

# Orson K. Miller, Jr.: Mycologist, researcher, teacher, and mentor

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Cripps, C. L. (Department of Plant Sciences and Plant Pathology, Montana State University, Bozeman, MT 59717, U.S.A.), Orson K. Miller, Jr.: Mycologist, researcher, teacher, mentor. *Memoirs of The New York Botanical Garden* 89: 1–29, 2004.—North American mycologist, Orson K. Miller, Jr. has devoted his career to promoting and furthering the discipline of mycology. He served as Professor of Mycology and Curator of Fungi at Virginia Polytechnic Institute and State University from 1970 until his official retirement in May, 2002. During his

42 years as a professional mycologist (32 at VPI), he focused on the systematics and ecology of higher fungi (primarily Basidiomycetes), highlighting the Agaricales (gilled mushrooms), Boletales, and Gasteromycetes. His monograph established him as a world authority on the Gomphidiaceae. His 1972 *Mushrooms of North America*, one of the first color field guides for this continent, is a notable milestone for mushroom identification in North America. He mentored 27 M.Sc. and Ph.D. students, some of whom are now leaders in the field. Dr. Miller has helped bridge the gap between professional and amateur mycologists, as well as between North American and European mycology. He was elected an American Association for the Advancement of Science Fellow in 1995. In 1989 he received the William H. Weston Award for Teaching Excellence in Mycology, and in 1997, the Distinguished Mycologist Award, both from the Mycological Society of America, for which he also served as President (2000–2001). The North American Mycological Association Award honored him for Contributions to Amateur Mycology in 1981.

Respected for his extensive knowledge of mushrooms and fungi, it is Dr. Miller's ability to transform the technical into easily understood synopses that make him so appreciated by students, colleagues, and avid mushroom enthusiasts alike. He can crystallize the diagnostic features of a mushroom with a few salient phrases, while dispensing knowledge with enthusiasm, warmth, and humor. He has enriched the lives of many by making the study of fungi accessible and appealing. Today, Dr. Miller continues his lifelong passion in a "private lab" among the conifer-aspen forests of McCall, Idaho, with his wife, Hope.

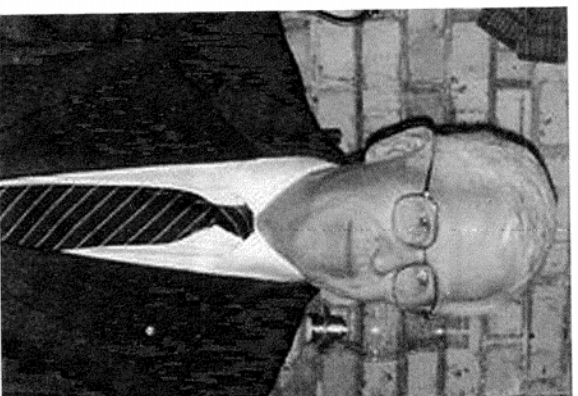


Fig. 1. Dr. Orson K. Miller, Jr.

## Early Years: The Molding of a Mycologist

"Sonny," as Orson K. Miller was nicknamed, arrived in the world on December 19, 1930. The only child of Bertha and Orson K. Miller, Sr. (a real estate and in-

surance agent), he grew up near Cambridge, Massachusetts. Orson was born left-handed, but the then common practice of training "lefties" to the right hand in kindergarten may have helped him become the star center fielder for Acton High School, who threw left-



FIG. 2. Orson during his undergraduate days at UMASS circa 1950.



FIG. 3. Orson in uniform—a rare event! 1953–1955.

### U.S. Forest Service and Graduate School

Orson entered graduate school at the University of Michigan in 1955, focusing on forestry in the School of Natural Resources. One of his first projects was to study uneven aged stands in Stinchfield Woods near Dexter, Michigan for Dr. Davis's class in forestry management. In the summers he headed west to work for the U.S. Forest Service as a timber cruiser in Deception Creek Experiment Forest for the Intermountain Forest and Range Experiment Station in Idaho. It was in Idaho that Orson first realized the diversity of mushrooms in the forest. A polypore specialist, Josiah Lowe, came to collect for three weeks, and further excited Orson's interest in fungi, particularly the wood-rotters. During fieldwork, Orson met Robert L. Gilbertson, then a professor at the University of Idaho, leading to a lifelong friendship and professional relationship that continues to this day. A month after a second daughter, Annalise (Lise), was born in the fall of 1956 in Coeur d'Alene, Idaho, the vagabond family moved to Darby, Pennsylvania, where Orson joined the NE Forest and Range Experiment Station as part of the Delaware Forest Survey. While engaged in similar work in Bangor, he attended a few classes at the University of Maine. Orson completed his thesis, "An analysis of the productive potentialities of two southern Michigan oak-hickory stands"

handed, and batted right-handed. His innate left-handedness might also have contributed to his visual teaching style. Mr. Headstrum, a high school teacher fond of natural history who encouraged Orson to study white pine blister rust for his class may well have sparked an early interest in forest pathology and the complex interactions between trees and fungi. After graduating in 1948 in a class of 42 students, Orson declined an invitation to try out for the N. Y. Yankees, deciding instead to continue his education in forestry at the University of Massachusetts in Amherst (Fig. 2).

During the four-year forestry program at UMASS, Orson's newly acquired knowledge of trees and forest pathology set the stage for his developing involvement with fungi. It was also here he met Hope C. Hartigan, then a junior majoring in drama, and a second lifelong love took root. After his 1952 graduation, Orson joined the Oak Wilt Survey for one summer. Facing an imminent Korean War draft, he enlisted in the U.S. Army Security Agency to become a security guard in the Military Police (Fig. 3). Orson and Hope were married July 11, 1953 in Gardner, Massachusetts, just before Orson shipped out to Sharon, West Germany, followed by Hope who worked as a CIA clerk typist 30 km away in Munich. As a non-commissioned officer in education and information, Orson administered courses, and did 'difficult' duty as a lifeguard in the swimming program. It was here Orson learned German, which was to be of value later in his career. Orson and Hope's first daughter, Andrea (Andy), was born May 20, a few months before Orson's return to civilian life in September 1955.

and received his Master of Forestry degree from the University of Michigan in 1957.

### Multi-tasking: A Ph.D., a Job, and Three Kids!

Orson spent the next few years, 1958–1963, in a Ph.D. program in the Botany Department at the University of Michigan. Forest Pathology was his initial focus, but as chance would have it, Dr. Dow Baxter—the pathologist—was on a year's sabbatical, so Orson attended some of Dr. Alexander H. Smith's courses on fungi and helped curate polypores in the UM Herbarium for mycologist Dr. Bessey Kanouse. Orson soon realized he wanted to study mycology!

After catching up on botany, chemistry, French, and his army German, he studied on a one-to-one basis with Smith, who officially became his major professor in 1959. At the time, the University of Michigan was a hotbed of mycology, and Orson also took classes from Drs. L. E. Wehmeyer, E. B. Mains, F. K. Sparrow, A. S. Sussmann (physiology of fungi), and W. H. Wagner (peridology). Orson was early in this illustrious line of UM-trained mycologists descended from C. H. Kauffman and E. B. Mains through A. H. Smith that included: Chester Leathers, Paul Harding, Kent McKnight, Harry Thiers, Howard Bigelow, Joe Ammirati, and Dick Homola.

Orson met aquatic mycologist Robert A. (Bob) Paterson and family at the UM Douglas Lake Biological Station, a connection that was to play an important role later in his career. At the station, Orson took courses on algae from F. K. Sparrow and on lichens and bryophytes from University of Tennessee's Jack Sharp, and served first as Alex Smith's teaching assistant for an Introductory Mycology course and later for Advanced Mycology. Harold Burdsall attended the mycology class during Orson's TA summer, and it turned Hal's life towards mycology.

In 1959, Orson took a fellowship at Fox State Forest near Concord, Massachusetts, where his third daughter Virginia (Ginny) was born. His first paper was published in Fox Forest Notes, a New Hampshire Bulletin, and reflected his forest pathology background: "Red pine mortality from root rot (*Fomes annosus*)."

In 1961, Alex Smith told Orson to go west and get a job, and Orson did, becoming a research Plant Pathologist for the Intermountain Forest and Range Experiment Station based in Spokane, Washington. Orson and Hope put the three kids in their pea green VW bug (the first of many Volkswagens) and headed west. (Per-

haps the fact that they ran out of funds and had to ask Orson's folks to wire money to Sheridan, Wyoming, explains the empathy Orson and Hope had for the trails and convolutions of their own graduate students' lives.) Orson spent two years studying the effect of ac-tadione spray on white pine blister rust, which—unfortunately—worked only as well as the oil base used as a control.

Orson was later transferred to the Moscow, Idaho Intermountain Forest and Range Experiment Station as one of three research forest pathologists (Fig. 4). Here he examined spore germination in *Echinodontium tinctorium*, the cause of heart rot in true firs, in addition to other forestry research. With Hal Burdsall as his field assistant in the summer of 1962, they collected and cultured mushrooms throughout much of northern Idaho. Hal tells how during his Priest River Experimental Forest summer, Hope and Hal realized how night-blind Orson was and had some fun with it. When laboratory lights were turned out at night, they would walk away, leaving Orson to negotiate his own way. There was a flagpole in the middle of the sidewalk, and Orson nearly walked into it several times. Although Hope and Hal found it more than a little funny, Orson was not amused.

Back in Moscow, a rule change required that Forest Service employees wear uniforms and shave. Orson, recalling his army days, refused to comply and continued to sport both casual attire and a beard because he was a researcher and not in direct contact with the public. He eventually managed to circumvent the requirements with no ill consequences. So the casual plaid shirts began early on (Fig. 5). The beard remained for years,



FIG. 4. Orson ready to fly off and collect fungi in Idaho for the Forest Service. His crew-cut hair is still dark.

