centrifuge to a firm pellet, discard supernatant, add 15 ml MES, mix well, centrifuge to a firm pellet, take supernatant forward to step 11
10. place beakers under columns, add 15 ml MES to elute dsRNA and gently squeeze paper by carefully inserting the syringe plungers into the tops of syringes
11. bring volume of samples in beakers to 20 ml with MES and add 3.8 ml of 95% ethanol to each, mix well
12. prepare a new set of columns and pour samples into columns
13. repeat step 9
14. place centrifuge tubes with 20 ml of 95% ethanol under columns, elute dsRNA with 10 ml MES into centrifuge tubes, squeeze with plungers gently, mix well, cover with parafilm, place in freezer overnight
15. balance tubes with ethanol, spin at 10,000 rpm for 30 min, pour off supernatant, drain upside down to dry (room temperature)
16. when dry add 10X original pad weight of fungus (grams) in lambda's 100 lambda = 0.1 ml of HEPPS-glycerol solution

ELECTROPHORESIS
I use very high quality agarose, usually a 1% gel, 6 mm deep in a 10 cm x 14 cm horizontal gel tray.
1. mix 1.0 gm agarose in 100 ml HEPPS, melt, add 100 lambda ethidium bromide solution (this is 5 micrograms of ethidium bromide per ml of gel solution), cast in a UV transparent tray that fits your horizontal gel electrophoresis apparatus
2. place 10 to 15 lambda samples in wells, add HEPPS to cover gel, electrophorese at 50 volts (will be about 150 microns) for 4 to 5 hours
3. place gel tray on a UV light box (Transilluminator, 302 mm) (in a very dark room) which makes the ethidium bromide stained dsRNA fluoresce bright orange
4. I have occasionally gotten very "sun burned" hovering over gels admiring them - I recommend a UV face shield instead of ordinary UV safety glasses
5. the gel, buffer, and electrophoresis apparatus can be treated with chlorine bleach or borax solution to degrade the ethidium bromide, it is also degraded by light

SOURCE MATERIAL
1. fungi are grown on the surface of sterile cellophane placed over agar medium in plates
2. growth should be "young", i.e. not to the edge of the plates
3. mycelium scraped from cellophane and weighed

EXTRACTION AND PURIFICATION
1. into each Braun Homoginizer bottle put: 20 gm glass beads, 0.45-0.50 mm diameter 4 to 10 gm fungus (depending on how wet) 10 ml MES-bentonite 3 drops Antifoam A grind 4 min with CO2 cooling every 15 sec
2. add 10 ml SDS solution and a few more drops of Antifoam A and shake vigorously, leave on ice for at least 30 min, shake occasionally
3. transfer to centrifuge tubes (balance with MES-bentonite), spin at 10,000 rpm for 30 min
4. pipette off liquid into small (100 ml) beakers with a mark at the 20 ml line, if volume of supernatant is not 20 ml, add MES to bring volume to 20 ml
5. add 3.8 ml of 95% ethanol, mix while adding, cover with parafilm, refrigerate overnight
6. cut discs of Miracloth, or some other filtering fiber to fit the insides of 20 ml disposable syringes, place syringes in a rack (2.5 cm x 7.5 cm wooden board with holes the diameter of the outside of the syringes) with the tip down, Miracloth covering bottom, place a baking dish under these to catch liquid
7. weigh out 2.5 gm lots of CF-11 ground paper (Whatman cellulose) into small beakers, add 25 ml MES-EtOH to each, mix, and pour into syringe "columns"
One hundred forty three incidents of actual or potential mushroom poisoning were reported to the NAMA Mushroom Poisoning Case Registry in its fourth year of operation, ending 30 June, 1986. Some were reports of earlier incidents, since reports of incidents, old or recent have been, and still are, invited. Overall, the Registry has now accumulated reports of 408 cases.

