

# Nature Trails

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The Monkey Head Nebula Births Stars [NASA/ESA/STSci/AURA](https://www.nasa.gov/ESA/STSci/AURA)

## **Gaining a Cosmic Perspective: An Astronomical Look at Our Place in the Universe**

**Scott Fisher**

**Astronomy Lecturer and Outreach Coordinator,  
Director of Undergraduate Studies  
Department of Physics, University of Oregon**

**Friday, 16 November 2018, 7:30 pm,  
Room 100 Willamette Hall, UO Campus**



“I don’t think I’ll ever love anything as much as this man loves space.” “Not only is he an expert in his field, but he is one hell of a teacher.” “I literally love him like I want him to be my dad...” “He is an inspiration and

the reason I am no longer afraid of science.”

Those are a few of the comments from University of Oregon undergraduate students who have taken Scott Fisher’s Astronomy 122 class. Fisher, our November speaker, is a faculty member of the U of O’s Department of Physics, where he teaches introductory-level astronomy courses, serves as the Director for Undergraduate Studies, and is intensely involved in outreach activities.

Fisher is originally from Pennsylvania but spent his formative years in northern Florida. As a child his drive to understand how things work led to more than one successful disassembly followed by an unsuccessful reassembly of a family electronic device. Having a son with a bit of this in him I can well imagine the eye-rolls and sighs of his mom and dad when they saw their DVR in pieces, knowing there was no hope of it ever recording anything again. This urge to know how things work led Fisher to physics—physics being, it can be said, the way the universe works. He majored in physics at the University of Florida, and it was there, during his senior year, that he first tasted astronomy.

Fisher took an astronomy class that year, and immediately knew this was it, the discipline he wanted to be a part of, if not master. He extended his undergraduate studies an extra year, taking enough astronomy classes so he could graduate with a double major: physics/astronomy.

As is the case for many talented individuals, Fisher was not satisfied with his level of understanding of his chosen field after finishing his B.S., so he became a graduate student in astronomy, still at the University of Florida. Part of his Ph.D. thesis project was constructing OSCIR, a camera to attach to a telescope so as to record what the telescope was focused on. At the time it was developed, it was one of only two in the world that could tease out the mid-infrared region of the spectrum. The camera’s name has a story. As they were building it they named it after Fisher’s graduate advisor’s dog, Oscar. They kept calling it Oscar, and after it was finished and put to use people wanted to know what the name meant. So they came up with this tortured acronym, which actually pretty well describes what it does:

Observatory Spectrometer and Camera for Infrared.

Before he finished his Ph.D. the Gemini Observatory, who wanted to put OSCIR to work on their telescopes, contacted Fisher. He went first to Hawaii, but also spent about a year and a half—spread over three years in the early 2000’s—in Chile, at Gemini South Observatory. So part of his thesis research was completed at Gemini, and when he finished his Ph.D. Gemini hired him as a staff scientist.

As he was carrying out his astronomical research Fisher became increasingly aware that not many local people in Hawaii—or Chile—understood what was going on at the Gemini observatories. His expertise in astronomical research gave him credibility, and the same personal qualities that now so endear him to his students made him a natural fit for taking Gemini to the public. He began going to local schools to explain to students what was going on and why it was both exciting and important. He became the Gemini rep at conferences, setting up and manning the Gemini booth. These activities led him to realize that outreach was what he wanted to do. He recognized that science literacy in the general public is critically important but is declining, and he could help stem the tide.

The National Science Foundation has programs in science education and pedagogy related to scientific disciplines. Fisher’s growing expertise in science outreach led to his being recruited by NSF. He took a three-year sabbatical from Gemini to serve as a Project Director in NSF’s Division of Astronomy. He had a budget of about \$12 million/year for funding educational and special projects. About a third of the funds went to support young faculty who were just getting their research programs off the ground (so to speak). Another third supported educational programs – research experience for undergraduates. The remainder supported one-off projects with strong educational ties. Fisher said this work was exhilarating, educational (it made him a better grant-proposal writer), but also demoralizing. There were many outstanding proposals that he had to reject—not because of their quality but because his project simply didn’t have enough money to fund all the good ones. The success rate was about 10%.

