Teaching Is New Every Day:

An Oral History of Science Illustration Teacher-Administrators

Jenny Keller and Ann Caudle

Interviewed by Sarah Rabkin
Edited by Sarah Rabkin and Irene Reti

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Jenny Keller (R) with Science Illustration students Natalie Renier (L) and Lindsey Kernodle (R). Courtesy: Science Illustration Program.

Ann Caudle Leading a Science Illustration Critique Session. Photo by Jennifer Keller.

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Introduction

Many Monterey Bay Area residents learn of the Science Illustration Certificate Program through its popular annual public exhibit of breathtaking student work. Internationally recognized as one of the most prestigious training platforms of its kind, this postgraduate curriculum prepares students with backgrounds in art and/or science to be professional visual communicators about scientific subjects.

The year-long program involves a rigorous curriculum of classroom and studio work, guest presentations and field trips, followed by ten or more weeks of internship. Graduates work as freelance and staff illustrators for hundreds of organizations, including zoos, aquaria, museums and botanical gardens, public and private research institutes and public agencies such as the U.S. Fish and Wildlife Service, and publications such as *Scientific American* and *National Geographic*.

UC Santa Cruz alumnae Jenny Keller and Ann Caudle have built, administered and taught in the Science Illustration Certificate Program since helping to establish it in the 1980s under the auspices of UCSC's Graduate Program in Science Communication. They presided over the illustration program's eventual migration from campus to UCSC Extension's classroom facility in downtown Santa Cruz, and later to their current institutional home: the College of Science at California State University, Monterey Bay.

In this oral history, Keller and Caudle describe the creation and evolution of the certificate program as well as their approaches to science communication, art and illustration, teaching and administration. I interviewed Jenny Keller on three occasions in June 2017; Ann Caudle joined us for a fourth interview on June 28th.

Keller's portion of the oral history contains several references to experiences shared with me. Jenny Keller and I met in the mid-1980s at UCSC. Keller had just earned her undergraduate degree and was beginning to teach science illustration courses on campus; I had recently completed the writing-and-editing track of the Graduate Program in Science Communication and had stayed on to study illustration, teach undergraduate writing courses and edit the program's flagship publication, *Science Notes from the University of California, Santa Cruz.* Our shared interests led in the early 1990s to "Reflections on the San Juan: A River Journal," a teaching collaboration that took place in southeastern Utah during three consecutive Junes. In 1994, I took

Keller's field sketching course at UCSC; in 1996 we helped inaugurate what became an annual five-day gathering of keepers of illustrated natural-history field journals—a group whose work was showcased in a 2010 exhibit at the New Mexico Museum of Natural History and Science in Albuquerque.

Keller recollects her early engagement with art and the natural world and describes the undergraduate studies that led her to create an individual major in natural science illustration at UCSC. As a student she took special inspiration from coursework with founding faculty member Jasper Rose and science illustrators Chris Carothers and Pieter Folkens, work-study positions at the UCSC Arboretum and the campus Publications and Graphic Services departments, and a spring quarter exploring California habitats in the Natural History Field Quarter with instructors Ken Norris and Steve Gliessman.

Ann Caudle recounts some of her experiences as an undergraduate art major at UCSC, including the support and instruction she received from faculty member Hardy Hanson. After graduating in 1971, Caudle worked as a freelance illustrator for magazines, eventually taking on contract work for the Monterey Bay Aquarium while that institution was preparing to open its doors. She was invited by Science Communication Program director John Wilkes to join the science illustration faculty at UCSC in 1986, and shortly afterward took on the mantle of program director. At this point the oral history becomes a lively conversation between Keller and Caudle, suffused with their palpable delight in each other's company over three collegial decades.

Keller's and Caudle's accounts of their experiences as both students and teachers are peppered with trenchant observations about pedagogy and learning. Their work entails not only helping graduate students master a variety of techniques for illustrating scientific concepts, but also coaching them in strategies for succeeding in a challenging career. It is clear from both women's remarks about this work that, notwithstanding their self-professed shyness, they are master teachers, channeling as much enthusiasm, expertise, generosity and creative insight into instructing others as into the making of their own art and illustration.

The oral history was transcribed by Irene Reti, director of the Regional History Project, who also worked closely with both Keller and Caudle on the final editing and production. Thank you to Jenny Keller and Ann Caudle for their meticulous review of

the transcripts, and for providing the photos included here. Copies of this volume are on deposit in Special Collections and in the circulating stacks at the UCSC Library, as well as on the library's website. The Regional History Project is supported administratively by Teresa Mora, Interim Head of Special Collections and Archives, and University Librarian Elizabeth Cowell.

—Sarah Rabkin, Interviewer and Editor, January 12, 2018

Family History

Rabkin: This is Sarah Rabkin and I am with Jenny Keller at her house in Santa Cruz, [California] on Wednesday, June 21, 2017. We are here to begin the first in our series of oral history interviews. So, Jenny, I'll start with, when and where were you born?

Keller: I was born in Redlands, California in 1962, October 4.

Rabkin: Tell me about your early days. In particular, I know that you have quite a few artists in your family. Can you tell me a little about that heritage?

Keller: Yeah, I have a great-grandmother, a grandmother, a mother, and an older sister, and my mother-in-law who are all, or were, all artists. And it just felt as natural as breathing to be an artist. It got kind of mixed in with the science, in terms of my generation. Both my sister and I are science illustrators of one type. She's a little bit more 3-D, and I'm a little bit more 2-D. (laughs)

But my dad is a scientist, a rocket scientist. He has the T-shirt that says, "As a matter of fact, I *am* a rocket scientist." And my mom was always doing art projects. She would just set things up right alongside her projects, for us to do our own work. And it was a really nice kind of setup because she wasn't saying, "Do what I'm doing," or, "Help me do what I'm doing." Her attitude was, "Here's some stuff. Do your thing," which is a qualitative difference that I think helped us feel our own creativity.

My mom did a lot of artistic things. She could paint. She did beautiful watercolors, expressive, loose watercolors of trees and things like that—not cheesy; beautiful close-ups of branching bark and stuff like that. But she also was a basket weaver. And she did

drawings, beautiful drawings with colored pencils, of still-life subjects. And she did life drawings of our pets, our dogs and things. I mean, kind of anything that she put her hand to, she could do. She's also good at baseball. I mean, she's really quite an amazing woman.

And my grandmother, my mom's mom, was a painter. She did oil paintings. Well, I guess I should go back to my great-grandmother because my grandmother kind of carried on my great-grandmother's legacy. My great-grandmother and her husband were involved in the history of California. They were involved with the California missions and documenting the whole history of, not only the missions, what they looked like, but what went on there. My great-grandmother wrote a book called *Indian Life at the Old Missions*.[1] She was fairly honest about conditions for Native Americans at the missions. She said the good and the bad, which was really remarkable for the time. I mean, she was perhaps not remarkable for the time; if we looked at it from where we are now, we'd think, maybe that wasn't as enlightened a view as one might hope. But she did address the bad things that happened to Native Americans in their life at the missions. So, my great-grandparents were historians. Her name was Edith Buckland Webb.

Rabkin: This is your great-grandmother.

Keller: My great-grandmother.

Rabkin: On your mother's side.

[1] See http://scq.ucpress.edu/content/66/2/173

Keller: Yes. On my mother's side. And Hugh Pascal Webb was her husband. And he was a photographer and she was the historian and oil painter. So, she set out to try to paint twenty-one of the California missions as they appeared at the time of their operation. And she got partway finished with that project.

She also did other plein air paintings, which, in honesty, are much more my favorites than the mission paintings, although those are beautiful and historically important. I have a photograph of her in the Sonoran Desert with her easel and her umbrella, out there painting the desert, which I take with me when I do my plein air painting, because then I feel like I have my great-grandmother with me.

Then my grandmother tried to finish the mission paintings that my great-grandmother didn't finish. And then added to that, she was painting Native Americans from the photographs that her father took of the Navajo. So that was the legacy of their painting. It was mostly paintings of the missions; the people who lived in the West and the Southwest at the time; and also, the desert itself, beautiful scenes of the desert itself, with red cliffs and sage and purple shadows of morning, and so on.

And then my mom, with her artwork that I described. And then my sister, who is two and a half years older than I am, Gail Binder. Oh, I forgot to say my grandmother's name is Helen Duke. My mother's name is Barbara Matheson. My sister is Gail. And Gail worked at the Oakland Museum of California for many years, until she recently decided to go into conservation work, art conservation. But she would also make sculptures of realistic things, like fish and plants, which I could tell more stories about.

And then there's my mother-in-law, who is Jo Hanson, who decided to become an artist—I don't know how old she was[2]—it was after she got divorced and kind of took up her art career, and had always been artistically inclined—but she's the person who started the internship at the municipal dump in San Francisco because they have a section to that landfill area that is the recycling area, and she was observing that a whole lot of stuff got wasted there, or could have been used for things. And so, she thought, well, wouldn't it be great if artists came here and used all this paint, and made sculptures out of these things? She was one of the first people to take found objects—this is urban detritus—and turn it into modern sculpture. There's actually one right there [in this room]. It's a sunflower made of bicycle wheels. And it has house keys and—I mean, you look at it and you realize, wow, there's a pop top to a can there. And all the paint, everything, came from the dump. She did a whole series of these. The other ones are in a museum here in Santa Cruz and also in the San Francisco Museum of Modern Art in San Francisco. She became an artist of some renown for doing this. And she made all kinds of wonderful things, such as a whole series of cockroaches (laughs) and little animals made from things from the dump, and other kinds of sculptures.[3]

Rabkin: And did she bring in other artists to do this internship, too?

Keller: Yeah. And, interestingly, one of our teachers in the Science Illustration Program, right now, new this year—Jane Kim—did the internship that Jo Hansen established, and that was part of her training to become the kind of artist she is. So, it's kind of a nice legacy.

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[2] Jo Hanson was about 48 years old (in about 1967) when she went back to school to study art at San Francisco State.

[3] See http://greenmuseum.org/generic_content.php?ct_id=285

So yeah, I've had an incredible environment to blossom in, in terms of art. And history too.

Rabkin: When we were preparing the interviews, you mentioned something about both of your grandfathers, on both your mom and your dad's side. Did you want to say something about them?

Keller: Sure. That has more to do with just, who I am, I suppose, than necessarily artwork or science. But my mom's dad, Coy Duke, was—how do I say? He was a really charming, loving man. He actually stood in for Clark Gable. My mom was born in Hollywood and they lived there. And he looked like Clark Gable, so there were times when he would do the stand-in when, I guess, Mr. Gable was too busy over here—(laughs) Needless to say, my grandfather was a handsome man. He also loved to fish, so he would take my sister and I fishing. And he'd say, "All right now, you boys, this is how you put the worm on—"

Rabkin: (laughter) He'd say that to you and your sister!

Keller: He called us boys. And it actually, to us, it was a real term of endearment. There wasn't any way to take it wrong from him. Growing up in the early sixties, girls weren't—you know, my dad didn't take us out in the backyard and show us how to throw a softball or anything. So, to have a grandfather who would take us fishing and do the things you do with boys was really exciting to us. My dad did a lot of other great things that most dads didn't do with their girls. But that was really wonderful about my grandfather on my mom's side.

And my grandfather on my dad's side, Buford Haven Wardrip, was just the most remarkable Renaissance man. I think he was a bit difficult as a father, a bit strict and demanding. But as a grandfather, he had mellowed. And I actually think it improved my dad's relationship with his own father to see his dad have a relationship with his granddaughter, me. There were a lot of grandchildren—and I don't know what possessed me, but my grandfather was always working in his woodshop. And I just went in there one day. And all the grandkids were a little bit tentative about Grandpa—he was a little bit like this head of the family kind of figure, revered and distant, and maybe people were a little afraid of him. But I just thought—I don't know—I went in there one day to his workshop. And he was surprised and he got me some wood to sand or something (laughs). And then we started making projects together. We started building toys together. I would paint pictures on Masonite and he taught me how to cut them up on the jigsaw. He taught me how to use the power tools.

Rabkin: How old were you?

Keller: I was probably eight years old when that first happened. And so—and I've made him sound like a woodworker, but he was actually a physician. He was a specialist of diseases of the chest. He ran the Alum Rock Sanatorium in San Jose, in the hills of San Jose, when my dad was growing up, and then moved into the valley of San Jose to be a physician of diseases of the chest. So that was his profession. But he was also an avid, excellent photographer. He had his own darkroom. He did his own woodworking. He built us kites, as grandkids. He also was very well read. And he built a house. He decided, wouldn't it be great to find a piece of property and build a house that the family could all be a part of? And he ended up doing that. He and his father, my great-grandfather, went to the Central Coast, over by Pescadero. At that time, you

didn't go over Highway 92. There were dirt roads further south that they traveled over, which would have come out around where Gazos Creek, near Butano State Park, is now. They bought a tract of land in a canyon that about ninety families got together and bought. And that house is still in our family and it's become our center point for the whole family. So, he did that too. He also sailed a boat. I mean, I don't know how he managed to do all these things—I look at the age that I am now and think about what he had done by the point that he was as old as I am now, and it just blows my mind. (laughs) So my dad's dad was a big figure in my life.

Rabkin: When did he build the house?

Keller: The house, now here's the thing—I'm going to do this without meaning to, but when you talk about the state park, most people say "Bu-TAH-no." But if you live in the canyon that my grandfather bought land in, they say "BYOO-tano." Those are the same thing, but I'm just going to say it different ways because it's so natural if you are a local you call it BYOO-tano. So, the cabin at Butano was built around 1940. And it was quite a project.[4] My dad and his brothers—my dad is Kenneth Buford Wardrip—he was conscripted at the tender age of fifteen (laughs) to help build this house. So, my grandfather worked them all morning; they got a half an hour for lunch, during which my dad would run up the canyon and dive in the waterfall at the creek to just take a break and cool off, run back, and then continue being a construction worker in the employ (laughs) of my grandfather.

[4] Keller provided the following footnote during the editing process: "My great grandfather, Herbert Haven Wardrip, drew up the plans for the house. He and my great grandmother, Eva Alzora Crews, lived in the canyon during the time that the three generations of our family worked together on construction. Of course, my beloved paternal grandmother, Elma Jeanette Gibbs, also contributed materially to the effort—providing love, warmth, humor, sustenance, and all the things a body could need to flourish—just as she later did for her fortunate grandchildren."

So, they built that house together. They built the house and then they built a woodshop, because of course, my grandfather couldn't have a house without a woodshop. And then he also built a giant swing, which is just a testimony to my grandfather, to have been standing in the forest and noticed: this hill and that open space, and the curve of that very, very tall fir tree, and if you got someone—well, he got someone from the phone company to climb up that tree with spikes and attach a chain. It must be—oh, I'm really bad at guessing distances—but maybe 150 feet. It's way, way up there. And then the chain and the cable, very secure, come down to this swing that you pull up onto a platform that Grandpa built. And when you get on that swing, the trajectory is so far, and the arc, that chain is so long that you almost don't feel the curve as you go out on this swing. It's almost just a straight ride through the redwood trees, which has always been a delight of that house and something that guests are always amazed and excited to try out. Or, they don't want to get on it at all. (laughs)

Rabkin: You mentioned that back when your grandfather was building the house, people didn't cross over to the coast on Highway 92. Is that because 92 had not yet been built?

Keller: I believe it had not yet been built, but I'm not sure. Because I think they would have taken that. It would have been a much easier route. But at the time it was a dirt route that was further south.

Rabkin: So, you talked about doing projects alongside your grandfather and learning a lot of skills in the process. Did you do similar kinds of things with your parents?

Keller: Definitely. Yeah. My dad was very into model airplanes, the ones that are radio-controlled, which I hated. I hated those planes. I don't like the noise they made. I didn't

like that we had to go out on weekends and sit on the hot tarmac in the desert with nothing to do, while Dad flew these planes that reeked of the kind of fuel that went into the little planes. So, I wasn't really keen on that.

