Nature Trails

Published by the Eugene Natural History Society

Volume Fifty-two, Number Three, March 2017

Photo by Mark Currey

The Amazing Evolutionary Innovations of Pipefish, Seahorses and Seadragons

Bill Cresko

Professor of Biology, Associate Vice President for Research, University of Oregon

Friday, 17 March 2017, 7:30pm,

Room 100 Willamette Hall, UO Campus

Bill Cresko grew up in northeastern Pennsylvania, in a small farming community not far from Scranton. This setting afforded ample opportunity for outdoor adventures and kindled his devotion to biology. His father, orphaned at age nine, became an engineer and insisted his children do well in school and go to college. Ever the obedient son, young William was an excellent student, availing himself of the advanced chemistry, physics and biology courses on offer at his small but excellent high school. He did so well that he won awards and was able to attend the University of Pennsylvania on an academic scholarship.

Neil Shubin, author of *Your Inner Fish: a Journey into the 3.5 Billion-Year History of the Human Body*, taught Cresko's first course in evolutionary biology. I can just imagine what an eye-opening experience this would have been for a small-town boy. Besides his academic load Cresko was an athlete, running on both the Penn cross-country and track teams. Several of his teammates were biology majors and the informal give-and-take with them, his growing realization that sophisticated math has a place in the study of biology, together with Shubin's course, led him to switch majors from physics to biology.

A graduate student of Shubin's was doing a dissertation on diamondback turtles and Cresko was able to become his assistant, doing fieldwork for three summers in Chesapeake Bay. It was an interesting problem; these turtles can live over one hundred years and females don't reach sexual maturity until age seven, when they are just the right size to get stuck in crab traps and die before producing more turtles. The turtle population in the Bay was declining rapidly and the graduate student's work was revealing why. Cresko would leave at 3am with the crabbers and rescue turtles from their traps and study them. A single trap sometimes held as many as 50 turtles. The end result of the project was a redesigned crab trap that excludes the female turtles, and their population began recovering.

Having completed his B.A. in biology Cresko went from the University of Pennsylvania out to Seattle, ready to work with Bob Paine, the "keystone species" ecologist, at the University of Washington. When Paine listened to Cresko describe what he was interested in, Paine told him, "you don't want to work for me, you want to work for Susan Foster, my last graduate student, who just started working on evolutionary questions using threespine stickleback fish." Cresko found Paine's advice spot on. He became a graduate student in Foster's lab at the University of Arkansas and followed her when she moved to Clark University, in Worcester, Massachusetts. His project was on population genetics and speciation in threespine stickleback. But when he finished his Ph.D. at Clark he felt he didn't know enough about developmental biology and the genetic basis of the traits that interested him so much in these fish.

And that brings us to Oregon. Cresko knew of the University of Oregon's integrative approach to biological questions and also that its Institute of Ecology and Evolution fosters collaborative work. More specifically, having decided the threespine stickleback was the organism he wanted to work on the rest of his life, he knew of John Postlethwait's and Chuck Kimmel's genetic and developmental work on zebrafish and thought that UO would be a great place for him to further his education. He was right!

Whether Cresko's running ability affected Postlethwait's decision will never be known, but widespread suspicion persists. At any rate Cresko became a post-doc in Postlethwait's lab, and the two of them put together proposals to NIH for a fellowship and NSF for research support, both of which were funded, making possible Cresko's stay through 2004.

His post-doctoral studies completed, Cresko applied to three schools for a permanent position, was offered all three, and chose to stay here. His rise has been meteoric. In short order he attracted an outstanding cadre of students, technicians and post-docs to his own lab, and they and their collaborators have churned out some seminal work, turning enough heads so that, even though he could still pass for a (mature) graduate student, Cresko is already a full professor, and has been named a Fellow of the American Association for the Advancement of Science.

When they were seniors in high school Cresko and Cristin Huislander met. They've been together ever since. She's also a Clark Ph.D., also on the University of Oregon faculty, and I'm thinking the two of them have each other to thank for their respective successes. And I have to tell you this: Their wedding ceremony took place at one of the most beautiful spots on earth, in front of the ranger's cabin at the First Meadow on Slough Creek in Yellowstone National Park. The bride-to-be covered

the steep three miles from the trailhead in a floor-length wedding gown and hiking boots.