His work at NSF was how Fisher ended up at the U of O. As he was leaving D.C. a friend told him Oregon was looking for someone like him. In his words, “They sent me the job description and it was ‘astronomy lecturer and outreach director’ and I thought, ‘I like astronomy, and I like outreach...ah, I’ll apply for it, let’s see what happens! I just thought it was a good fit.’” He ended up taking the job in 2012

and resigning from Gemini, although he maintains connections with scientists there.

Fisher is passionate about combating the anti-science bias that is growing in the U.S. He considers his class, Astronomy 122, one arena for his continuing fight. He knows his time is limited with these students, most of whom are not science majors, so he is indefatigable in his drive to quell their fear, to shed light on their misconceptions. He has only 23 class hours to win the day, so he is at it from day one. The comment by the student who said Fisher is the reason she no longer is afraid of science is a strong indicator that his efforts are bearing fruit.

Besides his teaching and advising work, Fisher is Associate Director of the Pine Mountain Observatory, the University's astronomical facility located out in the Oregon desert, east of Bend. So although he gave up 'the big glass' at Gemini, he has this 'smaller' glass. While the telescopes at Pine Mountain don't allow top-of-the-line research, they

do support undergraduate-level research, and Fisher and his students take full advantage of the facility.

In his talk, augmented with images and videos from observatories like the Hubble Space Telescope and our own Pine Mountain Observatory, Fisher will connect us to the universe we inhabit using a scale that relates the actual size of the universe to the audience. He will then tell us about one of the most exciting recent discoveries in all of astronomy—the existence of exo-planets. As of late 2017 we have confirmed that over 3,500 planets live outside our solar system. This will be an exciting, illuminating (ahem) hour, one you shouldn't miss. Come, and bring a friend or two, to hear Scott Fisher's presentation, "Gaining a Cosmic Perspective: An Astronomical Look at our Place in the Universe." The meeting begins at 7:30pm on Friday, 16 November, but just to be safe you might want to show up before then. As usual, we'll be in 100 Willamette Hall on the U of O campus. Also as usual, there will be cookies. John Carter

## Rooted

by Tom Titus

The tree was a giant among giants. The behemoth Douglas-fir rose from brittle duff on our short off-trail route between Gordon Lakes. The only hint of fall rain was the sound of impatient fingers tapping on a hard surface, waiting for those first good soakings that would swell the drought-stricken forest floor. The understory was sparse and walking was easy because the Gordon Lakes forest is perennially drier than the bits of brushy native forest remaining in the Coast Range.



A tree that stands out in a stand of big trees is worthy of respect. We stopped to gawk. Kim leaned

against the dark pillar four times the diameter of her own body. Furrowed bark mirrored deep basalt canyons falling steeply northward into the South Santiam River. Conk rot seeped into the base. The crown was broken against the blue sky, perhaps snapped off in the Columbus Day storm of

1962. Many of the limbs, some the size of small trees, were dying. The old tree was on its way out. If it were lucky enough to escape fire or another big wind, it might live for only one or two more human lifetimes.

Kim was the first to notice the most striking feature of this colossal Douglas-fir. In a circle beginning about 10 meters away from the trunk, the ground sloped upward toward the tree, as though a silent slow-motion eruption was occurring deep beneath the duff. At the base of the trunk, the forest floor was raised by about a meter. The bulging soil was an outcome of an invisible but massive root system anchoring the great tree to the basin floor.

When we think of roots, we are conscious mostly of how they support a tree like this one that imposed itself so magnificently above us. Other giants in the Gordon Lakes grove had toppled, reminding us that a healthy root system is a necessary but uncertain anchor providing resilience in the face of mountain winds. In grade school we learned that roots absorb water and nutrients from the surrounding soil. Tree sophisticates know that water molecules stick to one another in the interconnected woody cells called xylem, forming an unbroken column from roots to needles. This column is pulled upward from the roots as water molecules exit the open needle pores high in the canopy. Our basic view of roots as critical to the functioning of a tree is correct.



