Pyreno Pursuit: A Mycoblitz to Discover the Diversity of Pyrenomycetes in the Great Smoky Mountains National Park

By Andrew N. Miller

The first pyrenomycete mycoblitz was held in the Great Smoky Mountains National Park (GSMNP) September 5-9, 2005. Pyrenomycetes represent one of the largest groups of fungi, but are also one of the most poorly known, most likely due to their small size (usually <1mm diameter) and cryptic nature. An All Taxa Biodiversity Inventory (ATBI) is currently underway in the Park and the sampling of fungi, especially microfungi, is vital to ensure a complete and thorough survey of all of the Park’s organisms. Pyreno Pursuit was the first attempt to bring together experts to inventory the diversity of pyrenomycetes in the GSMNP. The objective of this study was to inventory pyrenomycete fungi during a week-long mycoblitz to assess their diversity, abundance, distribution, and host specificity in the GSMNP. Collecting occurred throughout the Park at various elevations to sample a wide variety of habitats ranging from pine-oak forests to hardwood coves to northern red oak forests. Locations included Alum Cave, Big Creek, Cades Cove, Greenbrier, Purchase Knob, and Sugarlands Visitor Center.

Participants included Dr. Sabine Huhndorf and her student, George Mugambi, (Field Museum, Chicago, IL), Dr. Andrew Miller and a student, Huzefa Raja, (Illinois Natural History Survey and University of Illinois Urbana-Champaign, Champaign, IL), Dr. Jack Rogers (Washington State University, Pullman, WA), Dr. Amy Rossman and her post-doc, Dr. Mikhail Sogonov, (USDA, Beltsville, MD), and Dr. Larissa Vasilyeva (Far East Branch of the Russian Academy of Sciences, Vladivostok, Russia).

All collections were entered into a database of pyrenomycetes of GSMNP. This database includes historical records gathered from L.R. Hesler’s lifetime list of Park fungi and from herbarium records from BPI. This week-long mycoblitz produced a total of 226 collections comprising 91 species and resulting in 65 (71%) new

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Park records and three new species to science. A checklist of all species collected during this mycoblitz will soon be posted on the Discover Life in America website (discoverlifeinamerica.org). It is anticipated that in the near future web-based identification guides and species pages will be created for each species discovered in the Park. The second annual Pyreno Pursuit mycoblitz is currently being planned for May 14-28, 2006.

Acknowledgments: This mycoblitz was funded through a Discover Life in America Grant (DLIA2005-11), while Vasilyeva’s travel was supported through a NSF BS&I Grant (DEB-051558), both to ANM. A special thank you is given to Dr. Ed Lickey (University of Tennessee, Knoxville) for his assistance in the identification of numerous host plants.

Questions or comments should be sent to Andrew Miller, Illinois Natural History Survey, Center for Biodiversity 1816 S. Oak St., Champaign, IL 61820. Email: amiller@inhs.uiuc.edu.
MSA Travel Awards to IMC8: Announcement and Call for Applications

We are very pleased to announce a call for applications for International Travel Awards for this year (details below and on the web at www.msafungi.org). MSA Executive Council has approved $4000 (in total) in support of travel by graduate students and postdoctoral fellows to the EIGHTH INTERNATIONAL MYCOLOGICAL CONGRESS (IMC8) in Cairns, Australia, August 20-26th, 2006. These awards are given to graduate students or postdoctoral fellows.

Application deadline: Received by March 15th, 2006.

Eligibility: An applicant (1) must be an MSA member, (2) must be presenting a paper or poster at IMC8 and (3) must be a graduate student or postdoctoral fellow.

Documents required:

(1) A cover letter requesting consideration for an MSA International Travel Award to IMC8. Provide telephone number and, if available, fax and email addresses, and include information on any past MSA Travel Award(s). Please also provide a brief budget outline for your costs in attending the meeting. If matching funds are available from the applicant’s institution, provide an address that can used to officially verify the receipt of an award.

(2) Abstract of paper or poster (please note which type of presentation).

(3) Curriculum vita.

(4) A one page description of the research project, including an explanation of how this award will further the applicant’s research/study.

(5) A letter of support from the applicant’s major professor addressing the student’s abilities and potential and briefly summarizing the student’s current research.

To apply: All documents listed above should be sent by email to the MSA Secretary. The application documents should be in PDF or WORD format and included as one or more attachments to a single email message. (The only exception permitted will be made for the letter of support from the applicant’s professor, which may be sent as an attachment to a separate email message directly from the professor, within the same deadline.)

Dr. Faye Murrin, MSA Secretary
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(Phone: 709-737-8018)
From the President’s Corner . . .

Dear Friends and Colleagues,

How quickly the year progresses! The MSA Annual Meeting with the American Phytopathological Society (APS) and the Canadian Pathological Society (CPS) in Québec City, July 29 - Aug. 2, 2006 is now less than six months away and preparations are in full swing with local organizers Linda Kohn and myself, working with Meeting Manager Paula Trenda and Director of Meetings Betty Ford at APS. MSA Council will meet on Friday, July 28, the day before the official opening of the meeting. The Foray, being organized by Don Ruch, is to be held on Saturday. Look for excellent collecting in the context of the locally rich history of amateur and professional mycology. The Opening Plenary Session on Sunday will feature three lectures of broad scope, each sponsored by a participating society. Jeff Townsend (University of Connecticut) is the MSA-sponsored lecturer. The Program Committee, chaired by Tom Bruns, has lined up four MSA symposium sessions: Fungal Movement: Contemporary Experimental Analysis, Bacterial Symbionts of Fungi, Diversity of Zoosporic Fungi, and Population and Species Divergence, each of which includes international participation from a diversity of research fields. As usual, the MSA will have numerous contributed paper sessions, plus posters. David Geiser (Pennsylvania State University) has kindly set up the abstract submission web site for all MSA sessions (abstract submissions for CPS and APS sessions are separate). The Social and Auction will be held on Tuesday evening in a venue adjacent to similar, but separate, activities for APS and CPS members. We welcome APS and CPS members to our auction! Inexpensive housing at Laval University will be available with transportation to the meeting. Students please submit your applications for MSA Mentor Travel Awards.