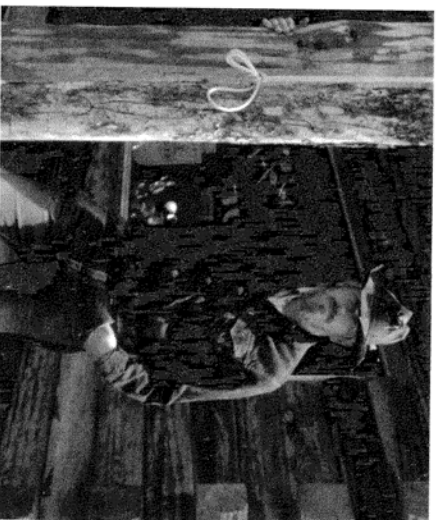


FIG. 5. Orson in his western garb in Idaho.

eventually turning snow white along with his hair, giving Orson a distinguished look at an early age.

While Orson supported his growing family as a forest pathologist, he was also completing Ph.D. work. He defended his dissertation at the University of Michigan in the spring of 1963; unfortunately, Hope could not attend his defense as she had to represent Orson at the dedication of the new Forest Mycology Lab in Moscow, Idaho. At Alex Smith's prompting, Orson concentrated on the Gomphidiaceae for his doctoral research, entitling his dissertation: "The Gomphidiaceae, a monograph of the genera and species and their world distribution." Interest in this group of mycorrhizal fungi so closely associated with the Pinaceae continued throughout his career. Forty years later it was the topic of Orson's presidential address to the Mycological Society of America, published in *Mycologia* (2003) as "The Gomphidiaceae revisited: a worldwide perspective." Early on he proposed the new genus *Chroogomphus* (named for its colored flesh), a decision now validated by his recent molecular work revealing his genus as a well-supported clade separate from *Gomphidius*. In addition, *Chroogomphus* is recorded only with *Pinus*, while *Gomphidius* also occurs with *Abies*, *Larix*, *Picea*, *Tsuga*, and *Pseudotsuga*. His recent phylogenetic analysis covers 25 species and three genera (including the secotoid genus *Braunitellula* with *Chroogomphus*).

After graduation, Orson continued as Forest Mycologist in Moscow, Idaho, until 1965. During this time, Dr. Frank Corner, a mycologist at Montana State University and former Kauffman student at the University of Michigan, offered Orson his position at MSU, since he was retiring. Although Orson accepted the job offer

and prepared for the transfer to Montana, the position was pulled, in essence, ending an opportunity for Orson to work in the western states. Nonetheless, he and Hope bought a small piece of land near McCall, Idaho, where, in the summer of 1964, they built an A-frame cabin in 11 days with help from Hal Burdsall. This allowed them a connection with the West over the years, a place to spend summers and holidays, and is where they now reside in retirement. McCall is a day's drive from Priest Lake, an area where Alex Smith spent much time at the Priest River Experimental Station in mycological endeavors.

### A Forest Pathology Position at Beltsville, Maryland

In 1965, Orson began negotiations with John G. Palmer whom he had met at professional meetings while working at the Beltsville, Maryland, Forest Disease Laboratory. John had transferred from the USDA Shade Tree Pathology Unit in Madison, Wisconsin, to become Project Director of the USFS Forest Disease Laboratory in 1960. In 1965 Orson joined him as a Forest Mycologist. John was a delightful person and a researcher who was a force in initiating the mycorrhizal conferences known as NACOM (today ICONM) with Edward Haskaylo. John and his wife Janice became lifelong friends of the Millers, eventually joining them in Blacksburg, Virginia in later years. Robert Stewart had previously worked with John on diseases of ornamental plants at BARC (Beltsville Agricultural Research Center), and his daughter Linnea Stewart Gillman became Orson's laboratory technician and later one of Orson's first graduate students at VPI. Linnea remembers her grueling hours preparing endless cystidia from *Gomphidius* sporocarps for Orson. Down the hall from Orson at Beltsville was Hal Burdsall who joined the lab two years later after obtaining his own Ph.D. These were lively times at Beltsville with John, Orson, Hal, Robert, and Linnea all laughing around the lunch table, scrounging for mushrooms on the grounds, or playing ice hockey on the frozen pond outside the lab. Orson spent the next five years primarily working on wood-inhabiting fungi, and publishing monographs on *Xeromphalina*, *Panellus*, and *Lentinellus*, or papers on other western aganics. During 1967 and 1969, his visits to the Yukon and Alaska with Bob Gilbertson stirred his fascination with Arctic fungi, on which he continued to publish throughout his life. In 1970, Orson left the Beltsville Lab, which was moved to Madison as the Center for Forest Mycology Research, to assume his duties as mycologist at Virginia Polytechnic Institute (VPI).

## The University of Montana, Flathead Lake Biological Station: Western Boot Camp for Mycologists

In 1964, Robert Gilbertson (Gil, to his friends) began teaching a field mycology course at the University of Montana Biological Station located on Flathead Lake in western Montana. That year Gil took the class to Priest Lake, Idaho, to spend a week with Alex Smith, Harry Thiers, Orson, and Ken Harrison from Nova Scotia, along with Hal Burdall, then Alex's summer graduate student assistant. Two years later, Orson visited Yellow Bay and accompanied Gil and the mycology class on a field trip through the Canadian Rockies. When Gil took a position at the University of Arizona in 1967, Orson took over teaching the class at the Biological Station, then directed by Dick Solberg and later by Jack Stanford. Orson taught mycology at the station in alternate years from 1971 to 1991, and a shortened version in 1995 as an affiliate of the University of Montana.

Orson developed a rigorous field course on mushroom identification that inspired many students to continue in mycology. Egon Horak, who visited in 1989, noted that there was nothing comparable in Europe. The general plan for the class was an hour lecture in the morning three days a week, followed by a lab exercise and microscopic examination of specimens until lunch time. Afternoons and weekends were reserved for field trips and mushroom identification. A regular highlight of the class was the week-long field trip into the Canadian Rockies to collect high-elevation fungi, especially appreciated by students since there was camping all along the way. Researchers, as well as students, came to learn about higher fungi in a class rich with daily exposure on many levels. Steve Stephenson came to learn and collect true fungi, and later to teach about his myxomycetes. Hal Burdall passed through in 1971. Stories from the biological station abound, but only a few are included here due to space limitations and perhaps editorial discretion.

Orson and Hope owned a sailboat that they used for pleasure (and to escape students) at the Flathead Lake station, although one summer a few students actually invaded their sanctuary by paddling out to the sailboat in a canoe to ask questions before a test (Fig. 6). The prize for most challenging student, however, probably goes to Hope Miller who took the course in 1970 (her first in 20 years) and who would mercilessly question Orson at night before each test. According to Orson, there definitely was no escape from *this* student! In reality, Orson's patience with students and concern for their future was legendary, and many of the survivors



FIG. 6. Hope and Orson among the ponderosa pines at the Flathead Lake Biological Station in Montana in 1986. (Courtesy of C. Cripps)

of the field station class are now mycologists or botanists in their own right. Their training was simply superb.

One year at the Biological Station, a rain dance was performed by the mycology class, led by student Ardeen Watts, a music conductor from Salt Lake City. Pots, pans, sticks, and bells probably never sounded so good, and the participants were even rewarded with a sprinkle of rain. There was also a "barbershop quintet" (composed of two Millers, two Baileys, and one John Olson) which belted out tunes from one of the small cabins late at night after a visit from "Jim Beam"; hiding outside, we found the rapid transformation from perfect harmony to total cacophony most hilarious.

Then there was the "Case of the Blue *Omphalina*," collected during one of the Canadian field trips. It appeared to be an exciting new species that Orson Miller and Egon Horak, field-guide pages flying, just couldn't pin down. It might well have gone to publication, had not the students confessed to application of food coloring at the stripe base, after which the color was absorbed realistically into gills and pileus (Fig. 7).

At the end of each course, it was traditional for Orson and Hope to give each student a "memento" of their time at the station. Most were for dubious distinctions, such as the "Phallales award" for someone who spiced up the class in a unique way, a deer pellet necklace for a *Coprinus*-lover, and a "frozen-bra" mushroom basket for a more eccentric student, to name just a few.



FIG. 7. Orson, John Orson, and Egon Horak perplexed by a blue *Omphalina* allegedly collected by the 1989 mycology class on their Canadian field trip. (Courtesy of C. Cripps)

Both the fun and the serious work of mycology lasted over 20 years, providing the ultimate field taxonomic experience for both students and researchers. Orson's Montana work also resulted in a significant checklist of macrofungi from the region. He was aided in this endeavor by Marie "of-the-long-lists" Bailey, a persistent Orson-inspired amateur mycologist who took his sum-

mer course several times (Fig. 8). From their home base in Oregon, Marie and husband Leeds continue to update the checklist of Idaho fungi, a serious contribution to the mycota of this region.

#### **Virginia Polytechnic Institute, a Long and Distinguished Career: Research in the Lab and in the Field**

Mycology's long tradition at Virginia Polytechnic Institute—also known as VPI or Virginia Tech, includes W. A. Murrill, past assistant director of The New York Botanical Garden and internationally known polypore systematist, who began his mycological career as a Tech graduate student in 1904. Robert Paterson (aquatic fungi) moved from the University of Maryland to head the VPI Biology Department in 1967. Acquainted with the Millers from Orson's graduate student summers at Michigan's Douglas Lake Biological Station where the Miller girls and Paterson children played together, Paterson invited Orson to interview for an available position at VPI. Orson left his federal position and was hired as an associate professor at Tech in 1970. Once his quality, experience, and dedication became evident, he was made full tenured professor after his three-year review in 1973.

