SPORE PRINTS

BULLETIN OF THE PUGET SOUND MYCOLOGICAL SOCIETY
Number 480 March 2012

Coleman S. Leuthy
1930–2012

We are deeply saddened to report that long time PSMS member and former President Coleman Leuthy passed away on February 1, 2012, after a several-year battle with multiple myeloma.

Coleman Stockdale Leuthy was born September 3, 1930. A native of Seattle, he went to Lake City Elementary and Lincoln High School. He graduated with a BS in Botany from the University of Washington and was a student and friend of PSMS founding father Dr. Daniel E. Stuntz. He also studied under mycologist Alexander H. Smith at the University of Michigan, Ann Arbor. To help pay for his college education he went through ROTC at the UW and served a hitch in the Army, attaining the rank of 1st Lieutenant. Because of his expertise in skiing, he served with the Mountain Cold Weather Training Command at Fort Carson and Camp Hale, Colorado, as part of an elite Army Ski Patrol. He also had a seasonal job as a National Park Ranger on the Olympic Peninsula because of his mountaineering experience. For 28 years he taught chemistry, botany, and biology at Nathan Hale High School in North Seattle before retiring in 1987.

A member since 1976, Coleman was President of PSMS from 1986–1988, and was largely responsible for getting us into, and raising the funding for, our present base at CUH. He was also a member of the Pacific Northwest Key Council, where he composed a key to the species of *Lactarius* in the PNW.

A life-long member of The Mountaineers, Coleman organized an annual joint PSMS/Mountaineers mushroom weekend at the The Mountaineer's Meany Ski Lodge near Stampede Pass on the last weekend of October. Since 2004, he also co-hosted an annual PSMS field trip over the Memorial Day weekend at his cabin on Eagle Creek near Leavenworth. In his memory, this event will be known as The Coleman S. Leuthy Mountain Maple Field Trip.

A member of the Washington Native Plant Society and the North American Rock Garden Society, he hosted annual field trips with local groups and planted many interesting native species at his cabin over the years.

Coleman was chosen as the recipient of this year's PSMS Golden Mushroom Award, but just missed getting the honor at this month's Survivor's Banquet.

A life-long bachelor, his "kids" as he called them were his pets, usually one dog and one cat, but he also had a horse at one time. His closest surviving relatives include his younger brother Phillip, along with his three nephews Cameron, David, and Chris Leuthy and their families. Coleman was a dear friend and will be greatly missed.

MUSHROOM IDENTIFICATION CLASSES FOR BEGINNERS

Patrice Benson

A series of four weekly mushroom classes for beginners will be held at the Center for Urban Horticulture, Douglas Classroom, on Thursdays from 7–9 pm. The classes will run from March 18 to March 29, and will focus on skills for collecting, identification, hobbies, and toxins. Slides and live specimens will be used to familiarize the student with mushroom anatomy, biology, and other aspects of mushrooms. This series of four classes will be repeated throughout the fall and winter months. To register and pay for the classes go to www.PSMS.org and choose "events." To honor one of our most prolific instructors we will have a Coleman Leuthy scholarship for a student in each series. To request a scholarship, e-mail education@psms.org.

JOY SPURR MEMORIAL FORAY AT CISPUS MAY 18–20, 2012

Patrice Benson

The Puget Sound Mycological Society will be honoring our charter member and nature photographer Joy Spurr by gathering at the Cispus Environmental Learning Center May 18–20, 2012. Please join us for this 3 day/2 night in-depth educational mushroom experience. Join guided forest walks to experience the ecology and beauty of the forest and the fungi's role in this ecosystem. Expert speakers will present programs, and guides and crafters will teach about mushroom identification, cultivation, and mushrooms as a source for natural dyes in daytime workshops. Joy Spurr's mushroom images will be featured in the evening lectures as we celebrate her memory and talents. This event begins at 3 pm Friday, May 18, at check-in and ends after lunch on Sunday, May 20. You must be a member of a local or national mycological society to register. Cost includes lodging (rustic, dorm style with hot water and electricity), meals, and all activities from Friday dinner through Sunday lunch. RV hookups are available on site.

Joy Spurr

Cost: Adults $95, children $45.
Location: Cispus Environmental Learning Center, Randal, WA.
Questions: Please e-mail to education@psms.org.
Registration*:* On-line; go to www.psms.org and choose "events."