The mid-year MSA Executive Council meeting will be held at the Glenerin Inn, Mississauga, Ontario, Canada, March 4. Early March can be an “interesting” time to travel in Ontario, so please think good thoughts about favorable flying weather for Secretary Faye Murrin (St. John’s, Newfoundland), Treasurer Karen Snetselaar (Philadelphia), Vice President Don Hemmes (Hilo, Hawaii) President Elect Greg Mueller (Chicago), and Past President, David J. McLaughlin (St. Paul). Along with the Executive Council, Don Natvig (Albuquerque, New Mexico), Editor-in-Chief, Mycologia and Jeff Stone (Corvalis, Oregon) Managing Editor, Mycologia will be present. There are two issues that will surely figure prominently at this mid-year meeting and beyond. First, the main ongoing MSA priorities are publishing Mycologia and Inoculum, holding annual meetings, and awarding prizes and fellowships. Of these, the main expense by far is that for printing Mycologia. If open-access policy in the US moves to the point where journals with federally-funded research must be available to readers without cost, then our present model for publishing Mycologia might become unsustainable. In contemplating new strategies for publishing Mycologia, we must move with caution, as any new direction in publishing will carry risks. Merely maintaining the status quo, however, also carries risks. As a publisher of Mycologia, the MSA urgently needs to begin making informed plans. The other pressing issue is that MSA membership is either declining gradually or remaining flat. We need a concerted effort to reverse the recent trend and actually increase our membership. In increasing membership, it would undoubtedly help to make annual MSA meetings a higher priority for the thousands of de-facto mycologists worldwide who do not belong to the MSA. For example, involving the burgeoning fungal genetics community in annual meetings could help enormously. Continued geographic collaborations on annual meetings, like our joint meeting with the MSJ in Hilo last summer, will also help. Clearly it is time for a joint meeting with the Latin American Association of Mycology.

For their insights and suggestions for the present and future of the MSA, I thank the Blue Sky Committee, Dave Geiser, Steve Harris, Rick Kerrigan, Francois Lutzoni, Michelle Momany, Karen Snetselaar, Joey Spatafora, and John Taylor. MSA members please continue to send your suggestions to me or to any member of MSA Council.

On behalf of the MSA, I congratulate The Mycological Society of Japan on its 50th Anniversary to be celebrated at its annual meeting in Chiba, Japan, June 3-4, 2006. Here’s to a future of productive collaboration between the MSA and the MSJ!
MSA Council approved three motions since my last report, all dealing with expenditures associated with IMC6.

(1) MSA Executive Council Poll 2005b-13: In response to a request by Wieland Meyer, Chair of the IMC8 Organizing Committee, $1,000 was allocated in support of colleagues from developing countries to attend IMC8 in Cairns, Australia, 2006.

(2) MSA Executive Council Poll 2005b-14: A total of $4000 was approved in support of MSA International Travel Awards (to students and postdoctoral fellows who are MSA members) for IMC8 in Cairns, Australia. (See the announcement in this issue of Inoculum and the Society website for further details if you are interested in applying; also see new award guidelines below)

(3) MSA Executive Council Poll 2006-1: The Society approved up to $3000 in support of a joint reception with the British Mycological Society to be held in Cairns Australia at IMC8

MSA Executive Council also approved Guidelines for MSA International Travel Awards, which included the following.

- MSA Council may approve expenditures of up to $4000 in one fiscal year (Aug-July) for the financial support of students and postdoctoral fellows who are MSA members to attend international scientific meetings.

- Eligible meetings include those held by societies with which the MSA is formally associated; at present eligible societies include only IUMS and IMA. Under special circumstances, ALMS may also be considered as long as there is a memorandum of understanding in effect between ALMS and the MSA.

- (Societies not included are those identified in the MSA roster as sister/allied societies, as these are for information and site linking purposes only; nor other societies holding more specialized meetings).

- Awards are generally for $500 each.

- Meetings for which travel awards will be announced will be identified at the beginning of the fiscal year (August) and announcements will be sent out with the general awards announcements in the fall.

- Funds so allocated shall be drawn from the unrestricted endowment and/or operating funds and shall be limited to the availability of such funds in the year requested.

- Other considerations may follow those for the Mentor Travel Awards.

New Members: The MSA extends a warm welcome to new (or returning) members: New memberships will be formally approved by the Society at the Annual Meeting, 29 July - 2 August 2006, Québec City, Québec, Canada.

Australia: Marlien Van Der Merwe

Canada: Alan Taylor

France: Philippe Callac

Ireland: Salem O Abosriwil


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Note: Members may also submit directory corrections via the form included in the MSA directory via the MSA Home Page: www.msafungi.org
Ms. Enith Rojas, Smithsonian Tropical Research Institute (STRI), Barro Colorado Island, Panama, and Dr. Gary Samuels, USDA-ARS, Systematic Botany & Mycology Laboratory (SBML), Beltsville, MD, attended the Norman E. Borlaug International Science and Technology Fellows Program for Central America workshops held on January 19-20, 2006 at CATIE, Turrialba, Costa Rica. This meeting brought together the approximately 20 Central American Borlaug Fellows for 2005. Ms. Rojas gave a presentation on her research with leaf endophytes in Panama, with emphasis on ‘next steps’ and she and Dr. Samuels participated in discussions about the Borlaug Fellows program. Ms. Rojas plans to work with Dr. Samuels in Beltsville for six weeks starting in early March. During this time she will further characterize the cacao leaf endophytes that are being used in experimental studies in Panama by Dr. Allen Herre, STRI. Ms. Rojas was selected as one of five Borlaug Fellows to participate in the Inagural Riley Memorial Lecture Series in February 28-March 4, 2006. This event is sponsored by the USDA Norman E. Borlaug International Science and Technology Fellows Program, the Riley Memorial Foundation, The National Agricultural Library, and the International Agriculture Office of Texas A&M Agriculture, Texas A&M University System. The meeting will acknowledge the legacy of Dr. Charles V. Riley, a prominent 19th century agriculturalist who possessed a vision for enhancing success of agriculture through new scientific knowledge.

Dr. Pedro Ferreira, Director of CATIE, Dr. Gary Samuels, USDA-ARS, Systematic Botany & Mycology Laboratory, Beltsville, MD, Ms. Enith Rojas, Panama, and US ambassador to Costa Rica, Mark Langdale.

Dr. Dilantha Fernando Recieves Award

Dr. Dilantha Fernando, Associate Professor Department of Plant Science University of Manitoba was recently awarded the prestigious University of Manitoba 2004 Merit Award for outstanding Research and Service. The award recognizes Dilantha’s exceptional contributions as a researcher in the field of biological control and epidemiology of plant pathogens of canola and wheat, and the training of post doctoral scientists and graduate students. Dilantha works on the management of fungal pathogens of canola and wheat. Dilantha was also conferred the title of Honored Professor during his recent visit to Inner Mongolia Agriculture University, Inner Mongolia University, and Inner Mongolia Academy of Agricultural Sciences in Huhhot, Inner Mongolia, P.R. China. During his visit to Inner Mongolia from August 7-21, 2005, Dilantha conducted a workshop on Sclerotinia disease management in sunflower in Linhe City, and gave lectures at the two universities and at the agriculture academy. Dilantha’s trip was sponsored and paid for by the government of P.R. China under the International Research Partnership program. While Dilantha is actively involved in several scientific societies and committees, he presently holds the positions of Treasurer of the Canadian Phytopathological Society, and the Chair, Workshops of the American Phytopathological Society. He earned his B.S (Hons) degree from the University of Peradeniya, Sri Lanka, M.S degree from the University of Kelaniya, Sri Lanka and the Ph.D. degree from Oregon State University, Corvallis, Oregon, under the supervision of Dr. Robert G. Linderman.
Die Pilzflora des Ulmer Raumes


This is a difficult book to categorize. At first glance, it seems to be a field guide, but it isn’t. As the title suggests, the main text consists of a listing of the fungi that have been recorded from the Ulm area of southern Germany. The text is augmented with extensive introductory material such as typically found in a field guide, plus a summary of edible and toxic fungi, and a mycologist’s photo gallery. In my experience, it is a unique combination of features and, thus, hard to pigeon-hole.