The Registry's operation has remained the same: as noted previously, reports are invited from all sources-including individuals, clubs, poison centers and health care providers- of incidents as far back as the reporter is confident of the data. In compiling reports no symptoms were rejected or interpolated. No corrections were attempted for observer, patient or volunteer bias. Reported species identifications were not challenged. However, when appropriate, synonyms were recorded for species or symptoms actually reported. The major caveats also remain. Since reporting is voluntary and irregular, the results do not represent the true incidence of mushroom poisoning nor the actual relative frequencies of poisoning by various species. There is also no valid assurance that ill effects are always due to mushroom toxicity as distinguished from incidental infections, from ingestion of other toxicants, or from individual hypersensitivities.

Twenty four of the 143 cases involved mixed species, and are evaluated only in terms of the relative frequency of overall symptoms, without attributing symptoms to particular species. In addition, there were 49 cases where the species remained unknown, 45 in children. In an unknown, but significant, fraction ingestion was only conjectured. Nevertheless, 33 of those children were treated with ipecac to induce vomiting and remove potential toxicants. Among all the 1985-6 cases, mushrooms were not frequently eaten as food (49%), with slightly fewer ingestions accidental (45%) and only 6% taken for non-nutritional recreational purposes.

Reports from the last year confirm that mushroom poisoning is most often a gastrointestinal insult. Among all the cases reported in 1985-6 vomiting occurred in 61% of the symptomatic cases; nausea, 55%; diarrhea, 38%; intestinal cramps, 26%. One or more of those or other gastrointestinal symptoms, such as retching or abdominal discomfort, was reported in 80% of the symptomatic cases. In earlier cases gastrointestinal effects have been severe, including hematemesis and rupture of the esophagus (Mallory-Weiss syndrome). Four deaths were reported; all due to an Amanita believed to be ocreata.

* Part of the Annual Report for 1986 to the NAMA Board of Trustees
Single, named species were associated with 70 of the cases received during the reporting period, and are listed according to frequency in Table 1. Eighteen of those species were reported to the Registry for the first time in the 1985-6 report-year with Grifola frondosa, Clitocybe nuda and Morchella angusticeps represented by 2 or more cases. It is worth noting that all 3 of those species are usually regarded as edible. Alcohol, which might facilitate absorption of a toxin, could have been a contributing factor only with Morchella esculenta. Fifteen other species each provided only 1 case.

Symptoms associated with various species were tabulated for all the cases reported thus far to the Registry, and are listed in Table 2 for identified species singly associated with 3 or more cases.

Misidentification is the major concern of the mycophagist, and Table 3 lists misidentifications from Registry cases cumulated through the last report-year.

Many of the species reported to the Registry are represented by only 1 or 2 cases, with consequent uncertainties that the reported symptoms can truly be attributed to that particular mushroom, as noted earlier. To stimulate reports on experiences with those species they are listed in Table 4. Since the collection of data on mushroom species of unknown or uncertain toxicity was a major impetus for establishing the Registry, it is hoped that publicizing such a "hit list" will be that stimulus.

Within the last year in particular, the Registry has received reports and inquiries about mushroom poisoning in animals and about harmful reactions from mushroom contact or inhalation. Because of the length of this report, those cases will be summarized later. They are mentioned now to stimulate additional reports. As mentioned previously, mushroom-related experiences need not be recent to be reportable, and the Registry continues to solicit reports of past as well as current misadventures in mycophagy, intentional or inadvertent, and of other types of mushroom reactions in people or animals.

Sincere and special thanks to the North Central Texas Poison Center, the Toxicology Committees of the Colorado and Oregon Mycological Societies, and to all others who have contributed to the Registry.

