Volvariella bombycina *mushroom* photographed by Thirunarayanan P. Research scholar, Department of Mycology and Plant Pathology, Banaras Hindu University, Varanasi, India.

Submitted by: Thirunarayanan P.

Thanks Thirunarayanan P. for your submission!
To submit a photo of your own for consideration in future *Inoculum* headers, please use this form.
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MSA Inoculum Team
Editor: Jessie Glaeser
Assistant Editor: Terry Torres Cruz
Book Review Editor & Memorials: Amy Rossman
2024 MSA Election Results

Congratulations to our new MSA 2024 leadership!

Vice President
Marin Brewer

Executive Vice President
Priscila Chaverri

Councilor
Systematics & Evolution
Jana U’Ren

Councilor
Ecology & Conservation
Posy Busby

Councilor
Genetics & Cell Biology
Sunny Liao

Councilor
Symbiosis & Pathology
Matt Kasson

Thank you to all candidates and those who took time to cast a vote.
How time flies! This is my last Inoculum column as Executive Vice President for the Society. I would like to express my deepest gratitude to all my mycological friends and colleagues for their support over the past three years, including the past EVPs whose well-organized files and long lists of advice showed me the way. Although I look forward to passing these files on to the next EVP, I will sincerely miss working with the MSA Executive and General Councils, the Mycologia and Inoculum Editors, our amazing service and awards Committees, and the MSA team at The Rees Group. It has been an honor.

**Council Business:** The Executive Council’s Spring Quarterly meeting was on April 28, 2024. Minutes from this meeting are available on the MSA website (https://msafungi.org/msa-meeting-minutes-and-reports/). The Council approved seven email polls since my February column: Poll 2024-04, Motion to fund the 2024 SPORES program, Poll 2024-05, Motion to send a letter on behalf of the MSA in support of the Duke Herbarium, Poll 2024-06, Approval of the Honorary Awards Committee’s recommendation for MSA Fellow, Poll 2024-07, Approval of the Honorary Awards Committee’s recommendation for MSA Fellow, Poll 2024-08, Motion to approve three proposed Bylaw Changes for the spring ballot, Poll 2024-09, Motion to waive membership fees for SPORES recipients, and Poll 2024-10, Emeritus membership for Richard Hanlin. The annual Council meeting is scheduled for June 8, 2024, at the Hilton Toronto/Markham Suites Conference Center in Markham, Ontario, Canada.

**Member Deaths:** Ludmila Marvanová passed away on January 16, 2024, Joe Hennen passed away on March 4, 2024, and Jim Ginns passed away on April 24, 2024.

**New Members:** I would like to extend a warm welcome to the following new members who joined MSA between February 6, 2024 and April 24, 2024. Their membership will be formally approved at the 2024 Annual Business Meeting in Markham, Ontario, Canada.

**Cameroon:** Grace Ngiah Agbor

**Canada:** Mark Vicari, Chujun Chen, Kamaldeep Chhoker, Sumhithaa Sriram, Eli Guan, Katie King

**China:** Yongjie Zhang

**Estonia:** Niloufar Hagh Doust

**South Africa:** Martin Coetzee

**2024 Membership:** If you have not yet renewed your membership for 2024, it is not too late. Click here: [https://msafungi.org/membership-login/](https://msafungi.org/membership-login/). Committed MSA members are encouraged to select an auto-renew or multi-year option to receive the $10 early renewal discount next year and reduce unintended lapses in membership.

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**REMINDER - MSA Directory Update:** Have you checked your information in the MSA directory recently? Accurate information ensures that the MSA can continue to bring you timely information about awards, elections, meetings, and news. To review your information, visit [https://msafungi.org/membership/](https://msafungi.org/membership/) or select the "Member Login" link found within the membership menu option at [msafungi.org](http://msafungi.org). If you need assistance, contact our MSA Membership Coordinator, Cori VanGalder (msafungi@reesgroupinc.com).

Please feel free to contact me if you are interested in getting more involved with the Society or have any questions about the Society or MSA business.

Respectfully submitted,

Emily Cantonwine (egcantonwine@valdosta.edu)
MSA Executive Vice President


This is the first book dedicated to the alpine fungi of France. 118 species have been described and illustrated by over 500 colored photographs. Includes many keys for determination.


This field guide covers the mushrooms of continental North America in regions north of Mexico. It treats 668 species of mushrooms and other fungi. It is suitable for mushroom enthusiasts at beginner and intermediate levels.

A central feature of this book is the color photographs. It contains nearly 2,900 color photos. The book credits 963 photographers for their contributions. Those photographers are scientists, scholars, students, field experts, and also internet message board users known only by fictitious pseudonyms.

One thing this book lacks is taxonomic keys. However, each species is treated with three to six quality images that illustrate morphology, close-ups and other identifiers. The photos provide an adequate visual reference for each species. Readers can simply page through the book to eyeball their way toward ballpark identifications.

Another notable feature is the omission of edibility criteria. This book does not label mushrooms as edible, medicinal, toxic or hallucinogenic. Omitting edibility criteria establishes a protective guardrail around the topic of consuming wild mushrooms as a food source. Perhaps this will emerge as a new trend in field guides for strengthening awareness about the potential danger of eating wild mushrooms.

The purpose of this book is to disseminate knowledge about mushrooms in the United States and Canada. The information stands on the shoulders of countless mushroom hunters and mycologists who continue to collaborate and share their discoveries, confirmations and corrections. This book proudly bears the endorsement of the National Audubon Society and it is designed to reach an audience of millions of people.

To purchase this book from Penguin Random House click [here](#).

To learn more about the National Audubon Society, click [here](#).

Submitted by Neil Dolinger, neil.dolinger@gmail.com
June 2024 Educator Spotlight: Marc Cubeta
Interviewed by: A Member of the MSA Education Committee

Note: Dr. Cubeta’s course activity “Soy Sauce in Disguise” can be found on the MSA website.

What is your name and how long have you been teaching Mycology?
Marc Anthony Cubeta. I have taught mycology-related courses for 30 years.

What is the title of your Mycology-focused course and what is the level of your course? (undergrad majors? Non-majors? Graduate?)
Kingdom of Fungi (PP222), a general education program course for undergraduate students (major and non-majors).
Introduction to Mycology (PP575), a course for advanced undergraduate and graduate students.

What is your favorite activity taught in this course and what is the goal of this activity?
PP222 - Soy Sauce in Disguise. This experiential learning exercise activity was developed based on discussions with Dr. Nicole Donofrio at the University of Delaware and is easy to assess and conduct. The initial goal of this activity is to provide students with background information (presented in a course lecture module) on the role that Aspergillus fungi, bacteria, and yeasts play in the soy sauce production process. This knowledge is used as a framework to conduct an in-class exercise where students assess the quality characteristics of two different soy sauces made with non-traditional and traditional methods. Instructions for conducting the soy sauce assessment are provided to the students as a pre-recorded video on the course website. Students allergic to soybean or wheat do not taste the soy sauces but can assess other quality characteristics that do not require tasting (e.g., aroma, color, ingredients, and viscosity). Following completion of the soy sauce assessment, students participate in a class discussion and submit a written document with a synthesis of their results for grading (see attached rubric). This exercise is worth 25 points.

How is this activity assessed (exam, essay rubric, other)? In other words, how do you know if it’s effective?
The rubric for grading this activity is presented below. In general, student grades are determined based on my and the teaching assistant’s observation of the student’s contribution to the class group discussion and ability to apply and synthesize knowledge related to the subject matter. I also use anonymous student comments provided in the final course evaluations to gain insight on whether the students enjoyed the exercise. In general, student comments received over many years have been extremely positive and supportive of this exercise and included numerous student testimonials stating that they actively communicated what was learned from this exercise to their family, friends, and parents.
What advice would you give to someone new to teaching a Mycology-focused course or who is looking to update their previously taught Mycology-focused course?