With the 1972 publication of *Mushrooms of North America*, one of the first color-illustrated field guides for our continent (Fig. 9), Orson shared his knowledge of



FIG. 8. Orson and Marie Bailey hard at taxonomic work, UMBS Biological Station (1995). (Courtesy of C. Cripps)



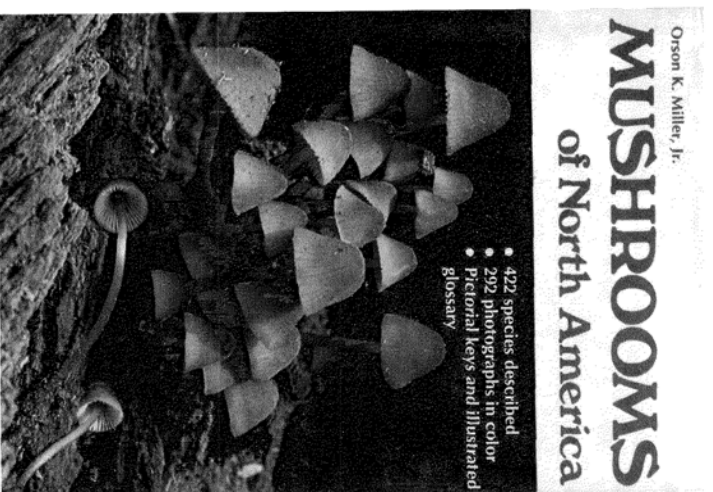


FIG. 9. Mushrooms of North America—a mycological milestone!

fungi with professionals and amateurs alike. It was a Mycological Milestone. To quote Robert Gilbertson: "Its success was basically the result of over 15 years of tireless field research and Orson's sound professional knowledge and understanding of the fungi. This book immediately became a standard and the most widely used manual for identification of mushrooms, not only in North America, but also in many other parts of the world at the same latitude and with similar ecosystems. I have relied heavily on this book in mycology courses I've taught ever since it first appeared, and I know most of my colleagues in teaching have also used it. Countless numbers of undergraduate and graduate students, along with legions of amateur mycologists, have learned about mushrooms from Orson's book. It has probably done more to promote mycology and interest in mushrooms than any other book in American publishing history. As a result, Orson has unquestionably become the major link between professional and amateur mycology in North America."

Since then, MNA has been reprinted as a paperback (with eight printings), and sold more than 245,000 cop-

ies. At 74, Orson is completing the next edition. This book was followed by *Mushrooms in Color: How to Know Them, Where to Find Them, What to Avoid* in 1980, co-authored with Hope. This sequel provides a more in-depth look at some of the best edible and most toxic mushrooms with detailed notes on how to tell them apart.

Initially at VPI Orson continued the Arctic fungal research begun earlier in the Yukon with the Icefield Ranges Research Project. As an investigator for the International Tundra Biome Programme and the Energy Research and Development Administration, he studied oil pollution in the tundra and the role of microbial decomposers at Barrow. His first Ph.D. student, Gary Laursen, assisted him first at Eagle Summit and later in Barrow, Alaska. After completing his research on higher fungi in the Arctic tundra in 1975, Gary spent one year as Orson's postdoc, and later devoted his mycological career to studying agarics in Alaska. Orson's former technician at Beltsville, Linnea Stewart Gillman, who worked on Arctic-alpine-boreal *Melanoleuca* species, was actually Orson's first student to complete a graduate degree (M. Sc. 1972).

Dave Farr was already Bob Paterson's student at VPI when Orson began supervising his own mycology students. However, Dave and Orson worked together to published the *Index of the Common Fungi of North America* in 1975. Dave's wife, Ellen Farr, earlier had completed her M.S. (on *Pholonia*) in 1974 and continued to work at VPI. Orson was on Steve Stephenson's Ph.D. committee from 1974–1976, and introduced him to both mycology and to the myxomycetes, which were to become the focus of Steve's life. Other master's students followed whose research always emphasized the higher basidiomycetes, except for one student who focused on lichens.

Linnea and Ilene Ray tell of the time several of Orson's students (no one is confessing to this) mistakenly ate a toxic *Chlorophyllum molybdites* that did not give a green spore print soon enough. All became fairly ill. Called from the hospital, Hope eventually tracked down Orson at the Yellow Bay Biological Station in Montana. It was quite an unpleasant surprise to have several of his graduate students victims of a mushroom poisoning! There is also a vague allusion to one student calling from jail for bail money later in Orson's career, but the details of this story are best kept secret.

Orson's focus on Arctic agarics is noteworthy. He contributed regularly to the volumes on Arctic and Alpine Mycology published every four years, and regularly attended each International Symposium on Arctic-alpine Mycology (ISAM). His work covered many Alas-

kan agarics, particularly Arctic-alpine *Cystoderma* and *Hebeloma* species. In 1990, Orson completed a taxonomic work on the *Galerina* species he had collected in Arctic Alaska with Egon Horak. His long-time interest in cold-loving fungi resulted in a paper on the "snow-bankers" from Idaho and Oregon that depend on melt water from persistent snow. Orson reported on cold-climate fungi in approximately 30 publications with R. Antibus, I. Brunner, H. Burdsall, V. Evenson, D. Farr, R. Gilbertson, E. Horak, G. Lausen, A. Linkins, E. Ohenoya, S. Redhead, R. Watling, and others. Bob Antibus conducted his own research on the physiology of ectomycorrhizal Arctic agarics in Orson's lab, receiving his Ph.D. in 1980.

John Palmer, now retired from the Center for Mycology Research, joined Orson at VPI in 1980, staying until 1995. Their investigations into the role of light in the development of *Rhodotus palmatus* and *Panus fragilis* revealed a species-specific dependency on particular wavelengths for normal sporocarp formation. They showed that specific wavelengths were needed for normal fruiting, and that, in the case of *Panus fragilis*, low temperatures caused an abnormal but fertile coralloid sporocarp.

Orson's intense interest in Gastromycetes, which first manifested itself in his paper on Alaskan *Calvatia* species, eventually resulted in his 1988: *Gastromycetes: Morphological and Developmental Features with Keys to the Orders, Families and Genera*, co-authored with Hope and with exquisite drawings by Cynthia Clem (Figs. 10 and 11). This highly useful book covers all the main genera of "Gastromycetes" including many secotioid taxa with relationships to agaric genera. Orson published the new genus *Neohydnus* with C. Ovrebo and W. Burk; and also published on *Calvatia* with H. Burdsall and G. Lausen, on *Gastrum*, *Gastrosporium* and *Radigera* with B. Askew, on *Calostoma* with E. Castro-Mendoza, on *Zellromyces* with S. Miller, on *Battarra* with K. Jacobson, and on some stunning species from Puerto Rico with D. J. Lodge and T. Baroni. Orson also had an interest in unusual secotioid fungi such as *Brainiella* (near *Photia*). An interesting side note is that fungus collection OKM 001, the first in his impressive life collection of almost 29,000 exsiccata, is simply labeled "puffball." Such a humble beginning should give hope to any aspiring mycologist!

The genus *Amanita* was also a focus and passion, and Orson described new species from Australia on his own, from Idaho and Oregon with E. Trueblood, from Hawaii with D. Hemmes, and from the Antilles with D. J. Lodge. The tremendous number of *Amanita* spe-

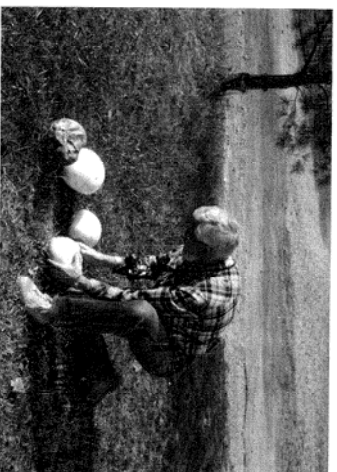


FIG. 10. Orson fabricating a mushroom picture of *Calvatia gigantea* at Fairy Stone State Park, Virginia, 1982. (Courtesy of Gerald Bills)

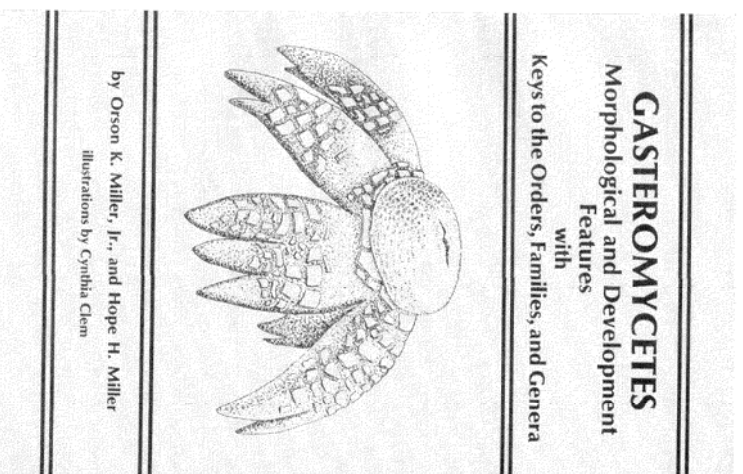


FIG. 11. *Gastromycetes*—The Miller's definitive guide to the genera.