Coleman lived a full life that many would envy, enjoying the outdoors as a mountaineer, climber, ski instructor, boater, horseman, mycologist, botanist, park ranger, high school sciences teacher, and an adventurer, visiting all seven continents. We invite all those who knew him to share your memories, tears, good times, and pictures on the memorial web-site we set up:

http://coleman-leuthy.last-memories.com

David Leuthy

Spore Prints

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Annual dues: single or family **$30**; full-time students **$20**

CALENDAR

Mar. 17 Annual Membership Meeting and Survivors' Banquet, 7:30 pm, CUH

Mar. 20 *Spore Prints* deadline, guest editor, Ron Post (e-mail items to ronpost4@gmail.com)

Mar. 31 Learning field trip (see Website)

BOARD NEWS — Denise Banaszewski

A committee has been selected to discuss the long-term goals of PSMS at a strategy meeting. This meeting will be on March 11. Our Spring Foray will be May 18–20 at Cispus. We have a limit of 90 attendees (plus speakers), so sign up on the Website if you are interested. The Survivors' Banquet is March 17. We will have an Irish theme, and it will be a potluck. We will also have a silent auction (bring your mushroom stuff to auction off!), the proceeds from which will be donated to the Ben Woo Scholarship Fund. We will bestow the Golden Mushroom Award for 2011 to Coleman Leuthy posthumously at the April membership meeting. We need a new librarian; if you are interested, please contact Marian Maxwell (marianmaxwell@hotmail.com) or another board member. We are also looking for someone to sell books at membership meetings. If you are interested, please contact John Goldman (john.goldman@comcast.net).

ANNUAL MEMBERSHIP MEETING AND SURVIVORS' BANQUET — Milton Tam

Saturday, March 17, 2011, at the Center for Urban Horticulture, 3501 NE 41st Street, Seattle.

It's time again for our Annual Membership Meeting and Survivors' Banquet. This is an opportunity to gather and congratulate each other for making it through another season of finding, cooking, and eating mushrooms. Since the March 17 is St. Patrick's Day, our theme this year will be "The Emerald Isle." The social hour will begin at 6:30 pm followed by a potluck dinner at 7:30 pm. Our newly elected officers and trustees will be presented.

Please bring an appropriate appetizer, entrée, or dessert to share. Please list the ingredients and any wild mushrooms included in your dish. We will secure a banquet permit, so that we can enjoy a range of beverages with our food.

We need donations of new, old, or seldom-used mushroom-themed trinkets (also known as "tchotchke"). There will be a silent auction with your donated items, with all proceeds going to the Ben Woo Scholarship Fund. Please bring your items to the banquet. We will also have door prizes. Raffle tickets for an original watercolor painting by Alexander (Sasha) Viazmensky will be available for purchase.

The cost will be $5 per person to cover incidentals as well as to indicate how many members will be attending. We will, of course, not turn members away at the door, but only those registering in advance will be guaranteed a seat! Last year we had a great turnout, and it was difficult to find seats for latecomers. You can conveniently sign up and pay on-line for this event on the members' section of the PSMS Website, or you can send a check, payable to PSMS, to John Goldman at 5819 SW Horton, Seattle, WA 98116, before March 14. If you have questions, call John at 206–933–0838. We look forward to seeing you on the 17th. Don't forget to wear something green!

ATTENTION ALL PSMS MEMBERS INTERESTED IN IDENTIFICATION — Brian Luther, Identification & Field Trip Chair

Hildegard tells me that quite a few people contribute and assist at her ID clinics at CUH. I'm especially interested in meeting those of you I don't know or don't know well.

If you have a genuine desire to advance in identification and would like to volunteer at the formal public ID table at the Exhibit every year, then I need you to contact me. This event, in particular, requires an advanced level of identification proficiency and it's my responsibility to monitor this.

I like to see potential identifiers help at as many field trips as possible, and this gives me the opportunity to assess your skills and work with you. I am always available for consultation at most all of the field trips. I have all of the spring outings scheduled and reserved, and in fact all of my fall 2012 field trips are as well. Because of work or other obligations some of you may not be

able to come to field trips regularly, but try to come to as many as possible.

For those of you I've worked with for years, then I'm already aware of your skills, and you don't need to do anything, except to continue the good work you've always done for PSMS.

If you don't regularly work with me at PSMS events, and you're interested in ID, then please contact me and I'd be glad to hear from you. I look forward to meeting you and working with you.

MONTANA STATE RESEARCHERS UNCOVER UNIQUE LIPID-PRODUCING FUNGUS Erin Voegele

Biodiesel Magazine, Feb. 16, 2012

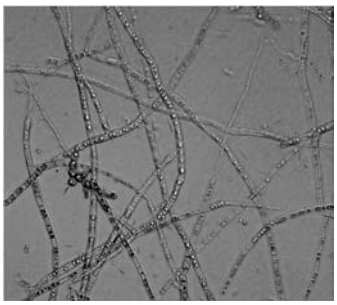
A research project at Montana State University has discovered a fungus that can eat algae and effectively ooze oil when dried. "The innovative process we have developed utilizes a novel acidophilic fungi (referred to as strain MK7) obtained from Yellowstone National Park (YNP) to directly convert lignocellulosic feedstock, five- and six-carbon sugars, and algae biomass to lipids for biodiesel using a remarkable minimal number of steps," said Mark Kozubal, a post doctoral research associate at MSU.