But those unseen roots pushing up the old growth duff were an invitation to a more expansive view of the centuries-long impact of this ancient Douglas-fir. Its life may have begun when a large huckleberry-season fire scorched the basin centuries ago, a time when the Santiam Molalla still traveled the well-worn east-west route along the South Santiam River. After the fire, a surviving Douglas-fir sent a small helicopter seed whirling to the scorched ground. The rains came. The seed germinated. A network of tendrils spread outward into soil made rich by nutrients from the burned forest. Ravens and flying squirrels and huckleberry-seeking Molalla could not see this fanning subterranean web. Growing roots enclosed pieces of basalt and dissolved them with organic acids, making minerals available to the larger forest community. Bits of mountain melted. Fallen needles and lichens built soil. Years crept by. Our lifetimes shrivel in comparison.

The new root system was colonized by a community of fungi, the mycorrhizae. These wrapped themselves around root tips with tiny club-like fingers. Mycorrhizal filaments slipped between cell walls, minute projections that enhanced water and nutrient uptake in exchange for carbon fixed by photosynthesis in sunlit needles. This mycorrhizal community expanded with the age of the tree, becoming extraordinarily diverse. Over 200 species of mycorrhizae coexist in a typical Douglas-fir forest. Mushroom aficionados recognize many of them for fruiting bodies that erupt after fall rains. The names are as mysterious and beautiful as the fungi: *Russula*, *Lactarius*, *Boletus*, *Cantharellus*, and *Hydnum*. The old Douglas-fir does not care how we name them. But I do. The moniker Golden Chanterelle exists symbiotically in my brain with autumn rain, contorted orange funnels nested in emerald moss, mushroom steam rising from a hot skillet into my nose.

This Douglas-fir does not care that humans have entered an era of “root consciousness.” We have

learned that hair-like strands of mycorrhizal fungi, the mycelia, reach from root tips to connect with the mycelial networks of other trees. The connection among mycelia is not passive. These fungal filaments are the nerve net of the forest, the intermediaries by which trees communicate. Through mycelia, trees exchange specific nutrients with one another, sometimes preferentially to seedlings and nutritionally deprived individuals in the network. Damaged or infected trees send warning signals to neighboring trees as chemical or electrical impulses. This particular Douglas-fir is likely a “hub tree,” one that is more highly connected than others through the mycelial network, a tree whose death would have a large impact on the interconnected community. For a moment I imagine what might be communicated through mycelia with the first shuddering bite of a chainsaw, a sobering perspective on the sterile term “wood products.” Science warns us to avoid inferring “consciousness.” But how certain can we be?

This old Douglas-fir probably doesn't care what I learn from it. I'm handicapped because I have no mycelia with which to share the language of roots. But I need to learn. I lift my hand and rest it on the trunk. Rough bark forms small indentations in my palm. The tree remains silent. I'm left with only my own language, only the slow-motion gathering of knowledge through science, cobbled with intuition, imagination, and metaphor. I have only my senses, bombarded by phrases of flicker call, canopy vertigo, bobcat spots of broken sunlight, springy duff rotting above huge roots. The language of roots is foreign and perhaps complex. But maybe the messages are simple. Stay put. Grow steadily. Become an anchor. Provide safe harbor. Connect with others. Transform your place. Share.

Needles crunched as we wandered in the direction of home to finger-drum for fall rain.

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### The Winter Fern of Oregon by David Wagner

One of the things I really enjoy about our seasonality is the vigor of the plant world in response to the arrival of the rainy season. Unlike back east, where forests at our latitude are frozen and dormant through the winter, our dormant season is in the late summer. With drought, rain is so scarce that photosynthesis comes to a standstill. Stomates on leaves have to close up to prevent desiccation. The mosses and lichens on the tree branches just dry up



and wait for the rains to come. And that's what the licorice fern (*Polypodium glycyrrhiza*) does. It is invisible all summer because it is summer deciduous. The licorice fern stems are buried in a moss mat. When the fall rains start and the mosses revive, so do the ferns. The fresh, green fronds are a

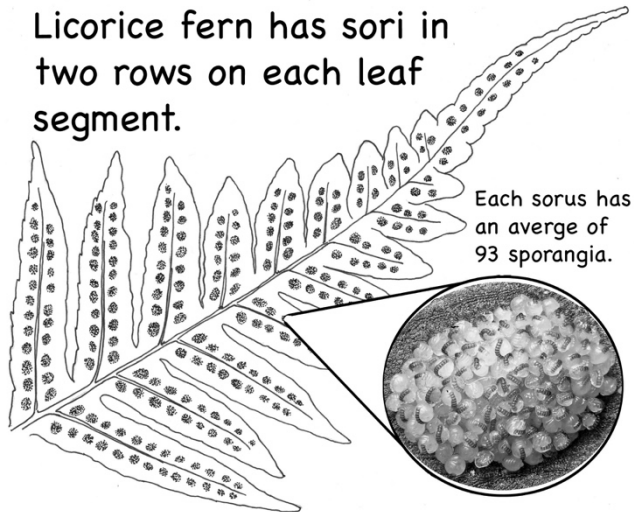
welcome sight.

