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Boot Camp for Scientists

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Boot camp fo

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– Anne Kruchten, associate professor of biology, iFOCUS coordinator

Students kick off flip-flops and wade kneedeep into the Pacific surf, armed with vials and tubes, collecting seawater and microscopic organisms buried in the sand. On another day, they peer through microscopes, searching for tiny fruit fly characteristics with names like “Captain Crunch” and “white eyes.” They program circuit boards with brightly colored wires, explore mathematical graph theory and examine the impact of heavy metals on chlorophyll in spinach leaves.

Welcome to iFOCUS,* an innovative week-long science program in which first-year Linfield students work alongside faculty and student researchers before the academic year begins.

Over the course of six days, 11 students had a hands-on preview of science research across the disciplines of biology, chemistry, math and physics. They scrutinized fruit flies, marine life, mathematical theory, complex circuit boards, chlorophyll interactions, and more. At the end, as researchers do, they designed and presented posters outlining their findings.

Connell Crabtree '18 peers through a microscope, scanning for Captain Crunch. Not the breakfast cereal, but the fruit fly.

“Okay, we have Captain Crunch and white eyes,” he calls out moments later.

Students are identifying traits of the tiny fruit fly: different body colors, curled wings and distinct patterns of shoulder bristles (i.e. Captain Crunch). As they gently sort specimens with small paint brushes, biology Professor Catherine Reinke encourages them to chime in and records the results on the whiteboard. It’s a lively discussion, centered on gene mutations and DNA genotypes.

“I’m getting to experience little bits of every type of science,” said Crabtree. “We’ve looked at electronics, genetics, marine biology and more. We’re seeing what each program has to offer.”

At right, Cheyenne Maio-Silva '18 and Peter Schafer '18 gather core samples of sand at Seal Rock near Newport, one of four beaches they studied during an overnight trip to the coast. The data revealed an increase in the amount of organisms the farther inland they sampled. Left, the marine biology section was led by Jeremy Weisz, assistant professor of biology.

**Interdisciplinary First-year Orientation Camp for Undergraduate Sciences*



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And that's just what faculty intend. iFOCUS reflects the importance of blended sciences – the need to examine issues from multiple subject areas, according to Anne Kruchten, associate professor of biology and iFOCUS coordinator. It also addresses the national need for STEM (science, technology, engineering, math) graduates.

"Science is inherently interdisciplinary," said Kruchten, one of six Linfield faculty involved in the program. "I can't do research only in my lab. I need to find a physicist and a chemist and a mathematician to have a complete project."

iFOCUS is changing the profile of Linfield science students by establishing a community of scientists early on. Once classes begin, iFOCUS students often spend time together, outside the science lab and also in student-led learning communities. Younger, more confident researchers pursue projects earlier and stay involved longer, ultimately changing how research progresses.

"We see first-year students in research labs because of iFOCUS," Kruchten said. "That doesn't happen at other schools. Generally students don't get to go into research until their junior or senior year, which may be too late for them to decide about a career."

Hearst grant expands iFOCUS

Thanks to a grant from the Hearst Foundation, iFOCUS is expanding to year-round programming, adding more opportunities for more students.

With increasing focus on encouraging more students to enroll in STEM majors (science, technology, engineering, math), the Hearst grant will help Linfield expand the iFOCUS program by supporting:

- A summer boot camp held prior to orientation that brings together faculty, student peer advisors and incoming students to engage in research activities that demonstrate the interdisciplinary nature of science.
- Learning communities that keep students immersed in science by working collaboratively on an interdisciplinary science research project with a science faculty member.
- A year-long seminar series featuring lectures on interdisciplinary topics by Linfield professors, faculty members from other colleges and universities, and scientists prominent in their fields.

Learn more about iFOCUS: linfield.edu/ifocus

Watch a video at: youtube.com/linfieldcollege/videos

A leg up

After three years with the program, Jeremy Weisz, assistant professor of biology, says iFOCUS students are more eager, involved and excited. Enthusiasm translates to more research, thoughtful questions, better projects and ultimately better science, according to Weisz and other professors.

"Students come out of iFOCUS knowing a handful of faculty so when they see us, they ask questions and voice concerns," Weisz added. "They are comfortable with us and that is really important. iFOCUS gives students a leg up."

On day four, at Seal Rock south of Newport, students are immersed in marine biology. They wade into the surf to collect water samples and press hollow tubes into the sand to gather core samples. They examine the tiny organisms in the sand – amphipods and polychaete worms – and record observations in a notebook. Back at camp, using a spectrophotometer, they analyze water samples for nitrate concentrations to find correlations between types and numbers of organisms in the sand and the nitrates in the water.