The Ulm area encompasses 16,132-km², contiguous topographic quadrats in a 4 x 4 array (2112 km² total area) centered on the cities of Ulm and Neu-Ulm, which lie along the Danube River near the border between Baden-Württemberg and Bavaria. Compiling a list of the fungal species of this area has been an ongoing endeavor of the Arbeitsgemeinschaft Mykologie Ulm (Mycological Study Group of Ulm) since its founding in 1976 by Enderle, and this compilation clearly has been his pet project.

The introductory sections include: what is a mushroom; life-styles and occurrence of mushrooms; collecting and identifying mushrooms; microscopic examination of mushrooms; material and methods; mycological history of the Ulm area which began in the early 1700s; founding and activities of the Arbeitsgemeinschaft Mykologie Ulm; study area description (quadrat designations); geology, soils, vegetation, weather, and climate of the Ulm area; nature and fungus conservation including Red List species; nomenclature and systematics; new taxa described in this book; glossary; abbreviations; legend for figures; list of specialists for various taxa; and a list of taxa for which Enderle is author or co-author.

The floristic part lists 2681 species (2823 total taxa) of fungi in a broad sense. For instance, 94 of them are Myxomycetes. There is a variety of different entry styles, some consist simply of attributions to other published sources. Others list specific collections by Enderle or other collectors. Some have extensive descriptive information, good to excellent quality color photos, or good quality line drawings of macro- and microfeatures. The color photos usually are of the less common species, or ones not often illustrated elsewhere. For example, included are 15 conocybes and 30 psathyrellas, but no boletes or russulas, and only one lactarius and amanita each. Photos of representative habitats of the Ulm area also are scattered throughout this and other sections.

The floristic list is followed by green- and red-margined pages with short descriptions and good color photos of 50 edible and poisonous fungi found in the Ulm area. Most have rather wide distributions and so this section would be useful far beyond the study area. Also included are ten rules to provide guidance for those who would hunt mushrooms for the table and, for those who fail to properly heed those rules, a list of sources for help in case of mushroom poisoning.

The final section consists of black-and-white photos of local and visiting mushroom hunters and mycologists, German and otherwise, such as Reinhard Agerer, Marcel Bon, Bruno Cetto(†), Gro Gulden, Egon Horak, German Krieglsteiner(†), Meinhard Moser(†), and Roy Watling. An extensive reference list and the index conclude the book. Fluency in German certainly will help you get the most out of the book, but much of value can still be gleaned without it.

So who’s the likely audience? Clearly for anyone interested in fungi and living in or near the Ulm area, it’s a must-have. I suspect that a search of the MSA roster would reveal that very few of our members are in that group. For most of us, living in North America, it’s less obvious why one would need this book. However, its comprehensive listing of taxa would make it a candidate for comparative biodiversity assessments, the large number of good photos of little brown mushrooms would make it useful for students of Conocybe and Psathyrella. The mycologist photo gallery is of interest for attaching faces to European mycologists who might only be names to many of us. The price is low enough that such users, and others, should consider indulging in this perhaps not essential, but high-quality and nice-to-have, volume.

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While Manfred Enderle’s book (reviewed above) is difficult to categorize, this one is easy. For years, students of European macrofungi have relied on two comprehensive sets of keys to help them identify their collections, namely Flore Analytique des Champignons Supérieurs by Robert Kühner & Henri Romagnesi and Die Röhrlinge und Blätterpilze by Meinhard Moser. The latter volume, originally published in 1953, was most recently revised in 1983, the same year in which an English translation of the 4th (1978) edition appeared (Moser 1983). Thus, at the time of his unexpected and unfortunate death in 2002, a revision was due and Moser was contemplating a 6th edition.

With Dr. Moser’s passing, the task of the 6th edition fell to one of his former students, Dr. Egon Horak. Like Moser, Dr. Horak has a broad knowledge of the macrofungi, both taxonomically and geographically, and is well known and highly regarded throughout the world. Although Dr. Horak used the 5th edition as a starting point, this volume is not simply an updating and minor revision of the previous edition. It is, in many respects, a new work reflecting the new author’s taxonomic viewpoints and, thus, was given a new, albeit similar, title.

As mentioned above, this book is easy to categorize. It’s a large set of keys to the Polyporaceae p.p., Boletales, Agaricales, and Russulales of Europe. It’s not, and wasn’t intended to be, exhaustive in its coverage, in part because of page limitations. However, it still covers over 2900 species. The focus is on central Europe; most arctic/alpine and mediterranean species are not included. The contents include the Foreword; a systematic outline of the included genera; advice on how to use the book; glossary; lists of abbreviations and symbols used in the text, sources of illustrations and specialist literature, and authors’ names; references; keys to orders and genera; keys to species; a list of the new genera, species, and combinations in the book; six plates (including 60 line-drawing figures of spores, basidia, cystidia, and pileipellis elements); and the index.

The bulk of the text (486 of the 555 pages) is devoted to the keys. Their organization and numbering scheme, hierarchical, with from one to five digits, for example 3.7.6.4.1 for a portion of Psathyrella, which is genus 3.7.6, will be familiar to those who have used the earlier editions, including the English version of the 4th edition. As in the earlier editions, all of the descriptive information is contained in the key leads, and there are no separate descriptions. In most cases, the final lead contains abbreviated references for illustrations and more detailed descriptions. Some also include one or a few synonyms, but these are not extensive lists with few comments reflecting taxonomic opinions and philosophy.

The included species mostly are ones that are familiar to Dr. Horak, and he examined many type collections during preparation of the manuscript. He endeavored to incorporate the large advances that have been made in European macrofungus systematics during the past two decades, but tempered this with a fairly conservative approach to genus names, not including many recently proposed ones that are based primarily on molecular data. His logic is that most users of the book will be using traditional macro- and micromorphologic characters and that it makes sense to recognize familiar genus concepts based on those features.

The book is attractive and well put together. However, it contains a large number of minor errors such as missing headings, missing bits of text, incorrect page references, and so forth that can make for annoying distractions when using the keys. Apparently most of these crept in during the production phase when it was too late for Horak to catch them.

How useful will this book be for those of us in North America? If you are identifying macrofungi and have a good command of German, then this will be a useful tool to help fill the void until we have comprehensive keys of our own. If your German isn’t all that good, then you might be better off sticking with the English 4th edition and the Nordic Macromycetes series, at least until an English version of this book is available. Although there apparently is some discussion of a translation, we might have to wait until the next edition for it to happen.

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Just as those mycologists specializing in microfungi must know the basics of mushroom identification, sooner or later a colleague or neighbor will bring you their sick tomato plant and you will need to help them solve the problem. That’s when you should turn to the extremely useful Compendia of Plant Diseases published by the American Phytopathological Society or similar books such as this Colour Atlas of Cucurbit Diseases.

