



Cathy Cripps collecting at Niwot Ridge.

A CIRCUMPOLAR INTERNATIONAL AFFAIR

Cathy Cripps

It all started with a tiny mushroom a few millimeters high called *Arrhenia auriscalpium*. This minute fungus has a cup-shaped cap attached on one side to short stem (Fig. 1). Instead of gills the cap is lined with a few veins. A child might call it a fairy spoon. It first turned up in my life on a foray led by Orson Miller to the top of an 11,000 ft mountain pass in Colorado in 1997. The unusual shape was interesting, but what captivated me was learning that it lived *either* above treeline, on high mountain tops, or at sea level in the Arctic (Figs. 2 and 3).

Serendipitously, a few days later I found myself trekking up to the alpine on Niwot Ridge with Austrian mycologists Egon Horak and Meinhard Moser. I



Figure 1. *Arrhenia auriscalpium*.

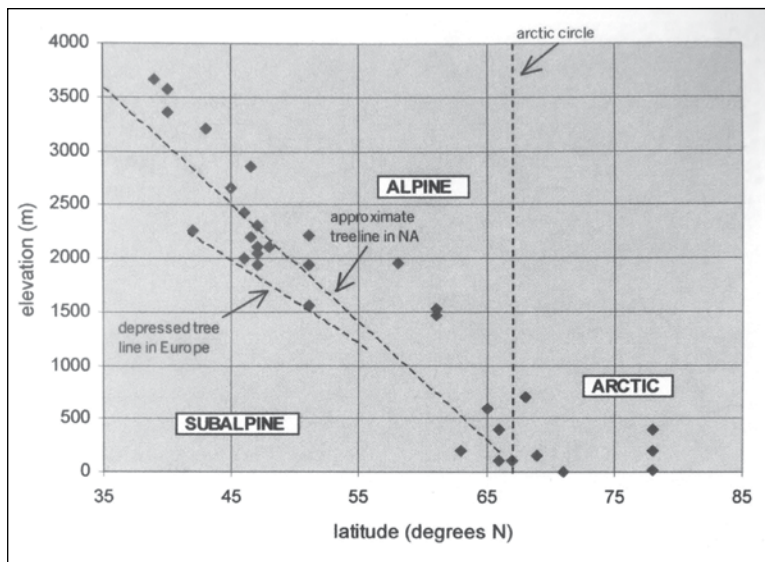


Figure 2. Circumpolar distribution of *Arrhenia auriscalpium*. Figure 3. Distribution of *A. auriscalpium* by elevation and altitude. With thanks to the Arctic Institute and Malte Humpert.

learned that there is a whole history of European mycologists studying the fungi above treeline in the Alps which started with Swiss born Jules Favre, the “Father of Alpine Mycology.” His book (Favre, 1955) is a classic still referred to today. When my husband found it in a used bookstore in Montana, I took it as a sign of things to come. A long list of alpine mycologists followed in Favre’s footsteps right up to the present. I was excited to learn that literature on alpine mushrooms existed, but would it be useful for identifying Rocky Mountain alpine mushrooms? Could mushrooms found on isolated mountain tops on either side of the Atlantic Ocean really be the same? As far as I could tell, except for a few collecting trips by Meinhard

Moser and Joe Ammirati, the Rocky Mountains peaks were mycological blank spots. As a new professor, I procured an NSF grant to study the alpine mushrooms in the Rockies. Egon and his wife Almut came over from Austria to help collect and to transfer their knowledge. Todd Osmundson signed on as a graduate student to study high elevation *Laccaria*. The scene was set.

International Symposia on Arctic and Alpine Mycology (ISAM)

As part of the grant, I attended the 6th ISAM in Greenland in 2000. The surest way to get to Greenland was by way of Copenhagen. I marveled at Greenland’s icecap as I flew over it the first time, knowing that I would fly back from the

European side that evening. On arriving at Kangerlussuaq, there it was again, just a short distance from the airport runway—*Arrhenia auriscalpium*!

The digital time on my camera said 12 a.m., it was after all the land of the midnight sun. Our ISAM crew included mycologists from Denmark, The Netherlands, Switzerland, Austria, France, Estonia, Finland, Norway, Japan, Russia, Greenland, and the USA. Most surprising to me was that a couple days prior I had been collecting in Colorado at 12,000 ft., and here I was thousands of miles away at sea level, collecting the same species!

We found *Russula nana* the iconic Alps mushroom and *Amanita nivalis* which was first found on the Scottish Highlands, both of which I knew from the Rocky Mountains. There appeared to be a core set of mushrooms that everyone had seen in their own countries. It was like finding a warm, welcoming international collective unconscious, with a common language of Latin.