According to Kozubal, he discovered the fungus strain through his studies in extreme Archaea in YSP hot springs that live in low-pH, high-temperature environments. "As these springs cool I noted that they feed into an algae-rich biomass portion of the spring at about 35 degrees Celsius," he said. "Within this algae I noticed fungi living on or with the algae. The pH of this biofilm was about 2.5–3.0. I decided to try to [grow] algae in the lab, but always ended up with the fungi, which was very interesting because nobody studies fungi in YNP springs. Virtually no studies have been done. I had read somewhere that fungi could accumulate a lot of lipids, so I tested strain MK7 on some feedstock and realized that it indeed did make a lot." In fact, lipids accounted for up to 60 percent of the cell volume of the fungi. "I also realized that it was growing quite well on all sorts of feedstocks, [including] wheat straw, hardwood, yard wastes, olive oil, and sugars," Kozybal continued. "That's when we decided to pursue the organism."

There are several ways in which the fungus is unique. First, Kozubal noted that MK7 can grow at a pH range of 0.7–7.0, which is quite a bit lower than related strains. "We suspect the enzymes to be more active at this low pH, which would be valuable for the conversion of lignocelluloses to sugars," he continued. MK7 is also capable of directly converting lignocellulosic feedstock into energy-rich metabolites with few pretreatment steps and no enzymes, which makes the process relatively simple and inexpensive. In addition, the strain can produce lipids from these feedstocks over a wide pH range, which negates the cost of pH neutralization steps. According to Kozubal, MK7 produces a more favorable lipid profile for biofuels, biolubricants, and other applications when compared to algae and other lipid-producing organisms. Another benefit is the strain is highly resistant to contamination by other organisms. Furthermore, MK7 has a high tolerance to manganese, which is used to increase the rate of lignin degradation. It also has a high tolerance to metals and low pH, allowing it to be incorporated into remediation strategies. Kozubal also points out that related strains of fungi have been shown to be easy targets for genetic manipulation.

Additional benefits of MK7 include the fact that the entire process of lipid production can be done in a single vessel, which Kozubal said will enhance cost effectiveness. While dewatering has been an issue with algae production, Kozubal noted that MK7 is easily removed from liquid phase, and therefore easy to dry for lipid extraction protocols. The process to extract oil might also be easier. "Algal cell walls are quite hard to extract from," Kozubal said. "This organism seems less difficult, but much needs to be studied."

According to Kozubal, 1 ton of wheat straw has been converted into about 160 pounds of lipid during his research project. That equates to about 22 gallons of biodiesel. "This is much better than the very few studies that have been done to use fungi for direct conversion" via a consolidated bioprocessing technology, he said.


Montana State University

The next step in MK7 research will be to find additional funding sources. Kozubal also said his group would love to have the support of an industry partner.

The fungus strain MK7 can consume a wide variety of biomass feedstocks, resulting in up to 60 percent lipid content.

RESEARCH DISCOVERS POTENTIALLY DEADLY FUNGUS SENSES BODY'S DEFENSES TO EVADE THEM http://www.sciencecodex.com/, Feb. 22, 2012

New Orleans, LA - Glen Palmer, PhD, Assistant Professor of Microbiology, Immunology & Parasitology at Louisiana State University Health Sciences Center, New Orleans, was part of an international research team led by Luigina Romani, MD, at the University of Perugia that discovered opportunistic fungi like *Candida albicans* can sense the immune status of host cells and adapt, evading immune system defenses. The findings were published online in *Nature Communications* February 21, 2012.

The researchers determined that *C. albicans* binds to the host immune signaling molecule, Interleukin (IL) 17A, which permits the fungus to navigate and tolerate the active immune environment of healthy host tissue, mounting effective countermeasures. IL-17A may also contribute to disease susceptibility by modifying the intrinsic virulence of the fungus. This study provides molecular evidence that by exploiting IL-17A, the fungus not only survives, but can cause disease to develop.

"It's a bit like the fungus is listening in on the conversations our immune system is having so it can best determine how to react and survive in our tissues," notes Dr. Palmer.