But my dad, like his father, turned the garage into this amazing workshop. So, if you wanted to create something there was the balsawood; there was the sandpaper; there were the loving hands and guidance to help you figure out what you wanted to do. And I think I have a definite MacGyver kind of streak, of loving to figure something out. I really think it came from my grandfather and my dad, the delight of just staring at something and trying to figure it out. You know, my friends tease me because I'll buy a backpack, a piece of outdoor gear, and they say, "Are you going to modify it?" And I say, "Oh, definitely. Every piece of gear needs to be modified. Why didn't they put a clip here?" (laughs) So I can't help looking at something and thinking, oh, you know, if you just drilled something here, wouldn't that be better? It's either genetic—I don't know if it's nature or nature. But that was really fun with my dad. And my mom—I already described how she was always doing art projects.

I wanted to mention the other things that my mom taught us by example, which I realize are so much a part of me, that I really cherish. And it's that she was always pointing things out to us. We'd be somewhere and she'd say, "Look at that color! Look at the light on these leaves. Look!" We would even be in a department store and she'd say, "Okay, girls. Look at this blue. What do you think is the same color at home?" I don't know if she was doing it consciously, but she was training us, or just allowing us to follow in her own mental process of looking at color and trying to remember it. And we would literally end up having the purchased scarf at home and we'd see who got

closest: "Oh, yeah, it's the thing on the mantelpiece. You remembered it the best." So even memorizing color became really natural.

And looking at paintings—well, this was also something that we did with my mom's mom, Helen Duke, my grandmother, a lot—we would sit down with paintings that were in progress and my grandmother and my mom would say, "Well, what do you think? What do you girls think?" And I'd say, "Well, I don't know, I think the orange here is a little strong as a reflective color. Or that cast shadow doesn't seem like it should be that dark because when the building gets that high, then the shadow would become more diffuse over there." So, these were things we were talking about as long as I can remember, talking about artwork—

Rabkin: So, in your single digits—seven, eight, nine?

Keller: Oh, yeah. What a compliment to us as little kids, to have our elders ask us our opinion, to be asked to think out loud. And another thing my mom did was she would play music—there was a lot of music in our house. Even though no one played an instrument, we were always listening to something. She'd say, "Oh, wait! Here. Listen to this." And there would be a riff, or a part of the music that she really loved. She'd quiet us all down and say, "Listen to this." And we'd all stop and listen. She taught us to—I don't know—revel in music, and appreciate it in all of its individual patterns and different artists that she loved. She'd bring a new album home and we would play it over and over and over. So, I think, wow, she really taught me to look at things, to listen to things.

Another thing that I realize I got from my mom is, we always had pets, a whole parade of animals. And she would put her hand on the head of the dog and be petting the dog

in this loving way, and she'd look up and say, "Don't you know? When you put your hands on an animal it just changes everything. Doesn't this calm come over you?" I took it for granted that that's the relationship that one could have with another species.

And I feel like my relationship with the pets that we had growing up changed my life. They felt practically like siblings. I don't mean that in that we were reduced to the level of the pets, as the kids. (laughs) Mainly that the pets were elevated. I believe that it's really important to have a relationship with another species, to see the world through different eyes. It's like going to another country. You find those really deep similarities and these interesting differences.

I think of this story of—we had a dog named Tog. He was an Afghan, the dogs with the really long hair. But we lived in the mountains, so we shaved the dog because that long hair would be really impractical. So, this was a polar bear of a dog—this pale fur, black nose. It was really adorable. But he had naturally long hair and oftentimes when they cut his hair they'd leave the top shag on the top of his head, and just leave it that way, because that's what the dog was used to and that was what the dog was looking out of all the time. Well, one time he came back from his trim and they had trimmed that hair on the top of his head. And we kids saw the dog looking so different and we laughed. We laughed at him! And the dog went and hid behind the couch. I thought, Oh! He's embarrassed. And we said, "Oh, no. Come back!" And we gave him a lot of love and he cheered right up and got used to it. But to see another animal be embarrassed, that was a lesson in compassion for a kid.

In the mountains where we lived at the time, there was no leash law. Anyway, our dogs would go out on their errands in the morning. They'd have their friends. They'd come

and go. They had their dog stuff that they were doing. It gave me a different way of looking at the world and appreciating differences, with animals themselves as other nations, as Henry Beston would put it.[5] That meant a lot to me. We had cats. We had dogs. We had birds. I had a pet chipmunk.

Rabkin: How did that happen?

Keller: I suppose it was probably bought at a local pet store, but I loved my little chipmunk. We had mice and rats and eventually an iguana. I don't know, it was quite the parade. It was really fun.

Rabkin: So, you mentioned that you were living in the mountains. Tell me more about that.

Keller: So, I was born in Redlands, which is in the valley, in Southern California, with the great San Bernardino Mountains rising to the north. My dad and mom got divorced when I was six. And my mom remarried Harlan Matheson, which is where she got the name Matheson. He had a house up in Running Springs. So, when I was six, we moved up to the San Bernardino Mountains, Running Springs. I'm trying to think what—I guess I hadn't gone camping yet with my dad, at that age. And partly, I'm sure due to my mom pointing it out to us—we just fell in love, *fell in love* with the mountains, the Steller's Jays, and the pine trees, and the way the air smelled in the morning. Our first

[5] Keller provided the following quote during the editing process: "We need another and a wiser and perhaps a more mystical concept of animals. Remote from universal nature, and living by complicated artifice, man in civilization surveys the creature through the glass of his knowledge and sees thereby a feather magnified and the whole image in distortion. We patronize them for their incompleteness, for their tragic fate of having taken form so far below ourselves. And therein we err, and greatly err. For the animal shall not be measured by man. In a world older and more complete than ours they moved finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth."—Henry Beston, *The Outermost House*

winter there we got a three-foot snow, which is a fair amount of snow, more than people tend to think would happen in the mountains in Southern California. And we built forts. We built snow forts with tunnels and we just thought it was fantastic. I had a childhood where—I mean my mom didn't really want us to do this, but we'd do it anyway. I'd wake up on a Saturday morning, pull on my sweatshirt and jeans and just go out in the forest, a long way from home, further than I would want my six-year-old to go. (laughs) We were way out there! Up creeks and—

Rabkin: So, you had undeveloped land around where you lived.

Keller: Yeah. And we had our dogs with us. We'd build forts and we'd try to make bows and arrows, which were totally ineffective, of course. But we'd put the veneer of fantasy on top of it, and it was wonderful. We were forest kids. We even built forts out of pine needles, in the summer. They were like domes. You could go in them. What else is on the agenda when you're a kid, but to make a teepee, or a fort, or a snow cave? We had a great time there. I think it really had a lot to do with my love of nature, moving up to the mountains.

First Trip to the Sierra Nevada

Rabkin: Well, that might be a good segue to talking about the trip that your dad took you and your sister on when you were, was it eight?

Keller: Yeah.

Rabkin: Tell me about that.

Keller: Okay, so my dad was introduced to backpacking when he was in his early teens, by his grandfather and father. They took a mule team up into the Sierra. But my dad got into the backpacking thing. So, when I was eight years old and my sister was ten, he decided to take us over Bishop Pass into the Dusy Basin of the Sierra Nevada, on the East side. I just think it was a really remarkable thing for a dad to do because that's a serious hike. I asked him about it later. I said, "Dad, what were you thinking?" And he said, 'I just was open to anything. I thought we might get out of the car and walk to the first lake and you guys would be entertained and say you were tired and we'd set up a tent and we'd spend our days there." But my sister and I were really gung-ho. And also, there was, at least for me, a certain amount of wanting to be like Dad. So, I was like, "No, I want to go up to the pass." And so, we actually did go all the way over the pass and down into Dusy Basin that first day. We kids had our little backpacks. It was an eight-day trip. My dad must have been carrying a 100-pound pack. I don't know how he did it. Because we had our little packs which, I don't know, had our clothes and in my case, my little teddy bear. (laughs) We each had a book to read and some toys. We did not have packs that were commensurate with what we all three needed. But my dad carried the load.

Rabkin: So, he was carrying your sleeping bags—

Keller: I bet he was.

Rabkin: And all your food.

Keller: All the food. Of course, it was all totally freeze-dried. But how else would you do it? He had all that stuff. Nevertheless, when we were, probably two-thirds of the way up the pass, I was wiped out. But we couldn't stop there and I didn't want to. But

we stopped to rest. And I happened to sit down on the outer edge of the trail. My dad was on the mountain side of the trail, where we sat on some rocks. Fortunately, he was watching me at that moment because there was quite a drop off, and I sat down and I fell asleep. I just went (closes eyes and leans backwards). My eyes closed and I started to fall backwards off the trail. And I woke up to him grabbing me—

Rabkin: Oh, Jenny!

Keller: —by the straps of my backpack, which I was still wearing.

Rabkin: Oh!

Keller: And him looking really afraid in my face. And he said, "You sit over here." And he put me down on the inside of the trail. So, we bravely made it up to the top of Bishop Pass and when we got to the top I thought, oh! I did it. I did it. Then my dad said, "So, we're going to go right down that trail and we're going to make a camp over there." And I started to cry. I said, "You mean we're not done?" (laughs) He was so sweet, he said, "No, we can't camp here." So, we went a little way down, and my sister and my dad left me on a rock because I couldn't go any further. I just kept falling asleep and stumbling. So they went and made a camp and they came and got me. My dad put me in my sleeping bag and he made—I still remember what he made for dinner—it was a freeze-dried concoction of green peas, chicken squares, carrot pieces, and sort of this white sauce. (laughs) It was on a plate. He had put me in my sleeping bag and he said, "Here, eat something." And he turned his back and I had fallen asleep, in the food. He wiped me off, tried again, and it happened again. Finally, he said, "You just sleep. I'll feed you in the morning."

Rabkin: (laughs)

Keller: And then the next day we were raring to go. We had the best time. It was a wonderland. Of course, at that time you could drink out of any stream in the Sierra. And those moss-covered creeks. I remember lying on the moss and staring into the water of the creek rushing by. I don't know how many hours I did that on that trip. We also hiked around.

We cried the day he said we had to go home. We said, "No, Dad. Let's stay." And he said, "Well, we're out of food. You kind of have to go home at some point." (laughs) But we were hooked.

And so, we went on backpacking trips for the rest of our childhoods together, and adulthoods. That trip changed our lives. We had it. We had that Sierra high, montane, granite wilderness bug. That shaped both of us, definitely.

Rabkin: Did you take art supplies on that first backpack?

Keller: Oh, yeah. We did. (laughs) Yeah. We always had art supplies. We had little tablets of paper, some pencils, some colored pencils. And my sister—so I said I took my teddy bear. My teddy bear was actually about five inches tall, had little arms that moved and a head that swiveled, and was fuzz-covered and really adorable. My sister decided to draw the adventures of my bear in the mountains, while we were there. And she made a little book. She had him wearing his little cap and then she had him paddling with one of our camp spoons, in one of our drinking cups, in one of the little creeks. Of course, he couldn't really hold the spoon, but you know—it was a story. I still

have that little book that she made—and the bear—of his adventure on our first trip in the mountains.

Rabkin: Fantastic. Wow.

Keller: Yeah. (laughs)

High School

Rabkin: So, Jenny, when you got to high school, were you, at that point, studying art in school, taking art classes?

Keller: Oh, yeah. Naturally I was. Art was the oasis. I didn't like high school. I didn't like school at all. I did well—I got good grades, but I felt like the (laughs)—it's a funny thing, but I felt like the bells were really insulting. You know, you're doing something. You're into it. And then this bell rings and you're supposed to drop whatever it is you are doing and go somewhere else and do something else. I just found it really irritating. I was really appreciative of two things, though: one was art class; the other was that my mom was one of my art teachers. Not only was that nice because I've always gotten along well with my parents, and she's a great artist and I learned a lot from her, but it also meant that I got a ride to school.

Rabkin: So, she was formally one of your art teachers. She was employed at the high school as an art teacher.

Keller: Yes, she was. So, she had to go to school early, so I always made sure I got PE first period. I would get in the car at our house in my gym clothes. And then I would spend that first hour before class started, running around the track. My dad was a

runner and he'd always take me running with him. So, I would run and then by the time PE started, I thought, okay, I'll do your little tennis thing, or whatever. I didn't really enjoy some of the ball games we had to play. I liked soccer. But anyway. So, then I would do tennis, or whatever it was, and then take my shower and get dressed, and then I had my day, which felt to me like—that makes sense. Why would I want to change my clothes in the middle of the day? I just felt like the whole thing should make more sense.

Then I'd get to art class and that was wonderful. I have brown, straight hair and my mom has curly blond hair. I look more like my dad than I do like my mom. So, my fellow students didn't know that my mom was my mom. But we didn't keep it a secret.

Rabkin: And she had a different last name.

Keller: And she had a different last name, right. And so, I would at some point during some class or other say, "Mom, let's go by the store on the way home." And the other students would say, "Whoa! What did you call her?" (laughs)

Rabkin: (laughs)

Keller: And I'd say, "Oh, this is my mom." And they'd go, "What?" Eventually, it got so that other kids in the class would call my mom, "Mom." Because she's a very nice teacher and very friendly and they thought it was funny. Eventually it got so that even after my sister and I graduated, kids would call my mom, "Mom" in her classes. (laughs)

Rabkin: (laughs) Maybe not even knowing why.

Keller: Maybe not even knowing why. But she *was* one of my art teachers. And actually, that makes me think of something that also resulted from that, that was really pleasant—of course, my mom was a friend and contemporary of my other teachers, my other art teachers, but also some of my other teachers. And because this was her tribe, her group of friends, they felt like friends to me, not in an inappropriate way, as if I thought I was an adult, or that they were fawning, or anything like that. But just—when my mom and her boyfriend would have parties, it would be my teachers that would come to dinner and so on. I think that contributed to my sister and I having a relationship with school that was placed—the responsibility of how we wanted to be with those people, and what kind of student we wanted to be, and what we wanted to learn from school, was placed on our shoulders in, I think, a good way. My mom is a very fun-loving person and she would say sometimes, "Oh, you guys. Why don't you skip school and we'll go to the beach," which is, I suppose, is what every high school student would dream of their mother saying. And my sister and I would either say, "Oh, yeah. Let's." Or we would say, "No Mom, I've got a test today. I think I'd better go." Which my mom was, I think kind of proud to share sometimes with her contemporaries.

Rabkin: Was she proposing to skip her own classes, too?

Keller: She wouldn't do that. That must have been a time when she was a substitute teacher or something, because she was very responsible. But I just remember feeling like my relationship with my teachers was held to account in a very genuine, personal way. And my relationship to my education was the same. In some ways, and I might even complain about this later in things that we talk about, I felt like there was a lack of guidance from my parents. I wish there had been more involvement. But I think the

benefit of it was that, it's your deal. They didn't ever say this but I knew that if I missed the test, I would have to make it up. I would be behind. And that was how life was. So, it was very much given to us and it kind of made you maybe grow up a little bit more than you would have at that point, if you had someone who was minding your business.

Exchange Student in South Africa

But I do think it was a fine line and it could have gone awry because—well, if we talk about South Africa, I can tell you about why I think it could have easily gone awry, but didn't.

Rabkin: Why don't we do that? Let's talk about your time in South Africa. And then when we finish talking about the time before college, we can take a break.

Keller: Okay, great. So, in 1979 I was selected, through their selection process, to be an exchange student through the American Field Service. And I had been told that if you told the organization that you would go anywhere, you had a better chance of being chosen. And I really wanted to go somewhere. My sister, Gail, had gone to Japan for a summer and it had been a really amazing, wonderful experience.

Rabkin: Also through AFS?