The beach trip was enlightening for Cheyenne Maio-Silva '18 of Hawaii, who is fascinated by marine biology.

"I'm interested to see the different types of organisms on the Oregon coast and compare them to the ones back home," she said.

But the iFOCUS experience offers more than just science to newly arrived students. Friendships take hold. The week includes a number of team building activities, such as camping at the beach, bowling, shared meals and s'mores around a campfire.

Victoria Wood '16, a 35-year-old transfer student from Rogue Community College, valued the chance to get to know faculty and other students, but the program's research focus had a personal appeal.

Seven years ago, Wood developed a rare form of psoriasis, Erythroderma, which covers her body from head to toe. With her sights set on a biochemistry major, she hopes to one day research genetic factors that influence psoriasis and study the root cause and possible treatments.

"Some people just get large spots, but it covers me completely," said Wood, who has adjusted her diet and increased her physical activity to find relief.

"iFOCUS helped me to realize I'm not the only crazy, nerdy, science-y person," she said with a smile. "I am surrounded by people who want to do something more, find the answers. It's nice to know there are others who want to do that, too, and to have that support system."

Physics Professor Jennifer Heath, center, watches Anna Vandershaegen '18, left, and Kathy Trinh '18, right, as they program circuit boards to spell out the word iFOCUS in a moving pattern.





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– Victoria Wood '16, iFOCUS student

Students teaching students

Tika Zbornik '17 holds a vial filled with a dark brown substance – food for the fruit flies.

"They love it. We make it every week," she said of the recipe of molasses, corn meal and yeast. Zbornik, a 2013 iFOCUS participant, joined Reinke's fruit fly research team as a result of her experience and has blossomed in the Linfield labs. The hands-on work is helping chart a direction for her future.

"I want to figure out if research is a viable career choice for me," she said. "I'm learning so much – we're doing five different projects right now so there's always something new happening."

Last fall Zbornik and Rhese Thompson '17, also a former participant of iFOCUS, organized a learning community – a small group of students doing science – that met throughout the year. With funding from a Rose E. Tucker Charitable Trust grant, the group was part of an ongoing genetics project in Reinke's lab, analyzing data to determine what was usable and what gaps needed to be filled. Zbornik and Thompson taught others research techniques they had already mastered.

Although Michael Morin '17, a biology major who hopes to become an endocrinologist, wasn't an iFOCUS student, he still took advantage of the learning community. He was curious about genetics research and the experience, coupled with his Linfield classes, changed how he approaches science.

"I used to think that there were definitive answers and methods for everything in question," he said. "But after a year at Linfield, I know that certainly isn't the case. Science requires an approach where many minds toy with an idea or question in order to discover something new, and the questions we ask are as important as the answers we look for."

Students concluded the week with a poster session, presenting research to the Linfield community. Over the course of six days, students scrutinized fruit flies, marine life, mathematical theory, complex circuit boards, chlorophyll interactions, and more.

Additional learning communities are planned this year, and according to Weisz, they show students that science is accessible, even if they don't have a background in it.

"There are still things you can do, questions you can ask, experiments you can conduct – all as first-year students," he said. "We want all students to go do science and see how cool it is."

Trajectory change

iFOCUS changed the trajectory of Riley Self's education – from biology to physics.

"I learned that physics isn't as scary as it sounded," said Self '16, whose goal is to become an environmental engineer. "Working with students who actually studied physics and seeing the work they did changed my mind. Now I'm working on the same research team as my iFOCUS mentor, Christina Bibler '15."

Self interned at Applied Physics Technologies, Inc., with Bill Mackie '71, professor of physics, where she learned to use a scanning electron microscope, and now runs it in the Linfield lab. This past summer she conducted research with Michael Crosser, associate professor of physics, to study properties of graphene, an atomically thin form of carbon.

Her favorite part of research is the collaboration. At APTEch, she sent research results to labs around the world. She's also worked with graduate students at Oregon State University, where Crosser is doing sabbatical research.

"It's cool to see how much people can learn and expand and work together from all over the world," she said. "Instead of just taking classes and learning about physics, I get to learn about what I can do with physics."

– Laura Davis

iFOCUS schedule

SATURDAY – Math, competitive graph coloring in morning; biochemistry in afternoon

SUNDAY – Biochemistry in morning; poster preparation, book discussion in afternoon; speakers in evening (intro to next day's sessions)

MONDAY – Biology, *Drosophila* in morning; Physics, Arduino programming in afternoon

TUESDAY – Marine biology beach trip, camping, collecting/analyzing samples, star gazing, sea life viewing

WEDNESDAY – Marine biology, whale watching, prep for poster session in afternoon

THURSDAY – Poster session