It is critical to develop a culture of trust between the students and instructor by providing a learning environment that emphasizes science-based exercises related to their everyday lives. The relative importance of identifying an educational mentor can be extremely beneficial for improving teaching effectiveness, which will continue to be a work in progress over time.

Includes two exercises that are posted on the website.

Memorials

We have learned that many dear friends have recently left us.

Ludmila Marvanova 22 February 1931–16 January 16, 2024. Eminent Czech mycologist, Ludmila Marvanova contributed to the study of aquatic hyphomycetes defining their crucial role in the food networks of aquatic ecosystems.

Joe F. Hennen 6 January 1928–5 March 2024 See memorial in this issue of the Inoculum.

James Herbert Ginns 1938–29 April 2024 Always smiling and welcoming, Jim was an authority on wood decay fungi who spent most of his career in Ottawa, Canada.

In addition, William Davis submitted a memorial for Martha Powell (1948–2023) for publication in Mycologia. This has been reviewed and accepted and is now in the production stage.

Joe Ammirati and Scott Redhead completed a memorial for Lorelei Norvell (1943–2023) to be published in Mycologia. This has been submitted, reviewed, returned and accepted for publication. It is now in the production stage.

Joe Fleetwood Hennen 6 January 1928–5 March 2024 International Specialist in Rust Fungi

Following in the line of rust specialists at Purdue University, Joe Hennen lived well into his nineties studying rust fungi until his recent passing at 96. Borne in Sherman, Texas, he started his career at Southern Methodist University, studying plant taxonomy with Dr. Lloyd Shinners, receiving his B.S. in 1950. He returned to Texas when he retired from Purdue in 1995 and, with his supportive wife Mary, who was also knowledgeable in rust fungi, continued his research at the Botanical Research Institute of Texas in Fort Worth, Texas. In between he spent most of his time at Purdue University, West Lafayette, Indiana, where he received his M.S. in 1952 and Ph.D. in 1954 studying with George B. Cummins, who lived to be 102. After serving as a plant pathologist of cereal crops at South Dakota State University from 1954–1958 and teaching undergraduate botany at Indiana State University from 1958–1968, he returned to Purdue as a Professor of Botany and Plant Pathology in 1968. Soon he was promoted to Director of the Purdue Herbarium, a position he held from 1971–1995.

As Director of the Purdue Herbarium he organized this vast collection of rust fungi contributing his own meticulously documented specimens (image left). Each specimen has extensive notes and drawings making them incredibly valuable to future scientists and often saving the specimen from destruction. This resource now serves as the center of research on the phylogeny of rust fungi and determination of the coevolution of rust fungi with their hosts carried on by his successor Dr. M. Catherine Aime.

Research by Hennen centered on the study of rust fungi now Pucciniales at first in the United States but later throughout the world especially in Mexico, Central and South America. He published widely with many collaborators training the next generation of rust specialists. Following his predecessors J.A. Arthur, who wrote the only account of all rust fungi of the United States (Arthur 1934), and Cummins, who published comprehensive books on rust fungi of grasses and composites, Hennen’s early research emphasized fungi on grasses in the western United States. Hennen & Ono (1978) published on the first and only rust known to infect a member of the palm family (Arecaceae).
Gradually his focus shifted to tropical regions including Hawaii (Hennen & Hodges 1981) and Mexico (Hennen et al. 1972; Hennen & Cummins 1973), then moving south to Argentina (Hernandez & Hennen 2002) and Brazil (de Carvalho & Hennen 2019; Hennen et al. 1982), always collaborating with local mycologists. Starting in about 1975, Hennen stimulated an increase in interest in the rust fungi in Brazil. He was always concentrating on his work on fungi planning comprehensive projects taking his associates collecting, observing symptoms present in the plants, bringing his magnifying hand lens close to the symptoms and, if there was a high probability that it was rust, he would show a gleam in his clear eyes, inviting anyone nearby to also observe, offering his knowledge for anyone who wanted to learn. This collaboration culminated in the two major outputs, first, the on-line Hennen et al. 2005, and finally the recently published Illustrated Genera of Rust Fungi of Brazil (de Carvalho & Hennen, 2023).

In addition to his dedication to the rust fungi, Joe was a family man married to Mary M. Winkler Hennen and had their son, Philip (image left). Mary accompanied him on collecting trips and published with him. Joe often had a merry twinkle in his eye and was friendly and supportive to all with a willingness to collaborate and train others in the study of rust fungi.

Literature Cited:


In 1953, she moved to Prague, where she completed her studies at Charles University and began working at the Biological Institute of the Czechoslovak Academy of Sciences. Her early research focused on plant pathogenic fungi.

She devoted herself entirely to phytopathology until 1965, when she embarked on a new phase of her scientific career at the Czech Collection of Microorganisms at Masaryk University in Brno. Here she built up and curated a collection of microscopic fungi, which is still being maintained and expanded. During this work, Ludmila acquired extensive knowledge of many groups of fungi. Her professional activity consisted not only of curatorial tasks and services related to the collection. She also took part in various research projects in which she studied, for example, the biodiversity of soil fungi in grassland ecosystems or fungal communities in caves.

Over time, she specialized in the taxonomy and ecology of aquatic hyphomycetes, microscopic fungi that inhabit plant litter in aquatic ecosystems. Her interest in the study of aquatic hyphomycetes was sparked by her husband, the renowned algologist Petr Marvan, when he repeatedly found their conspicuous spores in his samples. Ludmila was fascinated by the unique morphology of the conidia of aquatic hyphomycetes, and these fungi became her lifelong passion. Ludmila was a pioneer in the Czech Republic working on this ecological group, and thanks to her scientific zeal and diligence she soon became a leading internationally recognized expert alongside Enrique Descals, Cecil Terence Ingold (1905-2010) and John Webster (1925-2014).

Ludmila isolated aquatic hyphomycetes from material she had collected worldwide on her work trips or during her vacations or received from her colleagues. This resulted in a unique collection of several hundred strains of aquatic hyphomycetes, comprising 29 new genera and 71 new species, described either by herself or in collaboration with her colleagues such as Felix Bärlocher, Enrique Descals, Vladislav Gulis or John Webster. Together with E. Descals and J. Webster, Ludmila worked on a monograph on aquatic hyphomycetes. Hundreds of line drawings and species descriptions were made.

In January of this year, we had to say goodbye to the almost 93-year-old Ludmila Marvanová, an outstanding taxonomist and internationally recognized specialist in aquatic hyphomycetes, whose scientific work has significantly influenced several generations of mycologists worldwide.

Ludmila Marvanová began her scientific career at the Faculty of Natural Sciences at J. E. Purkyně University in Brno, where she specialized in phytopathology, especially fungal diseases of grapevines.

Ludmila Marvanová (1931 – 2024)
Unfortunately, this book was not completed due to the adjustments in the nomenclature of fungi caused by the principle of "one fungus - one name" and the rapid incorporation of molecular methods into taxonomy. It is unfortunate that she and her co-authors were unable to complete the Illustrated Guide to Aquatic Hyphomycetes. It would have been an instant classic. Ludmila's extensive bibliography covers topics of taxonomy, phylogenetic relationships, geographic distribution and ecological aspects of freshwater fungi. In addition, Ludmila has contributed as author or co-author to several identification keys for aquatic hyphomycetes and, despite her advanced age, she has remained active in publishing.