The first ISAM was held in Barrow, Alaska, hosted by Gary Laursen and Joe Ammirati. It was followed by others in Fetan, Switzerland in 1984; Svalbard, Norway in 1988; Lanslebourg, France in 1992; Labynangi, Russia in 1996; and Kangerlussuaq/Sisimut, Greenland in 2000. These symposia resulted in several volumes on Arctic and Alpine Mycology in 1982, 1987, 1993, 1998, and 2006. In the last one Egon and I published a paper on the





Figure 4. ISAM VIII participants on the Beartooth Plateau MT. In front: Leo Jalink (The Netherlands) and Steen Elborne (Denmark). Kneeling: Anna Ruotsalainen (Finland), Ellen Larsson (Sweden), Marijke Nauta (The Netherlands), Esteri Ohenoja (Finland), Anna Ronikier (Poland), and Pierre-Arthur Moreau (France). Standing: Robert Antibus (USA), Almut Horak (Austria), Egon Horak (Austria), Henry Beker (Belgium/UK), Henning Knudsen (Denmark), Cathy Cripps (USA), Taiga Kasuya (Japan), Mikako Sasa (Denmark), Michal Ronikier (Poland). Not shown Joanne Antibus (USA) and Don Bachman (USA), photographer.

worldwide distribution of my prized fungus *Arrhenia auriscalpium*. These volumes were invaluable for identifying the Rocky Mountain species. In 2002, I chaired a session on Arctic and Alpine Fungi at the International Conference on Mycology (ICOM) in Oslo, Norway and attended a field trip to Svalbard. The foray and the next ISAM (VII) in Finse, Norway in 2005 were led by Gro Gulden who studies the fungi of Svalbard, an island 500 miles from the North Pole. The last ISAMs were held on the Beartooth Plateau, WY/MT in 2008; in Kevo, Finland in 2012; and at Mt. Hakusan, Japan in 2016 before they were discontinued due to Covid and other factors.

Information is still accruing on fungi from Greenland, Svalbard, Iceland, Fennoscandia, Russia, Japan, the Pyrenees, and the Carpathians. I added our information to the growing international pile as a checklist (Cripps and Horak, 2008; Noffsinger, 2020) but kept collecting. One glorious alpine day

on yet another high pass in Colorado at 12,000 ft, I found *Arrhenia auriscalpium* once again. Egon exclaimed: "Aha, we are in the true alpine!" To him it was an indicator of the habitat, to me it was: *well, just look around, of course*

we are in the alpine. I also learned that *Arrhenias* are basidiolichens which live on the sugar provided by algae nestled in their mycelium.

For the 2008 ISAM on the Beartooth Plateau, in Wyoming/Montana,





Figure 5. *Lepiota favrei* named for the Father of Alpine Mycology on the Beartooth Plateau.

researchers from nine different countries descended on my stomping grounds (Fig. 4). A few Arctic mycologists from sea level experienced altitude sickness which soon passed, while the alpine mycologists climbed around like mountain goats. Their collective knowledge added more species to our growing list of Rocky Mountain alpine fungi (Fig. 5). About 70% of the Rocky Mountains alpine fungi appeared to match up with those found in the Alps and/or the Arctic. But were they really the same species or did they just look alike? Enter molecular techniques.

Molecular methods: confirming intercontinental distributions

Our international collections of “supposedly the same species” were so far flung that it sometimes seemed impossible they could be the same taxon. Molecular techniques began taking

mycology by storm in the 1990s, and helped determine what constituted a species, rooted out cryptic species, and debunked old morphological concepts of relatedness, but these methods were only beginning to be used for Arctic-alpine fungi. Teaming up with Ellen Larsson from Sweden, and Egon again, we decided to tackle a difficult group of *Inocybe* that all look similar—now called *Malloocybe*. They lack the usual metuloids (thick walled pleurocystidia) which are so useful in diagnosing species of *Inocybe*. It was exciting when we found out that the DNA (ITS region) from our fungi matched that of the original Types collected so long ago and far away in the Alps by Kühner and Favre. We did have the same species on either side of the ocean (Cripps et al., 2010)! Many intercontinental distributions were subsequently discovered by our international group. More papers on

Inocybe followed and one on alpine *Hebeloma*. My graduate student Ed Barge tackled alpine *Lactarius* and Chance Noffsinger went after alpine *Russula*. Many of our Rocky Mountain mushrooms matched their counterparts across the pond.

The explanation: glaciation

About 75% of Arctic and alpine fungi have a circumpolar distribution, with distant populations in alpine areas. I surmise that Arctic and alpine mycologists have the same distribution taken as a whole “species.” So why this strange distribution? Colorado botanist Bill Weber used to tell me: “it’s as plain as the nose on your face,” but it wasn’t until I had one of those “aha” moments when it clicked. In a nutshell, Bill’s hypothesis is that upon glaciation, old tertiary forests in these regions gave way to plants and fungi preadapted to

cold that survived in glacial refugia and ice-free corridors, such as Beringia. On glacial retreat 11,700 years ago, these fungi recolonized the Arctic, resulting in the present distribution of Arctic-alpine fungi (Weber, 2003).