Each Compendium is multiedited, multiauthored and thus represents the expertise of many professional plant pathologists specializing in diseases of that specific crop. This latest one, Compendium of Bean Diseases, Second Edition, has four editors and 20 contributors. Each compendium follows a similar format, specifically an Introduction about the crop itself, followed by the diseases according to major category such as Infectious Diseases and Noninfectious Diseases. Within each major category the diseases are listed logically such as Fungal Diseases of Subterranean Parts, Fungal Diseases of Aerial Parts, Diseases Caused by Bacteria, and so forth. Within each category such as Fungal Diseases of Subterranean Parts, the individual diseases are presented with an introduction e.g. Aphanomyces Root and Hypocotyl Rot, followed by Symptoms, Causal Organism, Disease Cycle and Epidemiology, Management, and Selected References. Included are illustrations of diseased plant tissues and microscopic characteristics of the causal organisms. Mycologists can be reassured of their important to plant pathology—fungi are usually the most damaging of the organisms causing plant diseases.

The Compendium of Bean Diseases is one of the larger APS Compendia with excellent color illustrations placed throughout the volume. This edition is up-to-date with, for example, mention of the introduction via hurricane of soybean rust into the United States in September, 2004. A short introduction reviews the history of common bean (Phaseolus vulgaris L.), the third most important legume crop after soybean and peanut. The scientific names of organisms are accurate for the most part and the short morphological descriptions useful. The final section provides a diversity of abiotic diseases such as Air Pollution, Sunscald, Wind and Sand Damage and Mineral Deficiencies and Toxicity. This volume is an extremely useful, authoritative account of problems that afflict the production of common bean.

The book on cucurbit diseases is a translated version of a book published in 1996 in French as Maladies des Cucurbitacées in 1991. Cucurbits include a number of high cash-value crops such as melons, watermelons, and cucumbers. The book is divided into two major sections: the first is subdivided into plant part affected and color coded, thus diseases on leaves are in the green section, etc. The second major part concerns each causal organism with a synopsis and descriptions. Unlike the Compendium, there are no references associated with each causal organism. This book has more of a diseases-for-dummies feel to it with hints for disease diagnosis such as illustrations of the diseased crop in the field, specific location of the disease on the plant, and symptom definitions with illustrations such as shriveled leaves versus wrinkled, bubbled leaves. Such specific disease symptom definitions are useful. This book is profusely illustrated with relatively little prose and lacks the short morphological descriptions of the causal organisms found in the APS Compendia. The emphasis is on diagnostics with shorter undocumented sections on disease control and management. To mycologists faced with a sick cucurbit crop, this book would be a welcome guide to disease problems.

— Amy Rossman
Book Review Editor
Fungi of Australia: Hygrophoraceae

In this first monograph in the Fungi of Australia series, the known Hygrophoraceae of the Island Continent includes 92 species and infra-specific taxa. The family is introduced with a “brief” but comprehensive coverage of its general taxonomic history and research in Australia; a discussion of its ecology, biogeography and conservation; and a detailed exposé of the macro- and microcharacters as used in the book. Each species is illustrated by clear, simple but informative line drawings. Sixty excellent color figures, termed “plates” but with several to a page, showcase the bright, attractive characteristics of the family. Seven pages of outline maps illustrate the known distribution of each species. An appendix presents eight new combinations and one new species written to satisfy the International Code of Botanical Nomenclature, followed by a glossary, seven pages of bibliography, three pages of abbreviations and contractions used in the text, and an index to taxa. Dichotomous keys are presented for genera, subgenera and species. The species descriptions are in a traditional format. Length and width measurements of spores and basidia are given as the range, mean and Q. Microscopic characters of all tissues are satisfyingly detailed.

Australia abounds in mycological novelties, as illustrated for the Hygrophoraceae by the color plates. Some Aussie species macroscopically mimic species in other genera: Entoloma, Inocybe, Laccaria, Omphalina, Russula, and Tricholoma. Nothing seems sacred in Australian mycota! Sixty-eight of the 92 taxa in the book are regarded as endemic. Dr. Young described most of them, the result of his vigorous interest in the family. Only one species of Hygrophorus, two of Camarophyllus, and eight of Humidicutis appear—all the others are placed in Hygrocybe.

Welcome as this contribution is, it is still a work in progress. The distribution maps show that most taxa are known only from the SE mainland coast. Only four or five have been found more than 50 km inland, and those principally in mesic, sheltered forests and woodlands. I would not dispute the author’s generality that cool temperatures and extended high humidity are needed for fruiting, but my collecting experience in dry sclerophyll woodlands of New South Wales and Victoria has convinced me that these habitats are replete with undescribed fungi that fruit only in years when weather conditions are right—they have not often been right in recent years of drought. I bet that plenty of Hygrophoraceae will eventually be found in dry woodlands, if only collectors can hit it right. Let us hope that Tony Young and others will find more of those elusive inland taxa.

The keys feature objective characters for the most part, although some couplets are ambiguous. For example, couplet 7 for species in Hygrocybe subgen. Hygrocybe gives this choice:

7. Lamellae and stipe bright cherry-red slowly fading to yellow.
H. cerasinomutata
7. Lamellae and stipe yellow with reddish or orange tints at most.

How do you know if a specimen in hand, yellow with reddish tints, has faded from red to yellow or was never red in the first place? The problem becomes more exasperating when the second choice of couplet 7 leads you to couplet 8, where the first choice is “Lamellae and stipe bright red.” Come again? You had just chosen the yellow lamellae and stipe of couplet 7! The author gives color chip coordinates from his color atlas in the descriptions of the species in question, but a reasonably diligent search failed to inform me what atlas he used. Moreover, in his opening paragraph on taxonomic characters, he reminds us that color can vary greatly between and within individual taxa. Surely some less ambiguous characters could be used to separate those taxa in the key.

That experience induced me to randomly select a half dozen species and run them through the keys as though the descriptions were specimens in hand. Most worked fine, but I found a few minor discrepancies between keys and descriptions. For example, couplet 6 of the key to species in subg. Hygrocybe notes ascending lamellae for some taxa. To be sure what the author meant, I consulted the glossary, which defines “ascending” only in reference to hyphae. Then I checked the introductory section on characters of lamellae: the term is not mentioned. Or, couplet 3 of subg. Cuphophyllus calls for white, cream-colored or pale to dark brown lamellae “with yellow or orange tints.” I had selected H. watagensis as my test species. No mention is made in the description of “yellow or orange tints.” It keyed out if I ignored the “yellow or orange.” These complaints may seem pedantic, but they can be irritating or even misleading to users of a key. While I am venting, I wish book editors would put page numbers for each taxon in keys to subgenera and higher taxa. If I’m paying 135 Australian bucks for a book, I shouldn’t have to look up the page number for a genus in the index and pencil it in the key. Sure, I know it’s a layout and printing problem, but some publishers can pull it off, why not all?