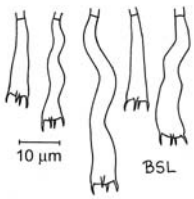
According to the Centers for Disease Control and Prevention, more than 20 species of *Candida* can cause infection in humans, the most common of which is *Candida albicans*. *Candida* yeasts normally live on the skin and mucous membranes without causing infection; however, overgrowth of these organisms can cause symptoms to develop. The symptoms vary depending on the area of the body that is infected. Candidiasis that develops in the mouth or throat is called "thrush" or oropharyngeal candidiasis. Candidiasis in the vagina is commonly referred to as a "yeast infection." Invasive candidiasis occurs when *Candida* species enter the bloodstream and spread throughout the body. Candidemia (a bloodstream infection with *Candida*), is extremely rare in people without risk factors, but it is the fourth most common bloodstream infection among hospitalized patients in the United States.

RESUPINATE FUNGUS OF THE MONTH: The Genus *Vararia* - Part II

© Brian Luther

The Basidiospores, *cont. from February Spore Prints*

There seems to be considerable variation in the interpretation of the spore shape throughout the literature for *Vararia phyllophila* and species with similar spores. Rogers & Jackson (1943) call the spore shape "lunate-acicular," Gilbertson (1965) refers to them as "fusiform to acicular," Welden (1965) describes them as "lunate-attenuate," and Lindsey & Gilbertson (1978) say they're "narrowly fusiform." *Vararia intricata* is a species with very similar appearing spores which Boidin & Lanquetin (1977) describe as "longuement naviculaires" (elongated navicular). Bernicchia & Gorjón (2010, p. 762, #24) describe this shape as filiform. Neither Burt (1926) nor Dennis (1970) describe the spore shape and give only measurements. Because the spores often have a distinct, but rather long, arc to them as well, I have described the spore shape as fusiform-navicular or fusiform-subfalcate (elongate, narrowing on one or both ends, and slightly sickle-shaped). What's clear is that the spore shape in this species doesn't fit within the usual, simple, single word definition.



Basidia, Vararia phyllophila.

There are only a few species in a couple of other unrelated genera of resupinates with similar long, curiously shaped basidiospores, including *Subulicystidium perlongisporum* and *Tubulicium vermiferum*.

Similar Species

Vararia pectinata is another species found in Florida and the West Indies with spores that approach, but are shorter (11–16 × 4–4.5 µm) than those in *V. phyllophila* (Rogers & Jackson, 1943; Welden, 1965). *Vararia intricata*, a species from the Lesser Antilles, has very similar but shorter spores, with clamped hyphae and much coarser dichohyphidia (Boidin & Lanquetin, 1977). *Vararia hauerslevii* is a related European species without clamps, but again has shorter spores (12–16 × 3.5–4.5 µm), as well as dichohyphidia that are larger, heavy stemmed, and form almost broccoli-like florets that are quite different from those in *V. phyllophila* (Boidin, 1989).

Discussion

Concerning *Vararia phyllophila*, Gilbertson (1965) said he had trouble finding spores, never saw basidia with sterigmata, and never saw any basidia with spores attached. Lindsey & Gilbertson (1978), however, provide illustrations of nine mature basidia, so this seems to vary from collection to collection. My personal experience with this species at first was like that mentioned by Gilbertson (1965). I made so many mounts without finding spores that I was beginning to wonder if it had any. Then when I did find spores, I realized they didn't look anything like what I had been looking for. They were so highly unusual that I had passed right over them thinking what I was observing was just "flim-flam" in the mount. I did eventually succeed in finding spores and mature basidia, but basidia with mature intact spores were rarely encountered. After I studied numerous slides, it occurred to me that the spores are simply so large that all are broken off of the basidia when making a mount, adding a cover slip, and then tamping it. I also found that the spores tended to be swept away in the mounting media upon adding the cover slip and sort of aggregated at the periphery—one explanation for my difficulty locating them. Apparently, it is commonplace when working with the genus *Vararia* to encounter difficulties locating basidiospores in mounts. This is mentioned by Burt (1926) for this species. Welden (1965) confirms this by elaborating for a whole paragraph on the subject. One of his comments is "A long and diligent search is often necessary to locate only a few spores." His comments certainly rang true for me, and I can vouch for his experiences with my collections.