Besides his research and teaching accomplishments Cresko has administrative talent. He is the University's Associate Vice-President of Research and many of us have read of his recent exploits while wearing that figurative hat. He played a critical role in the negotiations, totally behind the scenes, that led to the $500 million donation for the Knight Campus for Accelerating Scientific Impact at the University of Oregon made by Phil and Penny Knight.

Cresko says, "I'm fascinated by the diversity of life and the goal of our lab is to understand how it arises. What genes and developmental processes are involved?" He will talk to us about pipefish, seahorses, and seadragons, a subfamily of closely related small fish that form the family *Syngnathidae*. His lab last year published the entire genome of the Gulf pipefish (*Syngnathus scovelli*), which has enabled them to get at several fascinating questions. He'll divide his presentation into three parts, each of which promises to be full of pretty pictures and fascinating tidbits. First he will focus on the reproductive biology of these fishes. It's the males that get pregnant! In different ways. Lots of stories here. For instance, multiple females can mate with a single male pipefish, each depositing her eggs on or in the male and then blithely swimming off. These affairs produce a bunch of embryos of mixed parentage, and the male can actually distinguish among them and allocate more or less resources to them—or even eat them—depending on his assessment of the qualities of the nascent mothers. The males of some species, including *S. scovelli*, have brood pouches where the embryos are stored as they develop. In other *Syngnathus* species the embryos adhere to the surface of the male's body. In the second part of the talk Cresko will get into body shape. You can see why this group of fishes is made to order for such studies: How can they have such radically different body shapes and be so closely related? Some of them have lost fins. Some have more vertebrae than others. Seadragons have almost plant-like assemblages. Seahorses have prehensile tails. Pipefish heads are enormous in relation to the rest of their body. Yet with all these morphological differences they are closely related at the genetic level. In the last part of his talk Cresko will get at this; how gene activity during early development leads to radically different shapes later on, and how the seminal work in getting the entire genome of one of these fishes has laid the groundwork for a much deeper understanding of the relationship between evolution at the organismic and genomic levels.

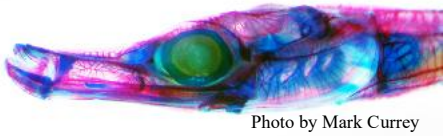

Photo by Mark Currey

Please join us at 7:30pm on Friday, 17 March in room 100 Willamette Hall on the U of O campus to hear Bill Cresko's presentation "The Amazing Evolutionary Innovations of Pipefish, Seahorses and Seadragons." As always, there will be cookies.

John Carter

Transformation by Reida Kimmel

Our weather is generally benign, but we do suffer occasional catastrophes: the Windstorm of '62, the Blizzard of '69, and now the Ice Storm of December 2016. All day and into the night on the 14th it rained, froze, and gently melted just a bit. The ice on every branch and twig was at least a quarter inch thick here in the 'Hollow', elevation 1000 feet. At dusk I was finishing chores and looking down the driveway. A north wind came up, just enough to add to the stress of the icy burden, and two of the three sister oaks that shaded our lower driveway collapsed and crashed, one across the driveway and garage, the other into our east pasture and the creek. The remaining oak leaned terrifyingly across the driveway. That night we shuddered to hear the gunfire sounds of trees breaking. Once a really explosive boom wakened me. By dawn it was quiet, and we looked out on wreckage. Trees were down everywhere, oaks and firs alike. The downed trees closed local roads. Road crews and Lane Electric worked day and night clearing fallen trees and trying to restore power and phone service. Here on Poppin's Farm our glorious incense cedar snag was reduced to two small branches. No oak or ash was unscathed. The tall volunteer cherries that had lined the little creek and made spring so beautiful were lying flat—fallen dominoes, future firewood. The giant ancient honey locust across the little creek was torn from the creek bank, its corpse straddled across the east pasture fence, supported by its massive limbs, each the size of a modest tree. The oaks that had shaded the house had been stripped of most of their limbs. The few branches that remained on the oak closest to the house sagged inches from our roof. It was my favorite, and beloved of birds and squirrels. The most popular bird feeder hung from it. But it, like the "widow-maker" oak in the driveway, had to go for safety's sake.