Thanks to her extensive knowledge of the taxonomy, morphology and ecology of aquatic hyphomycetes, Ludmila was frequently invited to speak at conferences and symposia, collaborated with experts from various research institutions and mentored the next generations of mycologists. Her research contributed significantly to our understanding of the biodiversity and phylogeny of aquatic hyphomycetes and their ecological importance in river ecosystems. She loved to collect foam samples from rivers, streams and even roadside ditches. Ludmila was an accomplished taxonomist. Her work was meticulous and her drawings were elegant and true works of art. Ludmila also loved her family and loved to tell us about her grandchildren.

Ludmila's contributions to mycology were recognized with her appointment as an honorary member of the Czech Scientific Society of Mycology in 1996 and an honorary member of the Mycological Society of America in 1998. She was also a member of the British Mycological Society, the Mycological Society of Japan and a member of the editorial board of the journal Czech Mycology. For Ludmila, work and commitment to science was a way of life that she successfully balanced with her personal and family life. As a grandmother and great-grandmother, she enjoyed a fulfilling private life alongside her scientific work.

Ludmila was not only a great expert and mentor, but also a fantastic colleague who was exceptionally humble, kind and always willing to share her knowledge. We don't know if Ludmila discovered mycology or if mycology discovered her. Undoubtedly, it was a strong and fruitful partnership that has left an indelible mark in the world of mycology and in the memory of all those who were lucky enough to know her personally.


Authors
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Felix Baerlocher (fbaerloc@mta.ca)
Marcia Wicklow-Howard was an exceptional individual; she had a positive, outgoing, and unassuming, gracious personality, and an outstanding ability to collaborate and connect with other people across a broad range of disciplines. Marcia's career was unique in that it combined education and mentorship with the study of fungi in natural systems. She was always friendly and upbeat with an easy smile and lots of laughter. Her life and career had a positive and lasting impact on a broad range of people, all of whom miss her very much.

Marcia Wicklow-Howard was born in San Francisco, California, on June 29, 1943, to Tom and Willa Cope Wicklow. Marcia had two brothers, the late Donald Wicklow, mycologist (Mycologia 114: 1032. 2022), and the younger Brian Wicklow. Marcia married Richard P. Howard in 1977 and together they raised two children, Eric Nordin and Anna Jarl Howard, in Boise, Idaho.

Following high school, Marcia attended San Francisco State University (SFSU) where she received a bachelor's and master's degree in biology. Marcia was one of several graduate students at SFSU that formed a community of young scholars who shared interests in botany, mycology and microbiology and trained under the tutelage of Prof. Harry D. Thiers, a mentor who emphasized field and laboratory studies as well as teaching and leadership skills. While her studies at SFSU were on imperfect fungi, the exposure and broad training of this program allowed Marcia as well as other students to continue their doctoral degrees in plants, bacteria, soil and pathogenic fungi, mushrooms, and lichens.

Following her studies at SFSU Marcia enrolled in the doctoral program at Oregon State University where she studied with William C. Denison and Walter B. Bollen and received a PhD in 1972. Marcia then took a 3-year teaching position at Monash University in Melbourne, Australia. In 1975 she accepted a teaching position in the Biology Department at Boise State University (BSU). There she taught botany, mycology, and microbiology courses for 30 years and served as chair of the Biology Department from 1986–1991.
Many of her students went on to become teachers, doctors, and biologists. Marcia also had a deep passion for college sports and served eleven years as the Faculty Athletics Representative to Gene Bleymaier, past Athletic Director at BSU. She was chair of the Intercollegiate Athletics Advisory Committee, responsible for student-athlete eligibility certification and represented BSU in its association with the NCAA and Western Athletic Conference. She retired from BSU in 2006 and traveled extensively with her husband both in the United States and abroad.

Marcia spent her early research years studying soil fungi. Her doctoral studies were on the species composition of soil microfungal populations in adjacent stands of red alder, conifers, and mixed alder conifer vegetation which she published with Denison and Bollen in 1974. She also published with Walt Sundberg on the genus Sadasivania in the 1970s. Marcia’s research at BSU emphasized fungal ecology especially post-fire recovery of micro-biotic crusts and the ecology of micro-organisms in semi-arid rangeland soils (Fig. 1).

Based on her research on soil crusts in high deserts, the importance of crusts is now known to be essential in contributing fixed nitrogen to these soils. The complex association of micro-organisms including lichens can be quickly destroyed when disturbed by cattle or other large animals such as humans. She examined the infection of Engelmann spruce seeds by *Geniculodendron pyriforme* in western North America.

In addition she and her associates completed the most comprehensive study of mushrooms and other macrofungi from the Owyhee Mountains in southeastern Oregon and southwestern Idaho (Fig. 2). These publications can be viewed at this link: https://www.researchgate.net/scientific-contributions/Marcia-Wicklow-Howard-2002006492

Joe Ammirati
Emeritus Professor, Burke Museum and Department of Biology
University of Washington
Stars Fell on Alabama, including Dr. Martha Powell...

...ushering us into an age of Chytrid enlightenment!
I am Prasanth Prakash Prabhu, a fifth-year Ph.D. student in the Department of Biology, at Clark University. Before coming to Clark, I did my bachelor’s and master’s in Botany and was trained in classical taxonomy of plants and fungi. I am particularly interested in the interactions fungi have with other organisms and I currently study the evolution of nematophagy in Pleurotaceae. I enjoy getting the opportunity to communicate mycology and love using art to connect the public to science.
Hi! My name is María-José Romero-Jiménez, and I am a PhD Candidate at the Busby Lab. I am from Costa Rica where I did my undergrad in Biotechnology Engineering. In the summer of 2020, I finished my Masters in Biological Sciences at the Porras-Alfaro lab in Western Illinois University. There I worked on describing *Darksidea phi*, a root-associated dark septate endophyte from semiarid grasses. In 2020 I started my PhD at Oregon State University. My dissertation work is focused on characterizing the leaf-associated yeasts of poplar trees and using them as a system to study diversity disease protection relationships of plant-associated fungi.

Outside of the lab, I like to participate and support student organizations, play pickleball with my friends, spend time with my chihuahua and my husband, bake, watch TV, and paint watercolors and other digital art. This piece represents some of the diversity of the Mucoromycota phylum. It includes illustrations of *Pilobolus*, *Mortierella*, *Rhizopus*, and the arbuscule of an AMF. MUCOROMYCOTA is the fourth piece of the Fungal Phyla collection that I have been working on for the past three years (Infinity Fungi, BASIDIOMYCOTA, and ASCOMYCOTA). You can follow me in Twitter/X (@9MariaJo) and Instagram (@fungibrush).
Savannah Gentry has been a part of MSA since 2017 during which she spent time as a previous MSA-SPS merchandise chair and committee member. She is a lifelong artist based out of Madison, WI and contributed logos to MSA in previous years during her time as a graduate student at the University of Wisconsin-Madison. Since receiving her doctorate for her work in fungal pathogens and wildlife diseases, Savannah currently works for the Department of Genetics at the University of Wisconsin-Madison as a Research Administrator and continues her love for art as a contract graphic designer all while being a single parent.
Aquatic fungi are a group of fungi that belong to 13 phyla, including Ascomycota, Basidiomycota, and Chytridiomycota. They are identified by their ecology (growing and reproducing in water) rather than their taxonomy and comprise approximately 6,114 species, with 4,073 freshwater species and 2041 marine species ([https://freshwaterfungi.org/](https://freshwaterfungi.org/), [https://www.marinefungi.org/](https://www.marinefungi.org/)) (Figure 1).

Despite the ongoing progress in identifying species from different aquatic habitats globally, we still know little about the diversity and distribution of aquatic fungi, as well as their vulnerability to environmental change. Aquatic ecosystems face various threats, including habitat decline, pollution, eutrophication, invasive species, ocean acidification, freshwater salinization, river regulation, and climate change. Individual studies suggest that these pressures also affect aquatic fungi, but our understanding of the consequences is far from complete. Unfortunately, only a few researchers are working on the ecology and conservation of this group of fungi.