Keller: Also through AFS. And I thought, okay, I want to do it and I want to go for a year. So I said, "Send me anywhere." It also seemed very adventurous.

One day my sister and my mom and I went to the post office because there were no mailboxes in the mountains. You go get your mail at the post office. That day there was

a strange package and inside of it was a photograph of a family, and a bunch of paperwork. I said, "Whoa, I think I've been chosen and I think I'm going to South Africa. And I think this is my family!"

And my mom said, "Oh, my gosh." And she naturally—this was 1979. This is only three years after the Soweto riots. My mom said, "Oh, I don't know." I took the papers back out of her hands. I said, "Mom, I'm going." I insisted on going. My mom was fearful, but I did go.

It was really a remarkable experience, as those things always are. I did think, whoa, *I didn't know you even sent people to South Africa*. I didn't even know that was on the list. But I wanted to go. And naturally at that time—and I don't know what they would do at this point in history—but at that time the government would not have let me go stay with a black family. My family was white. They were of Dutch descent. And I went to an Afrikaans school. Afrikaans is a Dutch dialect. And Afrikaner is the name that the people of Dutch descent call themselves in South Africa. I mean, imagine a California girl coming to a school where, not only is the language different, but I have to wear a uniform. And there was a distinct tension in the air between the different races that was palpable to me. I don't know how much it's noticed by the people who are in it from birth, but to anyone who visited that country then, and I'm pretty sure now definitely as well, there is a feeling of tension that I think you don't get away from, because of the history and what's gone on, and what kinds of strife is going on there between different groups of people.

Rabkin: What kinds of contact did you have with black South Africans?

Keller: That's a good question. So, my family—my father was the works manager of the Bloemfontein newspaper "Die Volksblad"—the main newspaper. Bloemfontein is a rather large city in the geographical center of the county. We lived in Bloemfontein, which is a city, but cities there—at least at that time—are made up of a city core and then a tiny bit of outskirts like suburbs, and then absolutely nothing. It's open veld, open land beyond that. It's very concentrated.

So, we lived in the city, but by heritage, my father of my family was a farmer, so he owned a large farm outside of Bloemfontein, in the town called Diepfontein, which means Deep Fountain. It had a deep well in it, a lot of water that was brought up by windmills from the desert. And they had seven hundred sheep on the farm. So, all of that is to answer the question of my contact with native South Africans—on that farm were many black families who had lived there for generations. Also, in town we had a black servant and a black gardener-person. So, I became close with the woman who worked with us in the house in town. We would play and joke together, and once I learned enough Afrikaans to do so, I would ask her questions and things. I also knew the people on the farm a little bit. But there was a definite precedent, or assumption, a desire to kind of keep us separate. I wasn't really so aware of this until, for example, one time when we were visiting on the farm I had brought one of my school friends with me and the black families on the farm said, "Would you like to go on a porcupine hunt with us with the dogs?" I thought, well, I don't really want to kill a porcupine but I'm not going to say no to that. I want to see stuff. So, I said yes.

So, there we are, crashing through the underbrush and scrambling over creeks, with flashlights and the barking dogs. We never got the porcupine, thank goodness. But after that, we ended up at some of the black families' houses. And they built a fire and

played music and we danced. I thought we were having a really great time. And we were. But at one point my friend from school, Jacomine, whispered in my ear, "My mom would disown me if she knew I was dancing with a black man." And I said, "Oh, my gosh. Really?" It just blew my mind because I thought we were just doing what we were doing, but she had this whole other world of concern and history. Well, I don't think she was feeling so prejudiced as not to do it, but she definitely came from that environment. And that was how it was there.

That also circles back to my saying I was given a lot of freedom and responsibility about my life in high school and it worked out well. But in South Africa it was so easy to be bad. You dance with someone and you're really breaching social expectations, if not the law. And in some ways, you could easily break the law. It was like that in so many aspects of life there.

I eventually had a boyfriend there. And one morning he stopped by my house on his motorcycle and picked me up and gave me a ride to school. It was as innocent as that. He pulled up to the side entrance of the school and I said, "Why aren't you going to the front?" and he said, "I think it's better if I drop you off here." I said, "Whatever," I didn't think anything of it. But I was in the headmistress's office by 11:00 am. Someone saw me. That got around the school like wildfire. And she took me in to her office and said, "What were you doing on the back of a motorcycle with a boy, in your uniform no less. You have to realize that you represent our school when you wear that uniform. And this is *not* proper behavior." And I'm thinking, what? What is it? Is it because I'm wearing a dress and it's a guy? What did you think? I was so astonished. I thought, wow, it's that easy to be bad.

There were other little things, like there's a button on the top of the uniform and it's a dress. So, when you sit down it kind of pulls across the back and—

Rabkin: It chokes you.

Keller: Yes. So I would undo the top button. And my girlfriends would say, "Oh, Jenny. (whispering voice) You've got to—" They'd gesture and say, "You've got to button that button." And I'd say, "I can't! It's choking me." And I wouldn't do it. (laughs)

These little things, I don't know, maybe it's a youngest child thing or something, it just sparked in me a sense of rebellion and it made me want to do— I felt this energy in me that I had never felt before of like, ooh, you know! It's like stirring up an anthill. It was so easy to ruffle feathers and so easy to do it inadvertently that it almost made me feel like I was being bad, so I might as well own it. And I didn't do anything really bad. Okay, I did drive a car and I wasn't supposed to do that. That went under the radar. But there was a little of that rebelliousness that I had never encountered in myself before.

But actually, in addition to observing and learning so much about what was going on with the political situation there and all I could say about that, the thing I think that was most remarkable as an individual in going to another country at that young age is that it struck me really early on that these people don't know anything about me except what I show them. Who I am depends on who I am from this moment forward. They don't have all of those assumptions about my goodness, or my badness, or my abilities, or anything. And not only that, I'm not speaking the language. I mean, I sound like a two-year-old.

So, I just think it's a really remarkable thing to put people in positions where they are able to reinvent themselves. I feel like that has influenced me in so many ways in the rest of my life—to not only think about doing that myself, but to try to give that to other people, like my students, like my partner, to try and recognize when they're trying to grow and let them do it, not remind them of something that happened in the past. I mean, I'm not perfect at that at all. But just to think about what do you learn from—

Oh, you will remember this, Sarah, because we were there together. I always think of this little saying and I don't know who to attribute it to, but it was on a little plaque on the table at the Four Corners School of Outdoor Education in Monticello, Utah. And it said, "Flowers bloom where there is room. This is true of people too." I just find that to be the most charming and soulful saying because things do bloom where there is room and you need to give things room. That experience of going to South Africa gave me room to decide who I wanted to be. You come back a different person. And you can keep doing that throughout your life, which is a really amazing thing.

Rabkin: Thank you. Was there anything else that happened before you got to college that influenced you in terms of your relationship with either art or natural science, natural history, that you'd like to talk about?

Keller: Hmm. I always wished I had taken biology in high school but I ended up, just by the luck of the draw, getting into chemistry instead. There was a choice of either/or. And it was interesting to me, but I think biology would have been a better fit, as a science. But there was one thing—yeah—that really (laughs) a surprisingly powerful influence that was a single image (oh, wait, that also makes me think of my art teacher in South Africa. There are so many things to say about that experience. And I'm not

even getting into the political stuff, which would be really nice to touch on.) But the image that I'm referring to was John James Audubon's Gyrfalcon, which is from his portfolio of the *Birds of America*, all these different birds painted life-size and printed on these big pieces of paper. And this particular one—the Gyrfalcon is a pale bird, a white-ish bird with beautiful dark markings sprinkled over it. And in this drawing, in this painting, there's one that's swooping down and one that's looking up that has its wing raised, so you can kind of see the underside and the top of the bird in this painting.

Rabkin: It is literally life-sized?

Keller: Yeah, that's why Audubon's birds are so weirdly contorted in that publication. He got the biggest paper that was available at the time, but then he had to fit a flamingo on it. So, the neck is kind of S-shaped and twined up. He was trying to do them life-sized but then some of the birds were really big for the paper.

Rabkin: Was he painting from dead specimens that he had shot?

Keller: Absolutely. Yeah. In some of my lectures I've been known to say that it's ironic that the Audubon Society is called that because Audubon went out and shot everything. And he shot multiple specimens for each image because there was no refrigeration and he would have to get a fresh specimen. I'm sure it seemed like there was just an untold abundance that would never end, but of course we know that is not the case. So, he did. He would shoot them and he would run wires through their limbs, so that he could then bend them into position and have them stay in that position. Then he put them against a gridded background and he would do their outlines and their details, from those birds that he killed.

But his Gyrfalcon—this painting influenced me because it's just so beautiful—that shading on the light and dark of those under-feathers. I was enchanted and I copied it feather for feather. I felt like it was what made me want to draw natural history subjects.

Another thing that made me want to draw natural history subjects was, when I was in Africa my art teacher did two amazing things. One of them was that she would not let us use anything but primary colors plus white and black. Forever, not simply as an exercise but all year. So, I learned to mix colors without even thinking. There was no choice.

Rabkin: Wow.

Keller: It taught all of us that. And I've always thought, I wish I would be brave enough to make my students do that, or have a situation in which I could make them do that for a year. Because it's just like no other kind of education you can get because that repetition and that knowledge gets in your hand and eye.

Rabkin: Did you learn to get every color you needed just from black, white, and primaries?

Keller: Yeah, pretty much. Although the primaries—we had junky paint. It was tempura and the red was not perfect. So, you couldn't get perfect purples, but they did pretty well. And with a good kind of Quinacridone-esque process red you can do pretty much everything. You have to choose your colors carefully. It wasn't perfect with the materials we had, but it sure taught us a lot.

The other thing that my art teacher in South Africa did was—oh, gosh, she took us on trips to wildlife preserves—went through the Kruger National Park and all kinds of things. But somehow, she knew I was interested in animals and she got me this gig at a local natural history museum. And they let me into the back room of the museum. It was like Night at the Museum, you know? There were rooms full of springboks and gemsboks, and all these different kinds of African mounted animals. It was the cabinet of curiosities, but it was the *warehouse* of curiosities. And they just let me roam. Day after day I would go in there by myself. No one else was back there and I would just dig through things and draw stuff. At about four o'clock, the curator would come in with a tray of tea. And we'd sit and have tea, sitting amongst all the stuffed animals, and chat. And then he'd leave and I'd go back to my drawing. And that was my paradise, was the museum.

Rabkin: You called this a gig. Did you have job responsibilities?

Keller: (laughs) I shouldn't have called it a gig because it wasn't really a job, but it was an assignment. It was me completing art assignments by using the natural history museum and all of its contents as my subject material.

Rabkin: I see. What a dream.

Keller: It was. It was. I had never realized how much into this I was my whole life. I thought things kind of got underway later, but it kind of was there that early on.

Rabkin: Would that be a good place to stop for now?

Keller: Mm, hmm.

More Early History

Rabkin: So, Jenny, you have a couple more stories about high school art teachers before we move on to college?

Keller: Yeah, I was thinking about Pam Herlitz, who was one of my art teachers. And the experience I'm thinking of was—she had given us an assignment to paint something realistically. And like we all did at the time, and maybe this still happens in high school art classes, I chose a page from *National Geographic*. It was a leopard on a rock with some foliage behind it. I was really excited to paint it because, of course, it was a gorgeous photograph. And off I went. I did the animal and I did the rock and everything was going great. And then came the foliage. Foliage is kind of hard. It can be complex, but random, but ordered, but abstract. I was really floundering. I had gotten a section kind of where I wanted it and I went up to her and I said, "How do you do this?" And she said, "Like that," and she pointed to the part where I also thought it looked kind of okay. I said, "But I don't know how I did that. Just tell me how you do it. Like, what steps do you do?" And she said, "You do it like you did that." And she handed my process back to me. I think it was actually better than if she had said, "Well, this layer, then this layer, then this layer." I said, "But that's really hard." And she said, "Yeah, that's how you do it." So, she was both saying, "Your intuition will suffice," and she was also saying, "Yeah, it's hard and that's how this is. When you're doing it right, sometimes it's hard." And I felt like that was a really good art lesson for me, that when it's going easy, that's great. It's easy. And when it's going hard, that can also be right, even if maybe it's a struggle. You're either going to learn something from it, or maybe you're going to achieve what you are aiming for. So that was a wonderful lesson from Pam Herlitz.

Another high school teacher that I loved dearly was Bill Dickson. Mr. Dickson was my English teacher. And he thought it was deplorable that we in high school were as bad at spelling as we were. He thought, "You should have learned this by now. You guys should be better at this." He said, "I'm going to give you regular spelling tests." We just dutifully went along with it, of course, because that's what the class was. But I was already a good speller. I knew all the words, and so for me it was just an exercise in writing down words. And he said, Mr. Dickson said once to me—I don't remember how he alluded to it, but he allowed that it was a little bit boring grading the spelling tests. And I thought, oh, okay.

Rabkin: (laughs)

Keller: So, I decided I would try and illustrate them while the test was going on, so that in the space of the amount of time that he would ask each word I would do a little drawing beside the word that would be some funny illustration of the word. And one time he even asked us to spell the word *disappear* and I just put a little cloud and I wrote, "Poof," and I didn't spell the word and he didn't mark it wrong. (laughs)

Rabkin: (laughs)

Keller: He just loved getting them. He said he would look forward in the stack at the names on the corners and say, "Oh, here comes Jenny's. This is going to be so fun!" Well, one day I was too tired. And I just wrote down the words. The day that he handed that test back to me he looked at me and he said, "How could you do this to me?" (laughter) "I'm looking for it. Here it comes; here it comes. And there's just a *spelling test* there!" I said, "It will never happen again." (laughter) And I felt like that—it can't have been the first thing that taught me this—my mom and my grandmother definitely

taught me this too—but you know, injecting humor in places where there is a bit of tedium, or fear, or something can really help get you through, help get each other through.

Can I tell one story about my mom and grandma?

Rabkin: Sure.

Keller: My grandmother got surgery on her knee and there was some recovery time, naturally. And my mom had gotten in the driver's seat of the car; my sister and I were in the back; and then my grandmother was getting in the front passenger's seat. It was her right knee. So, she got her left side in the car. And then she's trying to get her right leg in the car. And she's having to grab it and pull it in and everything. And my sister and I were sitting in the back seat, kind of silent, like oh, poor Grandma. This is going to be so awful for her. It hurts and she's had to have this surgery, and she must be embarrassed, and we're all waiting. Well, we kind of took on this "oh-oh" kind of attitude. But my mother looks over at my grandmother and says, "Oh, Mother. Get that bum leg in the car and let's go!" (laughter) And we all started laughing. My grandmother was laughing so hard that she couldn't get her leg in the car after that. She just sat there with one leg in the street and her forehead against the dashboard, laughing. And I thought, wow, there you have it. Look at these two. That was said with such love, it allowed us all to laugh and take our time and make light of a situation that was painful and difficult, but it made us feel more in it together. I thought it was a really wonderful lesson.

Coming to UC Santa Cruz as a Student

Rabkin: Mm. Well, shall we move on to UCSC? Tell me about how you learned of the existence of UCSC and how you decided to go there.

Keller: That's such an embarrassing answer. Well, I learned about UCSC—this isn't the embarrassing part—I learned about UCSC from a good high school friend whose older brother went there. He described it and she ended up going there to visit her brother, and she described it and I thought, well, that sounds great. So, my friend Soni is how I learned about UCSC.

I chose UCSC because of a combination of redwood trees and lack of guidance. I wanted to come to UCSC because it was a beautiful forest. And having had that whole experience of my family's cabin in the redwoods, and knowing how much I loved that environment—and being in California, also because of tuition, but loving California. I picked it because I thought it was beautiful. (laughs) And that's the truth.