Five days later we had power and phone service, the driveway was cleared enough to use, and it thawed. We were able to get a tree company to do

what had to be done to clear up our immediate surroundings. I grieved for the lost trees. The landscape that I, shade lover, had deemed nearly perfect albeit in need of constant loving tweaking, was irreparably altered, at least for my lifetime. I grieved for the wildlife: "my" precious birds and squirrels. I needn't have. I was in wonderland. The broken limbs and droopy shrubs outside our windows were shelter from January's foul weather and rich food sources for birds hunting insects and squirrels eating buds and cones. It was like being high in the trees spying on the real lives of creatures we know mostly from watching the feeders. Fewer trees meant better views. Of the red breasted sapsucker working on a young honey locust. Of the fresh large rectangular holes in the trunk of a recently dead Douglas-fir, most likely the work of the pileated woodpecker we hear so often in the valley. Cold weather, or perhaps adding a second suet feeder near a thicket of red-twig dogwood and Nootka roses, attracted a large flock of the tiny bush tits that tease me by their chatty companionship on my walks and refusal to visit my feeders. It's hard to stay depressed about hopeless piles of limbs and branches in the pastures waiting to transform into blackberry jungles, when one has a couple of visits a day from these soft gray and buff imps, clustering on a feeder, 17 at one count, here one moment, then gone, speeding off in a cloud, chattering cheerfully. Their name, tit, means tiny. They are not that tiny, not compared to a kinglet, but they seem tiny to me, and vulnerable, and very loveable.

We began to notice how bright it was. When we moved here forty-seven years ago the neighborhood was recovering from clearcutting in 1948 and constant subsequent grazing. Most of what we have come to think of as 'the woods' was pretty scrubby. Over the decades, trees volunteered or were planted, and we were in the midst of a lovely young forest. We abandoned our first vegetable garden, too shady to grow carrots, never mind corn! Chuck's carefully constructed "desert garden" and my rambling roses—gone, replaced by ferns, thimbleberry, saxifrages and fringe cups. Now all that is changed again. Our yard and house will be hotter in summer with more 'views', of the road, the neighbors, and our pastures. What can I plant that will be healthy and fast growing? I want plants near the house that can survive hot dry summers. My wish list includes vine maples, flowering currants, bear berry and sword ferns, all natives, and beautiful. I hope that some of the broken hardwood trees along the creek send out shoots to replace themselves. Yes, I will strive to transform this recent transformation. It might even be fun!

Oregon Ensatina

By Tom Titus

One can encounter a salamander in as many ways as there are salamanders in this wide capacious world of encounters. The Sunday salamander *du jour* was definitely a surprise. During a rare break in the February rain, Kim and I were at the Johnny Gunter cabin, I to prune the giant King apple tree in the yard, she to clean up after the winter mouse party and drive my broken body to town should I for some reason peel loose from twenty feet up. On my walk to the tree, I saw the 2- x 3-foot door of gray rough cut lumber that should have covered the opening to the cabin crawlspace lying in the grass. When I picked up the door, an Oregon ensatina was curled at my feet.

Photo by Tom Titus

To picture an Oregon ensatina, take a deep breath, exhale, and let your mind go to that wet morning in the woods when it isn't quite spring, isn't quite fifty degrees, the sun isn't quite shining, and you just found a salamander beneath a big piece of fallen bark on the trail. Now look at your index finger. This gives the approximate size, shape, and dimension of an adult Oregon ensatina. Point your pointer finger across your face and squint. From each side of your fingernail, grow a pair of dark protruding eyes with fool's gold flecks scattered in the iris. Behind these glistening eyes stretches the cylindrical finger of the salamander's body. The background color might be caramel or cinnamon or pecan or any number of other tasty colors that aren't quite brown. A series of tiny vertical canyons are incised in the abdomen and mark the position of each rib. Each groove is the color of mango flesh. Mangos are sloppy fruit, so the gilded juice may have dribbled and oozed onto the salamander's back. But gravity always wins, and pools of yellow pigment collect where the legs join the body.

Squint a little harder. A small round tail protrudes from the base of your imaginary salamander. The tail squeezes into a constriction where it joins the body. If a real Oregon ensatina is tailless, the break will have happened at this constriction. Guaranteed.

Look through the translucent walls of the lower abdomen. A cream-colored mass is visible. These are a yolky clutch of eggs. You can't see each individual egg, but there are about ten of them. The large eggs indicate that breeding season is nearly here. Now walk your mind into a wet spring night, when this

gravid female will seek an encounter with a male. A long and highly ritualized courtship will ensue, and the female will decide if he is worthy of her precious eggs. The male is also very invested in this relationship. He can produce only one tiny mushroom-shaped spermatophore with a packet of sperm perched on top. This is his entire reproductive investment for the season. If the female places her chin on the base of his tail and follows, he will extrude his precious spermatophore. If all goes well, she will slide over it and somehow pluck off the sperm-laden cap with her cloaca. The eggs will be fertilized inside her body. While mistakes in this ritualized behavior are undoubtedly made, animals prone to improvisation do not successfully mate and are excluded from the larger evolutionary dance stretching far out into the future. The status quo is where it's at.