Table 1
Species Reported in 1985-6

<table>
<thead>
<tr>
<th>Species</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorophyllum molybdites</td>
<td>11</td>
</tr>
<tr>
<td>Armillaria mellea</td>
<td>8</td>
</tr>
<tr>
<td>Amanita viros</td>
<td>6</td>
</tr>
<tr>
<td>Omphalotus orearius</td>
<td>5</td>
</tr>
<tr>
<td>Amanita ?ocreaata?</td>
<td>4</td>
</tr>
<tr>
<td>Amanita muscaria</td>
<td>3</td>
</tr>
</tbody>
</table>
Grifola frondosa 3*
Leccinum aurantiacum 3
Pholiota squarrosa 3
Clitocybe nuda 2*
Gymnopilus spectabilis 2
Gyromitra esculenta 2
Morchella angusticeps 2*
Morchella esculenta 2
Psilocybe semilanceata 2
Amanita verna 1*
Amanita ponderosa 1*
Armillaria zelleri 1*
Boletus subvelutipes 1*
Calvatia gigantea 1*
Hypholoma sublateritium 1*
Laccaria ochropurpurea 1*
Panaeolus foenisecii 1
Paxillus involutus 1*
Phallus impudicus 1*
Phallus ravenelii 1*
Psilocybe subcaerulescens 1*
Russula nigricans 1*
Scleroderma citrinum 1
Suillus americanus 1*
Suillus granulatus 1*
Verpa bohemi ca 1*

*First year reported to Registry

Table 2
Summary of Species Reported Three or More Times and Their Symptoms

<table>
<thead>
<tr>
<th>Species &amp; Symptoms</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Species unknown</td>
<td>63 cases; 49 in '85-6</td>
</tr>
<tr>
<td>none</td>
<td>70%</td>
</tr>
<tr>
<td>vomiting</td>
<td>21</td>
</tr>
<tr>
<td>intestinal cramps</td>
<td>17</td>
</tr>
<tr>
<td>diarrhea</td>
<td>13</td>
</tr>
<tr>
<td>nausea</td>
<td>13</td>
</tr>
<tr>
<td>fatigue</td>
<td>3</td>
</tr>
<tr>
<td>hypotension</td>
<td>3</td>
</tr>
<tr>
<td>Other: agitated, coma, convulsions, crying, dehydration, drowsy, hallucination, hyperreflexia, muscle spasm, respiratory failure, sleep, unconscious</td>
<td></td>
</tr>
<tr>
<td>Chlorophyllum molybdites</td>
<td>28 cases; 11 in '85-6</td>
</tr>
<tr>
<td>vomiting</td>
<td>96%</td>
</tr>
<tr>
<td>nausea</td>
<td>71</td>
</tr>
<tr>
<td>diarrhea</td>
<td>64</td>
</tr>
<tr>
<td>intestinal cramps</td>
<td>36</td>
</tr>
<tr>
<td>weakness</td>
<td>32</td>
</tr>
</tbody>
</table>
kidney failure 27
weakness 27
Other: liver damage, none (1 case with prompt emetic treatment)

<table>
<thead>
<tr>
<th>Gyromitra esculenta</th>
<th>10 cases; 2 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>vomiting</td>
<td>100%</td>
</tr>
<tr>
<td>nausea</td>
<td>80</td>
</tr>
<tr>
<td>jaundice</td>
<td>30</td>
</tr>
<tr>
<td>liver damage</td>
<td>30</td>
</tr>
<tr>
<td>delirium</td>
<td>20</td>
</tr>
<tr>
<td>diarrhea</td>
<td>20</td>
</tr>
<tr>
<td>kidney damage</td>
<td>20</td>
</tr>
<tr>
<td>loss of feeling</td>
<td>20</td>
</tr>
<tr>
<td>pain</td>
<td>20</td>
</tr>
<tr>
<td>paralysis</td>
<td>20</td>
</tr>
<tr>
<td>Other: abdominal discomfort, confusion, dehydrated, diplopia, disoriented, dizzy, dreams, fever, intestinal cramps, mydriasis, olfactory change, oral loss of feeling, respiratory failure, retching, sweating, weakness</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Omphalotus olearius</th>
<th>9 cases; 4 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>vomiting</td>
<td>100%</td>
</tr>
<tr>
<td>nausea</td>
<td>100%</td>
</tr>
<tr>
<td>salivation</td>
<td>56</td>
</tr>
<tr>
<td>diarrhea</td>
<td>22</td>
</tr>
<tr>
<td>dizzy</td>
<td>22</td>
</tr>
<tr>
<td>intestinal cramps</td>
<td>22</td>
</tr>
<tr>
<td>sweating</td>
<td>22</td>
</tr>
<tr>
<td>Other: weakness</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pholiota squarrosa</th>
<th>9 cases; 3 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>vomiting</td>
<td>100%</td>
</tr>
<tr>
<td>nausea</td>
<td>67</td>
</tr>
<tr>
<td>intestinal cramps</td>
<td>56</td>
</tr>
<tr>
<td>weakness</td>
<td>44</td>
</tr>
<tr>
<td>diarrhea</td>
<td>33</td>
</tr>
<tr>
<td>flushing</td>
<td>33</td>
</tr>
<tr>
<td>Other: malaise, salivation</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amanita muscaria</th>
<th>8 cases; 3 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>nausea</td>
<td>100%</td>
</tr>
<tr>
<td>vomiting</td>
<td>100%</td>
</tr>
<tr>
<td>weakness</td>
<td>62</td>
</tr>
<tr>
<td>intestinal cramp</td>
<td>50</td>
</tr>
<tr>
<td>sweating</td>
<td>50</td>
</tr>
<tr>
<td>drowsy</td>
<td>38</td>
</tr>
<tr>
<td>hallucination</td>
<td>25</td>
</tr>
<tr>
<td>mucus viscous</td>
<td>25</td>
</tr>
<tr>
<td>Other: diarrhea, disoriented, hematemesis, unconscious</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Psilocybe semilanceata</th>
<th>6 cases; 2 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>hallucination</td>
<td>83%</td>
</tr>
<tr>
<td>nausea</td>
<td>50</td>
</tr>
<tr>
<td>anxiety</td>
<td>33</td>
</tr>
</tbody>
</table>
sweating 29
convulsions 7
flushing 7
Other: chills, dizzy, drowsy, fever, lacrimation, muscle spasm, mydriasis, salivation, tachycardia, tremors