I really wish that my parents had said, "You know, you're the valedictorian. You could probably pick from a lot of different schools. You should check some things out, and we should go visit, and you should apply at more than one place." I didn't. I picked UCSC and I went there. I'm not sorry. It worked out wonderfully well for me.

But I look back on that and I think, what were they thinking? *Were* they thinking? Why would you let your— I was seventeen when I was applying to college. Would you let your seventeen-year-old—wouldn't you even want to mention that maybe you should look into things a little bit more? But I'm sure if my mom were here she'd say, "Well, you seemed so sure. That's what you wanted to do so we let you do it."

Rabkin: In their case, it wasn't for lack of education on their parts, since your dad was a rocket scientist and your mom was a high school teacher.

Keller: Yeah. Both of them college graduates. Yeah, so I don't know. They just let me do my thing and I did. And that's why I went to UCSC.

Rabkin: Tell me about your early impressions of the campus and some of your first experiences there.

Keller: Well, it was as beautiful as I thought. I really loved getting up early and walking to class in the morning and getting to see wildlife while I did so. I lived at Oakes College, which, if you've ever seen it, has spectacular views of the bay and the forest, depending on which way you're facing. And I made friends with our resident assistant family—well, they make friends with everybody. Janice was a runner and I was a runner, so we ended up running on the fire trails above the UCSC campus at 6:00 a.m. every morning, just about every morning. So, I got to know the campus in a natural history sort of way right off the bat and really, really appreciated it in that sense.

I didn't know what my major was going to be, but I just started taking art classes. And imagine my delight when I finally had gotten to a place where I could choose the classes I wanted. If I worked at it pretty hard, I could get into most of the ones that I wanted. And there were no bells. (laughs) I mean, classes stopped and started, but it just felt so much more human to me. And I was kind of irresponsible, in that I just took the classes I wanted. I did that for years. I did that for two years until I thought, whoa, I don't really know if I've got anything that constitutes a major happening here. Because what I was taking was art, art history, biology, chemistry—I just kept taking art classes and I kept taking science classes. And I thought, that looks good to me. I want to know

about astronomy; I want to know about biology; I want to know more about chemistry; I like sculpture. This would be great. Painting—of course! Drawing, yeah. And art history—love that. And so, I just kept doing those things through my first two years.

Rabkin: Were there general education or breadth requirements you were expected to fulfill?

Keller: Yeah, those were mixed in too because at UCSC each college—at least at the time, I don't know how they do it now—but the college had breadth requirements. And so, I was taking things of that sort. And there were some really interesting politically oriented classes, some of them having to do with southern Africa, so I got to do some of that. Oakes College was a really good environment for that. I think Oakes could have done better at helping groups of people from different races and backgrounds not only be recognized for who they were, but also to integrate. I felt like who we were was recognized well, but the integration wasn't really facilitated as well as it could have been, and we were kind of left to our own devices to do that, which worked well sometimes and not other times. Not for me personally, but you'd see a lot of things going on.

So, I had a good mix of those sorts of classes too. I took some math. I've never been—math, numbers—to me—they're a thing. I can't remember numbers. They're like smoke to me. They're very present and then they drift away. I can understand patterns in math, like the combination to our garage door opener. I had it in seconds and my husband said, "How did you remember that?" And I said, "Well, you take the first number and then you subtract one and then you subtract two and then you subtract three. And that's our combination." And he said, "Oh, you're right!" For me, those

things stand out. But the numbers themselves could be anything. So, I also took beginning math classes, at least one was one of my early classes at UCSC.

Rabkin: I remember you once telling me that the way you remembered my phone number had to do with associations between the numbers and colors.

Keller: Oh, yeah. I do have a little bit of synesthesia, which I have fun comparing with other people who have the same thing. If someone says they have color associations with numbers I say, "Okay, so: two." And if they say something other than yellow, I think, no! (laughter) Eight is purple, absolutely. Nine is gray. So yeah, I can remember numbers if I line up the colors. Or, I also studied American Sign Language for three years, so if I sign the numbers to myself and watch what that looks like, that helps me remember numbers a little bit. I think I could do anything if I put my mind to it. But my mind doesn't naturally go in a numbers direction. It wants to scamper and play other places. And so, I don't make it a priority, even though it's inconvenient and I wish I would sometimes.

Rabkin: So, you didn't do a lot of math study.

Keller: No. No. Fortunately though, when I got in a bad bike accident a few years ago and I was dragged off the road and came to, I remembered my husband's cell phone number without any trouble, even though you usually do it by just hitting a button. At least I knew that number, which for most people would not be such a proud moment, but I was very pleased to be able to call my husband at that moment. So, I can do it if I really try.

Studying Art at UC Santa Cruz

Rabkin: So, tell me a little bit about the art classes you were taking.

Keller: I took painting from Bob Chiarito, which I loved. He did some boring things, but it's good sometimes to be left with a task and just have to work your way through it. So, a lot of still lifes.

But he did also some interesting things—I don't know why I didn't suspect what he was up to when he gave us the assignment of bringing a mirror to our next class. But we all did and then he said, "Okay, you're all set up. Okay, I want you to paint yourself, your face," and he looks at his watch. "And I'll be back in half an hour. I want it done." And he left the room. We all went, "Uh, oh," and were madly squishing tubes of paint. At the time I had good eyesight, but I could also unfocus my eyes intentionally, not like squinting, but I just knew how to cross them slightly. I don't need to do that now (laughs) but I did that for the entire painting. I thought, this is going to be easier if I don't fuss the details. I just painted this blurry image and at the very end I focused and put a few little accents on. I still have this painting of myself at nineteen, or eighteen, whatever I was. It ended up being a really good painting, I mean, of a person. It looked kind of like me. But I was pleased that it wasn't self-conscious. It's really easy to be very self-conscious when you're struggling with a human face. It's easy to get the proportions wrong. But I didn't do that because I had taken away the detail. It was a great lesson because he had us cut to the chase by giving us such a ridiculous time limit. I happened to screen out the detail because I could. And that was another part of the lesson for me. In that class I also learned to love oil painting, which I actually departed

from for a good many years, and then have come back to in recent years, and have been really happy to do that. That was a good class.

I also got to take a class from Jasper Rose, who is one of the founding professors of UCSC. I believe I got in on the tail end of his tenure there, but oh, what a wonderful opportunity that was. He was the most—I mean everyone who took a class from him, like his art history classes, will remember his amazing flamboyance and brilliant storytelling, his British accent, and his drama. He walked with a cane, so he'd walk in with a limp, but then he'd use that cane during his lectures to crack the cane down on the table, and draw your attention to this and that. (laughs) It was a performance, in a way, although he wasn't full of himself at all. He just happened to be very enthusiastic about his subject matter. So, taking art history from him was wonderful. There was never a moment where you fell asleep. Even in the dark, back rows of Classroom Unit II, you were glued to everything that Jasper was saying.

I also got the opportunity to take a drawing class with him, which was just me and nineteen other people or so, maybe even smaller than that. One time he assigned us what he thought was a terribly difficult, almost cruel assignment. He said, "I know. I know. I'm going to have you guys really address this black and white issue." The issue with black and white is that you can have a really graphic image, or you can struggle to make grays out of black ink by using cross-hatching, or dots, or different kinds of marks to make things look like shades of gray, so that you get a more illuminated kind of form. So, he wanted us to create three-dimensional kinds of forms, but with black ink. And he said, "I'm going to have you guys do this with a *ballpoint pen*." (laughs) He thought that was going to be really hard, but he, I don't think, had actually tried it himself.

We came back with these gorgeous, velvety, nuanced, full-spectrum drawings that surprised all of us because it turns out that a ballpoint pen is actually a very versatile drawing tool. It responds to pressure. And ballpoint pen ink is actually a beautiful velvety black. So, we had these beautiful drawings and he said, "These look like etchings! These are gorgeous. I've learned something here." I felt like we all did. It was remarkable as a student, to have a teacher assign you something and then be visibly surprised at the results, to say that they themselves learned something. That was a model of behavior to me, as a teacher, something I really admired. And also, I don't know if I would have picked up a ballpoint pen, and I've used it ever since. I've done freelance projects with ballpoint pens. The client didn't even know that's what I was using, but it became a technique that I continued to use.

So, there's that thing of—maybe that's something we all do, where you're both in the situation and watching the situation. So, *in* the situation, I was learning this new technique and seeing how everyone did. And watching the situation, I was seeing Jasper respond to it in such a creative, brave, interested way, as a teacher, which I loved.

Rabkin: It sounds as if, even from a young age, you were naturally tuning in to your teachers, not only for what you were learning from them, but also noticing what they did and how they interacted with the students, what worked and didn't work.

Keller: I think so, yeah. Maybe that's from having so many teachers around me as a child—my mom, my mom's friends. Or just being interested in it. Something.

Rabkin: Yeah. So, you've talked to me before about a certain frustration, if I remember right, about attitudes you encountered in UCSC art classes toward representational art. Do you want to talk about that at all?

Keller: Sure. That's true. Funny, I recently re-read some of my narrative evaluations from UCSC.

Rabkin: The ones you received as a student.

Keller: The ones I received as a student. To try to tease apart the order of a couple of things I couldn't remember, which I know we'll come to, because it's relevant. But I read one. It was a printmaking class. Printmaking was another undergraduate class that I really loved. And I worked hard in it. And the teacher recognized that in the evaluation but she did say, "However, her work lacks imagery-development." She used that phrase to critique or criticize what I was doing, because what I was doing was often representational. Not all of my stuff was, but often it was. I just loved those twining roots going into the streambank, and the willow trees rising above it, and the darks and lights of that, and the shading of that, and the detail of that. To me, that was interesting and worthy of a composition. But this teacher really didn't like that.

The art department, in general, would try to steer you away from anything that was too representational because they would say it needs to be *interpreted*. It needs to have your emotion in it. It needs to be trying to make a statement of some sort. And I felt, at the time, and I feel now—and I actually I heard some of the longtime art professors like Jasper Rose and Mary Holmes *say* that you have to be *ready* to say something, and if you don't have something to say with your artwork, something that is compelling you to steer it in directions that are maybe more abstract, or taking realism and altering it in ways that will be meaningful to the viewer—if you don't have something you feel compelled to say—then you are not ready to create non-representational or abstract art. A good example is a cartoon of a political figure that has exaggerated features that

make it look almost "more" like the person than the person does in real life because the artist is making an interpretive statement. To use the words of Hannah Hinchman, you have to learn the discipline first and then take intelligent liberties with it. In the art department at UCSC, I felt that they weren't letting me learn the discipline. And I didn't know what liberties I wanted to take with it yet.

The words that Mary Holmes used to describe this was, "Oh, my gosh, the purple mud that comes out of the art department." What she meant was students would get canvas and paint, and put the paint on the canvas with the brush, and stir it around in confusion until it turned an awful shade of purple. And then they would call that their abstract painting, rather than actually having enough familiarity with the visual world that they could draw on that vocabulary and actually say things with it. You don't have to say realistic things, but if you know how to make something look shiny, or contrasty, or furry, or dramatic, or like it's looming over you, or as if a color advances or recedes, and why—if you learn those things, then you can speak any language with those tools.

I felt like I was put in the lower class, in a way, a lower standard, by some of the art teachers. Not all of them. A number of them were fine to let me do my nature thing with the art, let me pursue realism and revel in that, or take it places. But there was definitely that mood over at the UCSC art department, that representational art is to be scoffed at.

Rabkin: Mm. Do you think that reflected a larger attitude that was just part of the culture at that time?

Keller: Yeah— Well, actually when I said yeah just now, I was thinking of the art department as a whole. I don't know, culturally at the time—I think then and now

illustration has sometimes been seen as more of a mechanical art than a creative art, and that there is a, I think unjustified, but a viewpoint that it is a little bit rote. "Well, you know, you're just taking what *is* and making a picture of it."

There's, of course, a great deal of important interpretation and artistic expression in illustration work, but because it has parameters that have to do with scientific facts and realism, I think that some "fine artists" or fine art professors, instructors, would see that as limiting, and therefore not a good thing. I mean, I tend to think about it as like the channel of a river—it actually intensifies the energy of the water when the channel narrows. To have something to push against concentrates energy. And if those channels open out and the river gets to the plain, that energy dissipates. So, I think it's wrong to look at parameters, or rules, or conventions—something that the client is saying: you can do this but you can't do that; this is what I need, this illustration has to be just so—I don't look at those as a block to creativity, but something that concentrates it. You can aim it. You have to learn to work within it. Sometimes it's not easy to meet all of the demands and still come up with something that you feel is worth looking at. But that's the challenge and that's the excitement.

There is abstraction in that, as well, and you need to learn to read abstraction and speak with it to say real things. I think it was Pablo Picasso who said that art is the lie that tells the truth. And science illustration is definitely the lie that tells the truth.[6] There's a lot to be said about accuracy. We can go into that at some point, if we want.

[6] From a translated interview in 1923: "We all know that art is not truth. Art is a lie that makes us realize truth, at least the truth that is given to us to understand."

Studying Science Illustration at UC Santa Cruz

Rabkin: How about telling me about how you got into science illustration in college.

Keller: Okay, well, this is what I had to look up in my transcript, because I was realizing I couldn't remember what came first, the chicken or the egg. I was a sophomore, not a freshman, like I and others have come to believe. But when I looked it up, I realized I was sophomore when I saw in the catalog an offering of a science illustration course. Even as a sophomore, you couldn't necessarily get into the classes that you wanted. And this one only had about twenty students, so my chances were almost zero. This class was taught by Chris Carothers. And I went to the class and he said, "If you're below a junior, you should just leave." But I didn't. I sat there. And indeed, I didn't get into the class. He had made a waiting list and I wasn't even on the waiting list. But I came to the second class period anyway. I thought, well, if he doesn't notice me, maybe I can learn something before he kicks me out, and maybe I'll get in. But he noticed me and he said, "You need to go." (laughs) And I said, "Are there any spots available? I would really love to be in this class." And he said, "No, you should just go." So, I got up and he said, "Well, okay, just stay the rest of the period."

This was so brave of me, or pushy, I don't know. (laughs) But I just kept coming back. I knew that he worked at a graphics studio on campus. I am so embarrassed to tell this, but I literally went to this place of employment. He was coming out the door and I said, "Chris, please let me in your class. If you do, I promise you I will work harder than anyone in that class." And he said, "Oh, my god! Okay, just come." (laughter) And he finally let me in.

I was true to my word. I made sure of it. I did extra stuff. I worked really hard. I made sure that he was glad he let me in that class. And we did hit it off. That was in the spring of my sophomore year.

The following fall, I did an independent study with Chris. This is where he turned out to be one of my true mentors, because every week he'd give me an assignment and I would dutifully go away and do it. I'd do my best. It was the homework I wanted to do the most. There's no doubt that I really was putting energy and effort into it. We'd meet again the next week and he would look at my work. I'd bring it out and he'd just stare at it, silent. Then he'd kind of screw up his face and then he'd go—(sighs) "All right, well, so. These lines should all be parallel and this is kind of muddy over here. This looks— You need to clean this up. These lines—uh, oh." He would just tear it apart. He would say everything that was wrong. And then he'd say, "Okay, so next week what I want—" And he'd tell me.

And I'd go away and I'd just think, oh! This is so hard. Why don't you say something good? I'd go through the grieving stage and then I'd get mad at him. And then I would get determined and in that determined state I would do my next drawing. And then we'd meet again and he'd do the same thing. Every time. I'm not kidding. There was not a positive comment. We went through nine weeks that way. The quarters are ten weeks long.

And in the tenth week I brought in my drawing. And he does his silent part. He looks at it, and he goes, "*Hmm*." I thought Oh! Oh! You made a noise and it was high-pitched and it meant that you actually approved of something!" (laughing) And that was the sum total of my positive comments from Chris. But I was over the moon. I knew. I

thought, I got you. You like this one. I know you do. He did tell me some pointers on that one, too, but I was so pleased.