Burt (1926) gives the color of the basidiocarp as "whitish, becoming olive-buff in the herbarium." Gilbertson (1965) and Lindsey & Gilbertson (1978) say *V. phyllophila* is "Light Buff" when dry, Welden (1965) gives the color as "near Cream," and Dennis (1970) says it dries "olive-buff." This last color does not match well with our material from farther north in North America. Ridgway (1912) does not provide a good selection of white color shades, and I can't find a match with that reference. Color 2B in the Flora of British Fungi Colour Identification Chart (Anonymous, 1969) is a good match, as is color "92 y White" in the ISCC-NBS Color-Name Charts Illustrated with Centroid Colors (Anonymous 1964). Color 4A2 in the *Methuen Handbook of Color* (Kornerup & Wanscher, 1978) seems to be quite close. I did not see any greenish cast or distinct brown shades, as mentioned in the last two works, in my collections. The description given by Welden (1965) most closely approximates the color of my collections.

Stalpers (1996) wrote a key to all of the species of *Vararia* known at the time, and the CortBase website (http://andromeda.botany.gu.se/cortbase.html) currently recognizes 60 valid species in the genus *Vararia* worldwide.

There are several good treatments of *Vararia* in the European literature, including those by Boidin & Lanquetin (1984), Hallenberg (1985), Hansen & Knudsen (1997), Boidin & Michel (1998), and Bernicchia & Gorjón (2010). Bernicchia & Gorjón (2010) reference many other, related publications that are too numerous to mention here.

It's coincidental that two important studies on the genus *Vararia* in North America were published independently in the same year: Gilbertson (1965) and Welden (1965). The first author details and provides a key to nine species of *Vararia* in North America, with illustrations and describes one as new. Welden (1965), discusses the West Indian species of *Vararia*, describes three new species, provides a key to nine in the genus, and also includes illustrations.

Boidin & Lanquetin (1977) provide a useful key to the 12 species of *Vararia* from Central America, including *V. phyllophila*.

Distribution, Substrates, and Rot Type

Vararia phyllophila is found in North America, Central America, and the Caribbean, and thus its distribution is both tropical and north temperate. It was previously recorded from Jamaica and Idaho (Weldon, 1965), Florida, Panama, and South Carolina (Gilbertson, 1965), Panama (Dennis, 1970), New Mexico (Gilbertson et al., 1975), and Idaho, New Mexico, Florida, and South Carolina (Ginns & Lefebvre, 1993). Farr et al. (1989) list this species as occurring in the Southern United States to Central America. The voucher collection that Lindsey & Gilbertson (1978) cite from Arizona for this species is an error, because the identical collection number is documented previously from the state of New Mexico (Gilbertson et al., 1975).

In North America we have 11 species of *Vararia*, according to Ginns & Lefebvre (1993) and Ginns (1998). Of these, only two were recorded by those authors for Washington State: *V. investiens* and *V. racemosa*. The collection reported here appears to be a new record for Washington.

Vararia phyllophila is a fascinating species, and it was an unexpected pleasant surprise finding it on our property in Chelan Co. In western North America it is now known from Idaho, New Mexico, and Washington.

Throughout the literature *Vararia phyllophila* has been found on both hardwoods and conifers and is known to cause a white rot.

Relationships and Similar Genera

The genus *Vararia* has been traditionally treated in the family Lachnocladiaceae, but recent DNA studies have shown that it belongs in the family Peniophoraceae (Larsson & Larsson, 2003; Larsson, 2007), in the order Russulales. For additional references relating to this topic refer to Bernicchia & Gorjón (2010).

Closely related genera include *Asterostroma* with mostly globose and ornamented to unornamented spores, *Dichostereum* with ornamented and amyloid basidiospores, and *Scytinostroma* with more distinct dendrophyses (branched hyphal structures, but not dichohyphidia) that are only sometimes dichotomously branched, and often round tipped, or with unbranched skeletal hyphae not differentiated into dendrophyses.

Classification Hierarchy

Kingdom Mycota
Division Basidiomycota
Subdivision Agaricomycotina
Class Agaricomycetes
Subclass Agaricomycetidae
Order Russulales
Family Peniophoraceae
Genus *Vararia*
Species *phyllophila*

Key to species of *Vararia* known from the Pacific Northwest

1a. All hyphae lacking clamp connections (simple-septate) 2

1b. Hyphae with clamp connections 3

2a. Basidiospores 17–22 (24) x 3–4 µm, fusiform-navicular to fusiform-subfalcate; gloeocystidia up to 68 µm long, thin-walled and usually acuminate *Vararia phyllophila*

2b. Basidiospores 5–10 × 2–3 µm, short cylindric to ellipsoid, or slightly curved; gloeocystidia shorter, up to 35 µm long, often with a nipple like or narrowed, thin-walled apex and thick-walled on the lower half *Vararia racemosa*

3a. Basidiospores 8–12 (14) × 3.5–4.5 µm, fusoid, sometimes widest in the middle and tapering to both ends (biconic), with a fine proximal septation with an amyloid suprahilar region; gloeocystidia thin-walled; basidiocarp bright yellowish, ochraceous (color of ripe corn) to creamy *Vararia investiens*