Continued on following page
Identification of Common Aspergillus Species


Have you ever found yourself lost while driving? Its ok, you can admit it. It happens to everyone. You’re driving along when BAM! You suddenly realize that all of that familiar scenery is gone and now all that you are left with is street after street that look the same and before you know it you’ve managed to spend the next hour of your life going in complete circles. Then you think to yourself, it sure would be nice to have a good map, or better yet a GPS unit. Unfortunately, these are not always available so you pull into the closest gas station and sheepishly ask for directions. Its ok, you can admit it. It happens to everyone. You’re driving along when BAM! You suddenly realize that all of that familiar scenery is gone and now all that you are left with is street after street that look the same and before you know it you’ve managed to spend the next hour of your life going in complete circles. Then you think to yourself, it sure would be nice to have a good map, or better yet a GPS unit.

In my laboratory the other day I had a similar experience. Before you laugh yourself silly, I did not get lost in my own lab. I found myself lost while attempting to speciate a culture of Aspergillus. I had run through the familiar texts within the lab and then it happened. All that familiar territory was gone and I was faced with a dilemma. Here I was lost without a map and this time the guy at the gas station who has been so helpful in the past was not around to help. That was when I decided I needed a map or better yet a GPS unit. I got my hands on a copy of Identification of Common Aspergillus Species by Maren Klich.

The primary goal of this book is, according to the preface, to provide a morphologically based system for the identification of the common Aspergillus species. In addition the author generously includes several uncommon species to demonstrate the complexity and enormity of the genus Aspergillus. There are nearly 200 accepted species of Aspergillus; this book takes on 45 of the more common species providing an excellent reference text for the microbiology laboratory or for anyone with an interest in the morphology of the Aspergillus species.

The book is in a spiral bound format with good quality paper. The book begins with an introduction to Aspergillus species including their economic and medical importance, systematics, morphological features of importance for identification, learning to recognize morphological features, media and incubation, using this book, hints for making observations, and using the key. After the introduction there is an identification key, species descriptions, literature cited, Appendix 1-a table of major characteristics of Aspergillus species, Appendix 2-a data sheet that can be used to record macroscopic and microscopic characteristics, and finally an Index.

The real strength of this book lies in the fact that it includes over 270 photographs and electron micrographs, an identification key, 36 color plates, and a list of formulas to prepare your own growth media. The species are listed alphabetically and each description contains the following information: colony diameters, colony colors and textures, microscopic characteristics, distinguishing features, taxonomic references, common synonyms/related species, notes, habitats, and major mycotoxins. In addition to the descriptive information each species has five to six photographs and electron micrographs. Although not in color, these images include photos of the colonies, conidial heads, conidia and other distinctive features. The images also include scanning electron micrographs (SEMs) in order to give a more three dimensional view than can be photographed through a light microscope.

After using this reference text for almost a year I classify this as a must have book for any mycology/microbiology laboratory. The great part about this book is that I don’t find myself getting lost when identifying Aspergillus. Now, if I could just say the same thing about driving around town.

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Like most folks, when it comes to life in the Antarctic, I know very little. But, like most mycologists, I am keenly aware that fungi are known to occur in just about every corner of the Earth and Antarctica is no exception. But just barely. Despite being at the very limits of where organisms can eke out a living, Antarctica does support members of the Fifth Kingdom. And, as elsewhere, the fungi there can be found in aquatic environments and terrestrially. “Aquatic” here means they’re covered with ice most of the time. And by “terrestrial,” I don’t mean on the surface of rocks, I mean in the rocks.

Just a few paragraphs into Fungi of the Antarctic: Evolution Under Extreme Conditions, I quickly realized there is much to be learned about Antarctic mycology. If you’re a neophyte or expert this book is a great place to turn for information.

Basically Fungi of the Antarctic is an assemblage of two research papers authored by several experts in the field. The first paper, “Fungi at the edge of life: cryptoendolithic black fungi from Antarctic desert,” discusses the terrestrial fungi that occur there. Interestingly, fungi of the Antarctic are more apt to occur within porous rock, typically sandstone, rather than on the surface as lichens would in much of North America. This is because the microclimatic conditions just under the surface of rocks are somewhat buffered thermally and not subjected to such wide thermal fluctua-

The second paper, entitled “Evolution, taxonomy and ecology of the genus Thelebolus in Antarctica,” covers the fungi that dominate the aquatic regions of the continent, at least so far as is known. Fungi of this genus worldwide are typically found in association with mammal dung, and often in cold climates. In Antarctica, species of Thelebolus seem to have moved into birds as their animal host. In the environment, they form pink mycelial mats on the bottom of frozen lakes.

The authors of both papers hypothesize on the possible course of evolution for these fascinating organisms. But why study Antarctic fungi? Aside from describing some new species, which both groups have done herein, and some un-

Continued on following page
common lifestyles, what’s to be gained from investigating fungal life—or any life, for that matter—on the Seventh Continent? Possibly, quite a bit! Of course, there is always interest in extremophiles as a source of novel antimicrobials or other important biomolecules. Where would we be without DNA polymerases isolated from thermophiles? But there are some other “far out” reasons to explore life in the Antarctic. Some of the harsh Antarctic deserts are among the Earth’s closest analogues to that of Martian environments. Martian exploration and the search for life there are popular these days. Although the consensus is that Mars is inhospitable to life as we know it currently, it is thought that the Red Planet may have been more permissive in the past. The possibility that life is preserved there in a resting form cannot be ruled out. Thus, trying to determine the limits of life on Earth is a logical area of study.

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A Preliminary Monograph of Lentinellus (Russulales)

R.H. Petersen & K.W. Hughes.

The present volume is a specialist’s work. The genus Lentinellus was erected in 1879 by Karsten to include stipitate, agaricoid or omphaloid basidiomata and excluded pleurotoid forms, which were placed in Hemicybe. Saccardo did not recognize Lentinellus and placed Karsten’s genera in Lentinus Fr. However, Singer recognized seven species. Recently (1999) Moreau et al. published a floristic monograph of European Lentinellus. The three chapters of the monograph reviewed here by Petersen & Hughes recognize 24 species within the genus, which they place in the Lentinaceae. The first chapter is a biogeographic survey with presentation of morphological descriptions, ability to interbreed (biological species concept) and occasional reference to nucleic acid sequences across species (phylogenetic species concept sensu Taylor). This chapter includes a dichotomous key to the species organized by micromorphological and geographical data; the latter seems strange to include as a key character. A synoptic key might have been more useful. Macromorphological variation within most of the species is quite high and can misled the unwary. The diagrammatic representation of intercollection compatibilities is an exceptionally clear and useful depiction of the authors’ fertility experiments; crosses among single basidiospore isolates show most species have a tetrapolar mating system.

The second chapter presents full descriptions of the type specimens. Because several of these collections are in poor condition, the uniformity of their annotation should retard further deterioration, thus this chapter should prove useful to whoever may choose to monograph the genus in the future.