The thing is, for all of my description of what that was like, him doing that, he never made me feel bad about it. He didn't say things in a mean way. He always gave his criticism with this implicit assumption of *you'll want to know this*. Here's what you need next. Here's how to do it. It was wonderful. It toughened my skin. It made me so grateful to have someone who was telling it to me straight. It felt like it was 200 percent genuine and also totally openhearted, meaning that he wasn't holding back anything about this knowledge. He was just giving it over. That's a generosity I really admire in a teacher. He was a great teacher for me.

Rabkin: What still surprises and puzzles me a little bit about this story is how you didn't feel completely demoralized. Like I get it about the way he was respecting you and he was implying that he knew that you could do better. And at the same time, that he *never* gave you affirmation for anything—I'm just putting myself in your shoes and thinking, I think I might have started to feel, *wow, I guess I can't do anything right*. But that didn't happen. Do you think that it had to do just with your ability to take that kind of criticism? Or, was there something about the way that he held back affirmation that you knew on some level that what you were doing was worthwhile?

Keller: Well, yeah, I think that it had to do maybe with three things. Very much so, the way he did it. It was collaborative. It wasn't punitive. It was an encouraging kind of criticism, for all that it was pure criticism.

The other thing I think was that I got a lot of positive feedback in other parts of my life. My parents were very big fans and encouraging. My high school teachers. I felt like

what I was doing was pretty good and worthwhile. And the third thing was that I just wanted it *so* much. I knew what it was like to be an artist. I'd seen a lot of adult artists do what they do. My family had presented me with a whole bunch of good models. I knew I wanted it. It's almost like I couldn't stop. It wasn't that I didn't feel discouraged sometimes. I used the word *grief*. (laughs) I'm like, oh, this is just so bad. And then because he told me, I knew exactly what I wanted to do next and how to do it. And then I would do that. And then, he'd give me more pointers.

Rabkin: Hmm. Did you take further independent studies from Chris?

Keller: I thought that I did. But here's the thing—the history is really difficult to piece together. Because John Wilkes, who is the person who started, who invented and created, and was the director of the Science Communication Program at UCSC for so many years, and who started it off with the writing track of the Science Communication Program, and then eventually fulfilled his own dream of adding an illustration track to that, John Wilkes began that endeavor by offering a few classes in science illustration, but he did that by putting his own name as the instructor of record on those classes.[7] It was the only way he could get it through. He said, "No one asked me if I knew how to draw. I just said I was going to teach it." I don't know how you could do this, but then he hired Chris to teach that class, and Chris to be my teacher of my independent study. When I did an independent study in science illustration with Chris, it was actually listed as John Wilkes being the teacher. But I remember because of the evaluations that were written. I remember whose voice I heard them in. I also remember what

[7] See Interviewed and Edited by Sarah Rabkin, *Creating a World-Class Graduate Program on a Unique Campus: An Oral History of John Wilkes, Founder of UCSC's Science Communication Program* (Regional History Project, UCSC Library, 2015) Available in full text at and full audio at https://escholarship.org/uc/item/37p6h827

illustrations I did during that time and that they were commented on. I believe I have accurately teased it apart. I did remember Chris being my first teacher of science illustration. I also remember Chris being hired by John first, before John eventually hired Pieter Folkens.

And that leads into my next class that I took in science illustration, which was taught by Pieter Folkens. I've been trying to remember, when did I meet John Wilkes? And I can't. I can only place it in time in conjunction with that class that I took from Pieter Folkens. So, even though I'd been associated with Chris Carothers, who was hired by John, for three fourths of a year by the time I met Pieter, I hadn't actually met John before that point. Should I go on to talk about that class?

Rabkin: Sure.

Keller: Okay. So, it was very much in demand. It turns out, I think there were close to eighty people who showed up, that wanted to get into a class that was going to admit something like twenty or twenty-five. A whole lot of people wanted in.

Rabkin: Was this a different subject from the focus of Chris's class that you took?

Keller: Well, Chris's class was called *Science Illustration*. And Pieter's class was called *Introduction to Science Illustration*. I don't know why they did it that way. They maybe needed a new name because they wanted to write their own—maybe Pieter wanted to write his own course description? The course descriptions were different. So, I was one of those people trying to get in. And I think that Pieter was ready for this because he had to have a way to screen us. He had to have a way to decide who got in. And he didn't want it to just be your year in school, or your qualifications on paper.

He passed out paper and he said, "I want everybody to draw a mouse." So, we all drew a mouse. And turned them in. And John has told me later that he was with Pieter when he was looking through the mice. They thought that my mouse stood out as a very realistic-looking mouse. But I had had pet mice, and I spent time in the natural history museum, and I drew a lot of animals, so I kind of knew what a mouse looked like. And I had drawn my pets, growing up, too so I know how dogs' legs bend, and that the mouse has a little one and a little fatter. So, I kind of made up a mouse. And fortunately, it got me in the class.

And that was kind of wonderful because I was working at the UCSC Arboretum at the time.

Rabkin: Is this your junior year, at this point?

Keller: Yeah—

Rabkin: You said you had taken Chris's class in your sophomore year—

Keller: Spring of my sophomore year, and then an independent study with him in the fall, and then in the winter, Pieter's class. So that was really good. I got to do good stuff. I had good subject matter from the Arboretum. And by that point, the Arboretum had hired me through the Stanley Smith Scholarship from the United Kingdom to do my work-study work as an artist at the Arboretum. So, the drawings that the Arboretum was having me do were feeding into my education in this science illustration class. I don't know if they were the same illustrations. I don't remember. But it all was very congruent and productive.

Pieter was a difficult instructor, though, because he was unnecessarily harsh, in my opinion, in the way that he would critique people. It wasn't the kind of critique that felt fair and helpful. It felt like the kind of critique that was meant to break people down. And, in fact, Pieter said something to me that I'll never forget because it was rather cruel. He and I were in the parking lot, standing out by our cars—maybe I didn't have a car at that time—but I remember standing next to his car. Anyway, we were having a conversation and it was outside the context of class. And he said, "You just don't know how to be a professional illustrator." I said something like, "Well, that's because I'm still a student and I'm learning." And he actually shook his finger in my face and said, "When you get out there, you are never going to make it. They are going to *eat you up!"* And he shakes his finger in my face and turns on his heel and gets in his car. It was a pretty cruel thing to say to someone. Fortunately, I thought, I am going to prove you wrong. That just doesn't have to be true. And you don't have to be a competitive, angry person to succeed. I just don't feel like you have to do it that way.

So, it was a mixed bag. I learned things from Pieter and I got a good chance to do my thing. But he was kind of like the opposite of Chris. Chris was a very generous teacher. The knowledge he had, he was courageous and generous and brave enough to simply say: "Here it is." But I felt like Pieter was more like: *I want you to know that I know a lot but I'm not really going to tell you everything you need to know because that would mean a threat to me*. I have seen that in teaching, where I think: there's one who is jealous of what they know, and there's another who is open with what they know. And I really want to gravitate toward these open people, as the people who are going to be models for me, in life in general and as people I want to be able to learn from.

Rabkin: Were you already thinking at that point about the possibility that you might do some teaching?

Keller: No way. (laughs) No way. I hadn't thought about that at all. I just didn't think I could— I was very shy and it wouldn't have crossed my mind.

Rabkin: Interesting. And at the same time, part of your mind is absorbing all of this information that later will be really important to you as a teacher.

Keller: Yeah. Yeah. I think I've always been interested in how people tick. I suppose alternate careers for me could have been—well, psychology—well, all sorts of things. Linguistics. All sorts of things. But I've just really—I've felt for people. So, you know, you want to be a compassionate friend, you are watching your friends to see how they're doing. And that's interested me a lot.

Rabkin: Well, thank you, Jenny. I'm thinking that might be a good place to stop for today. Would that work for you?

Keller: Yeah, that sounds great.

Studying Lithography

Rabkin: Okay, good morning, Jenny. This is Sarah Rabkin. I'm with Jenny Keller for our second oral history interview. It's Thursday, June 22, 2017. And Jenny, there were a couple of things I wanted to pick up with from our interview yesterday, before we keep moving forward. One of them had to do with your reference to printmaking, because I know that's one of the things that you studied as an undergrad, doing art classes. And I

understand it's a form that you really fell in love with. Would you like to talk about that?

Keller: Sure. Yeah, I did fall in love with it. I took lithography and intaglio printmaking. Lithography we were doing on real limestone. The stones were three and a half, four inches thick, big heavy things that you had to plane. And they had to be so absolutely flat, so that you could put a level on it and you couldn't tug a piece of paper out from under it anywhere. It had to be absolutely perfect because when you run that thing through the pressure of the printing press, if it's not perfectly flat it will crack the stone. And they're really valuable because those get ground down and used again and again and again and again.

That was a wonderful process because with lithography you can do continuous tone artwork. You can draw on the stone with what feels very much like a black colored-pencil. It's a grease pencil. After you draw, you chemically treat the stone, so that everywhere that you put your pencil mark, or your grease, it wants to attract grease. And everywhere you didn't draw on the stone, it wants to attract water. So then when you're printing it, you wet the stone, fill up all of those areas that want to be wet, and then you roll the greasy ink over it. That pulls ink down into all the areas where you drew your lines. Then you put your paper on it and you run it through the press. And then you've got the thrill—and this was a thrill for me—the thrill of creating multiple originals.

Rabkin: Yes.

Keller: And that's pretty exciting for an artist because, aside from having something printed in a book, you've got your original and then you've got reproductions—well, I

guess books are reproductions too—but the stacks of them are pretty exciting when they come off the press. But this thing of having each one be touched by the hand of the artist and crafted—it takes a while to ink the stone and so on—was really exciting. The look of it is just beautiful because you get these luscious darks and lights, and the paper is of beautiful quality, and with the intaglio process—the etching and so on—again, you have an acid-etched plate, but you get beautiful zones of dark and light.

Rabkin: Would that be on a metal plate, the intaglio process?

Keller: Yeah.

Rabkin: So, this is helping me understand. I never really understood about lithography, but it sounds like you're literally drawing on the surface of this stone.

Keller: Yeah.

Rabkin: You don't carve into the stone, or etch it at all?

Keller: No, not at all.

Rabkin: It's about the grease pencil that you put on it, that then attracts the greasy ink.

Keller: Yeah, the treatment that you do to make the surface of the stone want to attract water or oil. They don't always, or maybe even very commonly, do lithography on stones anymore. It's now done on metal plates. But it's a similar kind of thing, where you cause the surface to attract water or grease. And so, that's lithography.

And then intaglio includes the etched plates. There are different ways to etch them. You are always putting it in acid but there are different ways to cover up the plate, so that it etches more or less. And I just fell in love with it.

However, the printmaking classes were taught in Applied Sciences at the time, and those rooms were never meant to be used in that way. The ventilation was very poor. And with all those acids and those inks and the solvents used to clean the inks, and so on, the air in those rooms was truly toxic. I was one of the people who reacted to it very strongly. I developed a terrible asthmatic kind of cough every day and started having a lot of health problems. I was never allergic to anything before that, and I started being allergic to cats, and foods, and had hay fever. It was coincidental enough that I should have realized that that was what was causing it, or I think someone should have dealt with the problem of the chemical exposure to all those people in those rooms. But I wasn't really convinced until I finished one class, and I think I spent a summer, and then started another class in the fall. And my teacher, who had known me before, said, "Wow, where's the hack?" I had no cough.

Rabkin: When you came in after a summer away.

Keller: Yes, after a summer away. And within a week I had it back.

Rabkin: Oh, my goodness.

Keller: So I had to drop the class. I thought, okay, I can't do this. It was really disappointing for me because I loved it. I had a really good time in it too, because my sister, Gail, was at UCSC ahead of me a couple of years and she took printmaking as well. We've always been really close. We shared that class and I had a lot of good

associations with it. I tended to do twice as many projects as the teachers asked because I was so into it, which only increased my time in the studio and probably made me sicker.

But it has really led to me feeling very strongly about protecting my students' health as much as I/we can. So, in our studio, we don't allow any kind of materials that will be inhaled, that will be absorbed through the skin, if we can help it. We warn our students, "Even your watercolors can have ingredients that can be toxic—there can be cadmium; there can be cobalt." I mean, the manufacturers of these materials publish pamphlets that will tell you which of their pigments will give you liver cancer; which will cause reproductive harm. They're required to list these things. I show these to my students because I want them to take care of themselves, and I'm not sure if they necessarily know how much they will appreciate it if they do. So, it's really important to me to try to be a guide in that.

Rabkin: Is that an environmental concern as well, with the water that people rinse their brushes in and so forth—do you have them avoid dumping it in sensitive natural areas?

Keller: Definitely. When we go out field sketching, we have these really cool water brushes. Originally, I used to get them from Japan. Now they're available in the United States. The great thing about having this special brush with the water in the handle is, not only is your water handy and with you when you're out in the field, but it just so happens that to clean the bush you use a paper towel. Sometimes people will put it on their sock or something, but I caution people against that because the sock can get wet and then the cadmium is right next to your skin. But then this paper towel that becomes saturated with unused pigment can be put in an appropriate place instead of into the

waterways, or any kind of water poured out on the ground, when we're out and about. And the same thing goes for pencil shavings and all sort of things. I like to encourage people to make sure that the plants and animals that they're so eager to visit are not harmed by that visit.

This will come up later but it has become more and more, I would say, of an easy sell with our students because, if I look at these decades that now I've been teaching, I don't have to tell them anymore. They are eager to know how to protect the environment. When we first started teaching we would have to tell them, "Here's the recycling bin and please use it." Now, of course, they say, "Where's the blue bin?" And everything on down the line. And their projects have changed, too, because of the increasing focus on what's happening in the natural world.

Rabkin: In terms of the topics that they illustrate?

Keller: Yeah. Definitely. It's a big change.

Rabkin: Interesting. Well, thank you.

Keller: Yeah, so printmaking led to a lot of things.

Rabkin: Yeah. Another topic that we just touched on very briefly that I wanted to pick up again was the topic of narrative evaluations, which you mentioned briefly. It occurs to me that that's really part of your history as an undergraduate, and later on we'll get to it as an instructor, at UCSC. And it might be interesting just to hear a bit about your experience with narrative evaluations, starting with your reception of them as a student.

Keller: I, perhaps like most students, loved them. It was wonderful to get some conversation about what you had done. Because a "B" is not always the same as another "B." A "B" might be awarded because someone who has top-notch skills only did good work. Or, a "B" could mean that someone was really not making it in the beginning, but then they pulled out all the stops and achieved something at the end showed a great amount of progress. So you know, there's so much back story, I guess, to each grade, that I really appreciated it as a student that, not only would I get some kind of assessment of my performance, but that it was nuanced: these things were good; this needed some work; this got better. It gave me so much more guidance, and that's what you're there for, to have your experts tell you what to do, where to go next, how to improve. And so, I thought they were great.

The Narrative Evaluation System

I appreciated them in a different way later, when I had to write them, and I can go into that now, or we can go into that later, whatever you like.

Rabkin: Sure, while we're on the subject.

Keller: Well, writing them—I felt a great responsibility to do a good job, as much as I could. And, as you and I both know, it was a huge, huge effort in terms of time and energy. (sighs) And there's the rub, really. Because something that I cared about so deeply, but that I found onerous to do—it took a good week of work after the end of each term, and since I was then teaching four terms, out of the year, that was a month of my working year that was concerned, morning until night, with nothing else, which is a significant piece of time in anyone's work life. That took away from time I could have been using to develop my courses, or even to talk to my students directly. So, it was

difficult. But I took it seriously and did my best. I even put a lot into the narrative evaluations that I gave to my big lecture course. I had, I think around ninety to a hundred students in that course, and I had one TA. So there was no such thing as little subgroups who were going to do the grading, or the narrative evaluation writing, for me, or from the standpoint of knowing each student well.