The Global Center for Species Survival, in collaboration with Shoal, the IUCN Species Survival Commission’s (SSC) Freshwater Conservation Committee, and several IUCN SSC Specialist Groups that focus on conserving freshwater life, first reported information about freshwater fungi in their Fantastic Freshwater report in 2022 ([https://shoalconservation.org/wp-content/uploads/2022/05/Fantastic-freshwater-v14-1.pdf](https://shoalconservation.org/wp-content/uploads/2022/05/Fantastic-freshwater-v14-1.pdf)). However, it was realized that a Specialist Group dedicated to the conservation of aquatic fungi was still missing from the IUCN SSC’s portfolio.
Unlike terrestrial fungi, no aquatic fungi have yet received a conservation assessment. The newly launched group, led by Isabel Fernandes and Sally Fryar, will focus on creating the infrastructure necessary for conservation assessment and planning. The group will create a database or inventory of aquatic fungi and develop the scientific and coordination basis for the first conservation assessment, planning, and action efforts for aquatic fungi. Through linkages with projects that are already underway, such as FUNACTION and the recently launched MOSTFUN project (also from Biodiversa+; www.mostfun.eu), the aquatic fungi SG will help to improve monitoring of these organisms and likely also be at the forefront of new species discovery.

Are you interested in aquatic fungi conservation? Get in touch with us.
Undergraduate students in the Zahn Lab (Utah Valley University) have completed the first survey of a multi-year study investigating the spatial dynamics of epiphytic and endophytic foliar fungi in the Pando aspen clone. Pando is a single giant individual quaking aspen (*Populus tremuloides*) covering 106 acres in the Fishlake National Forest in south central Utah.

Since Pando is a single genetic clone, it offers an exciting and unique opportunity to address questions about the spatial structure and distribution of plant-associated fungi without the confounding effects of different host species or even different genotypes.

This is the first survey of foliar fungi in this organism. So far, they have discovered that while epiphytic diversity is very high, endophytes diversity is low and have uncovered significant edge effects. Endophytic communities have higher turnover near the center of the tree than near the edges.

Once the first survey was completed, the Zahn Lab was awarded the Pando Next Generation Challenge Grant to expand the work into future years to see how patterns change over time and with a planned expansion of herbivore exclusion fencing. They look forward to expanding this unique tree as a study system for fungal community dynamics, and would love to collaborate with other mycologists to address important questions in fungal ecology.

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**A Mycological Connection in an Unlikely Place**

**Submitted by:** Donald H. Pfister, MSA Historian

*Brave the Wild River: the untold story of the women who mapped the botany of the Grand Canyon* by Melissa L. Sevigny (2023) is an account of an audacious adventure of two women, Elzada Clover and Lois Jotter, who risked their lives to make an unprecedented botanical survey. At the time, 1938, the Grand Canyon had not been explored botanically, but plans for damming the Colorado River were well underway. No commercial/tourist river runs had been made and the only woman who had been on the river did not survive. Clover was a botanist at the University of Michigan in era when women in the university were few and far between. Jotter was a Ph.D. student. Receiving some resistance from the university, Clover nonetheless organized the trip that came to be known as the Nevills-University of Michigan Expedition. Along with Clover and Jotter were several experienced river men. On the sometimes perilous passage down the river, Jotter helped with the plant collecting and photography including shooting motion pictures. As far as I can determine they did not collect a single fungus[1], but came back with many plant specimens of which several cacti were described as new. After their return, they relayed their exciting experiences in public lectures. I was surprised to find a mycological coincidence in the book not revealed until the book’s coda – Jotter marries mycologist Victor Cutter, Jr.
Victor Cutter’s mycological work began at Cornell University, where he studied the cytology of zygosporangia – researching the events of germination, nuclear fusion, and meiosis. Later, he studied and grew, in tissue culture, the cedar apple rust, *Gymnosporanium juniperi-virginiana*. He became professor and department head at the Women’s College of the University of North Carolina in 1952. Cutter died in 1962 at the age of 45 (see Fredrick K. Sparrow, *Mycologia*, 54:457-459), leaving his wife and two children. After Victor Cutter’s death, Lois Jotter Cutter, a Ph.D. graduate of the University of Michigan, whose dissertation work was on the cytogenetics of evening primroses, became a professor at the Women’s College of the University of North Carolina. There, according to Sevigny, she encouraged and counselled women in science and in life.

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**Melzer at 100**

**Introduction**

2024 marks the 100th anniversary of the publication of Czech mycologist Václav Melzer’s famous paper introducing the use of chloral hydrate in conjunction with iodine to evaluate the surface ornamentation of *Russula* spores. The paper, more akin to a brief technical note, is published in the 1924 edition of the *Bulletin trimestriel de la Société mycologique de France*, and was very narrow and specific in its focus: Namely that by adding chloral hydrate to an aqueous solution of iodine, the surface ornamentation of *Russula* spores could be visualized with greater detail and accuracy. In essence, the paper was meant to be (and is stated as such) a technical addendum to the major work by René Maire published in the same periodical in 1910 entitled “Les bases de la classification dans le genre *Russula*.” There is no suggestion in the paper to indicate any intent to expand the use of the described reagent to other areas of mycology, but of course that is precisely what happened. Melzer’s reagent has been used extensively over the years, and the term “reagent” itself is usually dropped, and is simply referred to as either “Melzer” or “Melzer’s”.

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*Lois Jotter Cutter. “Jotter not dressed up” from the Lois Jotter Cutter Collection, call number NAU.PH.95.3.48, Courtesy of the Colorado Plateau Digital Archives, Special Collections and Archives, Cline Library, Northern Arizona University.*
Due to the extensive use of this reagent, Melzer’s 1924 paper continues to be influential and heavily referenced even today, although not without controversy, by virtually every mycologist studying the various iodine reactions in ascomycetes, basidiomycetes, and lichens. An English translation of the paper, while surely in existence, does not appear to be readily available, and as such, we thought it appropriate on the centenary of its publication to provide one, which can be found at the end of this article. While our initial goal was simply to provide an annotated translation, we expanded the scope somewhat after reading some of the contemporaneous literature. Much of it is published in the *Bulletin trimestriel de la Société mycologique de France* (SMF), which is available online and is fully searchable. The scientific papers at the time did not abide by the formal structure of today’s publications, but were far more conversational in tone. As a result, it is generally possible even for non-specialists to read and enjoy them, at least those sections that do not delve into technical details. As in all scientific endeavors difference of opinions or outright disagreements often arise, and some examples are reprinted and translated as necessary below.

**Brief Biography**

Václav Melzer lived from August 1878 to May 1968, dying a few months shy of his 90th birthday. According to Josef Herink and František Kotlabia in “Life and work of Václav Melzer” published in the 1969 edition *Česká Mykologie*, Melzer became interested in *Russula* after reading René Maire’s paper in 1913. At the time, Melzer was an elementary school teacher; he eventually became elementary school director, retiring in 1938. According to Herink and Kotlabia, Melzer was interested in all aspects of natural history, but primarily in the study of mosses and lichens. They note that he was also an accomplished artist.
Initially a mycological generalist, Melzer gradually devoted his entire efforts to the study of *Russula*. He published 45 original papers and “works,” and along with his frequent collaborator Yaroslav Zvára, 10 additional publications, including three books. His most comprehensive work with Zvára was entitled “Českél Holubinky-Russulæ Bohemiae” published in 1927. This work, while well received, was published in Czech, leading Paul Konrad and Marcel Josserand to state in the 1934 edition of the SMF: “Melzer and Zvára's classification is one of the best. Unfortunately, it is in Czech, a language incomprehensible to most mycologists. Works of nature should only be written in the great languages of the world: Latin, French, English, Spanish, German or Italian. Mycology is already sufficiently mixed up without publishing works in little known languages. One would hope for a French language translation of this remarkable work.” Perhaps in response to the language barrier, Melzer and Zvára did publish a synopsis in French in the 1928 edition of the SMF entitled “Ceské holubinky (Russulæ Bohemiae).” The article notes that the authors restricted themselves to 76 species, conservatively culling out any duplicates, and including only those that they had “dans les mains” (in hand). Herink and Kotlaba also note that, in addition to using the chemicals described by Maire and others, Melzer investigated color reactions with any number of chemicals including potassium hydroxide, phenol, iron sulfate, ammonia, naphthol, and aniline, as well as the use of common household bleach (eau de javelle) to dissolve the internal content of spores prior to staining. Melzer also wrote a popular field guide in 1919 published in Czech, and entitled “The Practical Mushroom Collector,” reprinted in 1940 under the title “Edible or Poisonous?”

