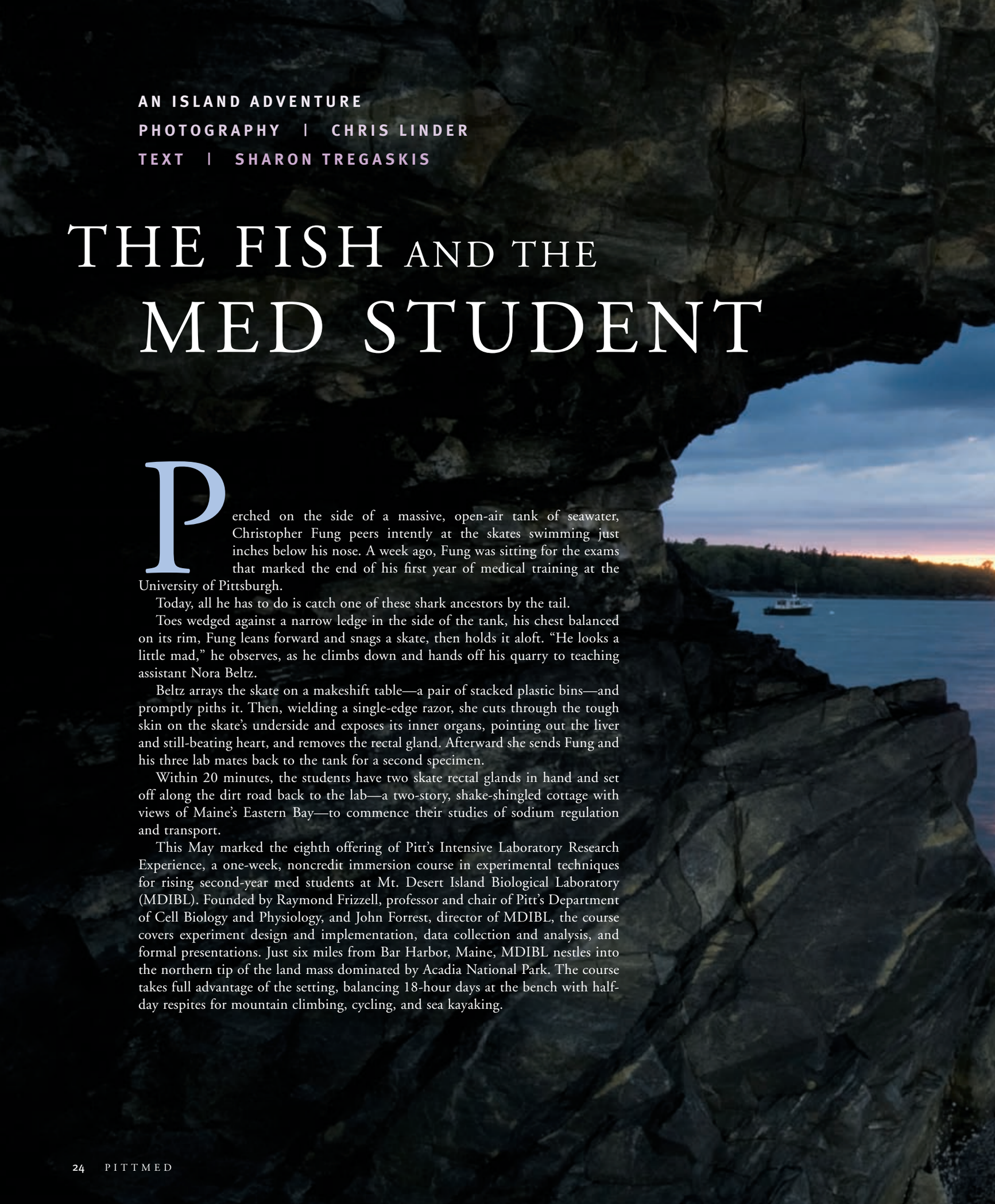

AN ISLAND ADVENTURE

PHOTOGRAPHY | CHRIS LINDER

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THE FISH AND THE MED STUDENT

Perched on the side of a massive, open-air tank of seawater, Christopher Fung peers intently at the skates swimming just inches below his nose. A week ago, Fung was sitting for the exams that marked the end of his first year of medical training at the University of Pittsburgh.

Today, all he has to do is catch one of these shark ancestors by the tail.

Toes wedged against a narrow ledge in the side of the tank, his chest balanced on its rim, Fung leans forward and snags a skate, then holds it aloft. "He looks a little mad," he observes, as he climbs down and hands off his quarry to teaching assistant Nora Beltz.