The licorice fern is the only epiphyte (plants that grow on tree trunks and branches) in our area except along the coast where a few other ferny plants are to be found. We have no orchids or air plants on our tree branches, unlike moist forests of the tropics. All our other ferns are terrestrial.

As a congenial fern lover, I have been drawn to study spore production in some detail. The licorice fern produces its sporangia (spore capsules) in midwinter, releasing spores through spring, before mosses on tree branches dry out. Its sporangia are arranged in tight clusters (sori) in two rows.

People like me want to know what the numbers are; we like to count. I sampled a series of average size fern fronds and counted the number of sori (singular = sorus) on each. Then, I counted number of sporangia in a sorus for ten average size sori. Getting the base number is easy: all local ferns, except grape ferns, have 64 spores per sporangium. The spores are small, about 60 micrometers, 0.060 millimeter.

**Licorice fern has sori in two rows on each leaf segment.**



**Licorice fern sorus with mature sporangia.**

The summary total is astonishing: 816 sori per frond times 93 sporangia per sorus times 64 spores per sporangium equals 4.8 million spores.

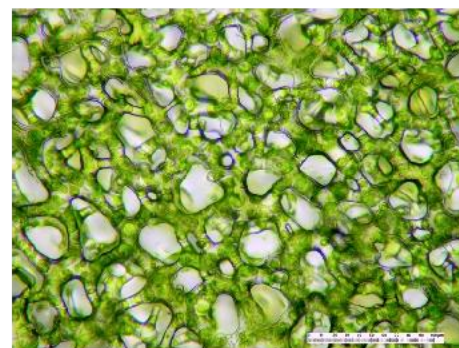
Each frond produces close to FIVE MILLION spores!! Looking at a bigleaf maple branch with dozens of fern fronds is just mind boggling. If there is even a tiny space suitable for a spore to germinate and start a new plant, the numbers make it likely for that space to grow a new fern.

Once I put a fern under the microscope, I am incited to delve deeper and deeper into studying its form. Their internal anatomy is beautiful and yet is still not well known. That's because all past studies concentrated on very thin slices of leaves. New digital technology allows us to look at thick slices with software that reconstructs its 3D form. The traditional, thin slices made people think that the spongy tissue with gas passages is little more than loosely packed balls. This is a false image. The spongy tissue is actually more like a jungle gym made up of cylindrical cells joined at the ends. This network of rigid, cylindrical cells joined in three dimensions is only now being appreciated.



**Lady fern internal anatomy of leaf.**

Deciduous ferns like licorice fern and lady fern (*Athyrium filix-femina*) have a relative thin spongy layer with small air spaces.



**Deer fern leaf internal anatomy.** Evergreen ferns like deer fern (*Blechnum spicant*) have a more open

network of thinner cells with wider air spaces.

## Events of Interest in the Community

**Sunday, 11 November, 3–5 pm. The fourth annual “The Nature of Gratitude.”** Tom Titus and Eric Alan usher in the season of gratitude with their own writings and photography. Special guests will include Joe Moll, executive director of McKenzie River Trust, musicians Beth Wood and Halie Loren, performance poet Jorah LaFleur, and poet Charles Goodrich. Admission is free. This year’s event is dedicated to Hearts for Hospice. Tsunami Books, 2585 Willamette St., Eugene.

### **McKenzie River Trust**

**Saturday, 10 November, 10 am–1 pm. Volunteer Willow Staking at Green Island.** This project is a part of a larger restoration planting effort happening on the island. Grab your waders, or borrow a pair of ours because this project is sure to be a ton of fun! This activity is best suited for those 12 years old and older. To register and see a map, go to <http://www.mckenzie-river.org/events/list/volunteer-willow-staking-at-green-island/>

**Friday, 16 November, 5–9 pm. Camp Creek Cellars Benefit for McKenzie River Trust.** Join Camp Creek Cellars for their “Last Waltz” Wine Tasting/Farewell Party to benefit the McKenzie River Trust! \$10 tasting fee on entry, half of which will be donated to the Trust. Oregon Research Institute, 1776 Millrace Dr. (You have to leave early enough to get to the EHNS meeting!)