In 1923, Melzer became a member of the Société Mycologique de France, and a permanent honorary member in 1946 until his death on May 1, 1968. Fellow Czech mycologist Albert Pilát, editor of Česká Mykologie and also member of the Société Mycologique, wrote a memorial in the 1968 edition of the SMF noting that Melzer just missed reaching his 90th birthday, which they were meant to celebrate on the 26th of August. The timing was fortuitous only in that it came just prior to the Soviet invasion of Czechoslovakia on August 20 of that year. As with all Europeans of his generation, Melzer had already endured two world wars, and not without consequence: A note from the November 1946 minutes in the SMF states: “M. Romagnesi has received news from M. Melzer; sadly, the exsiccata of *Russula* types from the foundational work of MM. Melzer and Zvára have been destroyed by the Germans during the war.” (Henry Romagnesi was a French mycologist also specializing in *Russula* among other Agaricales.) Quoting from Pilát’s tribute: “In his lost village, the country master does not lack for mycological specimens, but in terms of scientific literature, he is in a regrettable (fâcheuse) situation.” Pilát also notes that Melzer is fluent in Czech, German and French, and later studies Latin and English so that the “worldwide mycological literature becomes available to him.” As previously stated, Melzer, like many other mycologists, was also an accomplished artist, and often supplemented his works with accurately rendered color plates.
Russula Taxonomy Prior to Maire

Prior to Maire’s 1910 paper, the genus *Russula* was described almost exclusively along “Friesian” characteristics, namely those features that could be observed by the senses macroscopically (or with a hand lens), including characteristics of the cap, stem and gills, overall shape, size and color, gill attachment, gill spacing, spore print color, bruising if any, taste, smell, presence of a ring, fibers, scales, and numerous other physical characteristics. Elias Magnus Fries himself named a great many species, and elevated *Russula* to genus status from Agaricus, the name “Russula” being initially coined by Christiaan Hendrik Persoon in 1796. In addition, Fries divided the genus into five main groups (Compactæ, Furcatæ, Rigidæ, Heterophyllæ, and Fragiles,) a classification that, with some modifications, remains current today. Brief historical chronologies on the state of Russula research are summarized by Maire (1910), Henry Curtis Beardslee (1918), Frédérick Bataille in his preface to Richard Crawshay’s 1930 book, and Konrad and Josserand (1934). The investigators mentioned by these authors include Charles Horton Peck in the United States, and in Europe Lucien Quélet, Richard Crawshay, Rolf Singer, Melzer and Zvára, as well as many others. Quélet in particular named a great many species of *Russula*, and along with Narcisse Théophile Patouillard and Jean-Louis Émile Boudier founded the Société mycologique de France in 1885. Interestingly, both Boudier and Patouillard were pharmacists, as were many members of the Société Mycologique. Pharmacists in France were, and still are, trained in basic mushroom identification, mostly for the purposes of identifying poisonous species. It is possible to this day to walk into any pharmacy in France and have the pharmacist look over your collection and ensure that no deadly specimens are present.

Throughout the later half of the 1800s, Friesian characteristics were gradually being supplemented by microscopic and chemical observations. Fries himself was well aware of this, eventually describing *Russula* as having “Sporæ rotundatæ, saepe (often) echinulatæ” but according to Crawshay (1930), he left microscopic work to others. Microscopic observations were limited by the optics available at the time, or by whatever optics the investigator could afford. In addition, where improved optics were available, investigators did not necessarily upgrade, but continued to use their old instruments, familiar with their individual quirks and adjustments, and to which they were no doubt sentimentally attached. Peck was said to have used a “primitive” microscope, describing *Russula* spores as either echinulate or verrucose, but often depicting them in his figures as smooth, and frequently not mentioning ornamentations at all (Peck 1907). Boudier in his famous *Icones Mycologicae* (1904-1909) depicts three *Russulas* along with their spores, clearly showing the apiculus (hilar appendage), but with somewhat generic ornamentations. Boudier’s 1886 SMF article on mycological sample preparation simply mentions using a good microscope with a final magnification of 500 to 600 diameters, but does not provide many technical details. Regardless, both investigators are highly respected to this day. Peck named, collected, and archived innumerable species while Boudier’s “Icones,” due to their rarity and beautiful lithographs, have attained legendary status particularly among discomycete specialists who consult them to this day (Pfister 2015).
The study of *Russula* has always been difficult due to the extreme similarity between species. Maire writes: “The genus *Russula* comprises a large number of species, widely distributed in the forested countries with temperate climate. By their size, vivid colors, their pleasant or peppery flavor, these mushrooms have for all times attracted the attention of mycologists and mycophagists. Other than a few species, extraordinarily well characterized, and upon which everyone agrees, the *Russulas* are very poorly known.” To this day, in almost every paper, article, or field guide on *Russulas*, it is almost obligatory to state, in one form or another, that while the group is one of the easiest mushrooms to identify as to genus, it is one of the most difficult to pin down as to the exact species.

Maire divides his work into three categories, namely macroscopic (Friesian), microscopic, and chemical, which, with the addition of cultural, molecular and DNA analysis remains a standard methodology in mycological taxonomic research today. He also clearly distinguishes between natural and artificial classification. Natural classification attempts to group species based on their actual relationships whereas artificial classification is meant to simplify classification based on shared characteristics that do not necessarily represent actual relationships, but are useful shortcuts for identification. The authors mentioned above are sometimes at odds as to which is which. For example, Singer and Quélet suggest that spore print color forms the basis of a natural classification, but Maire does not.

Maire’s detailed microscopic work was made possible by the exceptionally high quality, color corrected immersion (using cedar oil) optics available at the time. The optics were perfected by Carl Zeiss based on the theoretical work of Ernst Abbe, and by the use of high quality glass developed by Otto Shott. The final piece of the puzzle was put in place by August Köhler who described a method of illumination using perfectly defocused light in conjunction with an Abbe condenser (see Zeiss.com-history.) The result was that by 1900, all of the elements were in place for high resolution imaging, and the optics at the time were comparable to many high quality objectives available today. So while investigators certainly had access to high quality objectives by the turn of the century, as previously stated, many may not have used them, either as a function of cost, or from sentimental attachment to their old instruments. In terms of cost, Maire states in his 1910 paper: “The objectives are today so highly perfected and the prices have come down such that no mycologist should do without them provided that the microscope is equipped with an Abbe condenser.” A diametrically opposed opinion is expressed by Maurice Langeron in the 1913 edition of his *Précis de Microscopie* where he states: “Unfortunately, these objectives have a very high cost, we would say even excessive, due to the difficulty of their construction, and the rarity of the fluoride glass used in their optics.”