The third chapter presents cladistic analyses of the genus based on ITS sequences of the large ribosomal subunit for 15 biological or morphological Lentinellus taxa; 11 were clearly delineated. With the full data set, the PAUP program was limited to 10,000 trees and 10,000 equally parsimonious trees were obtained. While most taxa show strong congruence among the various species concepts, some taxa are problematic in this regard. The authors invoke several possible explanations for the disagreements: slower evolution of ITS sequences than genes affecting morphology; mutation in developmental genes with pleiotropic effects that leave ITS sequences unaffected; rare hybridization events followed by introgression of the ITS sequences into one of the parent populations. For several clades, correlations are derived between geographic and ITS sequence data. As with many studies based on single gene families, this contribution can only present tentative topologies for the observed diversity and will best serve as an indicator for groups that require further study.

The data presented in this volume are generally clear and of high quality. My only quibbles have to do with: 1) placement of the legend for the well-reproduced color plates was at the end of chapter 1, nearly 100 pages from the plates themselves; and 2) the unitless terms $E$ and $E_m$ found in several tables and that presumably represent ellipsoidity of spores are undefined. Again, this is a specialist’s monograph; it will be of interest to taxonomists working within the Russulales, but few others. It should find its place in mycological libraries and herbaria.

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MYCOLOGIST’S BOOKSHELF

Recently Received Books


- Revised Synopsis of the Hyaloscyphaceae. 2004. A. Raitviir. Estonian Agricultural University Institute of Zoology and Botany. Scripta mycologica 20. ISBN 9985-9293-3-0. 133 p. Available from the author (ain@zbi.ee) or from Edizioni Candusso di Candusso Massimo (maxcandusso@libero.it).

Previously Listed Books


Continued on following page
MYCOLOGIST’S BOOKSHELF


MYCOLOGICAL SOCIETY OF AMERICA — GIFT MEMBERSHIP FORM

Sponsoring a gift membership in MSA offers tangible support both for the recipient of the membership as well as for mycology in general. Providing both *Mycologia* and *Inoculum*, a gift membership is an excellent way to further the efforts of our mycological colleagues, especially those who cannot afford an MSA membership. In addition to a feeling of great satisfaction, you also will receive a convenient reminder lent way to further the efforts of our mycological colleagues, especially those who cannot afford an MSA membership. In addition to a feeling of great satisfaction, you also will receive a convenient reminder for renewal of the gift membership the following year. In addition to a feeling of great satisfaction, you also will receive a convenient reminder for renewal of the gift membership the following year.

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Send this form to: MSA Business Office, PO Box 1897, Lawrence KS 66044 or FAX to (785) 843-1274, Attn: Processing Department

*If this membership is given after June 1, please add $10 to cover postage for past issues.

Inoculum 57(2), April 2006 15
A Unique Comprehensive Mycological CD-ROM

In light of my distinguished colleague, George Barron’s account of his Lab. Teaching mycological CD (and I have no doubt it’s a fine piece of work, since he is both a world-ranking mycologist and a superb photomicrographer), perhaps I may be permitted to give an introduction to my own CD-ROM about fungi. This has been a-building for the past 10 years, and now contains about 540 Megabytes of mycological information, with about 5,000 illustrations, including various video sequences and animations (Version 4.2).

This CD is unique in that it covers the entire spectrum of mycology, from an introductory discussion of the seven widely recognized Kingdoms (two containing fungi), and the concept of biodiversity, to a look at some of the latest revelations of molecular biology. I’ll go into that a bit later, and an extensive glossary with many sound files to aid pronunciation of arcane terms.

How did this all come about? When I retired from University teaching in 1994, the technology for building your own website was just becoming available. Since I now had a little time on my hands, I thought ‘Why not?’ and proceeded to do it. Now I know that Microsoft is famous for its bloatedware, and according to many computer-savvy people is essentially the Great Satan. Nevertheless, I was working on a PC running Windows, and naturally gravitated to a Microsoft program called Front Page, which supposedly made it easy to build your own website. And lo, it was so.

Once that had happened, the technology for burning your own CD-ROMs appeared, and likewise proved irresistible. I began to render my textbook The Fifth Kingdom into html (again using Front Page), and to accompany the text with all those lovely colour illustrations you simply can’t put in books because they are far too expensive to print. I also managed to build a number of animations illustrating fungal processes, and borrowed a couple more from colleagues. In addition, I found that I could insert short segments of video that I had taken in various parts of the world, and some of these seemed to enliven the presentation.

Originally, the Chapter numbers exactly matched those of my textbook, The Fifth Kingdom, but before long some of the Chapter ‘pages’ became so large that I had to subdivide them. Chapter 4, about the ascomycetes and their anamorphs, had to be split up into 4a and 4b. Then the basidiomycetes, about which so much information and so many pictures are available, had to be divided into four parts.

There are currently 25 ‘Chapters’, split up into 32 major html pages, with a number of smaller subsidiary pages interpolated wherever I deemed it necessary - this is the nice thing about html, it gives you such freedom to add interesting tidbits. Let me give you a few examples. (1) I didn’t want to complicate the treatment of the Aphyllophorales (Chapter 5a) too much, so added an extra page to explain ‘How we define genera in the Polyporaceae’. I show the value of such features as hyphal systems (monomitic, dimitic or trimitic), degradative enzymes (white rot or brown rot), presence or absence of clamps on generative hyphae, the kinds of cystidia produced, reactions of spores with Melzer’s reagent (amyloid or dextrinoid), and the size, shape, ornamentation and walls of basidiospores, and how these now allow us to recognize about 100 genera of polypores (21 of which are characterized in an accompanying table). (2) The relatively detailed treatment of the Clavicipitales in Chapter 4b has a pictorial appendix showing a selection of the superb paintings from the famous (but hard to come by) Japanese book by Shimizu and Kobayasi. (3) The discussion of Erysiphales has an extra page of illustrations from the fine monograph by Dr. Zheng Ru-Yong. (4) A discussion of the recent redispositions of most species of Coprinus in Coprinopsis, Coprinellus and Parasola on molecular grounds.

Chapter 25, which is not in the book at all, is titled: BUT HOW DO YOU ACTUALLY DO MYCOLOGY? and deals with many topics: photography - collecting - large fungi

Introductory Mycology MycoAlbum CD-ROM

The MycoAlbum CD has undergone significant improvements since the Hilo meeting. There are about 150 more illustrations for a total of 1050 annotated illustrations (most at 1024 x 768 pixels), plus numerous corrections to the scripted material. Also, there is now an Instructor’s version of the album supplemented with an IMAGE ONLY album of 700+ non encrypted images at 800 x 600 pixels accessible for power point presentations. Several hundreds of genera are used to illustrate features of biological or structural importance. For a listing of these genera see the following URL: www.uoguelph.ca/~gbarron/MISC2006/albumgen.htm.

These members who bought a pre-release version of the album at the Hilo auction can have a free copy of the final version (including image album) if they contact me directly.

For undergraduate and graduate students, the MycoAlbum CD is available for $15 plus shipping ($5). For mycologists, plant pathologists and other professional biologists, the cost is $25 plus shipping. For those who need access to images for lectures, quizzes etc., there is an Instructor’s version containing additionally a non encrypted image album of 700+ downloadable images at 800 x 600 pixels. The Instructor’s version costs $35 plus shipping. See my website at www.uoguelph.ca/~gbarron/ for details on ordering and further information. Personal checks acceptable from MSA members.