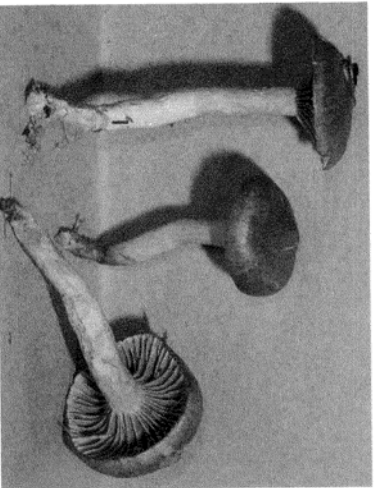


FIG. 12. Orson's genus *Chroogomphus*. (Courtesy of Tim Baroni)

cies in the southeastern United States, an important seat of diversity, was a continuous source of excitement for Orson during his years at VPL. He often amazed beginning students by placing fresh *Amanita* specimens or buttons on a bench top so they could witness the continued expansion and curving of the stipe when left overnight. In the 1990s, Dr. Rajendra Bhart came to study *Amanita* in the oak forests of Virginia so similar to those of his homeland in India. Orson's *Amanita* passion was recently rekindled by spectacular finds, such as *A. cruzii* O. K. Mill. & Lodge, with a two-layered universal veil, for the Basidiomycetes of the Greater Antilles project at the Luquillo LTER site, studied by a large collaboration of mycologists, headed by Jean Lodge and Tim Baroni.

Orson formally described many new species, including representatives of *Amanita* (23), *Chroogomphus* (genus + 15 species), *Cliocybe*, *Colybia*, *Cortinarius*, *Gomphidius* (5), *Hebeloma*, *Hohenbuehelia*, *Hygrophorus*, *Hypholoma*, *Inocybe*, *Lentinellus*, *Lentinus*, *Lactarius*, *Leucopholiota*, *Melanoleuca*, *Neohysurus* (genus), *Nolina*, *Omphalotus*, *Panellus*, *Panus*, *Pleurotus*, *Pseudonullostoma* (genus + 2 species), *Russula*, *Sinocybe*, *Suillus*, *Torrencia*, and *Xeromphalina* (see list on pages 23–24). Notable among these are *Pleurotus cystidiosus* O. K. Mill. with its coralloid asexual stage, and the ascomycete genus *Pseudonullostoma* O. K. Mill. and T. W. Henkel, called the “mycological find of the century” for its morphological resemblance to a gastroid stalked puffball that is a basidiomycete—that molecular methods revealed to be an ascomycete in the Elaphomycetaceae.

Over the years, the Miller lab became known for its mycorrhizal research, a topic of rapidly growing interest in the 1970s and 1980s. Miller's classic paper on the

“Taxonomy of ecto- and ectendomycorrhizal fungi” was published in Schenck's 1982 “Methods and Principles of Mycorrhizal Research,” closely followed in 1983 by “Ectendomycorrhizae in Agaricales and Gastromycetes” that laid the foundation for delineating the genera and families of macrofungi that were mutualistic with woody plants. This running hypothesis has been tested and amended by other researchers over time, and with modern methods. Orson addressed the evolution of mycorrhizal fungi, pre-dating molecular methods, in his classes and later with S. Borch and H. Thiers at the 6th NACOM meeting in 1985, John Palmer, one initiator of the North American Conference on Mycorrhizae (NACOM), also proved a valuable resource on mycorrhizal research methodology for students. Some of the first mycorrhizal studies in Orson's lab revolved around Alaskan Arctic fungi. Student research examined the mycorrhizal status of Arctic plants at Barrow (Laursen) and revealed a phosphatase activity in fungi ectomycorrhizal with dwarf willow in Alaska (Anthus and Linkins).

Orson's interest in mycorrhizal fungi could likely be attributed to his forestry background and particular attachment to pines; a background that helped to sustain his work on taxa (Gomphidiaceae, Boletales) with strong ties to the genus *Pinus* in particular and the Pinaceae in general. An early paper on *Suillus* and *Fistulina* (Pinaceae associates) with Smith and Thiers (1965) covered some of the Idaho species. A favorite topic was the co-evolution and biogeographic connection between pines and the Boletales with respect to plate tectonics in the Northern Hemisphere. Orson recently reported on pine-associated Boletales in the Dominican Republic and Puerto Rico for the Greater Antilles project, again with Jean Lodge and Tim Baroni. Here we might note that another nickname bestowed upon Orson is “The Big Bolete,” and, yes, he will answer to this name!

Orson's enthusiasm for the mutualistic basidiomycetes sparked numerous graduate studies that ran the gamut from ecology, systematics, diversity, host specificity, synthesis capacity, and physiology of ectomycorrhizal fungi (see list of student theses and dissertations at the end of the biography). Many students contributed to the lab notebook containing descriptions of mycorrhizal fungi in culture, with selected species formally described by Orson, John Palmer and Steve Miller.

The order Russulales, independently evolved to the ectomycorrhizal habit, was a focus of graduate students Gerald Bills and Steve Miller, with Gerald focusing on Appalachian species of *Lactarius* and Steve on gastroid relatives and spore dispersal (Fig. 13). Gerald's classic

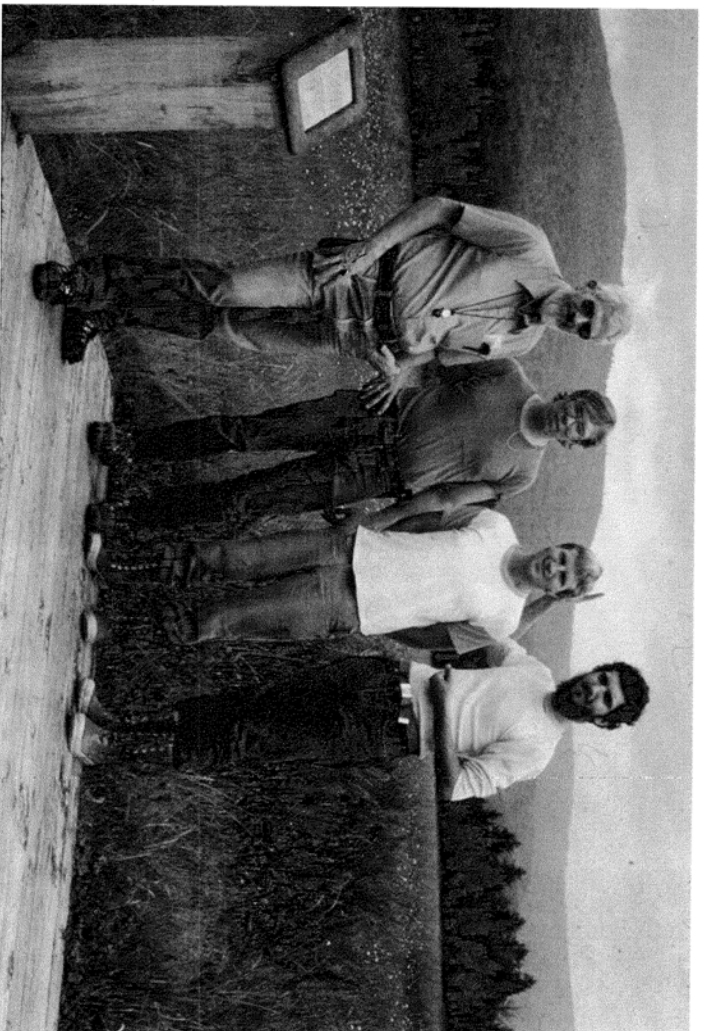


FIG. 13. Orson, and then graduate students Steve Miller, Gerald Bills, and Rytas Vilgalys on a lab excursion to Cranberry Glades, Monongahela National Forest, West Virginia (1982). (Courtesy of Gerald Bills)

1986 paper "Comparison of ectomycorrhizal basidiomycete communities in red spruce versus northern hardwood forests of West Virginia" helped initiate a modern quantification method useful for macrofungi in plot-based systems. Other investigations revealed host specificity between *Stropharia* species and various pines including species from Nepal (Van Corter, Kate Jacobson) and nuclear behavior (post-meiotic mitosis) in *Stropharia* that resulted in binucleate spores with concomitant implications for dispersal strategy (Jacobson) that differed by species according to further research by Roland Treu. Postdoc Treu taught a course on 'Mycorrhizae' at VPI that included R. Agerer's novel German research on identifying mycorrhizal species using only ectomycorrhizal root tip morphology. Students in Orson's lab later employed these methods in their own mycorrhizal research.

Orson's friend and resident researcher John Palmer had pioneered synthesis methods with Oregon's Randy Molina, and their 1982 paper "Isolation, maintenance, and pure culture manipulation of ectomycorrhizal fungi" is still cited in the methods sections of numerous

papers. Synthesis experiments were commonly carried out in the Miller lab with pines (R. Abler, V. Corter, V. Ford, C. Grub, K. Jacobson, M. Stankis, R. Treu), alder (I. Brunner, J. Murphy), aspen (C. Cripps), eucalyptus (G. Eaton), and oak (J. Walker). Ivano Brunner, a postdoc from Switzerland, studied the ecology of Alaskan alder species, followed by Orson's student Jack Murphy, who succeeded in a tripartite synthesis with *Hebeloma Paxillus* and the actinomycete *Frankia*. The ability of ectomycorrhizal fungi to tolerate heavy metals was investigated in the laboratory by C. Grub, and later on coal spoils by R. Abler. Miller students delineated mycorrhizal associates for subalpine fir (S. Miller), red spruce, and northern hardwoods (G. Bills), *Wetmorella* in Namibia (K. Jacobson), for arbuscular mycorrhizae), and western aspen including those on smelter sites (C. Cripps); see Fig. 14. At the 1996 International Conference on Mycorrhizae (ICOM) in Berkeley, Cathy Cripps and Orson organized the symposium on "Mycorrhizae in stressed ecosystems," emphasizing environments with a high heavy metals content or subjected to industrial pollution. Greg Eaton examined the



FIG. 14. VPI crew in 1991. Standing: Dr. John G. Palmer, Jack Murphy, Laurel Kuehn, Dr. Roland Treu, Dr. Rajendra Bhatt, and Dr. Orson Miller, Jr. In front: Greg Eaton, Kate Jacobson, and Cathy Cripps.

role of oxalic acid in soil with mycorrhizal fungi. A 1995–1998 USDA grant (to G. Nilsen, O. Miller, B. Clinton) funded research into the detrimental effects of the *Rhododendron* under-story on mycorrhization of forest canopy trees in Appalachian forests, with a large share of the mycorrhizal work completed by John Walker and Orson.

