Tillers 2002, **3**, 33-38

Home and away

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This is an excerpt from a longer story I am writing about my research leave last year, half of which was spent in Hawai'i. It was written at the same time as the preceding research articles were developed.

For Idelle and Amelia, who catch bugs

East Maui, Hawai'i

I follow Idelle Cooper as she heads down the Halemau'u trail from the ribbon of blacktop, leaving behind the rental jeeps, red Ford Escorts and shockingly large tourist buses headed up to the summit of Haleakala. She has left her job at Hawai'i Volcanoes National Park to join me for a long weekend on Maui, and I've promised her that today she will see amazing things. We are headed to the Nature Conservancy's Waikamoi preserve, adjacent to the National Park, on a hunt for flies.

Idelle graduated in May 2000 from Grinnell College with a double major in biology and art. She had taken two classes with me during her four years, performed summer research on prairie insects with me one summer, spent a semester in Costa Rica studying tropical biology, and again worked with me on research during part of her senior year. Idelle arrived in mid-January to live with us in Hilo and help me with field work before starting her job. She is one of the finest young naturalists I know -- my 3rd and 4th eyes in field – and a person filled with a quiet joyfulness in the beauty of small things.

It is now April , and I am halfway through my stay. My goal, as it has been during my entire research career, is to test theories of species formation. Scientists often describe their life's work as driven by these sorts of big ideas – the desire to test general mechanisms that explain why the world is the way it is. However, on any one day, we are usually doing detective work, following up on tips from others or hunches formed by our experience with our specific subjects, and it is this love of discovery that drives us.

On this day, I am betting on discovering something new. Rob Robichaux -- a botanist from the University of Arizona who studies the Hawaiian radiation of plants eaten by the insects I seek -- has told me I can find a unique species of this group in the Waikamoi preserve. *Dubautia reticulata* is a large shrub or small tree that is found only in the wet cloud forests on the windward side of east Maui. I am excited because I've never found mention of this species as a host for the flies, and I can't imagine why they would not be, since the flies eat most species of *Dubautia* I've seen. I can imagine the plants are hard to get to.

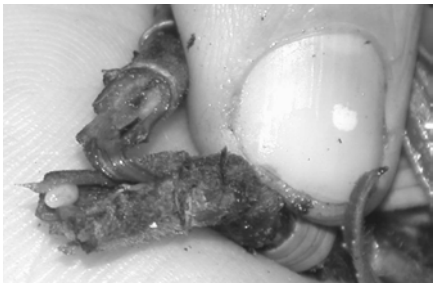
After reaching the floor of the crater we cross Ko'olau Gap on an old hunting trail now used as a trap line for removal of exotic mammals that move up from lower elevations into the park.

We can see off to the right the cinder cones and lava flows where silversword plants dot the landscape. This offshoot of the radiation that includes *Dubautia* is an endangered species, well adapted to the extremes of solar radiation, cold nights, occasional snows and long periods of drought at Haleakala. They were not adapted to the alien goats and deer that used to inhabit the park, and thus are federally protected. Like *Dubautia* species, their seeds are attacked by the flies. We turn away from the distant silverswords and towards their relatives at the lip of the gap, a break in the rim of sheer cliffs that ring the basin shown on most postcards of the park. The last set of eruptions filled deeply eroded valleys and then spilled lava down the slopes and all the way to the sea. We head for the treeline, which is right at the lip. On a clear day you can imagine the lava is still liquid, turning into a green cascade as it turns down to the sea. At closer range the green resolves itself into a cloud forest, fed by moisture driven upslope by the trade winds.

"Where did Rob say the population was?" Idelle asks. "Just a ways down past the TNC fence – that's all I got." "OK", she says. The going is tough, over tussocks of exotic grasses that threaten to twist ankles, but we decide to stay there and avoid falling into skylights of unseen lava tubes that hide on the open flats. We climb the fence and are soon enshrouded in thick fog, then a mist. I can see the contours of lava tubes running down slope a few hundred meters, the clouds obscuring any further view. The collapsed tubes themselves are now filled with a low canopy of *ohia* trees, the ridges between the tubes with shorter vegetation.