[The UCSC administration] had this great, I thought, idea of using a mail-merge method of writing a framework and then recording adjectives, snippets, bits of information about individual students all quarter long, and then hitting a button and having those things all fill in. And you could do it really simply, but I kind of got into it and I thought, ooh! Ooh, if I work it this way and I made sure that when they turned in their papers I address this, this, and this—I could make this sentence sound fairly personal— It just was an interesting puzzle to me, to feel that I could, in that moment, be really present with that student's term paper, write a comment, and know that if I saved it properly it would get to them, and that it would be part of a narrative of their progress and their performance. I found that to be quite satisfying. I did hit the button at the end, after some tears, (laughs) because I was really struggling to learn quite how this program was supposed to work. I had to call in the people who help you when you're a teacher struggling to learn some new technology. But I did hit the button eventually, and there were ninety-plus evaluations.

Rabkin: So, you were able to use that digital, time-saving evaluation approach to write what sounds like pretty substantive and personalized narrative evaluations.

Keller: Yeah, I felt like they were, and I got feedback from the students that they were too. I even took the evaluations that I wrote for students who failed my classes, which

didn't happen too often, but when they did I took those seriously too, to try to communicate something to the students. And I never necessarily knew how those were received, until one time—and this is one person speaking just for themselves, but it was gratifying for me—a student came to me and said, "Thank you. I failed your class but that was one of the best evaluations I've ever gotten. Actually it told me a lot of positive things and some things I want to work on, and I just really appreciated it. Thank you."

Rabkin: Wonderful.

Keller: So, they were a lot of work but, I felt, very worthwhile, both the receiving and the writing. When UCSC was transitioning away from the narrative evaluation system, there was a period during which they wanted us to do both, both grade people *and* write a narrative evaluation. It wasn't either/or. It had to be both. And I thought, wow, you took what was a workload issue for the instructors and made it worse. (laughs) Because to think about someone's performance in terms of a grade is a little bit, or maybe a lot, different than to be preparing to write them an eventual evaluation. And then suddenly we had to do both and it just added to the workload. It made it worse. There were some arguments that people would get more easily into graduate programs if they had a GPA that was easily compared with students from other institutions GPAs, so they wanted to add that. But eventually we all know that UCSC transitioned away from the narrative evaluations. I just heard from you that I think people can still request them, maybe?

Rabkin: That was the case for a while, while I was still teaching. I don't know if it's still true. Even if it's technically still true, I would imagine that no students think to do it. Even the first year that policy was in place, the institutional memory is so short in a

four-year institution that lots of students had no idea they could ask for them, or even knew what they were.

Keller: Or what the benefits might be.

Rabkin: You described the process of constructing the narrative evaluations as onerous. And I wonder if that was about the act of thinking about each student individually and writing about their strengths and weaknesses in the class. If you only had to do five of them, say, would it have felt onerous? Or, was it the sheer quantity of time and energy you had to put out?

Keller: That's a good question. It was quantity. I did not mind one bit thinking about the students and talking about the work they were doing actually in person. I was very happy to do that. Something about the written narrative felt judgmental to me and I don't like that. (laughs) I didn't want to have to write some kind of final pronouncements. That was hard. But also, I don't consider myself at all a natural writer. I think I can do it well enough if I really apply myself and get help from my (laughs) wonderful colleagues like you, who are good with words.

Rabkin: (laughs)

Keller: But I found it to be—(sighs) yeah, the sheer number of them and that I couldn't just sit down and talk to people was what was the struggle for me. Even now, writing letters of recommendation for students, which I do a lot—I have written so many letters of recommendation that I've now gotten to the point where I just sit down and I talk off the cuff. I've learned that those are actually some of the more pleasant letters of recommendation to receive, because there's something really genuine and spontaneous

about that kind of writing that is memorable and gives you a sense of that person, rather than the standard: this is how I know the person. I include that but I don't start it necessarily that way anymore, and it's made the writing easier for me.

Rabkin: So, you make it more informal, conversational—

Keller: Yeah, and I think I could have done that more with my narrative evaluations, but it also felt like I needed to be—something about the rubric made it seem more fair if I addressed the same things in the same order with each person. Maybe that's true; maybe it's not. But I kind of felt attached to that at the time.

Rabkin: One more question about narrative evaluations before we move on from that. I'm just curious whether you retain any memories of particular evaluations that you either received as an undergraduate student, or that you wrote?

Keller: (pauses) That would require some thought. I certainly had the pleasure of writing some over-the-top, very-pleased-with-someone's-efforts-and-performance evaluations. Some of the nice things that people said in evaluations stuck with me forever, just in mood, if not in particulars.[8] And some of the not-so-nice things—I mentioned one when we were referring to evaluations a little earlier. Also, I got one that said I was—it's terrible that you remember sometimes the little gut punches more clearly (laughs) than the praise, but the praise registers too. But one mentioned that I was very naïve about the way it was on the outside. And I thought, well, yeah. I'm nineteen. (laughs) And learning. And I didn't know if that was really even appropriate,

[8] Keller added the following footnote during the editing process: "I do remember that in my evaluation for his drawing course, Jasper Rose said something about how my chief task going forward would be to 'surmount the temptations' of my 'somewhat alarming precocity'—whatever that means."

to discuss whether or not I was ready for the real world. But perhaps it lit a fire, made me more aware.

Rabkin: Hmm, interesting. Thank you.

Natural History Field Quarter and Kenneth Norris

So, let's go on to talk about Natural History Field Quarter, which I know was a really pivotal experience for you as an undergraduate. How did it come about that you ended up in Field Quarter?

Keller: That is such a fortuitous sequence of events. I marvel that it happened and I'm so pleased that it did because it's hard to imagine my life without having had that experience. So, I talked about getting into the class that Pieter Folkens was teaching because I drew a mouse that made the grade and that John Wilkes happened to see. I owe a lot to that little mouse because John noticed me. And I don't remember quite how we ended up meeting, and I'm not even sure if I got the idea or if John got the idea first. But I think it was me, because it wasn't really unusual for people to do individual majors at that time. And I decided, I want to do an individual major in science illustration. And John agreed to be the chairperson for my major. I think Todd Telander was the cochair. You had to have a couple of faculty members on your committee.

Rabkin: I think it was three.

Keller: Yeah, there must have been a third. I should look at my transcript.[9] (laughs) Anyway, John and I proved to have a—I'll get to Field Quarter in a second—but it

[9] Apparently, committee members of an individual major are not listed on a transcript, so this remains a mystery!—Jenny Keller

proved to be a great relationship because I had a lot of ideas about what I wanted to do, and he was more than happy to let me make stuff up that I wanted to do.

Rabkin: Like what?

Keller: I would come to him and say, "Hey, I've got this opportunity to illustrate an entire issue of the Center for Marine Sciences newsletter. And I could just maybe make that a class, and I would do all of the illustrations for this issue." And he would go, "Great!" (laughs) It was just what I wanted to hear.

Rabkin: (laughs) And he'd sign on the dotted line.

Keller: And he would sign on the line. I did that again and again, where I would come up with something that I thought was a wonderful project, and he'd say yes. I wrote a proposal for my major that included pretty much everything that you would need for an art major and almost everything you would need to major in biology. So, I felt that it was a pretty easy sell, because if someone were looking at it, they'd go yeah, this constitutes a bachelor's degree, certainly.

So, I got into that with John Wilkes. I'm not sure if it was before or during, or what—but as I was taking that class from Pieter Folkens and talking to John Wilkes, he said, "Hey, have you ever heard of the Natural History Field Quarter?" I said, "No." And he said, "I think you should go meet Ken Norris." And I, knowing nothing about it, said, "Okay, sure. I'll do that." So, John called Ken and said, "I have a student I think you ought to meet." The meeting was set up and I went to Ken's office at Kerr Hall.

Rabkin: You had never met Ken before?

Keller: No, I had never met Ken. I hadn't even read up on what the Field Quarter was, before that meeting. I just thought, oh, I'm going to go meet this natural history professor. Sounds great. I went in and we chatted a long time, just about things, interests and art and science and nature and excitement. And then he told me about the Field Quarter. And I said, "Wow, what a wonderful thing. That sounds great."

Rabkin: What did he tell you?

Keller: He told me what they do, that you go out into the field—basically, almost, at that time, full time—taking trip after trip to various natural reserves in the Natural Reserve System, which, as we know, Ken Norris was the instigator of.[10] He's the person who started the Natural Reserve System. They'd go out to these varied natural environments of California and study natural history on site with a group of wonderfully varied yet like-minded people.

I just expressed what a wonderful thing I thought that was. I had no idea what he was going to say next, which was, "Well, would you like to join us?" And I said, "Yeah!" This was winter quarter and spring was the very next quarter. That was when they were going to leave. I said, "Absolutely! I'd love to," and went away from that meeting skipping down the trail across campus, thinking, I am so excited about this. And I got home to my apartment at Oakes College and I told my housemate, "Hey, I'm going to do this really cool thing next quarter." I proceeded to start to tell her about it and her face was—it was an expression I couldn't read, but it was sort of falling and angry at the same time. And finally, she said, "I can't believe it." And I said, "What?" She said, "I

[10] See Randall Jarrell and Irene Reti, *Kenneth S. Norris: Naturalist, Cetologist, Conservationist, 1924-1998* (Regional History Project, UCSC Library, 1999). Available in full text and audio at https://escholarship.org/uc/item/5kf1t3wg Also see the finding aid to the Kenneth Norris Papers available in the UCSC Library's Special Collections: http://www.oac.cdlib.org/findaid/ark:/13030/c8pc36x7/admin/

came to UCSC with the express purpose of trying to get into the Field Quarter and now I'm a junior and I've applied and I haven't even heard if I've gotten in yet. And *you* waltz in here and you don't even know about it until today and you're in?" She was quite upset. And I realized, in that moment, because I really hadn't before, that it was a competitive thing, and that I was incredibly lucky. Fortunately, my housemate got in too, and we were good friends before that and remained good friends. There was no rift there because it all worked out very easily. And off we went. So that's how I got in.

I was less prepared for the natural history part of it than pretty much any other participant. Fortunately, that was part of Ken's vision—not to have people unprepared, but to have people from a lot of different disciplines come in and do this thing, and learn about the natural world from their particular viewpoint. He could see I was already into it.

I have to say, though, during those first few days in the Mojave Desert going out with Steve Gliessman, (laughs) I was overwhelmed. Here's Steve, spouting off one scientific name after another. People are writing them down in their little notebooks and I am thinking, whoa! I'm sure I had encountered scientific names before, but the whole ladder of taxonomy, and the way things fit into it and so on, was a real steep learning curve for me, especially when I was dropped into a group of people for whom systematic botany was something that they had learned long ago, and incorporated and were building upon. So, I actually remember standing with Ken Norris on the deck of the Bunny Club there in the Mojave Desert, when we had a rare private moment, saying, "Ken, are you sure that I'm the right fit?" And he said, "Oh, yes, Jenny-san. You just go do your thing."

And those words echoed to me throughout the Field Quarter. I thought, okay, that means that my approach will work here. I still threw myself into everything that they were teaching me, but it became one of those things that I feel like I have wanted to pass on to other people.

I'll just take this tangent here, since it comes to mind. I've had the incredible honor of being a part of the Natural History Field Quarter in the last ten years, where I've taught them drawing workshops before they go, and been able, when I have time, to accompany them on some of the trips. And I tell that story, and I told it just this past spring, just this April, to my little group of students when we were out in the field. I've gotten the opportunity with Chris Lay—Chris has kindly bestowed on me the responsibility and honor of actually teaching the students for a couple of days, for part of their—

Rabkin: Out in the field.

Keller: —yeah, out in the field. We do a project where we draw something and then we try and identify it by looking at our drawings, and see how well we have observed and what questions we asked, or that we should have asked. And since I have these groups of students to myself, I always like to say, "I know this is a lot of stuff to take in. You're thrown into this whole new situation and you're coming at it from a lot of different ways." And I tell my story that I just told you. And I say, "I just want to pass on to you the words that Ken said to me." (I'm going to choke up) "Because, because if you're ever wondering how you fit into this, or if you're cut out for all this"—because this is pretty rigorous academically and for some people it's new to even sleep in a sleeping

bag in a tent—I tell that and I say, "Your teachers chose you. They want you and your sensibilities brought to this."

It's like the quote that we chose, Chris and I, for the wall of the Norris Center.[11] It has to do with: we need the artist; we need the poet; we need the scientist—he describes that we need all these viewpoints in the natural world to fall in love, to take up the cause and protect what we all cherish and depend on.

So, I just shared that with each of my groups. It was very sweet this time because one of the students during our evening sharing time, when we have nature notes and tell about events of the day, one of the students said, "Well, Jenny said this thing that meant so much to me." And I thought, oh, my gosh. I'm thrilled to think that I might have encouraged even one student. And someone else nodded and echoed that. And I just thought, that's Ken. That's coming straight from Ken.

Rabkin: I can imagine those students someday passing those thoughts on to the next generation.

Keller: Yeah, because we're all in this together.

Rabkin: Wow. Well, tell me more about your experience as an undergraduate in the Field Quarter.

Keller: Oh, right. Yeah. Well, I have a favorite story, I think, that I like to tell. We were—again, in the Mojave. We were heading out to the Kelso Dunes, which we used to do way before sunrise. The sun hadn't even come up yet. (How can that have been?

[11] The quote of Ken Norris's that Keller and Lay chose is: "Just as we perceive our community of purpose, we grow more accepting of each other's diversity. The poet, the artist, the teacher, the scientist become equal partners in our seeking." For more on the Kenneth S. Norris Center for Natural History see: https://norriscenter.ucsc.edu/

Because it was warm when we climbed the dune. Well, you know, memory is capricious.) Anyway, we were out that direction, sort of over by Bull Canyon Wash. We were walking through the scrub of the Mojave.

All of a sudden, there was this explosion of activity. About a dozen of us are running through the scrub, dodging this way and that. And then I see Ken at the head of the pack, who dives headfirst into the sand. He comes up with a scoop of sand and a lizard, and proceeds to hold it, carefully of course, by one leg. And we all crowd around to look at it. It was a leopard lizard, which has beautiful air-brushed spots and pattern on it, and kind of a pale beige background color on this lizard. And right on the spot, Ken started making up this theory about why this lizard would have the pattern that it does. He was gesturing toward the bushes and saying, "See how the wind has blown the sand and how it exposes some dark and light patterns just like these patches." We responded (gasps), "Oh, my gosh! You're right. Look at that. That would be perfect camouflage." We were immediately on board with his hypothesis and totally enchanted.

And then—and I wish I could remember what exactly he said—but then he was continuing to examine the lizard and point things out to us. And he goes, "Oh, but look here." And he pointed out something that really seemed to throw his theory into question, you know, kind of throw it out of the water. At that moment I happened to be standing on the periphery of the group that were crowding around Ken. And so, I had the very beautiful experience of not only being a part of what was going on, but watching it happen. And when he said that, there was a collective murmur. There was this sigh of disappointment that rose from the group. And these voices that were expressing support for his original idea.

Rabkin: And resistance to the new one?

Keller: Yes. And I thought, oh my gosh, look at us. We don't want to hear it. We are so attached to that first good idea, that we are pushing away the next piece of information that the lizard is telling us. It's right here. And we were slowing down. Our minds were getting clouded by our preconceived ideas, never mind that this theory was thirty seconds old. So fortunately for us, Ken was not stuck on that idea. And he proceeded, in that moment, to make up an equally magnificent and plausible theory of how the lizard got its spots, right there. And then we were off. And I thought, *oh. I get it.* You're saying: "Check it out. Don't stop checking it out. Keep looking at the real thing. Don't stop going to the source."