### **Lane County Audubon Society**

**Saturday, 17 November. Third Saturday Bird Walk.** Go to <http://www.laneaudubon.org/> for location and times.

**Tuesday, 27 November, 7:30 pm. Bogoslof: The Island of Fire and Ice.** Ram Papish will explore changes in Bogoslof, a very actively volcanic Alaskan island north of the Aleutian Island chain in the Bering Sea ecosystem. Papish will present data on seabirds and seals from Bogoslof Island and the Pribilof Islands. The colonies are going in opposite directions. Wildlife thrives on Bogoslof, even as the same species decline over most of the Bering Sea. The presentation will include photographs from both islands as well as scientific information about the area’s wildlife. Papish has spent about 10 summers on Alaskan Islands assisting in seabird and seal research, and will share stories about camp life in these remote, seldom-visited areas.

### **Mt. Pisgah Arboretum**

**Saturday, 10 November, 10 am–3 pm. Play in the Rain Day.** Visit Mount Pisgah Arboretum for the annual Play in the Rain Day, featuring tree climbing, foam archery, hayrides, campfire cooking, and more! This fun, all-ages family event is put on by the Youth in Nature Partnership. Discover how fun, easy, and rewarding it is to spend time outdoors in nature—in ALL kinds of weather. FREE!

**Sunday, 11 November, 8–11:30 am. Bird Walk.** Join Julia Siporin and Joni Dawning for another monthly bird walk intended for people with all levels of birding experience. Please bring binoculars. Option to continue the walk until noon for those who are interested. Rain or shine. Meet at the Arboretum Visitor Center. \$5, members FREE.

**Saturday 17 November, 10 am–1 pm. REI Stewardship Session: Trail Work Party.** Join us for this trail resurfacing work party co-sponsored by REI and Mount Pisgah Arboretum. Attend three trail work parties and receive a free t-shirt! Tools, gloves, and a parking pass will be provided to volunteers (we suggest you bring along a water bottle). Please RSVP to [site@mountpisgaharboretum.org](mailto:site@mountpisgaharboretum.org) if you plan to attend.

**Saturday, 1 December, 11 am–1 pm. Mushroom Walk.** It’s still mushroom season! Take a walk through the Arboretum’s forested trails with experienced mycologists Chris Melotti and Molly Widmer of the Cascade Mycological Society, and hunt for these fascinating fungi. Discuss identification, habitat, characteristics, natural history and the role of fungi within an ecosystem. Meet at the Arboretum Visitor Center. Rain or shine. \$5, members FREE.

### **Friends of Buford Park and Mt. Pisgah**

**Monday Morning Regulars. 9 am-12 pm.** Contact [volunteer@bufordpark.org](mailto:volunteer@bufordpark.org) for more information.

**Tuesdays and Thursdays, 9 am-12 pm. Nursery Work.** Meet and work at the Native Plant Nursery at Buford Park. Enter Buford Park from Seavey Loop Road. Turn LEFT after crossing the bridge and drive 1/4 mile to the nursery.

### **WREN (Willamette Resources and Educational Network)**

Go to <http://wewild.blogspot.com/> for information on WREN upcoming events.

### **The University of Oregon’s Museum of Natural and Cultural History**

**New Exhibit: NAVIGATING KNOWLEDGE.** From monkeys and maps to fossils and folklore, MNCH collections help University of Oregon scholars solve mysteries about our planet and our collective human experience. Glimpse into the vaults with UO faculty and student researchers and join their ongoing investigations: you’ll traverse land and sea to uncover life’s origins, voyage across the Pacific in search of the First Americans, discover how fossils can predict earthquakes, explore arts in Africa and the Americas, and more. Other exhibits: OREGON – WHERE PAST IS PRESENT; EXPLORE OREGON; and H2O TODAY. Exhibit hours: Tuesdays – Sundays 11 am-5 pm.