I see several ground-hugging relatives of the plants we're looking for underfoot, *Dubautia* species that coexist – and hybridize– at this meeting place of wet and dry. But no *Dubautia* trees. Moving in this landscape is too difficult to just wander around -- I get out my binoculars and begin to scan what I can see through the mist, looking for that particular hue of green that I've discovered is a strong predictor of a *Dubautia*. "That looks like one there, underneath the ohias." I cross the 50 meters first: "Yahoo!" I check the leaf characters with a photocopy of the plant manual, which I read through a ziplock bag so it doesn't turn to mush in the rain. We work our way down into a collapsed tube where there are many of the shrubs forming a subcanopy to the slightly larger ohia trees whose red inflorescences provide a startling splash of color to the green and gray landscape. We look for seedheads on the *Dubautia* shrubs, but as I expected, there are very few, since the flowering season is in the early fall. I finally find an old rotten one, and sure enough there are empty black pupal cases, a sign that flies have used this plant's seeds as food for their larvae. A new host record, but no evidence of which species of fly is the culprit. "Hey, Idelle. I guess I get to come back over Fall Break." Happy me. I grin at her through the rain.

It's coming down properly now and we are wet from scrambling through shrubs, so we sit under a shrub to eat our second lunch. As we chew our smashed pbj's, I stare upwards into the shrub and notice a hole in one of the stems. I open it and find an empty chamber, and then notice the slight swellings in the stem around the exit hole through which the adult fly left its larval home. "Let's look for galls – I'm pretty sure nobody's described them, but Steve Montgomery's found gallers on Molokai shrubs. A different plant species, but similar habitat." Steve Montgomery is a Grinnell alum from 1969, and a fabulous Hawaiian naturalist. I will spend many days during my six months following up on earlier finds by Steve and other fly hunters. We begin to search for more galls and Idelle gets the prize: She uses her fingernail to open a stem with a slight swelling, and I see a creamy blob between the slivers of green stem. A big grin splits her face. How many would show such joy in a maggot?



A few hours later we are retracing our steps out of the preserve, content to have many larvae and a few precious pupae of this gallmaking fly. Two adults will later emerge from these, showing combinations of characters never described before – we now know it is a species new to science, genetically distinct from similar species on other islands which eat different plant species. We trudge back up the switchbacks towards the road and the car, out of energy. Idelle asks me to tell her what I did for my Ph.D. research, and I try to remember. It was long ago, but I warm to the task, literally. The story gets us up the 1500 feet of elevation and back into the clouds as the sun sets. We return to the house at the park compound, shower and begin cooking dinner, tired but brimming with the happiness of shared discovery.

I then make the mistake of checking my email while we wait for the spaghetti to cook. "SHIT!" "Oh no. No. No." In my mailbox is a copy of an email sent by my colleague Vince Eckhart to the Iowa Department of Natural Resources concerning a large hog confinement operation that is suddenly sprouting from the Iowa soil just north of the college's field station. In the email, he asks whether the owners of the land complied with all state regulations for the siting of such large holding areas. He points out that the legislation about to be signed by the governor specifically prohibits siting such operations close to waterways, and this field was known to be in the floodplain of the nearby N. Skunk river (it was under water in the 1993 floods). He points out that current regulations specify that such operations must consider the effects on "public use areas," and that our station serves both the college and the community as a place of study and recreation. In a separate email to me, he is pessimistic. The current law has no teeth, and the owners built it just before the new one takes effect. We later learn the DNR approved the site because it was ONE FOOT past the current limit for adjacency to a water source, something they determined without actually visiting the site. The biggest environmental issue in Iowa, the proliferation of large animal confinement operations and their accompanying lagoons of liquid manure, has suddenly come home.