3b. Basidiospores 12–14 × 4–4.5 µm, without a fine proximal septation and inamyloid; gloeocystidia becoming thick-walled; basidiocarp light buff in color *Vararia pectinata*

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A SIP FOR THE ANCESTORS: THE TRUE STORY OF CIVILIZATION'S STUMBLING DEBT TO BEER AND FUNGUS

Rob Dunn

http://blogs.scientificamerican.com/, Feb. 15, 2012

Solomon Katz is an anthropologist. He worked for years to understand humans. It is an endeavor that can inspire a certain distance, a remove from the world. This is the remove necessary to see people in the way an ant biologist might see ants, like tiny specks moving back and forth on the landscape, compelled by unnamed impulses, surrounded by culture. This perspective, along with a fondness for beer, moved Katz to offer his most radical hypothesis, one that reconfigures how we think about the story of civilization. He hypothesized humans domesticated and bred crops such as wheat and barley because they needed more and better grains to brew beer. To Katz, beer is the "food" most central to the development of modern society. With beer, we began.

The margins of science are dense with shy ideas, variations in a minor key, micro-theories about micro-stories. Katz's is not one of them. His strikes a low, heavy, chord at the heart of one of the biggest questions we can ask about ourselves: What happened the day everything changed, the one on which we began to plant and harvest crops?

With agriculture came settlements, kings, waterworks, social classes, complex buildings, politics, writing, recorded history, and Ipads. All of this came with a startling inevitability. Similar trajectories unfolded independently around the world. Nothing could be more straightforward than making a hole in which to put a seed. You push your fingers into the Earth. You take the seed, branch or root. You drop it in and cover it and pull the weeds. What has grown is unfathomably complex. It is a modern world held aloft by the leaves, or more literally the descendants of that first farmed plant. *The question is why we planted it, and whether it could really have anything to do with beer*.

You depend on agriculture. The atoms in your body come from relatively few crops. Essentially none of your atoms are derived from wild plants or animals. If you were born in the U.S., more than half of your body may be composed of atoms derived originally from corn. We tend to see agriculture as an invention for which we have failed to record the inventor, akin to the telephone or the cotton gin. Somewhere far enough back in time there is, in this telling, a Henry Ford of the wheat seed. But maybe it makes more sense to assume agriculture would and could be invented, but to ask, once it was, be it more like a decision, a possibility that was always present but that eventually we chose to embrace. After all, agriculture arose again and again. But why would we choose agriculture? Agriculture led to progress, but also sorrow. Lifespans shortened and a range of health metrics, such as height, bone density, and pathology, worsened. Class structures developed. The poor and rich came into existence. Why would any society choose the path to a harder life? In the fertile crescent, Katz thinks the answer is beer.

The first beers would have been accidental. A mash of wheat and sprouted barley was left out, in a clay pot, on a clay shelf, in among the mud. Perhaps yeast fell in and fermentation began. Yeast is everywhere. Someone drank the result (we all known someone who would) and, in one way or another, found it worth making more of, using whatever yeast fell down out of the sky, like luck. Beer yeasts are single-celled fungi. They eat simple sugars. As they do, they produce more complex compounds, the nuance or lack thereof connoisseurs favor, *and* alcohol. The first sample would not have been high in alcohol content. But, if someone drank enough, they would have started to feel the party coming on.

The Cuniform symbol for Kash, a sort of early beer, was a jug with two men sipping at it from straws (top row), getting their party on. The Sumerians had more than fifty words for beer and were recording recipes for their favorite beers on clay tablets, one of which Katz, along with the Anchor Brewing company, tried to recreate. (They said it was good, but didn't share it widely because they had to drink it quickly, "for health reasons.")

Beer and bad decisions are no strangers. You have your examples. I have mine. The first bad decision beer led to though might have been agriculture.

By the time agriculture became a possibility, people would have been living in densities greater than any experienced before by a primate. They were densities sufficient to cause social problems—a kind of proto-urban pathological strife. Maybe beer and other intoxicants might have quelled some of these problems. "Dude, I'm sorry man, I did not mean that about your mom. Have you tasted my fermented wheat? It's all cool." Maybe it made more. Or maybe, with the onset of social discontent, the demand for substances like beer simply increased. Beer, though, also had other things to offer. Thanks to yeast, beer has more of several key nutrients, such as the B vitamins, than do the seeds out of which it is made. Beer also allowed food to be stored, as beer. And then there is disease. Dense humans favored new diseases. Epidemiologists refer to the emergence of diseases associated with settlement as the first epidemiological transition. Beer might have solved this too. As Katz put it, "beer drinkers would have had a 'selective advantage' in the form of improved health for themselves and ultimately for their offspring." But even as beer might have saved us, it asked something in return. It was a deal. To make enough beer to satisfy early demand we had to begin to farm.