Beltz arrays the skate on a makeshift table—a pair of stacked plastic bins—and promptly piths it. Then, wielding a single-edge razor, she cuts through the tough skin on the skate's underside and exposes its inner organs, pointing out the liver and still-beating heart, and removes the rectal gland. Afterward she sends Fung and his three lab mates back to the tank for a second specimen.

Within 20 minutes, the students have two skate rectal glands in hand and set off along the dirt road back to the lab—a two-story, shake-shingled cottage with views of Maine's Eastern Bay—to commence their studies of sodium regulation and transport.

This May marked the eighth offering of Pitt's Intensive Laboratory Research Experience, a one-week, noncredit immersion course in experimental techniques for rising second-year med students at Mt. Desert Island Biological Laboratory (MDIBL). Founded by Raymond Frizzell, professor and chair of Pitt's Department of Cell Biology and Physiology, and John Forrest, director of MDIBL, the course covers experiment design and implementation, data collection and analysis, and formal presentations. Just six miles from Bar Harbor, Maine, MDIBL nestles into the northern tip of the land mass dominated by Acadia National Park. The course takes full advantage of the setting, balancing 18-hour days at the bench with half-day respites for mountain climbing, cycling, and sea kayaking.

For 15 students in the Class of 2011, summer started with an *ahh*. Within a day of finishing their first-year exams, the group boarded an airplane bound for coastal Maine and a six-day research immersion program at Mt. Desert Island Biological Laboratory, where the mountains of Acadia National Park serve as a backdrop. RIGHT: One morning, students rose before dawn and drove to the summit of Cadillac Mountain to watch the sun rise. Shared body heat and blankets helped them stave off stiff winds.

The 15 students in this year's program were assigned three rotations, each investigating the structure and function of polarized epithelial cells from a different angle. While the rotation with Forrest examines the workings of the intact skate rectal gland—an organ roughly the size of a pinkie—Frizzell and Tom Kleyman's students explore protein expression in frog eggs. (Kleyman is chief of Pitt's Renal-Electrolyte Division and an MD professor of medicine, cell biology and physiology, and pharmacology and chemical biology.)

In the basement of MDIBL's brand-new research building, students participate in a tutorial on live-cell imaging using MDIBL's pair of half-million-dollar confocal microscopes. Upstairs, in a lab fully equipped for gene analysis, they learn methods for investigating gene transcription and expression.

"The idea is not to turn everybody into researchers," says Frizzell, "but to try to instill an inquisitiveness and a kind of jaundiced or skeptical eye ... so that they don't accept everything at face value but rather think about what went into [research claims]."

Back in Forrest's lab, the students have begun monitoring the effects of various drugs on the flow of sodium, chloride, and other ions through the gland. At a rustic wooden bench on the lawn nearby, Frizzell and Kleyman wrap up their introductory session on protein expression. Their students will investigate two of the epithelial ion channels implicated in cystic fibrosis, the subject of Frizzell's research.

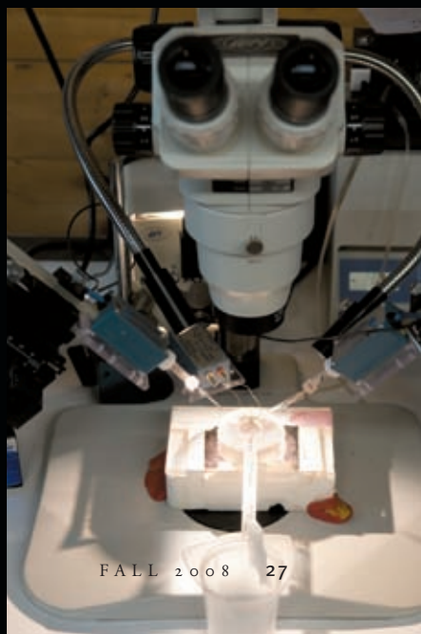
"When you're sitting in class and hearing about the techniques, they almost seem magical, fantastical," says student Aaron Hougham. "Actually getting a chance to do it and see it ... is kind of cool."

Earlier this week, in his gene analysis rotation with Pitt associate professor of cell biology and physiology William Walker, Hougham initiated a study of his own. While setting up a protein detection protocol, the 26-year-old got talking to his lab mates. "I said it would be fun to do something different, even if it

LEFT: Pitt med students work with skates for a study of ion transport. (MDIBL is leading the effort to sequence the genome of the little skate, *Leucoraja erinacea*.)

ABOVE (FROM LEFT): Atop makeshift stepladders, students catch skates for examination. • Renee Dallasen hands off a catch. • Students work in a rustic lab with ocean views.