Kellogg, Iowa

The Conard Environmental Research Area (CERA) was purchased by Grinnell College in 1968 and developed into a field station for biological study. It is named after Henry Conard, a well-known botanist who served on the faculty for 38 years. In 1996, a year after I arrived in Grinnell, I took over as faculty director of CERA upon the early retirement of its former director Karl DeLong. Since then, I have joined with a group of faculty and staff to develop the station as a premier location for the study of environmental biology. But the story of CERA is much broader than that, for it is representative of something much larger.

About 4 years ago, a small group of college faculty from across disciplinary boundaries came together to discuss our pedagogy with respect to our home. We felt a need to address our tendency as academic migrants to ignore the lessons of our own locales by building connections to the prairie – biologically, historically and aesthetically – and by exploring their relationships. The result was the formation of the Center for Prairie Studies. The effort began with faculty development, a series of workshops during which faculty from different disciplines met to talk and learn from each other. The most important outcome of this process is an emphasis in many courses across the college on the value of learning directly from one's locale. For field biologists, this seemed a natural extension of what we already were doing – although we learned as much as taught.

During this same time, the biology department was struggling with a problem faced by many in science pedagogy: the explosive expansion of biological information had resulted in introductory courses that were crammed with more and more information. Our experience in assessing student learning told us that major concepts and principles got lost amidst an overwhelming sea of information. Our approach to solving this dilemma was to stop trying to teach everything, but to use research problems to teach students HOW to learn. Involving students in research mimics the process by which we as scientists learn throughout our careers. We also hoped it would increase students' motivation and their retention of skills, ideas and facts. The result was a course called *Introduction to Biological Inquiry*.

My version of this course is called *Prairie Restoration*, and it takes place almost exclusively at CERA. I was motivated to teach this course – instead of one based on my research called *Modes of Speciation*-- by a piece

I read by Paul Gruchow, a writer from southern Minnesota:

> The schools in which I was educated were by most standards first-rate. But they were, as our schools generally are, indifferent to the place and to the culture in which they operated.
>
> Among my science courses I took two full years of biology, but I never learned that the beautiful meadow at the bottom of my family's pasture was remnant virgin prairie. We did not spend, so far as I can remember, a single hour on prairies -- the landscape in which we were immersed -- in two years of biological study.

I am only one of many faculty members who have embraced this idea, from all areas of the liberal arts curriculum. What have we learned so far? Teaching and learning in this way roots our commitment to a place and its people, wherever that may come to be in our lives. As a focus of my efforts, the place called CERA has become very important to me. Any threat to it has become personal.

West Maui, Hawai'i

On the day following our discovery of gallmaking flies in the Waikamoi cloud forest, Idelle and I are headed down to the broad valley of sugar cane and housing developments and over to west Maui. Today we are following another lead from Steve Montgomery, who almost 20 years before had collected specimens of a rare species, a gallmaker that attacks a different endemic plant genus, *Bidens;* the flies characteristics are so distinct that taxonomists put them in a unique Hawaiian genus, *Phaeogramma*. His collections of one species in this genus are the only known from west Maui, and getting new specimens for genetic analysis will help shed light on whether populations on different islands are distinct species.

Idelle knows I'm still brooding about CERA and tries to keep my spirits up by continuing her fruitless quest to catch a big dragonfly. "You have to wait for them to come to you" I tell her again, as she tries to chase down another. As we climb up the trail, we see few native plants and none of the native *Bidens* we are seeking. As the trail rises, the carpet of exotic weeds gets thicker. The end of the trail comes to a summit covered with pamakane, another exotic plant which we sweep with our nets -- just because we're there and what we're looking for isn't. We capture hundreds of tephritid flies, but they're exotic too, a gallmaker of pamakane introduced to stunt the growth of this weed so that cattle wouldn't get lost in them. I stare down the incredibly steep slopes through my binoculars looking for yellow flowers that will help me find the plants and thus the flies, although I know I wouldn't dare go after them down these slopes without climbing gear. I see no flowers, however. We sit and watch the helicopters fly past us, just under eye level. They fly under the clouds that are settling on the ridge where we sit, heading up the green valleys to see the waterfalls that have eroded this landscape over a couple million years. From that altitude, I'm sure tourists think that all is right with this place; it's green after all. But you need to see things closely -- you need that intimacy -- to know what it could be. To know *better*.