Katz is not the first to imagine the domestication of wheat and barley was for beer first and food second, but he has been the most eager and comprehensive in his arguments. What Katz envisioned was, as he put it in an interview with *The New York Times* several years ago, that "the initial discovery of a stable way to produce alcohol provided enormous motivation for continuing to go out and collect these seeds and try to get them to do better."

That beer has nutritional value absent from wheat and barley is indisputable, as is the observation that beer makes us feel good (at least initially). But, let's return though to the issue of disease. Katz did not dwell on disease, but disease definitely dwelled in the early settlements where we began. Agriculture followed the first settled human villages. Such gatherings of family and friends are nice, but they are just as often contagious. High densities of

people lead to more opportunities for diseases to pass body to body. The greatest challenge in being a parasite, whether a worm, bacterium, or virus is getting from one host to another. When hosts are rare and far apart, a parasite has trouble finding them. Imagine having to find a single rare species out in the Amazon or the Serengeti. But now imagine you must do so, as is the case for many parasites, without being able to walk. You depend instead on riding the wind, the water, or the hairy body of a mosquito. If you are a parasite that lives by such chance, most of your children will die and so you make many children and favor common hosts, like settled humans.

As humans began to build permanent homes and stopped migrated seasonally, the relatives came to town, and everyone gathered together. Suddenly, the odds a good wind, a river's flow, or a mosquito's flight would take you from one human to another increased, dramatically. As those odds increased, not only did many parasites and pathogens evolve the ability to "use" humans, many switched to using us exclusively.

Nearly all water-borne diseases of humans evolved after humans settled and share a basic feature of their life cycle. They enter the water when we poop and reenter humans as they contact that feces directly or drink infected water. Human settlements emerged before good waste disposal systems were developed. The edge of town would have buzzed with flies and pathogenic opportunity. Perhaps it was in this context that the need for agriculture arose, at least in the fertile crescent, at least maybe. It arose as a way of coping with human interactions and human diseases. Beer made you feel good, beer had nutritional value, AND beer might kill pathogens and so drinking beer and other fermented beverages would save lives from diseases like typhoid and cholera by preventing them from being passed from one person to the next. Beer was the last wall of defense between life and death.

The first alcoholic beverages would not have had a high alcohol content. High-alcohol-content drinks depend on a good supply of oxygen and alcohol-tolerant yeasts that appear to have evolved only after many generations of beer and eventually wine brewing. The first beer was light on both buzz and taste. You might add some honey or dates. It would then taste better, but not good, not compared with foods that could be gathered, foods like figs, berries, and wild meat. The first beers were not the garden's delicious fruits but instead its somewhat bitter, but fun, medicine.

Maybe, because of all of these benefits, albeit some of them very short term, we had to begin to farm, to feed the yeast that made our beer. Katz offered this hypothesis, but then he could not think of a test. Well, of course, he could look at the archaeological evidence, which he did. If he were right, he would have expected to see that the evidence for making beer predates that of, for example, making bread. It seems to. He would also expect to see some settlements that occur before agriculture. There do seem to be some. Then what?

Few papers have been published on Katz's idea in recent years. It lay fallow, at once interesting and untended. Science can be beautiful, powerful, and elegant. It can also be frustrating. Ideas can wait generations to find their moment. Sometimes good, right, true, and elegant ideas never find their time. They sit like seeds, waiting for light that might not come. Katz's idea seemed as though it might become one of those ideas. Then, just this year a group, led by Todd Schlenke at Emory University, working on, of all things, fruit flies, made a major discovery. Schlenke and his students did not know about the work of Katz, but what they did know was how to test whether animals drink booze to kill their pathogens. They do.

FLIES GET DRUNK TO KILL OFF PARASITES

Jennifer Welsh

www.livescience.com/, Feb. 16, 2012

Fruit flies can apparently out-drink Frank the Tank and not get sick from alcohol poisoning. Now researchers have found this fraternity-party ability may save flies from a gory death.

The results showed that drunk fruit-fly larvae turned the tables by killing wasp parasites in their bloodstream, essentially causing the parasite's organs to drain from its anus, the researchers found.

Fruit fly larvae feed on the yeast and other fungi from rotting, or fermenting, fruit; during their snacking, the flies are bound to ingest the boozy by-products of the fungi's fermentation—they are even able to use it as a food source and thrive on food with up to 4 percent alcohol.