George Barron, University of Guelph
In support of field biologists, modern field naturalists, and students of the natural history sciences, Eagle Hill offers specialty seminars and workshops at different ecological scales for those who are interested in understanding, addressing, and solving complex ecological questions. Seminars topics range from watershed level subjects, and subjects in classical ecology, to highly specialized seminars in advanced biology, taxonomy, and ecological restoration. Eagle Hill has long been recognized as offering hard-to-find seminars and workshops which provide important opportunities for training and meeting others who are likewise dedicated to the natural history sciences.

Eagle Hill field seminars are of special interest because they focus on the natural history of one of North America’s most spectacular and pristine natural areas, the coast of eastern Maine from Acadia National Park to Petit Manan National Wildlife Refuge and beyond. Most seminars combine field studies with follow-up lab studies and a review of the literature. Additional information is provided in lectures, slide presentations, and discussions. Seminars are primarily taught for people who already have a reasonable background in a seminar program or in related subjects, or who are keenly interested in learning about a new subject. Prior discussions of personal study objectives are welcome.

**Lichens and Lichen Ecology**
May 21 - 27, 2006
- **Dr. David Richardson** (david.richardson@SMU.CA)
- **Dr. Mark Seaward** (m.r.d.seaward@bradford.ac.uk)

**Advanced Mycology: Field and Lab Studies**
June 18 - 24, 2006
- **Dr. Donald H. Pfister** (dpfister@oeb.harvard.edu)

The whole thing is potentially very useful in teaching, since the pictures can be shown on a large screen with the aid of a digital projector. If the instructor wants the students to have personal copies of the CD-ROM, they can obtain these for far less than the average textbook costs, and with minimal shipping costs.

I will close by inviting those charged with teaching mycology courses to look at this tool and see how it might make their lives simpler, and those of their students more interesting.

_Bryce Kendrick_
bryce@mycolog.com
MYCOLOGICAL CLASSIFIEDS

Interactive Key to Hypocreales of Southeastern U.S. On Line

At the 2004 MSA meeting in Asheville, NC, a workshop was held on the Hypocreales of the Great Smoky Mountains National Park for which an identification guide was prepared. Limited copies were available and quickly disappeared. Since then, this revised and expanded guide has been published as CBS Biodiversity Series No. 4 (Samuels et al. 2006). This publication includes 101 taxa of Hypocreales with plates of illustrations that include macro- and microphotographs and descriptions. Emphasis is on the genera Hypocre a with 33 species and Hypomyc e s with 23 species in the Hypocreaceae as well as 11 species in the Bionectriaceae, 32 species in the Nectriaceae and two species in the Clavicipitaceae. In addition, these descriptions and illustrations with an interactive key are available at the website of the Systematic Botany & Mycology Laboratory:

nt.ars-rin.gov/taxadescriptions/keys/HypocrealesSEIndex.cfm.

This interactive system links the species name resulting from the interactive key with descriptions and illustrations to data about plant host, geographic distribution and literature in associated databases. Additional online keys with descriptions and illustrations available at SBML include: Hypomyc e s and Trichoder m a in the Hypocreales and Rust Fungi, Raven elia and Rusts on Legume Hosts.


Field Mycoloy Course Offered in North Carolina

July 10-21, 2006. Fleshy Fungi of the Highlands Plateau, Highlands Biological Station, Highlands, North Carolina. The Southern Appalachian Mountains are world-renowned for their incredibly rich diversity of fleshy fungi. Participants will be introduced to the fleshy ascomycetes and basidiomycetes that occur on the Highlands Plateau during peak mushroom season. Emphasis will be placed on analysis of macro- and micromorphological features in the identification of taxa. The daily routine consists of morning lectures on systematics, ecology, and phylogeny of fleshy fungi followed by field trips until early afternoon. Collections will be examined and identified after returning from the field, providing an opportunity to assemble an impressive collection of fleshy fungi for classroom instruction and research. Housing is available at the station for $40-60 per week (with linen). The station does not serve meals but a fully equipped kitchen is available with grocery stores and restaurants available in town. Three semester hours of advanced undergraduate credit is available from Western Carolina University or UNC-Chapel Hill. Tuition is $400. For additional information contact Dr Andrew S Methven, Department of Biological Sciences, Eastern Illinois University, Charleston, IL 61920; phone (217) 581-6241; Email: asmethven@eiu.edu or Dr James Costa, Executive Director, Highlands Biological Station, 265 N. Sixth Street, Highlands, NC 28741; phone (828) 526-2602; Website: www.wcu.edu/hbs

Mold Testing and Identification Services Available

Identification and contamination control for buildings, food technology, animal and plant diseases. ASTM & Mil-Spec testing for fungal resistance of materials. 10% discount for regular and sustaining MSA members. Please contact Steve Carpenter at microbe@pioneer.net or voice mail at 541.929.5984. Surface mail send to Abbey Lane Laboratory, LLC, PO Box 1665, Philomath, OR 97370 USA. For more information see www.pioneer.net/~microbe/abbey-lab.html
MYCOLOGICAL CLASSIFIEDS

Postdoctoral Fellowship Available at National Taiwan University

A postdoctoral research position is available from February 2006 to July 2007 at Department of Plant Pathology and Microbiology, National Taiwan University, Taipei 10617, Taiwan. The fellowship annual salary is $660,000-720,000 NTD, commensurate with experience and qualifications. The position will remain open until filled. The obligation of the post doctorate fellow will focus work on cloning, characterization, and gene expression from fungi with biocontrol potential. Personnel with doctorate degree in life science, particularly, with experience on gene cloning, are encouraged to apply. Applicants should send Curriculum Vitae, latest publications and list of two references to Dr. S.S.Tzean via email address sst@ntu.edu.tw. The perspective applicant will be contacted shortly upon evaluation.

Introduction to Food- and Air-Borne Fungi Course Planned in Ottawa

The course will be held from 12-16 June 2006. Ottawa, Canada. More than 100 mould and yeast species common in indoor air and on food will be examined, including important species of Penicillium, Aspergillus, Fusarium, Trichoderma, Stachybotrys, Cladosporium, Mucor, Rhizopus, Alternaria and Scopulariopsis. This 5 day course is appropriate for those interested in food spoilage, indoor air quality, industrial hygiene, mycotoxins, pharmaceuticals, biodeterioration, etc. Instructors: Robert A. Samson and Jos Houbraken, Centraalbureau voor Schimmelcultures. Keith A. Seifert and John Bissett, Agriculture and Agri-Food Canada. For more information, please contact Keith A. Seifert, Biodiversity Theme (Mycology & Botany), Eastern Cereal and Oilseed Research Centre, 960 Carling Ave., Agriculture and Agri-Food Canada, Ottawa, Ontario K1A 0C6 CANADA. Phone: 613-759-1378. Fax: 613-759-1701. Email: seifertk@agr.gc.ca or visit the course web site at www.indoormold.org (under courses).