<table>
<thead>
<tr>
<th>Amanita pantherina 16 cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>drowsy 75%</td>
</tr>
<tr>
<td>nausea 75</td>
</tr>
<tr>
<td>weakness 62</td>
</tr>
<tr>
<td>dizzy 56</td>
</tr>
<tr>
<td>intestinal cramps 50</td>
</tr>
<tr>
<td>dreams 44</td>
</tr>
<tr>
<td>forgetful 44</td>
</tr>
<tr>
<td>ataxic 31</td>
</tr>
<tr>
<td>vomiting 31</td>
</tr>
<tr>
<td>hallucination 25</td>
</tr>
<tr>
<td>confused 25</td>
</tr>
<tr>
<td>disoriented 25</td>
</tr>
<tr>
<td>sweating 25</td>
</tr>
<tr>
<td>coma 19</td>
</tr>
<tr>
<td>drunk-feeling 19</td>
</tr>
<tr>
<td>flushing 19</td>
</tr>
<tr>
<td>Other: agitated, altered mental state, chills, combative convulsions, diarrhea, incoherent muscle spasm, palpitation, respiratory failure, sleep, salivation, uncoordinated, visual disturbance</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amanita phalloides 16 cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>diarrhea 94%</td>
</tr>
<tr>
<td>vomiting 75</td>
</tr>
<tr>
<td>intestinal cramps 69</td>
</tr>
<tr>
<td>nausea 50</td>
</tr>
<tr>
<td>dyspnea 25</td>
</tr>
<tr>
<td>headache 19</td>
</tr>
<tr>
<td>sweating 12</td>
</tr>
<tr>
<td>weakness 12</td>
</tr>
<tr>
<td>Other: abdominal discomfort, drowsy, hypotension</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Armillaria mellea 14 cases; 8 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>nausea 71%</td>
</tr>
<tr>
<td>vomiting 71</td>
</tr>
<tr>
<td>abdominal discomfort 43</td>
</tr>
<tr>
<td>diarrhea 43</td>
</tr>
<tr>
<td>chills 29</td>
</tr>
<tr>
<td>intestinal cramps 29</td>
</tr>
<tr>
<td>mydriasis 29</td>
</tr>
<tr>
<td>sweating 29</td>
</tr>
<tr>
<td>weakness 29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amanita virosa 11 cases; 6 in '85-6</th>
</tr>
</thead>
<tbody>
<tr>
<td>nausea 91%</td>
</tr>
<tr>
<td>diarrhea 55</td>
</tr>
<tr>
<td>vomiting 55</td>
</tr>
<tr>
<td>intestinal cramps 36</td>
</tr>
</tbody>
</table>
fear of dying 33
Other: agitated, altered mental state, diarrhea, disoriented, dizzy, flushing, intestinal cramps, palpitation, muscle spasm, suicidal, thirsty, unconscious visual disturbance, vomiting, weak legs