BELOW: The MDIBL week makes science more real. Faculty mentors, research techs, and graduate teaching assistants offer context and coaching throughout each rotation. (FROM LEFT): MDIBL director John Forrest stresses a point in his lab. • Jessica Lee and Laura Viccaro prepare gene samples for analysis. • To study protein function in the oocyte rotation, students pass an electrical current through eggs of the South African claw-toed frog.



ABOVE: This summer's course participants (all from Pitt's Class of 2011): Daniel Doan, Rebecca Meyer, Michael Cosimini, Laura Viccaro, Gail Joseph, Michael Cho, Veronica Jarido, Hannah Lee, Renee Dallasen, Joshua Levenson, Sarah Luthy, Christopher Fung, Cary Boyd, Jessica Lee, Aaron Hougham

BELOW (FROM LEFT): In the imaging lab, Rebecca Meyer, Sarah Luthy, and Renee Dallasen examine living cells. • Specimens for imaging from a nearby woodlot. • A kayaking break. • At Mt. Desert, even a stroll across campus is a minirespite.

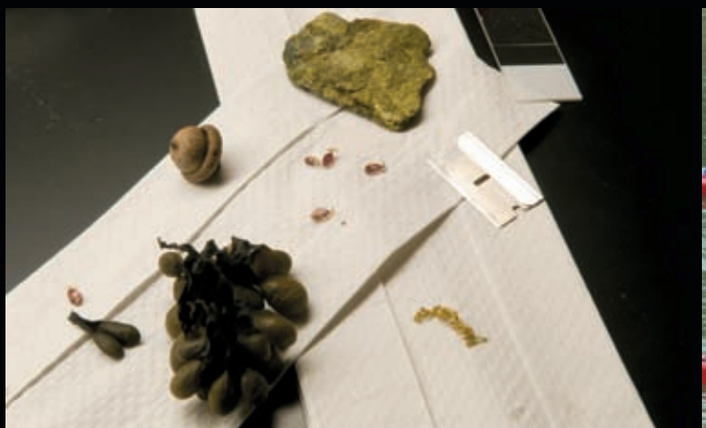
were kind of an elementary school experiment," he says. "I asked if we could use some media and a stick or something. Just see what we could grow."

Eager to foster the students' creativity, Walker handed over the media. Within a few days, Hougham's project has gained momentum, and mealtime chatter includes energetic speculation about what might reveal itself in imaging. (There's plenty of ribbing about the specimen itself, which includes a stick, leaf litter, dirt, and some of Hougham's saliva.)

After lunch, students in the imaging rotation dye Hougham's sample and mount it on the confocal microscope. Then Simon Watkins, head of Pitt's Center for Biologic Imaging, coaches them through the computerized controls to bring the images into focus. They zoom through the image in three dimensions, zeroing in on a region where bacteria wriggle past a spot of yeast. "Oh, wow," says student Renee Dallasen as a microbe swims across the screen. Watkins isn't charmed.

"Ew, this is gross," he says, searching for a particularly active zone. "There's all manner of good stuff in here." Then Watkins invites Dallasen to take the controls, and she sits at the screen, bringing images into and out of focus.

"I don't mind what they're looking at, as long as they learn something about the scientific method, enjoy the process, and it makes them think," says Watkins, who admits that he ensured the wild specimen was triple wrapped before it went in the incubator, to guard against contamination of nearby specimens.



After a full day in the lab and a few hours early the next morning to polish its thoughts, each group gives a presentation introducing classmates to the concepts covered in the rotation. The skate group, calling itself Skateorade, includes a logo modified from the sport drink of a similar name among its slides. When the imaging group takes the floor, the students discuss Hougham's sample and detail the techniques they used.

"Knowing I was going to have to describe my group's results in front of others who had far greater understanding than I do forced me to ... ensure that I really understood exactly what was happening," says group member Rebecca Meyer.

The night before the students depart, Watkins—clad in khaki shorts, an MDIBL sweatshirt, and battered oven mitts—bustles among three fire pits, poking at embers and tugging at grates. Already he's demonstrated how to pacify a lobster by stroking its belly. He even stood one on its head. Now he's intent on preparing dinner. Small groups warm themselves near the fires while a dozen students gather at the base of a soaring evergreen, strategizing about how to free the Wiffle ball lodged in its branches that only moments earlier was the centerpiece of a spirited game.

"This has been a bonding experience," says class president Cary Boyd, as another student scales the tree trunk. "A lot of the barriers between faculty and students have been broken down."

After a week of coaching students through the finer points of confocal microscopy, Simon Watkins doles out a lobster dinner. But he's always teaching. During the feast, he wanders among students offering tips for extracting optimal enjoyment from the regional delicacy.