Numerous mycologists contributed to the ambitious 1995 USDA-FS Columbia River Basin project charged with assessing baseline biodiversity and proposing conservation measures for selected biota including fungi. Orson, Hope, and Cathy Cripps provided an extensive checklist of over 1,300 species of higher fungi (including mycorrhizal fungi) for their region of Idaho and western Montana. Orson acknowledged additional contributors R. Antibus, B. Askew, M. & L. Bailey, H. Burdall, H. Van Cotte, R. Gilbertson, C. Gruhn, R. & B. Farnsworth (McCall, ID), D. Farr, G. Lausen, E. Horak (Fig. 15), K. Jacobson, S. Miller, J. Olson (Ontario, OR), R. Rosentreter, S. Stephenson, E. Trueblood (Nampa, ID), and the Southern Idaho Mycological Association (SIMA), and also thanked J. Antibus, I. Baxter, C. Croghan, E. Farr, T. Flynn, L. Gillman, D. Manning, F. Nisheda, and K. Scates. All are Miller colleagues, friends, students, neighbors, professionals, and amateurs, who Orson considers a part of his extended mycological family. In true Orson fashion, he thanks them for their work over the years.

The early 1980s brought fungal genetics, mating studies, and molecular analytical techniques into the Miller lab. Much early research focused on saprophytic agarics that are more likely to produce spores that germinate under laboratory conditions, and are more easily

maintained in culture than mycorrhizal fungi. The arrival of Rytas Vilgalys, a student interested in fungal genetics, spurred forward research on the delineation of biological species. Rytas developed fungal mating protocols to untangle the *Collybia dryophila* complex followed by graduate students Tim Flynn and Jack Murphy, who examined the *Agrocybe praecox* group, and the *Collybia subnuda* intersterility groups, respectively. Orson had begun work on pleurotoid fungi, some of which was conducted with Oswald Hilber, a visiting researcher from Germany. Vilgalys and Miller followed this earlier morphological work with mating studies to sort out the *Pleurotus ostreatus* complex in North America. *Pleurotus ostreatus* (Jacq. ex Fr.) P. Kumm. was more common in eastern North America, while the related *P. populinus* Hilber & O. K. Mill. and *P. pulmonarius* (Fr.) Quélet were more common further west. In addition to establishing geographic distributions for the three biological-morphological species, they also uncovered a pattern for host preference. Orson also used mating studies to help define a putatively new species of *Hypholoma*.

One of the first (1980s) molecular methods used to address fungal taxonomic relationships—DNA hybridization—was tested first by Vilgalys on his *Collybias*, and later by Flynn on the *Armillaria mellea* complex. Now with his own lab at Duke University, Vilgalys has become an internationally recognized leader in fungal molecular systematics and genetics. Later on, Kate Ja-

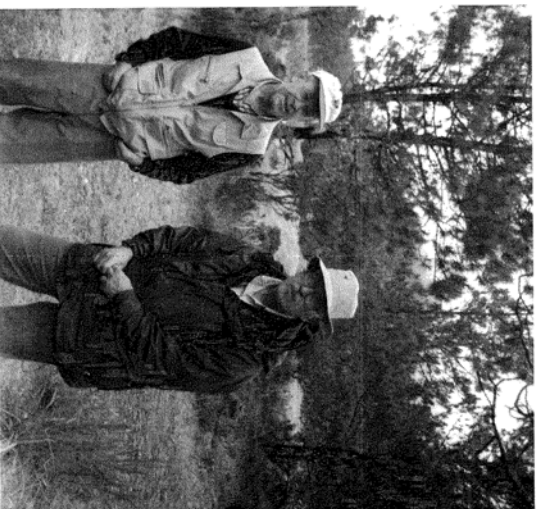


FIG. 15. Egon Horak and Orson at Valle Nuevo National Park, in the Central Mountain Range, Dominican Republic, 1997. (Courtesy of Jean Lodge)

cobson found RAPDs (randomly amplified polymorphic DNA markers) more informative than somatic incompatibility tests in assessing *Sullus granulatus* genotypes, and with Orson published her results in the Proceedings of the National Academy of Sciences. With the molecular revolution in full swing by the 1990s, Orson's final three students became well versed in molecular techniques. RFLP (restriction fragment length polymorphism) analysis was used to compare mycorrhizae in forests with a *Rhododendron* understory putatively allelopathic to tree seedlings (Walker & Miller) and to identify mycorrhizal fungi on the roots of woody vegetation on coal spoils (Ablert & Miller). Aime and Miller analyzed the ITS (internally transcribed spacer) region of ribosomal DNA to help delineate relationships within the Crepidotaceae. Three of the authors of the ambitious "One hundred and seventeen clades of Eulagarics" (Jean-Marc Moncalvo et al., Molecular Phylogenetics and Evolution 23: 357–400, 2002) are connected to the Miller lineage (Vilgalys, Aime, and Orson himself). Orson's 2001 MSA Presidential address shows that his research of the Gomphidiaceae begun in the 1960s had come to fruition 40 years later with the comparison of his early morphological, and later phylogenetic species concepts and the molecular support of "his" *Chroogomphus* as a separate genus. The molecular work added to the scientific arsenal of the Miller lab.

In his 32 years at VPI, Orson published more than seven books and 150 papers, gave over 500 presentations to professionals and amateurs all over the world, and edited over 34 books, mostly of detailed taxonomic works. Perhaps his notorious proclivity for rising at 5:00 A.M. each day aided and abetted such productivity, no doubt helped along by an all-day coffee routine, exemplified by the notorious green metal thermos always nearby. Alex Smith always had a Coke at hand, but for Orson, it was coffee.

Orson's research career appears to be reaching a crescendo. From 1993 to the present, Orson has been an author or co-author of 47 papers. He also served as a scientific advisor for "Texas Mushroom" (Metzler et al. 1992), and co-wrote *Mushrooms of North America in Color, A Field Guide Companion to Seldom-Illustrated Fungi* (1995) with Alan and Arleen Bessette and Hope. He has collaborated in numerous grants to study higher fungi. The most recent grant—the Lodge and Baroni Basidiomycetes of the Greater Antilles project has taken Orson to Belize, Dominican Republic, and Puerto Rico to study the fungi under his beloved pines in an entirely new region. In 2002, Orson and Cathy Cripps co-chaired the Symposium on Arctic and Alpine Fungi at the International Mycological Congress in Oslo, Nor-

way. In this symposium, indicative of Orson's continuing interest in Arctic fungi since his early days in Alaska, he presented "Arctic fungi of North America" and Cripps reported on her NSF grant "Alpine Fungi of the Rocky Mountains."

Orson has been actively involved with the Mycological Society of America in numerous capacities as a committee member and Councilor during the 1970s, Chair of the Finance Committee from 1993 to the present, as Managing Editor of *Mycologia* (1998–2000), Vice-president (1998–1999), President-elect (1999–2000), and President (2000–2001). He was a founding member of the Mid-Atlantic States Mycological Conference that has introduced many students into the realm of professional presentations. Among other VPI academic duties, Orson curated 30,000 collections of higher fungi in the Masse Herbarium, primarily those he collected himself during his travels in the Alaskan Arctic, Korea, Japan, Australia, Scandinavia, Great Britain, Switzerland, Austria, the former Czechoslovakia, the former Yugoslavia, Namibia, Thailand, Puerto Rico, Dominican Republic, Jamaica, and Belize (Figs. 16 and 17). Internationally well known and well respected, he has spread the mycological gospel in workshops and talks all over the world, and is one of the first mycologists to bridge the European-North American gap with intercontinental research visits.

This illustrious research record led to Orson's 1995 election as an American Association for the Advancement of Science Fellow, and 1997 designation as a Mycological Society of America Distinguished Mycologist (that Society's highest honor). This was followed in 1998

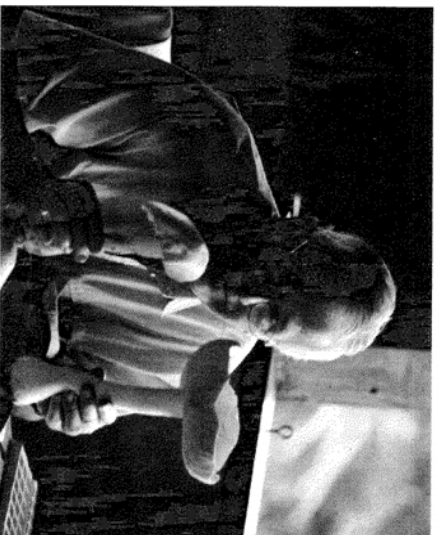


FIG. 16. *Amanita polypyrans* collected by Orson in the Dominican Republic, 1999. (Courtesy of Jean Lodge)



FIG. 17. Drs. Cathy Cripps, Uschi Peinner, Martin Siegl, Meinhard Moser, Reinhold Pöder, Hope, and Orson Miller at Meinhard's home in Innsbruck, Austria (Feb. 29, 1996). (Courtesy of Don Bachman)

by his being awarded the Thomas Jefferson Medal for Outstanding Contributions to Natural Science by the Virginia Museum of Natural History.