Amanita brunescens 5 cases
All cases: diarrhea, intestinal cramps, liver damage, nausea, vomiting

Amanita ocreata 5 cases; uncertain identification
for 4 fatal cases in '85-6
dead 80%
liver damage 100%
coma 80
kidney failure 80
combative 40
nausea 40
vomiting 40
Other: delirium, diarrhea, disoriented, dizzy, incoherent, intestinal cramps, kidney damage

Gymnopilus spectabilis 5 cases; 2 in '85-6
dizzy 60%
Other: fever, flushing, full feeling in face

Leccinum aurantiacum 5 cases
nausea 100%
diarrhea 60
vomiting 60
burning/aching 40
chills 40
dizzy 40
weakness 40

Suillus luteus 5 cases
diarrhea 60%
intestine cramps 60
nausea 40
weakness 40

Colybyia acervata 4 cases
All cases: intestinal cramps, nausea, vomiting

Corrinus atramentarius 4 cases
burning/aching, chills, disoriented, dizzy, flushing, limbs heavy, nausea, palpitation, sense of suffocation, sweating, throbbing head, tachycardia

Laetiporus sulphureus 4 cases
nausea 100%
vomiting 75
Other: flushing, intestinal cramps, sweating

Leucoagaricus naucinus 4 cases
nausea 100%
diarrhea 50
vomiting 50
Other: dizzy, intestinal cramps, salivation, sweating, weakness

_Panaeolus foenisecii_ 4 cases; 1 in '85-6
hallucination 75%
Other: altered mental state, diarrhea, drowsy, fever, hyperactive, inattentive, insomnia, sleep, sweating, unconscious, visual disturbance

_Amanita gemmata_ 3 cases
diarrhea, dizzy, nausea, weakness

_Cantharellus cibarius_ 3 cases
Aching neck, anorexia, chills, diarrhea, nausea, vomiting

_Grifola frondosa_ 3 cases; all in '85-6
chills, dehydrated, drowsy, flushing, intestinal cramps, nausea, vomiting, weakness

_Pleurotus ostreatus_ 3 cases
dizzy, dyspnea, flushing, hallucination, itching, malaise, nausea, sweating, tachycardia, tingling limbs, vomiting, weakness

_Psilocybe cubensis_ 3 cases, 1 death
anaphylaxis, anxiety, delirium, diarrhea, disoriented, drowsy, dever, flushing, hallucination, hyperactive, hypotension, inattentive, muscle spasm, mydriasis, pain, respiratory failure, talkative, visual disturbance

_Scleroderma citrinum_ 3 cases; 1 in '85-6
nausea, 1 asymptomatic with prompt emetic treatment
1 inhaled spores: sneezing, tachycardia

**BRIEF RESEARCH NOTE**

Spore Mounts for Rusts and Smuts

One's aim is a well-cleared mount with plenty of spores near the center of the cover-glass. Good clearing of the contents and turgor of the spores are necessary, for detailed study of wall sculpturing, and for accurate
measurements. Heated lactophenol is very effective, although the mounts deteriorate after a few months; but the trick is to keep most of the spores in the middle of the mount despite having to heat it nearly to boiling point to achieve full clearing and remove air bubbles. **Polish a slide well with** cleaning tissue, so that it wets readily with any liquid. **Toward the right end add two vertical streaks of lactophenol about 1 cm long and 1.5 cm apart. Pick up some lactophenol from one streak on a spear-pointed needle and deposit a small drop centrally between the two streaks. Under the **dissecting microscope** pick up plenty of spores from one or more sort and deposit them in the small central drop. Polish a cover glass and put it in place, tapping it down only gently. Heat over a small flame gently until the used end of the slide is hot. Examine under the dissecting microscope to ensure that nearly all spores are fully cleared (uncleared spores are usually much darker). **Rust spores from arid regions are often so heavily pigmented that it may be necessary to heat and cool the slide several times. Even the most delicate wall markings can be measured under phase or interference contrast. Making mounts under the dissecting scope simplifies distinction between spore states and guards against picking up sand grains, which would wreck the mount. Some urediniospores are flattened ovoids with three basic dimensions: length, width and thickness. Undue pressure on the cover causes all spores to lie flat, making measurement of thickness impossible. With gentle pressure, and abundant spores in the mount, some contiguous spores generally remain on edge.**