And for me, that has become such a touchstone, because I believe it's crucially important to good science to keep asking those questions. And it turns out it is equally important for science illustration. You have to keep looking at the real thing, or you'll start making it up, or drawing what you think a leaf looks like, or a lizard looks like, or a fox's ears look like. Are they triangles? Well, no—sort of, but if you just put a triangle on top of that head, that's not going to look like a fox's ears.

So, it's really important for science illustration and I feel like it's also important when you're traveling, to not judge things immediately but to kind of keep taking things in and see what they mean in their particular context. And I feel like it's also important in relationships, like I think I've touched on before, to allow someone room to grow and see who they are, and who they are now, and who they've turned into.

It's informed my teaching. I feel like teaching is new every day because every person who comes to you, you never know what they're going to say. You never know what

question they're going to ask. And even if they ask a question you've heard before, you've never heard it in that context, about that subject matter, with that person. I have thought of miraculously new teaching things about topics that I have taught for decades, as recently as a few weeks ago.

It was that moment when I thought: oh, he's not teaching us about the lizard. He *is* showing us about the lizard. But he's demonstrating how not to get stuck, how to keep your mind open, and your observation open.

Rabkin: And you understood that to be a very deliberate teaching moment, on Ken's part?

Keller: I think it's just how Ken was and he was giving that to us all the time. I think there could have been any number of instances that I observed and that everyone observed during that term and during Ken's entire teaching career, where he demonstrated that. But it was so beautifully demonstrated in that moment that I couldn't not take it in.

Rabkin: Is this the process that Ken called "Turning the Wheel?"

Keller: Mm, hmm. Exactly. Yeah, you ask your questions; you play them out; you let them fly, see if they're something worth pursuing, or something worth discarding, or something work picking up later. You just are never done. Yeah. Spinning the Wheel. That's what he calls it.

Rabkin: Mm, hmm. You had three teachers on that Field Quarter. Do you want to talk about the others?

Keller: Well, I mentioned Steve. And one of the things that Steve did during those times when he was firing a million plant names at us was—I felt like Steve showed his enthusiasm endlessly. He was an encyclopedic and demanding, in a good way, teacher. But he also—you'd turn around and there he'd be with something he didn't know, deep into the flora of California, which was then the one that was written by Munz, which was even harder to get through than the current Jepson. Jepson is a joy compared to how difficult it was to key out a plant in Munz. Anyway, there he'd be, learning something new. And I saw this during my Field Quarter in 1983. And I saw it again in 2012, when I happened to be lucky enough to go to the Granite Mountains when Steve was on his very last year of teaching Field Quarter. And in 2012, Jepson was not only the book that we were all quite used to using, but Jepson itself had gone through a giant revision and had put whole groups of plants into different families, or divided up some families into new names and so on. And there was Steve, saying, "Well, let's figure out why they did this? Let's do the new. Let's—" And I thought, wow! I so admire that. He was not at all stuck. I mean, he wasn't above complaining, like, "Oh!" (laughs) "*This* has changed too." But he was on board. He was right there. I saw him looking through the Jepson, murmuring, "Oh, oh, well, okay. I can see that." He's talking to the book, as he's holding his plant in one hand, to see the relationships that have been described in this new way. So that was one of the things I love about Steve. Really, what a wonderful example he set for all of us, and has continued to.

Larry Ford was our other teacher. He was the TA. Larry also taught me a lot about Spinning the Wheel because we had a great afternoon together on the Big Creek Reserve. Our job that day was to do a niche hunt. We had been invited to go out and find one species and find out as much as we could about it. I headed out and got lucky

to have the TA happen to be in my vicinity and help me out. He and I just asked questions all day.

Rabkin: He spent a whole day with you?

Keller: Well, all afternoon.

Rabkin: Wow.

Keller: And so, the lizard was a great example. But to go at it for even longer and write pages and pages and pages. I think I would have done that anyway, but to bounce off someone else and have me think of a question, and him think of a question, and both of us propose answers, and try and explore some possible answers to those questions—I don't know how to describe it any more than that?

Well, maybe this is it? Maybe this is also part of the key of the miracle of Field Quarter and Ken's vision. At no other time in my college career was I given that gift of time, to really take time to observe something. We saw the results of it all the time, in our textbooks. You're kind of told about it. But there was no other time at which I was actually asked, or given the opportunity to really do it. Ken referred to it as Crossing the Threshold of Boredom. You need to let people do that. You need to get people out there. [bored voice] And they do their thing and then they settle down and then they ask some questions. And then they're like, "Now what?" It's beyond the "Now what?" where you really start getting deep into something.

That was what I got to do with Larry that day, was to really run that process through its paces, at least over the extent of the better part of a day. And, of course, scientists need to do that over the better part of weeks and months and years and decades. I think of

Robert Sapolsky studying the baboons for twenty years in Kenya and the things that he learned. It's amazing to me that that isn't incorporated into every science major's experience, because good science depends utterly on sustained, in-depth, direct observation, and an attempt, at least, to be objective. And we all need practice at that.

Rabkin: And it takes time.

Keller: And it takes time.

Rabkin: One of the books that Ken wrote ended up being titled *Mountain Time.*

Keller: Mm, hmm.

Rabkin: Is that the same idea?

Keller: Definitely. That's, I believe, what he was referring to, and I think others will agree with me. I am on the executive steering committee for the Natural History Field Quarter.

Rabkin: For the Friends of the Natural History Field Quarter?

Keller: Yeah. Well, I'm actually not just one of the Friends. This is now a smaller group of people that gets to consult about the directions, curriculum, budget—the things that it takes to run the Field Quarter. And I (laughs) actually took issue with Chris Lay, who I want to add at this moment I think is brilliant and the perfect person to be running the Field Quarter. But we have our discussions. And one of them was he was having the students write a blog about the Field Quarter, as it progresses. And I said, "Chris, I don't know. I don't think that feels like Mountain Time. I think people need to get away from the mirror, the constant demand that has become just so much more pronounced

as time has gone on, to report, to advertise oneself, to show what you're doing before you've even really done it."

And I don't know if I influenced him to do this, or if it was actually a change, or if he was doing it this way from the beginning. But he now does it so that one student on one day, I think once during the whole Field Quarter, is responsible for that little report on that day. And I think, okay, I can handle that. I can imagine that one day where I'm thinking, "Okay, I'm going to tell the world what we did today. I'll take a few pictures." And then, in sum, those entries end up being something that the outside world can read about that year's Field Quarter. That feels a little better to me. I just think it's so important, though, to help people learn to slow down. And it's really difficult if you've got your cell phone there, and you're thinking you're going to keep contact, and keep posting, and show people what you're doing, and talk about it.

Rabkin: So, the way he's set it up now, any given student only is responsible for one day's worth of reporting.

Keller: A little bit. And that may be how he did it from the beginning. I may have gotten the wrong impression about that. But at the time—we actually were having this conversation when Jenny Anderson happened to be present, who is not a part of that particular executive committee. But we were all together. And she agreed. She said, "Yeah, Jenny. I think so too. I think we need to encourage people, or we're going to lose it. We're going to lose what is special about Field Quarter if we get people doing too many things." I always think there need to be fewer things.

When I take people field sketching, I've learned if I take people to the park where there are a million ducks, a lot of different kinds of birds; they're swarming around your feet

and there's all kinds of stuff to draw—I've actually had people in that situation say, "What should I do now? I've done them all." And we usually stay for three hours, which is a long period of time. But I think, you've drawn *every* duck in *every* possible angle? How could you be bored? I just don't relate. But I've heard that. By comparison, I've taken people to Neary Lagoon, where sometimes you walk out on the boardwalk and you don't see one bird. And we've done that and people have settled in and they've waited. And finally, here comes a grebe. (gasps) And they're just fascinated. They draw that thing. They'll draw that one bird for three hours. They won't stop. There's something that happens when you slow down and reach for it.

Rabkin: Focus.

Keller: Yeah, focus. That's the word.

Rabkin: Can you talk a bit about keeping a field journal on Field Quarter?

Keller: Yeah. That was a pivotal moment because I had already been drawing natural history subjects and I had already been keeping a sketchbook, like a lot of artists do, drawing this and that. But I hadn't really put the two together in a field setting before Field Quarter. I fell for that immediately and I knew that I would never be the same. (laughs)

Rabkin: What was it about keeping an illustrated journal in the field that was such a big revelation for you?

Keller: Well, it was a combination of being outdoors, that first backpacking trip; it was a part of my realization that you can never stop asking the real thing, an endless stream of questions; and my love affair with everything that had to do with art and science. It

was the way the light was falling on something right there at that moment. You could see, not only what the lizard looked like, but what it was doing. It was just everything that mattered to me brought together in one place, I would say.

Rabkin: Do you still have your journal from that Field Quarter?

Keller: Oh, yes, like probably every person who has been through the Natural History Field Quarter, I have my journal. And I have read it recently. I was afraid that I was a terrible writer but I read some things and I thought, well, that's pretty soulful. Oh, yeah. I could tell I was moved and learned something there.

Rabkin: You've been beaming since I asked that question.

Keller: (laughs) Yeah, I do have my journal still. And I've even used some of those drawings, later—I did landscapes, a lot of landscapes as a part of my special project.

Rabkin: Landscape paintings.

Keller: Mm, hmm. I've used some of those recently. Someone asked me, do you have a drawing of the Mattole River that we could use as a promotional poster for an effort to save part of the Mattole? And I said, "Yeah—in fact--it's really old, but you're welcome to it." So we printed that.

Yeah, those pages still speak to me, from 1983 to the present.

Rabkin: Wow, shall we take a little break?

Keller: Mm, hmm.

Rabkin: Okay, we're back after a break. And Jenny, is there anything else you want to say about Field Quarter?

Keller: I do. It was a really powerful experience, I think, for all of us. And I guess this is not uncommon, but we have stayed in touch, me and my Field Quarter mates, and all of us, and our instructors, as much as we've been able to.

Rabkin: This is from 1983?

Keller: From 1983. Just last year we went to Belize together.

Rabkin: Your whole group?

Keller: Well, as many of them as we could round up. There were some last-minute, sudden—suddenly someone wasn't able to make it, or so on. But we had a good number of them. We had sixteen people. A couple of those were spouses. But one of our group, Mathew Miller, is an expat in Belize. He actually went down to Belize right after Field Quarter, as part of the Peace Corps, and never left. It just struck a chord with him. So, he invited us down to the now nature preserve that he has established there. And we did it all over again, all the way down to the bus. He has a big bus and we rode around in the bus, and we looked at nature, and we took hikes and we went down rivers in little boats, and visited Mayan ruins, and snorkeled. It was absolutely fantastic. And this summer some of us are going to Boulder to get together again. I'm hoping that people will want to come back to California during one of our wonderful reunions and just hang out in the California landscape again.

Rabkin: During the reunion of the Field Quarter as a whole.

Keller: Yeah. That's a good way to do it. So, we've kept in touch. And what a miraculous group of people. There's Mathew, who I mentioned, who is doing conservation work in Belize; Alexa Dvorson is a news reporter based in Germany now, but she's worked for the BBC and NPR and you name it. And Rachel Goodman, who is a wonderful, still-based in Santa Cruz-reporter. And Paul Henson has written books. I could go on and on. These people have done impressive things.

And all of them have this Field-Quarter-inspired ingredient, including myself. It does that. I think that's why the Field Quarter has inspired such incredible loyalty. When we had the first reunion, the forty-year reunion in 2012, there were over five hundred participants. It was not only the biggest event that was at the Alumni Weekend at UCSC that year, but the biggest one they've ever had. And it was all for a single class. It wasn't for a major, or something like that. UCSC was astonished that there's this body of people out there who care this much about this one course. And fortunately, from there, with incredible amounts of effort, especially, I would say, on the part of Chris Lay, and Larry Ford, and Jenny Anderson, the Packard Foundation bestowed a grant of two million dollars to support the perpetuation of the Field Quarter and the creation of the Norris Center. That work was done by people who cared that much about this particular enterprise and its uniqueness and its power.

Rabkin: You said that you see a certain shared ingredient or characteristic among all of the alums of your year and maybe all the years of Field Quarter. Can you describe that characteristic?

Keller: Oh, it has to do with nature. It has to do with conservation. And it has to do with observation and paying attention. I would even go so far as to say: compassion

and soulfulness in the work that they do, whatever direction they've taken it, which is a pretty grand claim. You can claim that for a lot of other professions too. But it just seems that there's always this ingredient of caring for the natural world and trying to share that with other people in a way that inspires them to care for it too.

Rabkin: Hmm. Thank you.

Working with Graphic Services at UC Santa Cruz

You had some work-study jobs as an undergraduate. Would you like to talk about those?

Keller: I would, because I would say that they contributed to my education as much as any of the courses I took, with the possible exception of Field Quarter, because that was head and shoulders above everything. When I was growing up, we had no money. We were on the precursor to food stamps, which was food commodities, which was basically food that the army deemed unfit to feed to their recruits, and was quite old, and they decided that poor people could have it. So, I didn't have any money to come to school and I got a work-study position, which was a lifesaver. If anybody ever thinks that those things don't help launch careers and lives, they're mistaken. It was a wonderful thing, so I was able to get through college by working. My first job was in the Publications Department at UCSC. At first, they had me making posters and things like that for events, like in the theater, and in the various departments and things. That was fun, but I wasn't really trained in design, so I felt a little bit out of my element. I could draw but I didn't know that much about type, layout, and stuff. But I learned. That was good.

But then we hit on this idea that I could paint the barn sign at the base of campus. And I loved that because that thing was fifty-six feet long and four feet high. I remember the dimensions exactly because what I did was divide it into one-foot squares and then I basically had a grid that I would blow these giant posters up on. So, I was out there with rollers and painting the giant letter E. It's funny, by the way, when you're working at that scale you actually are not paying attention to spelling.

Rabkin: (laughs)

Keller: I remember one time backing up to observe my work in progress and realizing that I had misspelled a giant word, and running back, and rolling it over again and fixing it.

Rabkin: I did not know that you did that job.

Keller: I did. I painted the barn sign.[12] It taught me, actually, about not fussing over the details because you can get away with a fair amount of soft-edged abstraction. In fact, it looks better when you back up. It's like reducing a work of art mechanically—it becomes tighter and finer and the transitions make more sense.

I'm surprised they thought I knew how to do it. They just said, "Just paint this really big." And fortunately, I knew how to use a grid and blow stuff up. So, I did and it worked out. That was really fun.

[12] Jim Urban has also created and painted some of the signs for UCSC for many years. See https://news.ucsc.edu/2012/04/review-jim-urban.html —Editor

Then I got a job at the UCSC Arboretum with Brett Hall and Ray Collett.[13] That turned into the most magnificent thing for me because, well, I loved taking care of the plants and Brett was the perfect kind of boss for me because he was kind of along the lines of John Wilkes. He'd say, "So, water these plants and prune this bush." And I'd say, "Well, how much should I water the plants and what branches should I take off the bush?" (laughter) And he'd say, "Well, the water, enough, and the plant—well, think about how it grows and how you want it to grow after that." He even had me laying pipe for irrigation. And he'd say, "Well, this main, it needs to get over there in kind of an orderly fashion." I took this kind of instruction or direction to mean, "Your intuition will suffice." It worked great for me. I thought, okay, so I'll water the plants the amount that I think they need. And I'll shape this plant. And I think this pipe should go that direction. (laughs) It was a fantastic job and I really enjoyed that part of it, even when he made me weed the Erica garden, which took weeks and weeks. It was very tedious.

Rabkin: This is heath-family plants?

Keller: Yes. Heath family. I like meditation and it turns out I enjoyed gardening, even though I hadn't really done it much before. But then—oh, this may be how this happened—I saw a really beautiful plant called a *Talopea speciosissima* in one of the domes, in one of the special greenhouses. And I was taking that class from Chris Carothers at the time. And I said, "Could I have a cutting? Could I draw this?" They gave me a specimen to draw and it was a perfect subject for my class.