### A Talented, Dedicated, and Inspiring Teacher: Training "New, Interesting, and Unusual" Mycologists

What is it about Dr. Orson K. Miller, Jr., that inspires us to want to learn more about higher fungi, keeping so many of us in the field of mycology and stimulating a lifelong passion for the subject in others? To borrow a phrase used to describe geneticist Barbara McClintock, it could be his "feeling for the organism." But perhaps more importantly, it is Orson's absolute, steadfast dedication to mycology, coupled with a personality that promotes the fungal kingdom at every turn. Orson enjoys sharing knowledge and has the patience and the passion to teach anywhere at any time. He allows us to feel a part of something larger than our daily lives, and ourselves, and we want to join!

This is not to diminish Orson's highly organized teaching style. He is a novice taxonomist's dream and presents all the fungal taxa methodically with tidy notes. He developed one of the most exciting, informative mycology courses for its time, inspiring generations of students. Dr. Miller purposely began with quiet mushroom walks, "leading you down the garden path." Then he set the hook with slide shows of colorful fleshy fungi, followed with easy identification keys—before we knew it—he had reeled us in all the way through the brutal Pyrenomyces. Most of us swallowed hook, line, and sinker. None of his lectures were totally canned, and he

continually updated teaching material with new slides and information. You could sit in on Introductory Mycology many times and still learn something new each time (and some did).

Orson's teaching style was visual. He completed intricate drawings on the chalk board, referred to the outline on the left side of the board, and ended each lecture with a slide show to illustrate certain points. He used his low baritone to describe mushrooms, spores, or ultrastructure from a projector slide, thereby allowing his message to flow mellifluously into the brain. Periodic quizzes were also visual, and students identified color slides to family and genus. Students responded positively to this visual style of learning, which possibly stemmed from Dr. Miller's early left-handed orientation. In all, at VPI and the Flathead Lake Biological Station, he taught Introductory Mycology 50 times! So when Hope would occasionally chime in with a corrective statement from the back of the room at the Biological Station lab (while knitting), we understood Orson was momentarily on auto-pilot. (Just how many times DID Hope hear those famous lectures?)

At VPI, Dr. Miller also taught Introductory Plant Biology, as well as higher level courses, including Biology of the Fungi (both Basidiomycetes and Ascomycetes & Deuteromycetes), Biology of the Fungi in aquatic systems (team taught with R. Paterson), Biology of Lichens, Mycorrhizal Methods (with R. Treu), and Advanced Mycology (in 1990 with E. Horak). Whatever the course, it was always accompanied by an intensive laboratory, which often took much more than the allotted time. Orders, families, genera, and species were presented as dried and/or fresh specimens, in seemingly endless array. We went through the lists, learning the fungi and their microscopic characteristics one by one. Most courses offered an organized field trip, and usually several per semester. This allowed us to observe Orson as a forerunner in his natural habitat, expounding on the fascinating ecology of the higher fungi. "Look! Here a fairy ring, there a polypore, over there a handful of roots with mycorrhizae." He always found something to excite us in his showcase. It was quintessential Dr. Miller to have us recognizing mushroom species through just a smell, a taste, a color, a shape, and a couple of important features.

While his brevity in the field was a joy, this well-trained mycologist sometimes imparted information at an alarming rate in the classroom. If we didn't get through the material in the course of the class, the last few lectures could go on for two or more hours—and we tolerated it, writing until our hands cramped. Only later in life would some of us come to realize the utility of our extensive "OKM" notes. His carefully crafted,



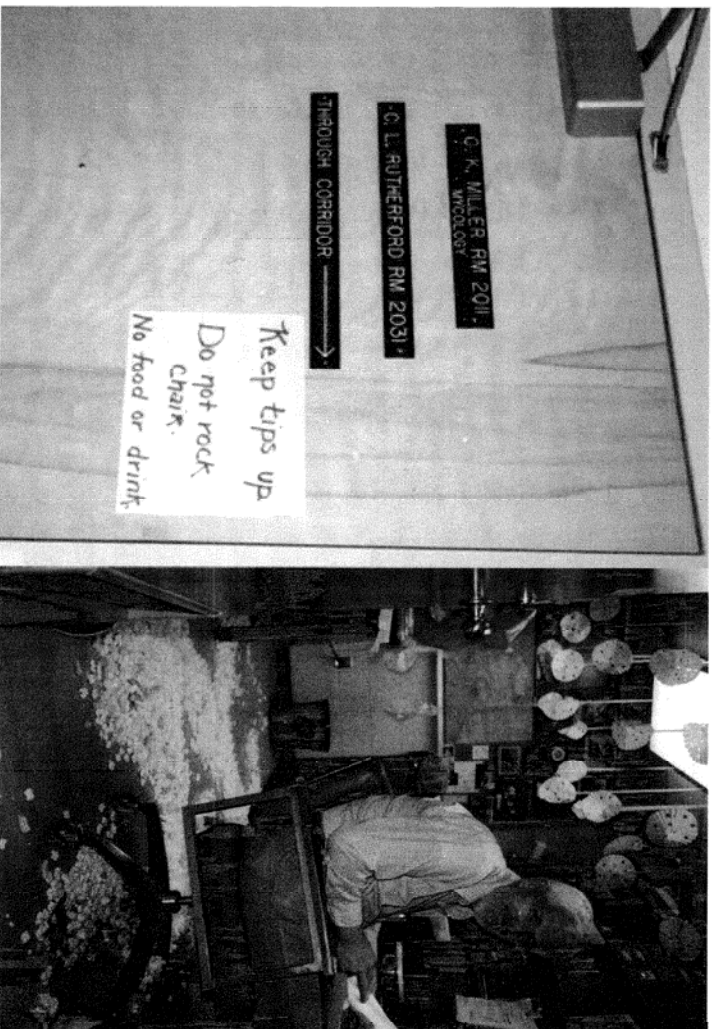


FIG. 18. A student-caused powder snowstorm in Orson's office at VPI (1980s).

detailed tests or "random knowledge samples" were designed to extend the learning experience. Periodically, a student might find the "B.S." stamp (containing the full eight letters), on a returned page.

The unbroken chain of mycological knowledge that stretches back past Dr. Miller, to Alexander H. Smith, to C. H. Kaufmann and to E. B. Mains (all at University of Michigan), and still further back to George At-

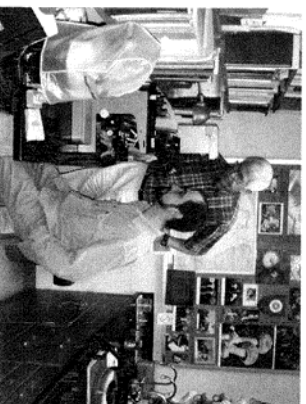


FIG. 19. Orson instructing John Walker in his small office at VPI, 2002.

kinson at Cornell must be celebrated. It should be projected as a holy grail wherever it exists in academia. It is one rationalization for small classes in this age of mass education.

Dr. Miller's warm mentorship and academic excellence combined to make students feel they could achieve any goals they set for themselves. He met with each graduate student one hour per week, and there was a constant stream of undergraduates flowing through his office for advice and counseling (Figs. 18 and 19). In later years, students learned not to schedule a meeting directly after lunch if they did not want to face Dr. Miller nodding off after his sandwich. However, this could be a benefit for graduate students who wanted to avoid discussion of undone tasks. Dr. Miller's philosophy was to let graduate students struggle on their own to develop a research project at an early stage in their career. He thought it better to let us agonize over coming up with a unique project early in our training, to condition us to the challenges that lay ahead. It was a conscious strategy. However, student research was obviously an extension of Dr. Miller's interests and influence, and his underlying joy in studying the higher fungi was certainly passed along.



"Myco-lunches" were instituted over the years during which we would meet for weekly discussions ranging from the mycological to the non-mycological. Carol Lamphear Cook, a non-Miller student myco-family member, remembers these lunches as an important part of her time at VPI. Undergraduates were also invited to participate. Dr. Miller patiently listened as we practiced our professional talks and suggested improvements. He encouraged students to attend the Mid-Atlantic States Mycological Conference (MASMC) which offered a comfortable academic atmosphere for launching a scientific speaking career. Not many mentors take the time to practice-quizz each Ph.D. candidate prior to their preliminary exams—yet Orson did so every Sunday for a month in advance of the big day. Orson's paper at the 1995 AIBS meeting entitled "Training Ph.D. students in Mycology—the role of your major professor" expounded on his mentoring philosophy. Many Miller graduate students held teaching assistantships, and three (Abler, Aime, and Cripps) won university-wide VPI teaching awards, and others have since received teaching awards at other universities, no doubt benefiting from Orson's own teaching style.

Some of us still visualize Dr. Miller hunched over his desk in the small closet that passed for an office in Derring Hall. You could stretch your arms out and almost touch both walls lined with books and reprints. Towards the back was a microscope and drawing tube, metal boxes of projector slides, a small sink and cupboards, and up front stood an immaculate desk, with a cup that usually held a pencil labeled "OKM, do NOT remove from office" in orange tape. If anything was labeled with orange tape, it was OKMs.

There were no windows in his office; there was often a radio on low—background music for drawing spots. The hall outside the cramped office filled over the years with papers, books, reprints, journals, and dryers despite periodic visits from the fire marshal. Yet there was always room for a small study station supplied with mycology books, literature, and a slide viewer for mushroom photographs, where undergraduates could read for class or study for tests. Basically, Dr. Miller provided the tools and atmosphere for learning, and students responded. Outside in the main foyer, a glass display case housed dried fungi, posters, and fungal-based products that attracted the attention of both passing students and visitors. The large laboratory across from Orson's office had tall windows up to a cement-beamed ceiling that opened onto a view of green space. Each graduate student had their own "spot" in the lab, which was otherwise filled with chemicals, equipment, computers, books, and—in later years—gel boxes.