We head down, and the frustration at not being able to follow up on Steve's singular find adds to my general foul mood. In the parking lot, Idelle is triumphant after finally catching a huge dragonfly – and she chased it, she teases. We try to pick the weed seeds from our boots and shoelaces before we get into the car. I drop Idelle at the airport to catch a flight back to Hilo, where she will stay with my family for the night before returning to her job. My kids will be happy to see her. In a deep funk all the way up the road to Haleakala, I think again of the Waikamoi cloud forest and how I am certainly carrying seeds on my boots and clothes from west to east Maui. Back at the house in the park compound, I strip, shower and throw everything in the wash: clothes, insect nets and backpack. Listening to the chug of the washer, I scrub my boots hard with a brush -- a full, ritual cleansing -- and imagine buildings full of pigs at CERA.

Koke'e State Park, Kauai, Hawai'i

It is now June and I am once again hunting flies in the Alakai Swamp area on the island of Kauai. I had been there twice before, but never noticed the insignificant bumps on the stems of *Dubautia paleata*, a common shrub in the undisturbed bogs at that elevation. My two summer research students, Anne and Aleia, are with me. We had discovered in the previous week that Anne always found galls first, and she quickly does here as well. Their distribution is maddening -- abundant on one plant, then absent on the next 100 we carefully check. We peel the stems to find larvae and a few pupae we'll later raise to

adulthood, but where are the adults? As is usual here, the sky is overcast, occasionally sending a light mist down to remind us that we are in a swamp and might as well feel like it.

Suddenly, the sun breaks through, and I immediately catch two large flies I had never seen before. Their size and body color reminds me of the gallmakers I'd seen from other islands, including the flies that emerged from the galls from East Maui. But the wing patterns are different – later we'll determine that they are genetically different from other gallmakers, a beautiful, distinct species. I go crazy sweeping the vegetation, realizing that their appearance coincided with the change in light and temperature. I capture three more during the 15 minutes of sunshine, after which they disappear for good, back to their hiding places where no scientists with nets lurk.

Despite the change in weather, I keep sweeping with my net, but then hear a voice on the boardwalk behind me: "Hi! What are you looking for?"

I turn to see a boy of 10 or so, eager and polite.

"Insects," I explain. "I'm studying the native species of flies that live off these plants."

"Cool." I am reminded of my daughter Amelia-- or is it Idelle?-- an earnest face of pure interest in the new. His parents and kid sister are approaching from behind.

Suddenly his expression changes, spurred by a connection: "Say, do you know Mr. Montgomery?''

A pause while my mind whirs. Of course – Steve Montgomery. "Yes I do. I was collecting insects with him on Oahu just a few weeks ago."

"He came to my school to show us how to find insects." A grin splits his face.

"That was fun, huh?"

"Yeah. It was really cool."

"Ya wanna see what I found?" Steve and I are now working together.

"Wow, those are really beautiful." This from the Mom. They head down the boardwalk into the mist and towards the Pali, the 4000 ft. overlook to the north shore of the island.

The boy turns back to wave. I yell to him: "Hey, keep looking for insects."