The female Oregon ensatina lays her clutch in a moist cavity in a rotten log or moss-covered talus. To maximize the chance that each egg in this small clutch produces a viable juvenile salamander, she remains with the cluster until they hatch four months later. Each egg contains enough energy-laden yolk to see the embryo through to metamorphosis, which occurs inside the egg capsule! Thus, the baby salamanders hatch as fully terrestrial juveniles. From an evolutionary perspective, this reproductive mode is extraordinary. The Oregon ensatina invests a large amount of energy in each egg, at the expense of producing a large number of eggs. Intense parental investment in a small number of eggs has liberated this species from the vicissitudes of freestanding water, including pond drying and a host of aquatic predators.

The reproductive habits of the Oregon ensatina are remarkable but not an evolutionary novelty. This species is a member of the lungless salamander family, which contains over 300 other species with no free-living aquatic larvae. Yes, I did say lungless. Squint as hard as you like, but you will find no lungs in this animal. All of her oxygen needs are met by diffusion through thin, moist skin that is suffused with capillaries carrying red blood cells that glom onto incoming oxygen molecules and transport them throughout her body. Her skin contains cells that make slime, cells that make pheromones, cells that make antipredator toxins, and cells that contain a variety of pigments, including the xanthophores that make her look as though she has been splashed with mango juice. Human skin is thick, clumsy, and boring by comparison.

Humans seem generally thick and clumsy and boring in comparison to an Oregon ensatina. I don't really mean this. What I really mean is that we tend to think of ourselves (because we can think) as sitting on some rarified evolutionary pinnacle of large brains, language, and logical reasoning. We'd like to think that because these define our humanity, they make us dictators of the known world. Right now we *are* dictating the future of the planet, probably for the worse. Nevertheless, no one can objectively evaluate themselves, whether with self-criticism or self-acclaim. But why not be gobsmacked by the evolutionary innovations of the Oregon ensatina and her relatives? I know of no human who can live without lungs, make slime with their skin, or become distasteful to predators. These salamanders are amazing. We should give them their due.

ENHS FIELD TRIP TO MALHEUR NATIONAL WILDLIFE REFUGE Thursday–Sunday, 1-4 June

The spring 2017 ENHS field trip will be to the Malheur Field Station, where we will enjoy world-class bird watching on the Refuge, at the field station, and at the Refuge headquarters. Side trips also are possible. Carpools will be arranged.

Accommodations at the Field Station: We will stay in recently renovated spaces, some of which have separate bedrooms with two beds. The Field Station will provide three meals per day on Friday and Saturday and two meals on Sunday, with pack-your-own brown bag lunches.

Costs: Lodging is $30 per person per night, the eight meals add to $87 per person, and there will be a small cleaning fee, for a total of $177 per person (in 2014, our last trip to Malheur, this figure was $172).

Details: This is not a guided trip. However, people who have been to the area have various favorite places. We will leave Eugene Thursday afternoon. Pack your own dinner or stop for it along the way (a deli in Bend is a popular spot). Friday and Saturday can include the Refuge headquarters, the central patrol road in the Refuge, and a loop around Steens Mountain with stops at Mann Lake, Mickey Hot Springs, Pike Creek, Fields, and other places in the Alvord Desert and Catlow Valley. Sunday will be a shorter day, with a possible stop at Fort Rock.

To participate: The trip is capped at 20 participants. Make a check out to the Eugene Natural History Society and give it to Judi Horstmann or Kim Wollter at the monthly meeting or mail it to the Eugene Natural History Society, P.O. Box 5494, Eugene, OR 97405. Be sure to provide participant name(s), phone numbers, snail mail addresses, and e-mail addresses. All payments must be made by **1 May**. Refunds may be made in the case of emergencies. For more information, contact Kim Wollter at 541-484-4477, kwollter@comcast.net.

ENHS FIELD TRIP TO HJ ANDREWS EXPERIMENTAL FOREST Saturday, 6 May. Led by Fred Swanson. Details in the April issue of Nature Trails.