There were many visitors to the lab: community members bringing in mushrooms to identify, distressed folks concerned about potential mushroom poisoning, visiting mycologists, some of them long term (see page 22), VPI colleagues with questions on fungi, graduated students returning to chat, high school students with projects, undergraduates in life crisis—Dr. Miller met all with a gracious and caring attitude. He never got angry at a student (even when they deserved it), but his serious concern was far more effective.

Then there were the weekly Biology departmental seminars that the Miller students were strongly encouraged to attend. In later years, Orson tended to fall asleep as soon as the lights were turned down. We would watch him struggle to stay awake, only to succumb to sleep at some point. On one occasion, a nodding Dr. Miller knocked his coffee cup from the armrest of the chair, across the floor to the feet of the nonplused speaker. Yet he would amaze us by being the first to raise his hand to ask a question as soon as the lights went on. His

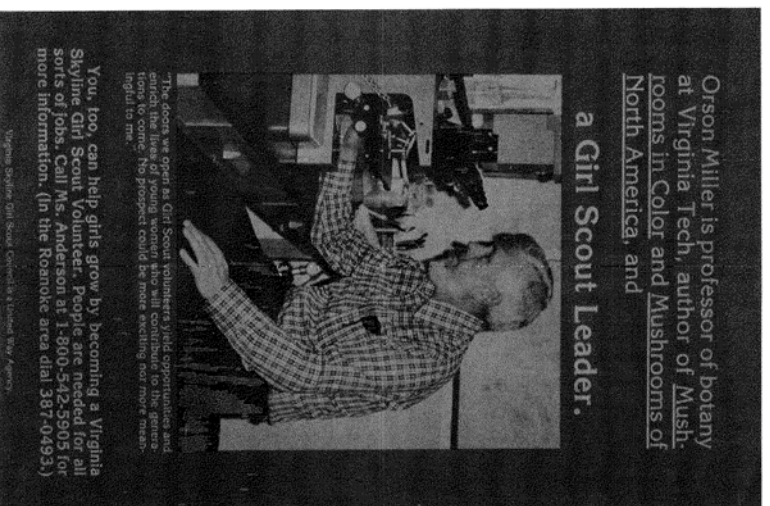


FIG. 20. As a Girl Scout leader from 1973–1983, Orson promoted an interest in natural history.

middle name "Knapp" (a.k.a. nap) took on a new meaning over time.

Off the Blacksburg campus, as a girl scout leader (often for his daughter Andrea's troop) from 1973–1983 (Fig. 20), he fostered an interest in natural history in young women. The Virginia Skyline Girl Scout Council acknowledged his service as an honorary volunteer. As a father to three daughters and a girl scout leader, Dr. Miller was a natural to foster women in mycology. Under his mentorship, five women received Ph.D.s, 11 earned master's degrees, and several more were tutored as undergraduates, including Lauraine Hawkins, now a mycologist at Penn State University, Mont Alto campus, and Jessie Micales, Supervisory Plant Pathologist at the Center for Forest Mycology Research in Madison. Orson not only encouraged women in science but sometimes made us feel a little like extended daughters. Dr. Miller was invited to the 1995 Bemji, Minnesota Mary S. Whetstone NAMA foray honoring women mycologists to lecture on "Women in Mycology." Miller's colleague and Arctic agaric specialist Dr. Gro Gulden, was chief mycologist for the event. He was also involved with sorority affairs at VPI with Hope (Fig. 21).

In all, Dr. Miller mentored 13 graduate students to

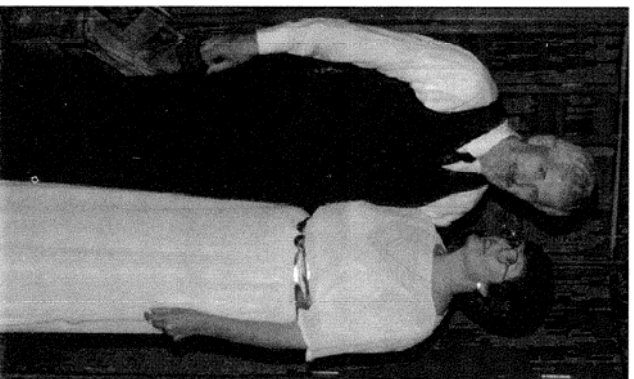


FIG. 21. Orson and Hope on their way to a sorority dance at VPI in the 1970s. Both were involved with sorority affairs at VPI.

M.Sc. degrees and 14 to completion of their Ph.D.s. It is a high tribute to Orson's legacy that over two-thirds of his graduate students (whether employed by academia, industry, or government) hold or have retired from careers related to mycology and/or teaching, while the rest contribute to amateur mushroom societies or maintain a private interest in the fungi. Orson fully deserved his 1999 Weston "Teaching" Award from the Mycological Society of America for the countless hours spent in mentoring and teaching and thus enriching so many lives.

### A Link Between Amateur and Professional Mycology

As noted above, Orson encouraged amateur mycological societies his entire career. He has led countless forays, given hundreds of talks, and has genuine concern for promoting their activities. To quote Bob Gilbertson: "Every member of every amateur mycological society in America feels that he or she knows Orson personally. They love the guy." Through both personal encounters and books, Orson's contributions towards the popularization of North American mycology are, quite simply, enormous. His consuming interest in ALL things mycological make his "disciples" feel that knowing and learning about fungi is both important—AND fun!

Amateur mycology can be serious business in Europe and Asia where it is often difficult to tell professional from amateur. On this side of the Atlantic, there is no long history of amateur mycological involvement, and Orson's promotion of "mushrooming" has helped keep many enthusiasts at the microscope and using field keys despite lack of financial gain. With academic institutions turning increasingly towards molecular techniques, the knowledge reservoir of the biodiversity of fleshy fungi resides more and more in these regional human resources. Mushroomers who have collected with Alex Smith, Howard Bigelow, Harry Thiers, Dan Stuntz and their ilk are the ones who have come to know special fungal finds first-hand from the experts and know the "spots" where rare species were found. Understanding its importance to mycology as a whole, Orson cultivates this knowledge base wherever he finds it. He has "lifted" casual observations to the academic level by publishing new species with amateurs, contributing to regional and foray checklists, and generally encouraging locals to share accurate field information with the "expert." Orson, who extends courtesy to all, treats virtually everyone as a neighbor, friend, and extended family. Both Orson and his resolutely sociable wife

Hope have turned once casual "amateur" acquaintances into honored and respected friends.

In order to deliver his 250 (and counting) talks to mushroom clubs and interested groups Orson and Hope have been constantly on the go traveling to or from meetings since 1970 (Figs. 22 and 23). Not counting the professional venues, Orson has traversed at least 31 states and ten countries (Canada, Finland, Sweden,



FIG. 22. Studying fungi in the myco-van during a field trip to the redwood forests of California.



FIG. 23. One in a long line of Volkswagens that have carried the Millers all over the country, parked in Bozeman, Montana (1993). (Courtesy of Cathy Cripps)

New Zealand, China, Korea, Australia, France, Japan, and South Africa) as an invited speaker to interested groups. His primary topic being, of course, the higher basidiomycetes, he has covered: mushroom toxins, mushrooms of the tundra, gasteromycete diversity, spore dispersal, edible and poisonous mushrooms, mycorrhizae, mushroom families, ecology and evolution of mushrooms, desert fungi, snowbank mushrooms, mushroom cultivation, morel hunting, western mushroom species concepts, mushrooms around the world, and bolete evolution, to name but a few. Several talks were given at North American Mycological Association (NAMA) annual meetings and forays. Of note are two early forays, one in 1973 at the biological station near Bigfork, Montana (hosted by the Spokane Mushroom Club) and the second in 1976 at McCall, Idaho, hosted by the Southern Idaho Mycological Society (where Orson has strong regional connections). Orson attended the NAMA meeting in Colorado in 1983 hosted by the Colorado Mushroom Society (CMS), and was the chief mycologist several years running for CMS's Denver Botanical Garden Mushroom Fair. He also attended NAMA meetings in Pennsylvania (1982), New York (1991), North Carolina (1994), Minnesota (1995), California (1998), Missouri (1999), and Oregon (2002). Orson encouraged many graduate students to attend these meetings, which provided good training in foray protocol along with the chance to observe a large number of taxa in the field and on the tables.

A special foray was the 1983 "John Cage/Orson Miller Foray" held at Mountain Lake near Pearisburg, Virginia. John Cage (1912–1992) was a well-known avant-garde composer, artist, writer, and poet who spent summers in his Mountain Lake studio. An avid mushroom collector and a founder of the New York Mycological Society, he and Orson struck up a friendship over their common interest. Their joint foray joined the beauty and artistic form with the biological function of mushrooms: Orson spoke on "Form and function in the higher fungi." Some of us had the opportunity to observe John Cage at his studio exploring the I Ching as a randomizing technique for his large canvas paintings. Once, while collecting morels with Orson at Mountain Lake, John asked whether we thought "it possible to identify trees by the sound wind made going through the leaves."