D.B.O. Savile

Biosystematics Research Centre, Wm. Saunders Bldg.

Central Experimental Farm, Ottawa, Ont., Canada K1A 0C6
The 1983 Iowa Foray
Wm. Bridge Cooke
1135 Wilshire Ct.,
Cincinnati, Ohio 45230

Those who attended the 1983 Foray met near the north entrance to the Scheman Building, Iowa State University. Buses picked us up and took us to Ledges State Park in Boone Co., Iowa, where the morning was spent collecting fungi in the valley of a tributary of the Des Moines River. By noon we had reassembled in a picnic area for a box lunch. In the afternoon, after the Foray Portrait was taken, we visited woodlands in the vicinity of the picnic area, and some wandered farther afield. By 3:30 P.M. we had boarded the buses for the return trip to the Campus where in a laboratory in Bessey Hall the specimens were laid out for drying and observation.

During the Foray several interesting fungi were found including Chionosphaera apobasidialis D. Cox, described from Illinois and found also in Connecticut, New York, and Pennsylvania, only on Carpinus, and Xylomyces chlamydosporis Coos, Brooks & Lamore, previously found in Rhode Island on submerged wood near marine habitats; the Iowa collection was found on damp wood in a very moist location, but the wood was not submerged in water. A fungus noted as Poria cocos covered the debarked wood of a standing tree for a number of feet. This species is now considered a synonym of Wolfiporia extensa, an interesting range extension.

The Foray List
Location I: Ledges State Park along the Des Moines River, south of Boone, Boone Co., Iowa.
Location II: Campus, Iowa State University, Ames, Story Co., Iowa.
Reporting collectors:

B - Margaret Barr Bigelow, University of Massachusetts, Amherst.

C - Wm. Bridge and Vivian G. Cooke, Cincinnati, Ohio - MU.

G - Roger Goos, University of Rhode Island, Kingston.

R - Clark T. Rogerson, New York Botanical Garden, Bronx.

MYXOMYCETES:

Ceratiomyxa fruticulosa (Mull.) Macbr. - I, C-61722, 61727. Dictydiom cancellatum (Batsch) Macbr. - I, G.

CHYTRIDIOMYCETES:

Physoderma pluriannulatum (Berk. & Curt.) Karling - I, R.

oomycetes:

Peronospora alta Fckl. on Plantago sp. - II, R.

Ascomycetes:

Amphisphaeria umbrina (Fr.) deNot. - I, B-6937. Diatrype platystoma (Schw.) Cke. on Carpinus caroliniana - I, R. Diatrypella favacea (Fr.) Ces. & deNot. - I, B-6934.


BASIDIOMYCETES:


Fungi Imperfecti

MAURITZ ANDERSON received one of the two Outstanding Faculty Awards for 1987 given by the College of Natural and Mathematical Sciences of Towson State University. The College consists of about 90 faculty members.

MARGARET E. BARR BIGELOW was named to the titled chair, Ray Ethan Torrey Professor of Botany at the University of Massachusetts in December, 1986. Also awarded the University's Faculty Fellowship Award for distinguished research at the University of Massachusetts.

DR. EVERETT S. BENEKE of Michigan State University, has been awarded a plaque for his contribution to the Mycology Division in the International Union of Microbiological Societies. Dr. Beneke was the first Chairman of the Division from 1970 to 1978. The award was for the development of the Division into a major force in all aspects of mycology worldwide.

IRIS CHARVAT received 1987 Morse-Amoco Foundation Award for outstanding contribution to undergraduate education at the University of Minnesota.