Events of Interest in the Community

Lane County Audubon Society

Saturday, 18 March, 8am-noon. Third Saturday Bird Walk. Site and leader will be determined by interesting bird sightings posted to OBOL and other pertinent information available before the day of the walk. Details will be posted on the LCAS Facebook page (facebook.com/pages/Lane-County-Audubon-Society/330177413824?ref=hl) and on the website (laneaudubon.org). All ages and skill levels are welcome. To carpool, meet at 8am at the South Eugene High School parking lot, corner of 19th and Patterson. We plan to return by noon. A $3 donation is appreciated to help support Lane County Audubon's activities. FMI: Jim Maloney at 541.968.9249 or jimgmal@comcast.net.
Tuesday, 28 March, 7:30pm. Birds and Bugs, with Rick Ahrens. Much of bird migration is driven by the seasonal availability of bugs in the northern latitudes. In this lively and informative slide show, we'll look at numerous examples and discover how important birds are to the overall health of various ecosystems. 1645 High St., Eugene.

Mt. Pisgah Arboretum

Saturday, 11 March, 10am-noon. Nature's Slimy Creatures. Slugs, snails, worms and more! On this walk for families, learn about the lives of our slimy friends here at the Arboretum with Education Coordinator Jenny Laxton. Finish the walk by creating some slime of your own to take home. Rain or shine. Meet at the Arboretum Visitor Center (AVC). Members $5 per family, non-members $8 per family.
Sunday, 19 March, 8-11am. 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 AVC. $5, members free.
Saturday, 25 March, 1-3pm. Aquatic Amphibians Walk. Mount Pisgah has great habitats for breeding Willamette Valley amphibians. Join Tom Titus, biologist and author, for a talk and walk through our riparian areas and learn about the unique assemblage of amphibians that rely on healthy aquatic habitats for reproduction. We'll listen for Pacific chorus frogs, watch for roughskin newts in amplexus (mating), and search for egg masses of the Northwestern salamander. Bring rubber boots. Rain or shine. Meet at the AVC. $5, members free.
Sunday, 26 March, 10am-noon. Wildflower Walk. Join Arboretum Site Assistant and botanist Matt Groberg for an exploration of our early spring wildflowers. Learn up to 20 native wildflowers. Perfect for beginning and intermediate plant enthusiasts. Rain or shine. Meet at the AVC. Don't forget your parking pass. $5, members free.
Sunday, 26 March, 1-4:30pm. Sumi Ink Designs Workshop. All skill levels will experience success in this joyful exploration of abstract design with Glenda Goodrich. Designs can be used in large format as framed art, or in smaller pieces for cards or collage. Designs are created with Sumi ink and watercolor, watercolor pencils, colored inks, gel pens, glitter pens—pretty much anything goes for color. Color combinations and basic elements of design will be included in the instruction. $25 members, $30 non-members. All supplies are included in the registration fee. To register call 541-747-3817 or visit http://www.mountpisgaharboretum.com/workshop-registration/
Saturday and Sunday, 8, 9 April, 10am-3pm. Botany Workshop. In this two-day, thorough workshop, botanist Tobias Policha will help participants improve their identification skills and knowledge of our local flora. Topics include plant anatomy, family characteristics, and using a botanical key to aid in identification, with the focus on flowering plants. This is a hands-on class, so be prepared to go outside. Recommended text for class: Gilkey and Dennis' Handbook of Northwestern Plants (2001 edition). $40 non-members. $30 members. $7 materials fee (paid to instructor). All materials included. Please bring a hand lens if you have one. Pre-registration required. To register call 541-747-3817 or go to: http://www.mountpisgaharboretum.com/workshop-registration/

Friends of Buford Park and Mt. Pisgah

Monday Morning Regulars. 9am-noon. Contact volunteer@bufordpark.org for more information.
Tuesdays and Thursdays, 9am-noon. 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)