### **Native Plant Society of Oregon, Emerald Chapter**

**Monday, 19 November, 7 pm. Southern Beach Forests, Flowering Plants, and Landscapes of Patagonia.** Join Gail Baker, retired LCC Botany Instructor, for a talk on her recent trip to Patagonia. Learn about the region’s iconic mountains and ice fields, and its unique flora. The meeting is at the Amazon Community Center, 2700 Hilyard St.



### Nearby Nature

**Sunday, 12 November, 8:30 am–3 pm. No School Day Adventure. Fun with Fungi.** Fungi, bacteria, insects—oh my, the FBI! Discover and uncover the forest’s mighty recyclers. Investigate insects, make art from nature’s leftovers, and go on a scavenger hunt. \$45 members, \$50 non-members. Scholarships available. Ages 6–9, max 12 kids. Outdoors in Alton Baker Park and at our Yurt. To register, call 541-687-9699, ext. 2 or go to <http://www.nearbynature.org/events/november-12-no-school-day-adventure-fun-with-fungi> and click the green dragonfly logo.

**Saturday, 1 December, 1–3 pm. Get Squirrely!** Enjoy a family-friendly outdoor adventure. Play acorn hide-and-seek, find out who’s getting ready for winter, and enjoy fireside nature tales. Rain or shine! Meet at the Hendricks Park Wilkins Shelter. Members free, non-members \$5 per family. Preregister at 541-687-9699 or go to <http://www.nearbynature.org/events/december-1-nature-quest-get-squirrely> and click on the green dragonfly logo.

### North American Butterfly Association, Oregon (Eugene/Springfield) Chapter

Go to <https://www.naba.org/chapters/nabaes/> for information on NABA’s next meeting.

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**ENHS welcomes new members! To join, fill out the form below. Membership payments allow us to give modest honoraria to our speakers, as well as to pay for the publication and mailing of *Nature Trails*. Our web address: <http://biology.uoregon.edu/enhs>**

### MEMBERSHIP FORM

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State & Zip \_\_\_\_\_ Phone \_\_\_\_\_

E-mail (if you want to receive announcements) \_\_\_\_\_

I (we) prefer electronic copies of NT rather than paper copies. \_\_\_ Yes \_\_\_ No

If yes, email address (if different from the one above): \_\_\_\_\_

ANNUAL DUES: Family \$25.00

Individual 15.00

Life Membership 300.00

Contribution \_\_\_\_\_

**Annual dues for renewing members are payable in September. Memberships run from September to September. Generosity is encouraged and appreciated.**

Make checks payable to:

Eugene Natural History Society

P.O. Box 5494, Eugene OR 97405



Star eruption. Image from Gemini Observatory.

The Eugene Natural History Society meets on the third Friday of the month September through May except in December when the meeting is on the second Friday. Meeting time is 7:30 pm and our standard meeting location is room 100 Willamette Hall on the University of Oregon Campus. Any temporary changes will be noted in the newsletter for the current meeting and on our website: <https://pages.uoregon.edu/enhs/>

### ENHS. Officers and Board Members 2017-2018

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Nature Trails: Editor: John Carter, [jvernoncarter@comcast.net](mailto:jvernoncarter@comcast.net); Support Staff: Ruth BreMiller and Reida Kimmel.

### 2018-2019 Speakers and Titles

16 Nov.	Scott Fisher	<b>Gaining a Cosmic Perspective: An Astronomical Look at our Place in the Universe</b>
14 Dec.	Bruce Newhouse	<b>Pollinator Primer: Your Tiny Neighbors and the Plants They Love</b>
18 Jan.	Laura Tesler	<b>Undersea Photography</b>
15 Feb.	Samantha Hopkins	<b>Evolving Mammals on an Active Landscape: Biogeographic History of Oregon's Mammals Over Deep Time</b>
15 Mar.	Amanda Stamper	<b>Burning for Butterflies, Birds, and Blooms: Prescribed Fire in the Willamette Valley</b>
17 Apr.	Scott Burns	<b>Cataclysms on the Columbia: The Great Missoula Floods</b>
17 May	Vanessa Petro	<b>How Busy are Beavers in Oregon?</b>

A good place to park for our meetings is the Physical Plant lot: turn north from Franklin onto Onyx, go about a block and you will be in the lot. After 6pm it's open to the public.