DENNIS E. DESJARDIN received a National Science Foundation Doctoral Dissertation Improvement Grant for research on the genus *Marausius* from the Southern Appalachian Mountains. [Major Professor: Dr. Ronald H. Petersen]

D. A. GLAWE has been promoted to the rank of Associate Professor in the Department of Plant Pathology, University of Illinois at Urbana-Champaign.

ESTELLE LEVETIN recently became the editor of the International Aerobiology Newsletter, put out by the International Association for Aerobiology.

ROBERT D. LUMSDEN received an ARS Fellowship Award. He spent six months (February through July 1987) at the Glasshouse Crops Research Institute (Institute of Horticultural Research, A.F.R.C.), Littlehampton, England working in the Microbiology Department with Dr. J. M. Lynch and Coworkers.

ANDREW J. MOYER was inducted in the Inventors’ Hall of Fame at Arlington, Virginia. His selection was based on two patents on the industrialization of penicillin with the work being done during World War II.

DR. ROLF SINGER from the Field Museum of Natural History in Chicago, Illinois has received the George W. Clinton Award, "for life-long achievement in Natural Sciences." Dr. Singer was also honored as a Professor ad honorem at the Universidad de la Republica, Montevideo, Uruguay in April, 1987.

EDMUND TYLUTKI has won the seventh annual Faculty Award from the University of Idaho. He is best known for his three-volume "Mushrooms of Idaho and the Pacific Northwest."

LYNFERD J. WICKERHAM recently became the editor of the International Aerobiology Newsletter. (This is the newsletter for the International Association for Aerobiology.)
Walter J. Sundberg, during his sabbatical travels presented the following lectures:

"The Hand Lens--a Tool for Studying Mushrooms" to the North American Mycological Association (September 25, 1986; Priest Lake, ID); "Leptota--Eyeball and Hand Lens Biology" to the Puget Sound Mycological Society (Oct. 13, 1986; Seattle, WA); The Distribution of Mushrooms and Mucologists--An Axiom Proved" to the San Francisco Mycological Society (November 18, 1986; San Francisco, CA); "Interesting and Unusual Mushrooms" to the Santa Cruz Fungus Federation (December 12, 1986; Santa Cruz, CA); "Leptota--Eyeball and Hand Lens Biology" to the Oregon Mycological Society (January 29, 1987; Portland, OR) and "In Search of the Elusive Lepiota" to the Biology Department., San Francisco State University (February 10, 1987; San Francisco, CA).

CORRECTION - ADDITION

Harold Keller should have been listed as a member of the Committee on Finances, 1985-88 in the following issues of the MSA Newsletter, Vol. 36, No. 2, (December, 1985) and Vol. 37, No. 2, (December, 1986).

DEATHS OF MEMBERS

Dr. Charles L. Fergus

Dr. Gordon R. Wasson (December 23, 1986)

Dr. Vincent W. Cochrane

CHANGES OF AFFILIATION OR STATUS

GERALD BILLS has left the USDA Systematics Laboratory, Beltsville, Maryland to fill in for Martha Christensen for the 1987-88 Academic year at the University of Wyoming, Laramie, Wyoming.

GEORGE P. CHAMURIS has accepted a position as Assistant Professor in the Department of Biological and Allied Health Sciences at Bloomsburg University.

ROBERT W. MARTIN, JR. has accepted a Research Scientist position at Kraft, Inc. and is working in the Physical Chemistry laboratory.

ROLF SINGER was a Fulbright Professor at the Universidad de la Republica, Montevideo, Uruguay, from March through April 1987.

MARK SPEAR was promoted to Director of Research of Sylvan Spawn Laboratories.

UNIVERSITY OF ALBERTA MICROFUNGUS COLLECTION moved to the University's Devonian Botanic Garden. Phone: (403) 987-3054.
The following individuals have moved or changed address since the printing of the last MSA Directory and are requesting response to an announcement with this issue of the MSA Newsletter. Please make these changes in your Directory as they will not appear in future Newsletter issues.