Tuesday, 14 March, 9-11am. Wetland Wander at Golden Gardens Park. Join WREN and City of Eugene employee Lauri Holts for a special TURTLE themed wander! Golden Gardens Park provides year-round water and protected habitat for the Western pond turtle, and they are often spotted sunning on logs in its ponds. WREN staff and volunteers will guide this walk. Participants should bring water and wear muck boots. WREN will provide binoculars. Directions: In Eugene. From Hwy 99, west on Barger, right on Golden Gardens Street. Meet at the intersection of Golden Gardens Street and Jessen Drive.
Saturday, 1 April, 10am-2pm. Family Exploration Day. Join WREN for unstructured, independent exploration of the wetlands! We provide a backpack of binoculars, field guides, bug net, hand magnifier, and bug boxes, you bring your curiosity and sense of adventure! Drop by anytime between 10am and 2pm to check out your backpack. WREN staff and volunteers will be on hand to answer your questions. This event is free and families are encouraged. WHERE: Tsanchiifin Walk. Directions: meet at the parking lot of the West Eugene Wetlands Education Center at 751 S Danebo Ave. (From West 11th, turn north onto Danebo Ave, the lot is the first driveway on your right after the bridge.)

Tuesday, 11 April, 9-11am. Wetland Wander with WREN and BLM at Oak Hill. WREN's FIRST Wetland Wander at this location. Learn all about this essential habitat from BLM restoration ecologists and see first-hand restoration in action. WREN staff and volunteers will guide this walk. Participants should bring water and wear muck boots. WREN will provide binoculars. Directions: Head west on Royal Avenue, turn left onto Oak Hill Cemetery Road—follow to end. Park along Oak Hill Cemetery Road and meet at the gate.

The University of Oregon's Museum of Natural and Cultural History
Exhibit Hours: Tuesday through Sunday, 11am-5pm

Native Plant Society of Oregon, Emerald Chapter
Thursday, 16 March, 7pm. Woodland Meadows and Steub-obst-Wiese—Traditional European Orchard Management for Oregon. Speaker Will McClatchey is a former professor of Botany, University of Hawaii, and a former VP for research at the Botanical Research Institute of Texas. His research has focused on ethnobotany conservation and traditional cider-orchard management practices. He is now attempting to develop woodland meadows in South Lane County. Meeting location: upstairs in the Stellaria Building, 150 Shelton-McMurphey Boulevard, Eugene.

Nearby Nature
Monday, 27 March, 8:30am-3pm. Bugtopia! No School Day Adventure. Discover who's flying, digging, and hopping in the park and garden! Use nets, screens, and magnifiers to find hidden creatures in the compost, soil, ponds, and meadows. Play fun bug games and build your own cool insect out of recycled materials. $45 members/$50 non-members. Ages 6-9, max 12 kids. Outdoors in Alton Baker Park and at our Yurt. To register, call 541-687-9699, ext. 2.
Thursday, 30 March, 10-11:30am. Green Start Play Day: Bug Buddies. Enjoy outside nature play in our Learnscape plus pre-school crafts and stories. Rain or shine! Indoor area available for wet weather. Kids 5 and under only, with an adult. Members free, non-members $5/family (adult and pre-schoolers). Meet by the Yurt in our Learnscape at Alton Baker Park. Pre-register: 541-687-9699.

Cascade Mycological Society
Go to http://cascademyco.org/category/events/ for information about upcoming events.

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

Community Action

The ENHS Board has submitted a statement to the Lane County Board of Commissioners in opposition to the Old Hazeldell Quarry on TV Butte near Oakridge.

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

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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	_____

Make checks payable to:
Eugene Natural History Society
P.O. Box 5494, Eugene OR 97405

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

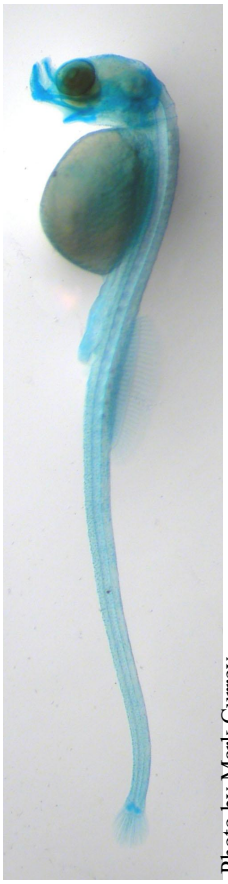

Photo by Mark Currey

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Schedule of Speakers and Topics for 2016-2017

17 Mar.	– William Cresko	– The Amazing Evolutionary Innovations of Pipefish, Seahorses and Seadragons
21 Apr.	–Svetlana Maslakova	– Pythons of the Sea: Natural History of the Nemertean Worm
19 May	– Ed Alverson	– Southern Willamette Valley Natural Areas Through the Seasons