Higher alcohol levels can be toxic to the fruit flies, study researcher Todd Schlenke, an assistant professor at Emory University, told LiveScience. "If the alcohol level gets too high, they can't break it down fast enough." The flies in the study only reached about 0.02 percent blood alcohol levels; they would have to drink four times that to reach the blood alcohol level considered illegal for driving.

This idyllic existence on a booze-soaked piece of fruit is often disrupted by parasites, including wasps that lay their larvae in the larva of the fruit fly. If untreated, the tiny wasps eat the flies from the inside out, bursting from the flies bloodstream fully formed. The researchers have discovered, though, that the flies use their naturally high tolerance to alcohol to kill off their blood bugs.

In the study, when the wasps tried to lay their eggs in fly larvae on food containing 6 percent alcohol, they were less likely to lay eggs, "presumably because they are feeling bad," Schlenke said. The eggs they did lay were less likely to survive.

"If you dissect open a fly that was fed alcohol food, the wasps were obviously dead and in a lot of cases the internal organs in the wasp larvae had fallen out the wasp's anus," Schlenke said. "They were turned inside out." Now that's a bad hangover.

When infected larvae are placed in a dish with both alcoholic and non-alcoholic food, they even make a break for the alcohol to reduce their parasite load: After 24 hours, 80 percent of the infected fly larvae were hanging out on the alcohol side of the dish, but only 30 percent of the uninfected larvae were.

"We gave them a choice between food with alcohol and food without alcohol, and the infected flies overwhelmingly went to consume the toxic alcohol food," Schlenke said. It's as if the flies ask themselves, "Do I want to suffer from toxic levels of alcohol or do I want to die from this wasp?"

MUSHROOM PICKERS FOUND ALIVE AFTER SIX DAYS IN OREGON WILDERNESS **Nigel Duara**

The Bulletin, Bend, Ore., Feb. 5, 2012

Portland, Ore. (AP) - A family of three huddled on the edge of an old-growth Oregon forest for six days, lost and cold, unable to signal search helicopters flying low and slow overhead. Their ordeal began last Sunday when the three went out looking for hedgehog mushrooms.

Without food, water, or even warm clothing, Belinda and Daniel Conne, along with their 25-year-old son, Michael, survived by drinking water from streams and taking shelter in a hollowed-out tree. On Saturday, they managed to crawl to a clearing, where a search helicopter spotted them several miles outside the community of Gold Beach, roughly 330 miles south-southwest of Portland.

"They just got turned around," Curry County Sheriff John Bishop said. Bishop said the three were "remarkably in pretty good shape," given the amount of time they spent outside. He said they likely could have survived for two or three more days in the area, where fresh water is plentiful but food is scarce. The weather was mostly clear, with temperatures in the 40s and 50s.

Bishop said the family was spotted by Jackson County Commissioner John Raschor, who was searching for them in his own helicopter with Curry County Sheriff's Lt. John Ward.

After being spotted by Raschor and Ward, the Connes were transported by a U.S. Coast Guard helicopter to Curry General Hospital in Gold Beach. Daniel Conne suffered a back injury, Belinda Conne had hypothermia, and their son had a sprained foot and minor frostbite. All three also were dehydrated and hungry.

The area where the Connes were found is rugged country in the Klamath Mountains riddled with a maze of logging roads. People frequently get lost or stranded there.

RAGOUT OF HEDGEHOG MUSHROOMS WITH TANGERINES AND CURRY **Jack Czarnecki**

A Cook's Book of Mushrooms
via *Mycolog*, Humboldt Bay Myco. Soc., Feb. 2012

Ingredients:


Sue Cappel

3 Tbs extra-virgin olive oil
2 small onions, finely chopped
1 lb fresh hedgehog mushrooms
~ Juice of 1 orange
½ tsp dried savory
1 tsp curry powder
1 tsp salt
¾ cup heavy cream
3 tangerines, peeled and sectioned into small pieces, pith removed as best as possible

Steps:

1. Place the oil in a large saucepan over medium heat. Add the onions and sauté until just barely soft, about 3 minutes. Add the mushrooms and continue to sauté for 5 minutes more.

2. Add the orange juice, savory, curry powder, and salt, and heat for 1 minute. Add the cream and heat until the mixture begins to thicken. Add the tangerine sections and heat for 2 minutes more. The mixture should be thickened enough so that the sauce does not run. If not, continue to heat until it reaches that point. Serve immediately. Serves 4.

Here's to a long life and a merry one.
A quick death and an easy one.
A pretty girl and an honest one.
A cold beer—and another one!
—Irish toast

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