Gerald F. Bills, Department of Botany, University of Wyoming, Laramie, Wyoming 82071. Phone: (307) 766-2140.


George P. Chamuris, Department of Biological and Allied Health Sciences, Bloomsburg University, Bloomsburg, PA. Phone: (717) 389-4400.

Frances A. (Mimi) Harrington, 4552 Metro Court, Annandale, VA 22003. Phone: (703) 941-1815.

I. Brent Heath, Department of Biology, York University, 4700 Keele Street, North York, Ontario, CANADA M3J 1P3. (415) 736-5511.

Tien-ming Jen, Mycosis Research Laboratory, Department of Pathology, Veterans General Hospital, VACRS, Shih-pai, Taipei, Taiwan (112), Republic of China.

Hack Sung Jung, 3084 White Birch Court, Fairfax, VA 22031. Phone: (703) 273-4018.

Marion M. Kyde, The Tulgey Wood, R.D. #2, Ottsville, PA 18942.

Ji-Yul Lee, 1-332 Myungryoon-dong 3-ga, Jongno-gu, Seoul 110 KOREA.

Ms Miki (Roberge) McGee, P.O. Box 199, Brisbane, CA 94005.

John M. McPartland, 1212 Chew #3, Allentown, PA 18102.

Florence H. Nishida, Botany Section, Natural History Museum, 900 Exposition Blvd., Los Angeles, CA 90007.

G. B. Ouellette, C.P. 3800, 1055 rue du PEPS, Ste-Foy, Quebec, G1V 4C7. Phone: (418) 648-5802.

David D. Pope, Department of Plant Pathology, University of Georgia, Athens, GA 30602. (404) 542-2571.


Joseph A. Stevens, Apartment 33G, 7447 South Shore Drive, Chicago, IL 60649-3851.

Hiroshi Yaegashi, Tohoku National Agricultural Experiment Station, Omagari, Akita 014-01, JAPAN. Phone: (0187) 66-1221.
ORTHO PHARMACEUTICAL CORPORATION, Research Division, Route 202, P.O. Box 300, Raritan, New Jersey 08869-0602.

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

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

PIONEER HI-BRED INTERNATIONAL, INC., 1206 Mulberry Street, Des Moines, Iowa 50308.

THE QUAKER OATS COMPANY, Group Quality Assurance, John Stuart Research Laboratories, 517 West Main Street, Barrington, Illinois 60010.

ROHM AND HAAS COMPANY, Research Division, P.O. Box 219, Bristol, Pennsylvania 19007.

SCHERING CORPORATION, Pharmaceutical manufacturers, Bloomfield, New Jersey 07003.

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

SOUTHWEST MOLD AND ANTIGEN LABORATORIES, INC., Since 1952, a leading provider of quality raw mold product to the allergy profession, P.O. Box 53492, Oklahoma City, Oklahoma 73152.

SPAWN MATE, INC., Nutrient supplements, spawn, research labs, technical service and products for the mushroom industry, 555 North First Street, San Jose, California 95112. (408) 998-4408, TLX 171135.

SPRINGER VERLAG NEW YORK, INC., PUBLISHERS, 175 Fifth Avenue, New York, New York 10010.

SYLVAN SPAWN LABORATORY, INC., Producers of Fungi on Solid Substrates, West Hills Industrial Park, Kittanning, Pennsylvania 16201.

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

WYETH LABORATORIES INCORPORATED, Division of American Home Products Corporation, P.O. Box 8299, Philadelphia, Pennsylvania 19101.

FRONT COVER - NOTE - ERIC BOEHM

Eocronartium muscicola (Fr.) Fitz. is a simple septate auriculoriod heterobasidiomycete found parasitizing numerous temperate moss genera. It has occupied a pivotal position in the phylogenies of the lower basidiomycetes, especially with regards to the origin of the Uredinales.
MYCOLOGICAL SOCIETY OF AMERICA NEWSLETTER
220 BIOSCIENCE CENTER
UNIVERSITY OF MINNESOTA
ST. PAUL, MINNESOTA 55108
USA

ROGER GOOS
DEPT. OF BOTANY
UNIV. OF RHODE IS.
KINGSTON, R.I.