The main chemicals used by Maire included sulfo-vanillin, sulfo-formalin, and “teinture de gaïac,” a resin extracted from evergreen plants in the family Zylgophyllaceae (Tortelli, 2004). Interestingly, Maire was aware of the staining properties of iodine and in a somewhat prophetic statement wrote: “The membrane of *Russula* spores often turns blue, either directly with iodine, or by zinc iodochloride. It would be interesting to investigate if there weren’t a possible application of these reactions to systematics.”
**Russula Taxonomy After Maire**

In the years following Maire’s 1910 paper, and despite repeated efforts to clarify and classify members of the genus, identification remained difficult, prompting Fernand and Mireille Moreau to state in the 1930 edition of the SMF: “We fear to alienate a number of mycologists, distanced by the difficulties of the newer methods of determination; what amateur would want to undertake the determination of a mushroom, if only for the purposes of consumption, if one has to resort to numerous chemicals, or have at one’s disposal an expensive microscope?” However, they later write that dedicated mycologists are able to recognize individual species in the field, despite their inherent variation, by a particular and unique “physiognomy” that is “evident to the naturalist, but difficult to express by formal analysis.”

Adding their own views on the subject, Konrad and Josserand state in the 1934 edition of the SMF: “But while the species determination in Lactarius offers no greater difficulty than that of other mushrooms, the genus *Russula* is the most scrambled of them all, and it is only after lengthy, patient, and minute observations that it becomes possible to see a little clarity … and then again […] this is in fact the case with all homogeneous species, but *Russula* beats all of the records.”

Singer in 1932 published a lengthy monograph in German in which he classified all the *Russula* species known at the time. This paper was not mentioned by Konrad and Josserand in their 1934 SMF article, prompting Singer in the subsequent 1935 edition to publish a synopsis with a somewhat bitter introduction: “The notes of Konrad and Josserand on the classification of *Russulas* cannot stand without indicating another effort to classify this genus published in a work that is not cited by the above authors […] however, it appears that my 1932 monograph in which all the world-wide known *Russulas* are described for the first time, has escaped their attention […] It seems to us useful to reproduce the corresponding chapter in this publication, as the content of the publication is unknown to two of the most experienced and conscientious researchers in the field.” This subtle rebuke was no doubt elicited in response to Konrad and Josserand’s somewhat dismissive comments on a previous work by Singer in which they state: “Interesting study that however appears to us to be more bookish rather than the result of personal observations in the field.”

**Influence of Melzer’s Paper**

Following the publication of Melzer’s 1924 paper, his reagent became widely adopted by mycologists. In the 1928 edition of the SMF Edward Martinius Gilbert and Robert Kühner described the use of Melzer’s reagent in their investigations of *Amanita* spores. They noted that certain *Amanita* spores were “amyloid,” becoming blue when treated with Melzer’s reagent, while others remained “inamyloid” and did not stain blue. Furthermore, the amyloid reaction was not random, but correlated neatly with the then established sub-sections of *Amanita*. Certain sections invariably stained blue, while others did not. Therefore, the amyloid reaction had immediate taxonomic value. Kühner and Maire (1934) studied hundreds of *Agaricales* and noted that the amyloid reaction was widespread across many genera. In addition, certain spores stained red as opposed to blue, a reaction eventually described with the term “dextrinoid.”
Following these discoveries, the use of Melzer’s reagent became widespread among mycologists, not only those studying basidiomycetes, but those studying ascomycetes as well. The use of chloral hydrate remains controversial particularly among ascomycete researchers, as part of the “clearing” effect on occasion leads to complete inhibition of certain reactions (Baral 1987). Adding to the confusion, Langeron in his Précis de Mycologie (1945) and his Précis de Microscopie (1945) published a revised formulation with reduced iodine concentration and increased iodide to iodine ratio. Kühner mentioned in a short note in the 1946 edition of the SMF that Melzer’s original formulation was “beaucoup trop chargé en iode” (loaded with too much iodine), an opinion no doubt shared by Langeron.

Not all Russula specialists were convinced of the utility of Melzer’s formulation. Crawshay in his 1930 work Spore Ornamentation of the Russulas used a fairly strong (2.5%) aqueous iodine stain, stating: “Various other formulae exist, and the above solution may be employed with a solution of chloral Hydrate in equal proportions. I have not found, however, that any better results are obtained by this method, if as good, than by using the one solution.” In addition, Crawshay, while writing favorably of Maire’s work, was not so kind when describing Beadslee’s and Melzer’s interpretation of spore ornamentations, stating: “Although a certain number of descriptions of the spore ornamentation of various species have been given in the above mentioned works, it is necessary for me to add that with a great number of these descriptions I am in complete disagreement, and that moreover the descriptions of many of the spore ornamentations given by these authors are in complete disagreement among themselves,” ascribing this to “incorrect use of the microscope” which can result in faulty images “with detail that does not exist at all.”

It is hard to argue with Crawshay’s work. In it he describes 92 Russulas, comprising 72 species and 22 forms, with spore images of 85 species drawn with a detail and resolution equal to or exceeding that of many current publications. In addition to using brightfield and darkfield illumination, he deployed (with help from the Carl Zeiss workshop) an extraordinary technique to further increase resolution by using a specialized UV (ultra violet) microscope with quartz optics, magnesium arc lamp (275 nanometer wavelength) and fluorescent screen. Crawshay goes to some length and detail describing the correct use and scrupulous adjustment of the microscope in order to achieve optimal results.
Melzer’s reagent is still considered an essential reagent today despite the difficulties in obtaining its main component, chloral hydrate. Chloral hydrate is now a controlled substance due to its strong narcotic effects and historical use in “knockout drops” or “Mickey Finns.” Current formulations include the 1924 original, Langeron’s modification with lower iodine content, as well as many other variations (Baral 1987). For a quantitative analysis of the differences between the original formulation, Langeron’s modification, and aqueous iodine (Lugol’s) solutions, see Verdier (2023).

**Translation of Melzer’s Paper**

There are of course many ways to translate from one language to another. Each language has its own peculiarities, specific vocabulary, grammar, sentence structure, as well unique idioms that have no exact equivalent, or would appear confusing or nonsensical if translated word for word. In this translation, we have purposely retained as much as possible the original wording, sentence structure, and punctuation which, while this may not result in a “best practice” translation, more accurately retains the mood and feel of the original.

In the mycological world, a prejudice has become established that the morphological variations in the membrane of *Russula* spores is too insignificant to afford any help in the systematic characterization of this genus.

This opinion has as its origin the fact that the majority of authors have worked with objectives that are too weak, under which the ornamentation of the spore, often very delicate, has escaped them, and mycologists have remained convinced that *Russula* spores were characterized by an admirable uniformity of their membrane which must be either echinulate in the greater number of species, or almost smooth in exceptional cases.

It is thanks to M. René Maire, the famous French mycologist, to whom credit is due for being the first to demonstrate, in his excellent paper “Les bases de la classification dans le genre Russula,” that the membrane of *Russula* spores could offer very telling characteristics, when it is studied carefully, with close attention.

I will allow myself to cite from his work (l. C. p. 45) the following passage related to this subject:
“If under certain cases the ornamentation of the membrane may be recognized with a good dry objective, it is none the less often only apparent when one uses an immersion objective. In order to obtain images as clear as possible, it is best to use an artificial light source: an Auer lamp, a Nernst lamp or an incandescent bulb with frosted glass if one has access to either gas or electricity; or in ordinary cases, an incandescent oil or alcohol lamp, or an acetylene lamp.”

However, some mycologists may not have access to artificial light or may prefer to work under more normal circumstances. To those, I would recommend another method in order to decipher the most delicate ornamentation of *Russula* spores, a method that has served me very well for several years with great service. It is a mixture of an iodine-iodide solution and chloral hydrate.