Keith Seifert
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NOTE TO MEMBERS:
If you have events to announce, please notify Inoculum editor Richard Baird so they can be listed in the Calendar of Events.

rbaird@plantpath.msstate.edu
Below is an alphabetical list of websites featured in *Inoculum* during the past 12 months. Those wishing to add sites to this directory or to edit addresses should email <rbaird@plantpath.msstate.edu>. Unless otherwise notified, listings will be automatically deleted after one year (at the editors discretion). * = New or Updated info (most recent *Inoculum* Volume-Number citation)

- Ascomycota of Sweden  
  [www.umu.se/myconet/asco/indexASCO.html](http://www.umu.se/myconet/asco/indexASCO.html)
- Australasian Mycological Society Website for Introductory Fungal Biology (53-4) 
- Authors of Fungal Names (54-2)  
  [www.indexfungorum.org/AuthorsOfFungalNames.htm](http://www.indexfungorum.org/AuthorsOfFungalNames.htm)
- Bibliography of Systematic Mycology  
  [www.speciesfungorum.org/BSM/bsm.htm](http://www.speciesfungorum.org/BSM/bsm.htm)
- British Mycological Society (54-1) 
  [britmycolsoc.org.uk](http://britmycolsoc.org.uk)
- Cordyceps Website  
  [www.mushtech.org](http://www.mushtech.org)
- Corticioid Nomenclatural Database (56-2)  
  [phyloinformatics.org](http://phyloinformatics.org)
- Coverage in Ukraine of Higher Fungal Ranks (56-2)  
  [www.cybertruffle.org.uk/lists/index.htm](http://www.cybertruffle.org.uk/lists/index.htm)
- Cybertruffle’s Fungal Valhalla (56-2)  
  [www.cybertruffle.org.uk/valhalla/index.htm](http://www.cybertruffle.org.uk/valhalla/index.htm)
- Dictionary of The Fungi Classification  
  [www.indexfungorum.org/names/fundic.asp](http://www.indexfungorum.org/names/fundic.asp)
- Distribution Maps of Caribbean Fungi (56-2)  
  [www.biodiversity.ac.psiweb.com/carimaps/index.htm](http://www.biodiversity.ac.psiweb.com/carimaps/index.htm)
- Distribution Maps of Georgian Fungi (56-2)  
  [www.cybertruffle.org.uk/gruzmaps/index.htm](http://www.cybertruffle.org.uk/gruzmaps/index.htm)
- Distribution Maps of Ukrainian Fungi (56-2)  
  [www.cybertruffle.org.uk/ukramaps/index.htm](http://www.cybertruffle.org.uk/ukramaps/index.htm)
- Electronic Library for Mycology (56-2)  
  [www.cybertruffle.org.uk/cyberliber/index.htm](http://www.cybertruffle.org.uk/cyberliber/index.htm)
- European Powdery mildews (52-2)  
  [nt.ars-grin.gov](http://nt.ars-grin.gov)
- Fun Facts About Fungi (55-1)  
  [www.herbarium.usu.edu/fungi/funfacts/factindx.htm](http://www.herbarium.usu.edu/fungi/funfacts/factindx.htm)
- Funga Veracruzana (53-6)  
  [www.uv.mx/institutos/forest/hongos/fungavera/index.html](http://www.uv.mx/institutos/forest/hongos/fungavera/index.html)
- Hadrianus Junius Stinkhorns (52-2)  
  [www.collectivesource.com/hadrianus](http://www.collectivesource.com/hadrianus)
- Index of Fungi  
  [www.indexfungorum.org/names/names.asp](http://www.indexfungorum.org/names/names.asp)
- ING (Index Nominum Genericorum) Database (52-5)  
  [ravenel.si.edu/botany/ing/ingForm.cfm](http://ravenel.si.edu/botany/ing/ingForm.cfm)
- Interactive Catalogue of Australian Fungi (52-1)  
- Interactive Key, Descriptions & Illustrations for Hypomyces (52-6)  
  [nt.ars-grin.gov/taxad Descriptions/hypomyces/](http://nt.ars-grin.gov/taxad Descriptions/hypomyces/)
- Interactive Key to Hypocreales of Southeastern United States (57-2)  
  [nt.ars-rin.gov/taxad Descriptions/keys/HypocrealesSEIndex.cfm](http://nt.ars-rin.gov/taxad Descriptions/keys/HypocrealesSEIndex.cfm)
- ISHAM: the International Society for Human and Animal Mycology  
  [www.isham.org](http://www.isham.org)
- Mycologia On-Line (53-3, page 18)  
  [www.mycologia.org](http://www.mycologia.org)
- Mycological Progress (52-3)  
  [www.mycological-progress.com](http://www.mycological-progress.com)
- The Myconet Classification of the Ascomycota  
  [www.umu.se/myconet/Myconet.html](http://www.umu.se/myconet/Myconet.html)
- Mycosearch web directory/search engine (51-5)  
  [www.mycosearch.com](http://www.mycosearch.com)
- Mushroom World [new Korean/English site in 2001] (51-6)  
  [www.mushworld.com](http://www.mushworld.com)
- NAMA Poison Case Registry (51-4)  
  [www.sph.umich.edu/~kwcee/mpcr](http://www.sph.umich.edu/~kwcee/mpcr)
- Pathogenic Fungi From South Africa (52-4, page 29)  
  [nt.ars-grin.gov/fungaldatabases/southafrica or www.saspp.co.za/](http://nt.ars-grin.gov/fungaldatabases/southafrica or www.saspp.co.za/)
- Plant-associated Fungi of Brazil (54-2)  
  [nt.ars-grin.gov](http://nt.ars-grin.gov)
- (Select Search Fungal Databases, option 3, Host-Fungus Distributions)
- *Pleurotus* spp.  
  [www.oystermushrooms.net](http://www.oystermushrooms.net)
- Rare, Endangered or Under-recorded Fungi in Ukraine (56-2)  
  [www.cybertruffle.org.uk/redlists/index.htm](http://www.cybertruffle.org.uk/redlists/index.htm)
- Registry of Mushrooms in Art Website  
  [members.cox.net/ mushroomsinart/](http://members.cox.net/ mushroomsinart/)
- Searchable database of culture collection of wood decay fungi (56-6, page 22)  
- Species of Glomeromycota Website (55-3)  
  [www.amf-phylogeny.com](http://www.amf-phylogeny.com)
- Systematics of the Saprolegniaceae (53-4)  
  [www.illumina-dlib.org](http://www.illumina-dlib.org)
- Tripartite Similarity Calculator (55-1)  
  [www.amanitabear.com/similarity](http://www.amanitabear.com/similarity)
- U.S. National Fungus Collections (BPI)  
  [Complete Mushroom Specimen Database (57-1, page 21)](http://www.ars.usda.gov/ba/psi/sbml)
- Website for the mycological journal Mycena (56-2)  
  [www.mycena.org/index.htm](http://www.mycena.org/index.htm)
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