Grinnell, Iowa

Soon after returning to Grinnell last summer, I began to prepare myself to teach the Prairie Restoration course after a two-year hiatus. I hadn't been back to CERA in the month or so since I'd been back from Hawai'i. I was afraid at the potential loss. I'd been scrambling to get classes together, making sure my summer students projects were written up, making sure I had my head together after the year away. A booklet arrived in the mail, addressed from Jon Andelson, the director of the Center for Prairie Studies: the third booklet in a series introducing students and faculty to the resources of our area. The first was about local prairie remnants, the second about local producers of food – this one was called "A Beginner's Guide to Grinnell" and is an amazing compendium of facts about Grinnell, from the history of the buildings to the uses of various farm implements you might see by the side of the road. It was researched and written by a student I had known well, an amazing young woman who had enlivened an introductory biology class years back. In her later years, she had immersed herself in the various opportunities that the Center for Prairie Studies has created.

In the Preface to the guide, she talks about her alienation upon her arrival to Grinnell:

> When I first visited Grinnell as a prospective student I was not impressed with Iowa. My mother and I drove all the way from our home near Washington, D.C. to tour a few liberal arts colleges in the Midwest. I felt exposed driving through vast open spaces and treeless agricultural landscapes. The three-mile approach to two from the interstate paraded past fast food franchises and agricultural implement stores. After looping around the two square blocks of downtown I turned to my mother and asked, "Is this it?"
>
> I couldn't imagine what it would be like to live in such a small town after having grown up in the bustle and congestion of the D.C. metropolitan area. Despite the alienation of remoteness I felt being in such an unfamiliar context, I was won over by my impressions

> of Grinnell College. The next fall I found myself once again on Interstate 80 heading west as a new student.
>
> Knowing that the town of Grinnell would be my home for the next four years, I hoped that my second impression would be more favorable, that I would somehow feel an intimate connection with this place as soon as I drove into town. But it didn't happen. . . . My love for Iowa and Grinnell was not just there, waiting for me with my dorm room key and course catalogue when I registered as a first year student. However, it grew over the years as I slowly ingested the character of the place. Through the process of learning about Grinnell and the surrounding area, I developed a deep appreciation for those aspects of the community and landscape that had initially seemed foreign.

However, most striking to me is the postscript:

> **About the author**: Hilary Mertaugh graduated from Grinnell College in 2001 with a degree in Anthropology and Global Development Studies. Her interests in economic justice and community development led her to work with Save the Children in Bolivia, UNICEF in Turkey, the Self-Employed Women's Association in India, and a rural community action agency in Vermont. Though she grew up in Northern Virginia and has worked in various contexts, Iowa is the only place Hilary ever truly felt at home.

The despair I have felt while working in the natural world is not unique – it's an occupational hazard, a malaise I recognize in my students when their feelings of powerlessness well up, or when I ask them to do painstaking research rather than taking what appears to be *direct action*. That despair can be dispersed, however, by an intimate, by a *better,* knowledge of the place one lives. This usually involves a commitment to seeing differently, to the perception of textures and fluxes in the natural landscape, including in its people. It means paying attention to the little things -- not being satisfied with the view from the helicopter. *You've got to get down on your knees in the grass.* I think of this as a sort of human restoration project I perform by engaging my passions as a scientist and teacher. You can take on both these roles as well, whatever your job title may become.

I found a new expression of this emotional landscape in a book I bought last month for my mother. It is a wonderful, thick natural history of the Chicago region, the city in which I grew up and my parents have lived for more than 40 years. It was written by a lawyer, Joel Greenberg, who is obviously also a fine naturalist. It seemed appropriate that I would thank my mother with this gift. She grew up in small town North Dakota, and it was her attention to the natural and human world that awoke these life-long interests in a child from the inner city. The dedication to the book includes an unusual quote from Philippe Regis de Trobriand's book a *Military Life in Dakota (1951).* I haven't yet seen this passage in its original context, although I presume it is about a man's love for his wife. However, Greenberg uses it to express his relationship to the place whose past and present he has labored so hard to bring to life for his readers. For me it echoes the mixture of loss and hope I have about the places where we live:

> And I should see you again as I saw you, and I should love you again as I loved you . . My thoughts are all filled with you – you who brighten my past when I look back, a past which is bright because of you and which would be dark without you – you who appear to me still young and beautiful and charming as in other days.