We should first prepare the following iodine-iodide solution:

<table>
<thead>
<tr>
<th>Grams</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium iodide</td>
<td>1.5</td>
</tr>
<tr>
<td>Iodine</td>
<td>0.5</td>
</tr>
<tr>
<td>Water</td>
<td>20.0</td>
</tr>
</tbody>
</table>

We should then mix 1 part of this solution (for example 5cc.) and one part (5 gr.) of chloral hydrate to obtain the desired reagent.

By virtue of this reagent, the spore membrane will soon take on a bluish gray or greenish gray tint, while the ornamentations become almost black, very distinct, and very apparent (1).

Under these conditions of study, we can distinguish two extreme types within the Russula spores: Spores that are aculeate, and spores that are cristulate (2).

(1) Zinc chloride, heavily diluted, gives results that are slightly inferior.

(2) M. R. Maire has divided them into three types: The echinulate type, the cristulate type, and the near smooth type. Representatives of the 3 type (R.nigricans Pers, adusta Pers. and melliolens Quel.) from the action of this reagent have shown themselves to be clearly reticulated, and furthermore, we have not found up to now any Russula spores that are absolutely smooth and polished, which is why we believe it is useful to restrict the above three types to two principal groups.
1. Aculeate spores are covered with isolated, more or less sharp, needles. If the needles are elongated, we have echinulate spores; in contrary cases, one speaks of spores covered with either warts or granules.

Aculeate spores are the most frequent in the genus *Russula*, and it would be useless to enumerate the species in this group.

2. Cristulate spores are more interesting. Within them one can distinguish two sub-types: reticulated spores and crested spores.

   a) In the reticulated type the needles are joined together at their nodes by thin straight lines, which form very obvious more or less elongated networks (fig. a). Certain species in this group present spores where the lines radiate from several points spread out along the surface of the spore (fig b).

   In optical section reticulated spores may appear granular, warty or aculeate according to the height of their nodes.

   I cite as examples of reticulated spores: R. Adusta P., nigricans B., densifolia Secr., emetica Sch., fragilis P., sardonia Bres. (Non Fr.) serotina Quél., ochroleuca P., lepida Fr., rosea Sch., melliolens Quél., mustelina Fr.

   b) The crested type is characterized by spores wherein the needles or warts are elongated in straight or arched crests, either parallel or intersecting, more or less anastomosing, ordinarily accompanied by a few isolated needles. In optical section, they show themselves as either aculeate or warty (fig. c-d).

   This sub-type is well characterized by the spores of R. aurata With., amethystina Quél., amœna An., Romellii Maire, and mostly by those of R. laurocesari, (=subfoetens Sm.?).

Even though there exists between these two groups certain intermediaries (R. drimeia Cke, sororia Fr., virescens Sch., etc.), it will not be difficult nonetheless to arrange the studied species within one or within the other. One must only be careful to examine spores that are well ripe mostly of the reticulated type, as the fine ornamentation of their surface is visible, in certain species, only at their perfect maturity.

As an example of the usefulness, for the in-depth study of the spore, I cite several very similar species, easy to confuse, but that are distinguished relatively easily by their spores, when one studies them while using the above described reagent.
Species with aculeate spores

- R. alutacea Pers.
- __Integra__ L.
- __Cœrulea__ Cke.
- __fellea__ Fr.
- __fusca__ Quél.
- __Puellaris__ Fr.
- __Nauseosa__ Pers.
- __paludosa__ Brtz.
- __Fœtens__ Pers.

Species with cristulate spores

- R. Romellii Maire.
- __melliolens__ Quél.
- __amethystine__ Quél.
- __ochraleuca__ Pers.
- __Mustelina__ Fr.
- __serotina__ Quél.
- __nitida__ P.-Cke.
- __Cloesii__ Fr.
- __Laurocerasi__ m.

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1. The term “membrane,” technically the spore wall, is used in the French literature, while “surface ornamentation” is used in the English literature.

2. Crawshaw (1930) translates this section almost verbatim, but without attribution: “It is indeed surprising, yet nevertheless a fact, that the majority of mycologists are still under the impression that the morphological aspect of the surface of the spore is of too little importance to be much aid in the determination of the species.”

3. According to Bucyk (1991), the terms echinulate (spiny), and aculeate (needle-like), as well as other terms are often used interchangeably. These terms include verrucose, echinulose, spinulose, “connectifs” (connections), jumelé (twinned), “piquetées” (as in a picket fence), “zébrées” (like Zebra stripes), etc. The difficulty according to Bucyk is that “a limited number of different ornaments may occur in a large number of combinations, not only within a certain species, but even on a single spore.” This confusing mix of characteristics is evident in the photomicrograph at the beginning of this article.

4. The Auer lamp “bec Auer” was developed by Carl Auer in 1885 using a mantle impregnated with rare earth metals, similar to the Coleman camping lanterns available today.

5. The Nernst lamp was developed by Walther Nernst in 1897 and used a ceramic rod as a filament. The advantage was that the ceramic rod did not oxidize in air, but required pre-heating in order to operate.

6. The French word used is “nœuds” (knots) in its secondary meaning of “nodes.”

7. Optical section or “coupe optique” refers to an image taken at the center of the spore which shows the ornamentations projecting horizontally from the outer periphery. Melzer draws the ornamentations as being an integral part of the somewhat thick “membrane” (spore wall) as opposed to separate external structures.

8. Ripe (mûre) as opposed to “mature” was used in the French and English literature. This may be due to the association of mushrooms with plants, although Langeron in his Précis de Mycologie considers them to be protists.
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Caroline Verdier is a managing editor for the Journals of the Cognitive Science Society. Patrick Verdier has spent a career in both light and electron microscopy, and is a founding member of the Rhode Island Mycological Society.

Both authors endured most of their primary and secondary schooling in the French educational system. Neither author claims to have any specialized knowledge of the genus Russula.

Various unidentified Russulas collected within half an hour or so (Rhode Island) all in close proximity to one another. Photograph montage by Patrick Verdier.

In reading through these pages, I see again the paths of the woods and forests of the environs of Besonçon, where, in the company of my friend. I passed so many agreeable hours and of which I have a vivid recollection. -Frédérick Bataille preface from Crawshay (1930).
Federal Funding for the SPORES Undergraduate Mentorship Program

We are pleased to announce new federal funding for the 2024 edition of SPORES. The National Science Foundation (NSF) and the United States Department of Agriculture National Institute for Food and Agriculture (USDA NIFA) awarded Principal Investigators Javier Tabima Restrepo (Clark University), Sara Branco (University of Colorado Denver), and Terry Torres Cruz (Purdue University) a total of $46,553. Obtaining these funds would not have been possible without the assistance of the remaining SPORES organizing subcommittee (José E. Solórzano, Lotus Lofgren, and Fabiola Pulido-Chavez). The funds, in collaboration with support from MSA and donations from our community to the SPORE bank (https://msafungi.org/donate-online/), will support 24 undergraduate mentees and 12 mentors to participate in the SPORES program during the 2024 MSA meeting in Markham, Canada. These mentees and mentors represent researchers from diverse backgrounds, enriching the MSA community and serving as a model for inclusive leadership within scientific societies.
MSA and its members understand the critical role that diversity plays in boosting scientific communities and driving innovation in STEM fields. As a professional scientific society, MSA has a unique opportunity to provide skills, training, and mentorship to underrepresented scientists, empowering and supporting their career advancement, and contributing to their retention in the field. SPORES was established in 2023 to diversify, advance, and promote future mycologists by recruiting early-career students from underrepresented groups and providing them with financial support and mentorship for their first MSA meeting. The mentors are active MSA members (PhD Candidates, Postdocs and Faculty) who provide guidance before and during the meeting. Mentors and mentees join together to attend welcome and wrap-up receptions, as well as conference events, fostering networking opportunities and a sense of belonging.