At forays (Figs. 24 and 25), Orson is always at the tables, working to identify the mushrooms. Typically, he quickly identifies as many species as possible from all the tables to get a species list started, being careful not to ignore the more common species. His specialties are addressed as time allows along with the more rare





FIG. 24. Orson expounding on a gasteromycete at a SIMA foray in McCall, Idaho, 1992. Steve Miller in the background. (Courtesy of Michael Beug)

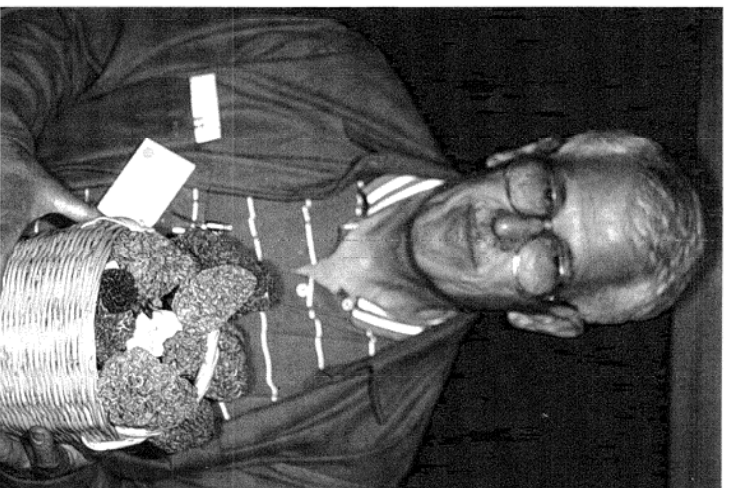


FIG. 25. Orson with a bucket of Mordcs at a SIMA foray, 1992. (Courtesy of Michael Beug)

and unknown fungi. This kind of logistic results in a significant number of common species being labeled right away, providing immediate satisfaction for the foray collectors. Orson is able to name a tremendous number of agarics, boletes, polypores, gasteromycetes, apophalloporales, fleshy ascomycetes, and myxomycetes by sight. He does not shy away from naming mushrooms in the field, which can be extremely valuable for those who learn by rote. Locals are often familiar with the form of a certain mushroom and only need the name to fill in a missing link. Orson is loved for his clear, concise teaching style by foray-goers.

Forays overrun with fungi provide one set of problems for the chief mycologist, and forays with few fungi present another. I had the opportunity to witness Orson work his magic at one dismally dry Virginia foray where a group had paid for a day of mushroom collecting and identification. An entire morning's search turned up only two or three small polypores. Most of us would have thrown up our hands in despair. I did and was promptly chastised for my attitude. Orson held those polypores in his palm like gold as the group

gathered around. He examined them carefully and publicly with his hand lens, turned them over, sniffed them, tested the texture, sliced them, and passed around the hand lens so everyone could observe the hymenium. All the while in hushed but lively tones, he discoursed on their ecology and biology. People began to ask questions and engage in actual science. Orson, pulling out his *Mushrooms of North America*, turned to pictures of the polypores. It became a team effort when Hope chimed in with information on dying yarn with polypores. A few choice edibles of the area were discussed, after which Hope went to the van, brought out a camp stove and proceeded to make her special Hot Mushroom Dip with store-bought mushrooms. Orson kept the conversation focused on fungi as we munched away on the treats. It was a lesson in professionalism and on how to turn a "three-polypore" foray into a satisfactory experience for all. Everyone learned something.

Orson's versatile and unusual talks included one on



FIG. 26. Hope, hostess Polly, and Orson discussing mushrooms on "Panorama," a local Virginia television program.

fungi, and he was on "Panorama" (WDBJ in Virginia) in 1982 (Fig. 26). Lorelei Norvell tells how she came to see Orson on another television show. On receiving a pre-release copy of *MNA for Christmas* in 1971, she wrote the esteemed Dr. Miller regarding technical changes for the first edition. In his courteous (as always) reply letter, Orson added that Lorelei might be able to see him "in person" on the then-popular network show "To Tell the Truth." The very next evening, she saw the distinguished mycologist questioned on national television as the panel tried to guess his occupation.

Orson gives freely of his time to the public and appears to enjoy it. In 1981, he was presented with the North American Mycological Association award for his contributions to amateur mycology, and in the subsequent 20 years he has only increased his involvement.

### Free time?

"Eskimos and their environment" to gifted children in the Montgomery County, Virginia school system, and several on "Oil and fungi in Alaska" to rotary clubs. He was interviewed many times on the radio, both local and National Public Radio, the latter on fairy rings. Several local television shows invited him to talk about

While it sometimes seems that mushroom collecting is his hobby rather than his work, Orson has managed to find time for other activities. In the early days, he sailed his own boat on Flathead Lake to escape from the fungal environment. Jack Murphy tells us Orson is a vicious racquetball player. Jack spent many noon hours getting destroyed on the court by Orson until he learned to exploit Orson's bifocals with high lobes. Orson has spent many holidays with his family at the Idaho cabin downhill-skiing in the winter, and fishing, hiking, and rafting in the summers. Miller-hosted "Happy Hours" were legion and held anywhere the mycological family gathered, in hotel rooms, at field camps, in the Virginia home, at the Idaho cabin, at Flathead Lake and other biological stations, once even in Orson's van with guests jammed in tightly to tipple because alcohol was not allowed at the camp (Fig. 27). The Idaho cabin, built during 11 days so many years ago, has now evolved into a house complete with a mycology lab and extensive library. Today, Orson is retired there with his wife Hope, with two of his daughters right next door in Montana and his third across the continent still in Virginia. Retired Iowa mycologist Don Huffman and his wife Maxine are just down the road. Today, Orson is putting the finishing touches on another edition of his first book, writing more papers, and employing his well-honed fly-fishing skills snaring trout in high mountain lakes and streams. His continues to be a very full life (Fig. 28).



FIG. 27. The notorious Miller happy hours were held wherever the mycological family gathered.

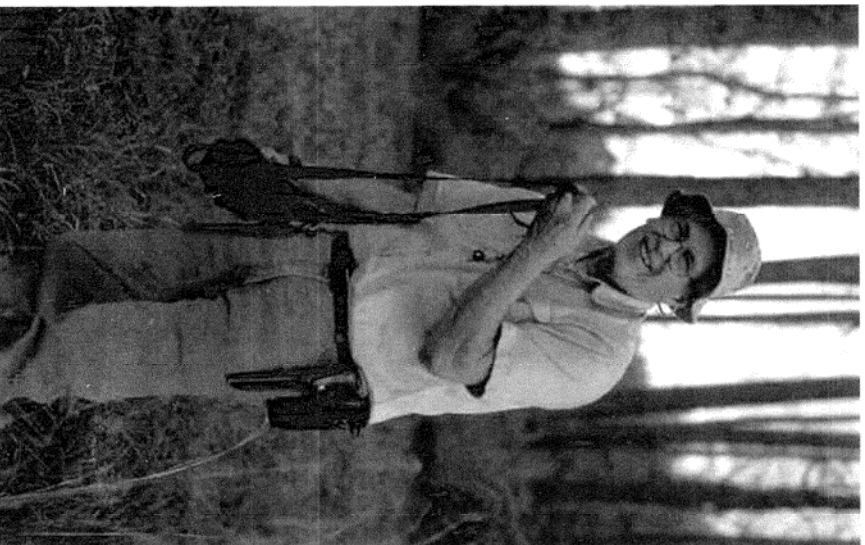


FIG. 28. Orson in the field at King Vulture Falls, Mountain Pine Ridge district in Belize, 1999. (Courtesy of Tim Baroni)

### Hope Miller

Born in West Chester, Pennsylvania on June 10, 1933, Hope was adopted at the age of three weeks. Hope C. Harrigan lived in Gardner, Massachusetts, before entering college at the University of Massachusetts. She studied speech and drama for three years before marrying Orson on July 11, 1953. Hope has been invaluable as co-author of three of Orson's mushroom books and as a contributor and editor of numerous papers. Amazingly, she has been Orson's companion on almost all field trips and forays, every stint at the biological station, and nearly all professional meetings. Hope has been to more professional meetings than many mycologists!

At forays, she gives talks on cooking with mushrooms and dying with fungi. What began as demonstrations developed into entire courses on cooking with mushrooms, leading to television and radio spots, and a cooking column in Blacksburg's "New River Messenger." This culminated in "Hope's Mushroom Cookbook" a collection of recipes developed and gathered over many years of mushroom collecting with her husband. At the 1995 NAMA meeting in Bemidji, Minnesota, she lectured on "Beatrice Potter, the Mycologist," another of her interests. During extended field trips, Hope is tireless in helping Orson find, collect, and process fresh fungi into dried specimens. Despite her extreme fear of snakes, she follows Orson into areas where snakes are known to lurk. All the travels listed for Orson apply to Hope as well. She serves as a terrific "straight man" for Orson's constant joshing and a wealth of information on Orson's personal affairs which we could exploit at social gatherings.

In Blacksburg, Hope was active in Girl Scouts for 27 years (plus ten more as a scout herself), and served as Vice President of the Virginia Skyline Council. She received the Thanks Badge, which is the top Girl Scout award. Hope was advisor for Kappa Theta from 1983–2001, and was voted Advisor of the Year for all sororities at VPI in 1990, and again in 1991. She was 1982 Volunteer of the Year for Service to Youth given by the Blacksburg Civitan Club, and received the Life Time Achievement Award for contributions to amateur mycology from the Texas Mycological Society. This background reveals a mentoring ability to young people that complemented Orson's role as educator.

Her spousal dedication has been above and beyond the call of duty, but this may be explained by her stated philosophy: "If you can't beat 'em, join 'em." Now with Orson in Idaho, Hope continues her quilting and knitting work, and is no doubt even now helping Orson with the next mycology project. Their daughters, teacher Andrea (Andy) Onken and financial planner Virginia (Ginny) Miller are nearby in Montana, while teacher Annelise (Lise) Mayer remains in Richmond, Virginia. The Millers presently have five grandchildren. Through it all Hope has kept the home fires burning and met the professional side with down-to-earth common sense, loyalty, good humor, and dignity. We thank her for her support of Orson, her help to young women over decades, and her own contributions to mycology.