Alpine Mushrooms of North America: a new book

Now, almost 30 years later, I'm happy to say that there is a small, portable field guide for the *Alpine Mushrooms of North America*. It's a record of what we found, a baseline for conservation, a resource for education, and hopefully it will inspire some fit young mycologist to carry on the study of alpine mushrooms. I can confidently say that most of these mushrooms are not found in other field guides, but many are found in the Arctic.

On a recent foray in Alaska with my former graduate student Kate Mohatt, USFS ecologist, we found it one last time. There in the vastness that is Alaska, below our feet on yet another high mountain was: *Arrhenia auriscalpium*! Our whoops of excitement startled Kate's dog so much, I thought it would trample our prize, but a strong "sit, stay!" command did the trick. One more tiny trophy, hundreds of miles from the others.

Further Resources

Barge, E.G., C.L. Cripps, and T.W.

Osmundson. 2016. Systematics of the ectomycorrhizal genus *Lactarius* in the Rocky Mountain alpine zone. *Mycologia* 108(2): 414–440.

Cripps, C.L. 2025. *Alpine Mushrooms of North America: Treasures Above Treeline*. University of Illinois Press, Chicago; 238 pp.

Cripps, C.L., E. Larsson, and J. Vauras. 2019. Nodulose-spored *Inocybe* from the Rocky Mountain alpine zone molecularly linked to European and type specimens. *Mycologia* 112(1): 1–21.

Cripps, C.L., U. Eberhardt, N. Schutz, H.J. Beker, V.S. Evenson, and E. Horak. 2019. *Hebeloma* in the Rocky Mountain Alpine zone. *MycKeys* 46: 1–54.

Cripps, C.L., and E. Barge. 2013. Notes on the genus *Lactarius* from the Rocky Mountain alpine zone USA in regard to Finnish arctic-alpine species. *Karstenia* 53: 29–37.

Cripps, C.L., and E. Horak. 2010. *Amanita* in the Rocky Mountain alpine zone, USA. *North American Fungi* 5(4): 9–21.

Cripps C.L., E. Larsson, and E. Horak. 2010. Subgenus *Mallocybe* (*Inocybe*) in the Rocky Mountain alpine zone. *North American Fungi* 5(5): 97–126.

Cripps C.L., and J. Ammirati. 2010. Eighth International Symposium on Arctic-Alpine Mycology (ISAM 8) Introduction. *North American Fungi* 5(5): 1–8.

Cripps C.L., and E. Horak. 2008. Checklist and ecology of the Agaricales, Russulales and Boletales in the alpine zone of the Rocky Mountains (Colorado, Montana, Wyoming) at 3000–4000 m a.s.l. *Sommerfeltia* (Norway) 31: 101–121.

Cripps C.L., and E. Horak. 2006. Ecology and world-wide distribution of *Arrhenia auriscalpium*: a true arctic-alpine fungus. [Arctic and Alpine Mycology VI, eds D. Boertmann & H. Knudsen] *Meddelelser om Grønland Bioscience* 56: 17–24.

Cripps C.L., and L.E. Eddington. 2005. Distribution of mycorrhizal types

among alpine vascular plant families on the Beartooth Plateau, Rocky Mountains, USA, in reference to large-scale patterns in Arctic-Alpine habitats. *Arctic, Antarctic and Alpine Research* 37(2): 177–188.

Favre, J. 1955. Les champignons supérieurs de la zone alpine du Parc National Suisse. *Ergebn. Wiss. Untersuch. Schweiz*. Vol. 5, 1–212.

Larsson, E., J. Vauras, and C.L. Cripps. 2017(2018). *Inocybe praetervisa* group – a clade of four closely related species with partly different geographical distribution ranges in Europe. *Mycoscience* 59: 277–287.

Larsson, E., Y. Vauras, and C.L. Cripps. 2014. *Inocybe leiocephala*, a species with an intercontinental distribution range—disentangling the *I. leiocephala*—*subbrunnea*—*catalaunica* morphological species complex. *Karstenia* 54: 15–39.

Noffsinger, C., and C.L. Cripps. 2021. Systematic analysis of *Russula* in the North American Rocky Mountain alpine zone. *Mycologia* 113(6): 1278–1315.

Noffsinger, C., C.L. Cripps, and E. Horak. 2020. A 200-year history of Arctic and alpine fungi in North America: early sailing expeditions to the molecular era. *Arctic, Antarctic, and Alpine Research* 52(1): 323–340.

Osmundson, T.W., C.L. Cripps, and G.M. Mueller. 2005. Morphological and molecular systematics of Rocky Mountain alpine *Laccaria*. *Mycologia* 97(5): 949–972.

Weber, W.A. 2003. The Middle Asian element in the Southern Rocky Mountain flora of the western United States. *Journal of Biogeography* 30: 649–685. 📌

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