Last year, SPORES welcomed 19 mentees who became MSA members and participated in the annual meeting in Flagstaff, Arizona. Mentees engaged in discussions on professional careers networked with a large number of mycologists and were made to feel included and a valuable part of the MSA community. This success was only made possible by the dedicated volunteers serving as mentors, and the invaluable support of MSA and generous SPORE bank donors who provided funds and conditions for implementing the program.

As we prepare for this year’s MSA meeting, we want to thank everyone involved in this project. Your support has been instrumental, from the mentors and volunteers who have directly interacted with the mentees to the valuable donations you have provided. We want to also thank Cori VanGalder and Bill Stoeffler. They have spent a lot of their time supporting logistics for the SPORES program and provided information that was crucial to the outcome of the NSF proposal.

We expect SPORES 2024 to be a great success and encourage you to sign up as a mentor for future iterations of the program and/or get involved in the MSA Diversity, Equity and Inclusion Committee. If you attend this year’s MSA meeting, please engage with the SPORES 2024 mentees. They represent the future of mycology and will value a warm welcome to our society.
New MSA Travel Awards

MSA has implemented two new awards in 2024, in honor of two respected mycologists; Charles Mims Travel Award, and Don Pfister Research Award. You can donate to those, or any of the other funds supporting travel to meetings, and research, by going [here](#).

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Join your friends, colleagues, and neighbors this year at IMC12. Find all of the information you need [here](#).

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Mycological Excursion in Eastern Belgium on Saturday Aug. 17th

On Saturday Aug. 17th the Botanical Society of Liège (Société Botanique de Liège) will organize a one-day excursion in Eastern Belgium, guided by its president Hon. Prof. V. Demoulin from the University of Liège.

Macromycetes will be especially searched for but any kind of fungi could be observed including lichens, for which however a specific excursion will be organized the day before by Prof. N. Magain of the University of Liège. Liège is the major city of Wallonia (the French speaking part of Belgium, located 30 km South of Maastricht on the river Meuse, at the North-Eastern corner of a region of old (Hercynian) mountains occupying most of the area between the Meuse and the Rhine. The geology is varied with a core of old hard acidic rocks called the Ardennes in Belgium. The altitude is close to 700 m in Belgium and slightly more on the German side, which is enough to show altitudinal contrast in the vegetation and make it a point where rain coming from the Atlantic or the North Sea is abundant. It is a cross-road of vegetation from oceanic, continental and even Southern and boreal vegetation.
The itinerary will allow to see some vegetation on limestone in the Ourthe valley, at the beginning and the end of the excursion, a peat bog site in one of the highest points in the Ardennes, the “plateau des Tailles” (about 650 m.). This was an important battlefield during the “battle of the Bulge” of WWII, eighty years ago this year, and the following stop will be in woods of the Bastogne Plateau (“the Bulge”) to search for fungi in deciduous forest and spruce plantations, where “GI foxholes” are often still visible. From Bastogne we will go West to Marche in the Famenne depression that borders the Ardennes on the North-West. This depression is due to the erosion of shales that can hold carbonated fossils and are the site of oak-dominated forests rich in mycorrhizal fungi. The stop in this area will be near a village called Biron, where Prof. F. Darimont, pioneer of mycosociology in the forties and fifties, and other mycologists from Liège have made many discoveries including the Northernmost location of Amanita caesarea in Western Europe.

On the way back, two short stops will allow the sighting of ancient monuments, the covered alley (Neolithic) at Wéris and the medieval castle at Lognes.

Departure will be from Liege central station (Les Guillemins), one of the most renowned railway stations devised by the architect Calatrava. Time of departure could be adjusted for the timetable of the day for trains from Maastricht (one every hour). According to the number of participants, travel will be by shared cars, rented mini-busses or a large bus, with shared cost. To make the necessary arrangements it is important that participants firmly confirm their attendance as soon as possible. Please mail socbotlg@hotmail.com and copy V.Demoulin@uliege.be.

Given the proximity between Maastricht and Liege, it may be that some congress attendants wish to remain in their hotel in Maastricht for a few more days. If they prefer to move to Liege, the society could search accommodation there if asked to using the same mails as above.

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A Moist Chamber Technique for Isolating New and Interesting Fungi and Myxomycetes

Publication Alert!

This article may interest a mycological audience that may wish to use moist chamber cultures in their research. Rare and new species of fungi and myxomycetes can be found using this technique. The link included here will take you to the actual paper contents. Click on the supplementary information to see the four appendices. Happy hunting for microbiota!

This article is part of the special issue “Resilient botany: Innovation in the face of limited mobility and resources.

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**Eagle Hill Announcement**

**Eagle Hill Institute’s 2024 Mycology and Related Seminars**

Eagle Hill is right on the coast of Eastern Maine, between Acadia National Park and Petit Manan National Wildlife Refuge.

**Jul 28 – Aug 3** — **Identification Skills for the New Mushroomer: Foraging for Edible and Medicinal Mushrooms** — Greg Marley and Michaeline Mulvey

**Sep 29 - Oct 2** — **Fall Mushrooms in a Changing Climate** — David Porter and Michaeline Mulvey

For general information, the registration form, seminar flyers, and a complete calendar: [https://eaglehill.us/programs/sems-weeklong/calendar-weeklong.shtml](https://eaglehill.us/programs/sems-weeklong/calendar-weeklong.shtml)

If you have any questions about the content of the seminar, please reach out to the seminar instructor(s), whose contact info can be found on the seminar flyer. If a seminar you are interested in is full, and you would like to be put on the waitlist, please fill out the application form. If you have any questions about registering for the seminar, please contact us at [office@eaglehill.us](mailto:office@eaglehill.us).
A.H. Smith Lake States Mycological Foray

The 50th Year Anniversary Edition will be held September 5-8, 2024 in association with Midwest American Mycological Information at the Clear Lake Education Center, located halfway between Manistique and Munising, in the Upper Peninsula of Michigan. Established to promote interaction of “Lake State’s” mycologists and their students, it will include two days of collecting, viewing and discussion of collections, and short student presentations, if there is interest. Registration information will be forthcoming later this summer. If you wish to be and believe you are not on the mailing list for this foray, contact Anne Pringle (apringle2@wisc.edu).

Thank you to all who have donated to MSA funds since our last publication of Inoculum!

MSA continues to be immensely appreciative of all of the generous donors that allow the Society to continue to fund research and travel through various endowment funds. If you're interested in supporting any of these funds, there are multiple ways you can donate!

- Use MSA's secure donation portal (you will be redirected to Wild Apricot, the payment processing platform for MSA)
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- Call the MSA Membership Coordinator with your donation information at (608) 441-1060 ext. 162
- Mail a check, paid to the order of The Mycological Society of America to:

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Submit Your *Inoculum* Content!

In addition to welcoming photos to be considered for the *Inoculum* header photo, we invite you to submit your articles, stories, announcements, and creative content as well!

To submit a photo for header consideration, please use this form.

To submit additional content, you may email it at any time to Jessie Glaeser (jessieglAESer@yahoo.com), Terry Torres Cruz (ttorresc@purdue.edu) or Cori VanGalder (msafungi@reesgroupinc.com). Please follow the guidelines below.

- Please include title of article or photo
- Articles should be submitted in a Word document, without photos embedded. Articles will need to be reformatted for final publication. Photos should be sent separately.
- When submitting an article via email with multiple attachments, please number and give a brief explanation of each attachment. This is especially important when submitting multiple photos.
- Articles are not edited for accuracy of information, only grammatical soundness. Please make sure all information is correct to the best of your knowledge when you submit it.