[13] See Irene Reti, Interviewer and Editor. *The UCSC Arboretum: A Grand Experiment* (Regional History Project, UCSC Library, 2007). Available in full text and audio at https://escholarship.org/uc/item/958665h4

But then the people at the Arboretum said, "Oh, you can draw." So, we applied for the Stanley Smith Scholarship from the U.K.[14] And I was awarded that scholarship. So, for two years, on the money that came from that scholarship, I was employed by the Arboretum to illustrate for them. I ended up doing posters and a calendar and all kinds of IDs for their different plants. I even had the opportunity to draw—what was it? There was one called a *Belliolum*, which is a really unusual plant. But there was something else—I'm forgetting the genus—but it was in the Winteraceae. That's a really "primitive" plant family. The different plant parts are not as distinct as they are in more "modern" plant families. They are actually not in concentric rings, but in more of a spiral. And there's sort of a gradation between sepals, which become petals, which become stamens, and on into the center part of the female reproductive part of the plant. So, I got to draw the parts of this plant under the microscope, and take all the petals off of these really rare flowers, and draw each one, and show their gradations. So that was scientifically significant work and I was totally thrilled to do that for the Arboretum. It also fed into my major, what I wanted to do, what I was interested in.

And when that job ended, I ended up working at Graphic Services with Annette Whelan. I was hired to do technical and illustrative illustrations for professors on campus, for whatever they needed. Whatever walked in the door was what we did.

Rabkin: So, for journal articles they were publishing and needed illustrations for?

Keller: Exactly. For their presentations—at that time they would be put on film slides. Sometimes it was a chart or a graph showing their data. I found that meditative and fine to do. Other times it was maps and things that needed to be created, posters sometimes.

[14] See http://www.grantsforhorticulturists.org.uk/Smith.html

But some of the most fun work was—I think it was—I can't remember the client for sure—I'm thinking Diane Gifford Gonzalez. But someone came in saying, "Well, in the field I was able to observe the mother chimpanzee pointing to something and having her young offspring look in the direction that she was pointing, rather than looking at her hand, which is what most animals will do." And she said, "It was very significant to my observations in the field but I never got a photograph of it." I said, "I can make that happen! You can tell me what you want it to look like."

I had another assignment where someone wanted to create—what would seem very rudimentary now, but a computer program that would help people learn another language. They just needed a whole bunch of simple drawings of objects: a pencil, a fork, a ball, a map. It was a zillion— I must have done hundreds of them. They wanted them to be consistent. They didn't want them to be photographic. They wanted them to be simple drawings that anybody could recognize in any language. So, I got to draw a whole bunch of *things* (laughs).

It was just really, really fun, the variety that would come through the door. The university also wanted, at one point, the slug mascot to be promoting safe sex on campus. It was the Health Center that said, "Can you possibly do something that we can use to promote safe sex?" Maybe it was me who thought of Sammy, the Safe Sex Slug.

Rabkin: (laughs)

Keller: Anyway, that's how he came to be known. I think I was the one who said, "I think we can incorporate the slug in this." (laughs) What I did was I drew a condom.

Sammy was—you know, when you're doing a three-legged race and you've got a gunny sack?

Rabkin: Yes.

Keller: So, Sammy was kind of like in the gunny sack, sort of holding it up to his chest and scooching along, and it was jutting along behind him, with the little curvy marks that make something look like it is sort of jiggling. And he's proudly holding it up like, "I practice safe sex!"

Rabkin: So, the gunny sack, in this case, was a condom.

Keller: Was a condom. And they went for it. They thought it was great. And the students thought it was really fun too. It was done in a tasteful way, I think.

So, we did everything from that, to the more scientific things.

Eventually, I was the one who said, "We've got to get a computer." We didn't have any computers when I started.

Rabkin: When was this?

Keller: Well, I started working there when I was maybe a junior, definitely by the time I was a senior. And I was hired on as a regular employee there after I graduated, so I had an easy transition from graduating to having a job. I was there for seven years, as well as doing other things, like starting to teach for the Science Illustration Program and doing freelance work. I said, "You know, this is the wave of the future. We've got to get a computer." I talked them into it, so our first Apple was shared amongst the three illustrators in our department. I remember thinking it was so miraculous that you could

pick different fonts, print them out right there, see what it looked like. At the time, we had to determine what words we wanted and send them off to the typesetter, and then get the galleys back, and cut them apart, and glue them on. Oh, my goodness. So that was where I used my first computer, too, was at Graphic Services.

Illustrating Ken Norris's *Dolphin Days*

Rabkin: Your description of the various kinds of illustrations you were doing for Graphic Services reminds me of the time when you did book illustrations for Ken Norris. I wondered if you want to talk about that?

Keller: That was that same period of time after I graduated. Ken asked me to illustrate one of his books, which was just so exciting, Ken, of course, being the preeminent marine mammologist, as well as all the other things he was. And he had so many amazing stories to tell. He also happened to have probably the largest library of great photographs of Hawaiian spinner dolphins, which is what *Dolphin Days*, the book that he was writing at the time, was about. Of course, at that time there was no internet, so finding reference material was difficult. So, I had someone who knew an incredible amount about the subject matter and a lot of reference material, and he wanted a lot of illustrations.

It was just the most amazing, fun project, partly because he had great ideas of what he wanted illustrated. He wanted me to illustrate the Semi-Submersible Seasick Machine, which was a craft of his own design that he later learned really did make you—well, he didn't name it that in the beginning. It got that name afterwards because it was a little boat with a tube below it and you'd climb down there and be able to view things underwater. But apparently, the swaying of the boat made the bottom part really

(laughs) shake you back and forth in a terrible way. Anyway, I got to illustrate things above and below the water, and the dolphins doing everything from their aerial antics to mating. I did a drawing of Ken observing the dolphins. I wish I could have drawn him better. As an artist, you're always looking at things, going, "Oh! I wish that was—" That was one of my illustrations that I wish I could have done better because I'm not that good at drawing people, even now. But it was okay.

I had an idea while I was doing the illustrations for that book. So much about that species is about movement. I said to Ken, "Ken, you know what we should do. We should draw an animation and have it printed on the corners of the pages of this book. When people flip the pages of the book they'll see a little dolphin jumping, the way spinner dolphins do." They get up speed and they shoot themselves out of the water and they do all kinds of aerial antics. It's pretty unique. But he said, "Oh, yeah. Yeah. Nah." He didn't take the bait.

And I thought, oh, I've got to convince you somehow. So, I got a videotape, probably from Ken. This was literally pushing the tape into the machine—it was a VHS tape—looking at the big TV screen and trying to advance the videotape only five frames at a time: 1, 2, 3, 4, 5. And then there'd be some blur and I'd think, okay, I'll draw that dolphin. And then da-da-da-da-da. And I would draw the next pose. And seventy-five drawings later, as well as many more than that for the splash that happened after, which was important to us, I had what I thought would convince Ken to say yes.

Rabkin: You did all that work on spec, as it were.

Keller: Yeah, I thought, this is going to be cool and I just—I thought, even if he doesn't say yes, I have to try. So, I had these drawings on index cards and I took it to our next meeting and I flipped it for him. And he said, "Oh, yeah. We've got to do that!" (laughs)

And so, I talked to the publisher at W.W. Norton, who—that was also a real education for me because they're in New York and every single phone call we had, I would think, *oh, no.* This is going so badly. We're having an argument. This is— She's so harsh, oh! And then we'd wrap up and she'd say cheerfully, "Well, Jenny, it's been great talking to you. Okay, let's go ahead." And we'd hang up and I'd think, what was that? And I realized—well, it was kind of a West Coast/East Coast thing. But also, to work with a client—you know, Ken was my client; I was his illustrator, and that was a certain sort of relationship. But this person was *really* businesslike: don't like this, yes, no, do it this way—That was my first experience of what it's like to work under—I wouldn't say that they were unnecessarily harsh parameters, they were just realistic parameters of what they need, and what they want, and what you have to do.

I did learn a little bit of that back at the Arboretum, too, actually, when I did an illustration that took me twenty-five hours. That was the *Belliolum*. And they said, "Oh, Jenny, we love it, but you used parallel lines to shade the leaves. It looks like a monocot instead of a dicot." And I had to do it over! They weren't being mean. They simply said, "This is saying the wrong thing."

Rabkin: Because the parallel lines made it look as though the leaves were veined in parallel, and dicots have more quilted—

Keller: Yeah. Branching.

Rabkin: —branching veins.

Keller: Right. Anyway, so Ken said yes. And then I proceeded to talk the publisher into it. And two things that were cool. It was great to have it in the book. The book ended up winning the Burroughs Award that year, for the best book in natural history published that year. Also, though, it gave me a great insight, an example into the possibility that an artist can notice something that even the scientist does not. Because I commented really offhandedly to Ken one day after I had finished that animation, that the splash that was created by the dolphin crashing back down into the water lasted ten times as long as the original action, the dolphin's jump itself.

Rabkin: And you knew that very well because you had been forwarding the video by five frames.

Keller: Yeah. I was kind of just complaining that I had to draw so much water, and so much bubbles, and the bubble trail and so on. But when I said that, he said, "*Really*? It does? That's really interesting to me. I hadn't thought about that. Oh, my gosh!" I said, "What?" And he said—I'm remembering as best I can exactly what he said—but, "I was thinking of this as being very important in terms of dimensional space, so when a dolphin makes a sound it emanates in a certain direction. But the water is very much a three-dimensional space. You might want to not just project things in one direction. If you can project them in all directions equally loudly, that could be a better signal to your mates that something is going on here. I had never really thought about the temporal aspect of that, that you not only can make a sound that radiates equally in all directions, but you can make it last longer. You can make a sound that lasts a long time."

I was like, "Oh, okay." I kind of shrugged. I thought, well, great. I didn't know that that was significant. But it was my comment from having sat with those images, and drawn that many pictures of something, and comparing the two, that made him think that. And he was quick to say, "Thank you." And there are other examples of that in science illustration.

Rabkin: Where the illustrator, by dint of the kind of attention that they have to pay, ends up contributing to the discovery process?

Keller: Yeah, exactly.

Rabkin: Wonderful, great.

Four Corners School of Outdoor Education

So, it was around this time when you graduated, you continued working for Graphic Services. At some point along that time period, you did some teaching in Utah for the Four Corners School of Outdoor Education. Do you want to talk about that?

Keller: Right. Yeah. Well, you and I, Sarah, did that together. I'm pretty sure you're the one who came up with this idea. Had you taught for them before?

Rabkin: I think what happened was that George Wuerthner, who was a graduate student with me in the writing part of the Science Communication Program, had at some point gotten a gig teaching for the Four Corners School of Outdoor Education on the San Juan River, and I believe he was doing it with Page Stegner, who at the time was a creative writing professor at UCSC. And Four Corners had them teaching as a team, with Page teaching writing, while they all went down the river together, and

George teaching photography. He was a landscape and wilderness photographer, among other things. And they did it, I don't know how many times, once or twice, and then Page decided not to do it anymore. Page had also taught a class for UCSC, a creative writing class on the San Juan River, so he had a connection to that river.

In any case, Four Corners was looking for somebody else to partner with George to do literary and verbal kind of instruction while he was doing photography. So, there was one year where George and I taught the class together. He invited me because he knew me. And that was all very interesting because he was teaching photography before digital photography, so nobody ever saw the pictures that they took while they were on the trip. So, there was a lot of metaphorical discussion going on about how to make a good photograph. And what we discovered was that there are a lot of parallels between talking about photography and talking about writing: framing and focus and emphasis and value. And then George could no longer do it and I think that's when I approached you. I remember going to your house on Colorado Street—

Keller: Mm, hmm.

Rabkin: —and trying to pitch this to you. And I think you were a little skeptical at first, maybe. But somehow eventually—

Keller: Looking back, I can't imagine why I was skeptical, if that was the case, because I can only see it from the vantage point of now, what a great thing it was.

Rabkin: Well, you didn't know the program. We didn't know each other very well at that point. It was kind of a new endeavor.

Keller: I think part of what made that so enjoyable for us as teachers is that the Four Corners School was hiring river guides—I know I would have initially thought, wait, I'm not a river guide. But since they took care of that part, you and I could concentrate on the writing and the sketching.

I just remember staying up late at night in our shared tent with the excitement of the incredible ways that what we were trying to teach were interweaving and crossing and supporting each other, and talking about the next day: "Oh, oh, if you're going to have them do that, I'll have them do this. And then your afternoon thing will lead into—" I just remember it being kind of a nonstop joyride for us. And that can't be bad for the participants, when the teachers are having a blast.

Rabkin: That was my first opportunity to essentially take your classes. It was such a privilege to be your student and your fellow teacher at the same time.

Keller: Likewise.

Rabkin: I think the class was called: "Reflections on the San Juan: A River Journal," or something like that.

Keller: Yeah.

Rabkin: And we were on the river for eight or nine days.

Keller: Yes.

Rabkin: And we would camp every night and we would stop along the river and do little lessons at lunchtime at various stops.

Keller: And actually, now that I think about the history of that—the evolution from writing and photography, to drawing and photography—a really nice thing about the class we taught was that they could all land in the same book. People would bring their journal and those sketches and those poems—all of their responses were right there before them on those pages. We think naturally, you and I do, given how much we have enjoyed creating illustrated field journals, and illustrated journals in our own lives, that that's a really rich way to respond to the environment.

Rabkin: I don't remember, how much teaching had you done at that point?

Keller: I think I had done a fair amount because I think that that was 1993.

Rabkin: Oh, okay. It was that far along.

Keller: I think it was 1993-1995. And I started teaching for John [Wilkes] in 1986.

Rabkin: Oh, wow. Okay. So maybe we should back up then and start talking about the graduate program in science illustration?

Keller: (laughs) Sure, that would be good, to get to that topic.

Rabkin: Was there anything else you wanted to say about "Reflections on the San Juan"?

Keller: No, I think there's an endless amount that we could go into with each thing. Just that the participants were quite wonderful, and I loved how Jake [one of the river guides] would get out the conch shell and blow the horn in the morning, and call out: "Caww—FEEE!" And then we'd all gather. It's another great example of how a group

of people that goes to do an adventure together bonds in a way that makes each thing you do on that adventure have lasting meaning.

Rabkin: Yes.

THE GRADUATE CERTIFICATE PROGRAM IN SCIENCE ILLUSTRATION

Genesis of the Program

Okay, so there you are. You've graduated from UCSC; you're working at Graphic Services now. And somehow the Science Illustration Graduate Program gets born. Tell me about that.

Keller: Okay. When I graduated, John said, "Hey, you know, I am trying to get this Science Illustration Program off the ground. Do you think you would like to someday teach in it?" And I said, "Yeah! Sure." And in my mind, I remember very clearly at the time, I was thinking, yeah, right. That's never going to happen. You're never going to call me to teach. I just thought it seemed kind of pie-in-the-sky.

So, I was working at Graphics Services, gainfully employed, and illustrating Ken's book, and getting my career off the ground. And a couple of years went by and John called me. And he said, "Okay, do you want to apply?" I said, "Definitely." So I did. He gave me the job.

Then I thought, whoa! Now—*uh-oh*. I have to get up in front of people. Well, a way of describing how much of a leap that was for me is to just say that when I told my friends and family that I had taken on this job of being a lecturer in Science Communication, creating and teaching an illustration class, their response was not, "Wow, great, Jenny!

Congratulations." Almost down to a person they said, "What? *You*? How are you going to do that?" Because my shyness was a big part of who I am and was. And they just couldn't see me doing it, couldn't see me getting up in front of a group of people and talking like that.

It was one of those things that—well, fortunately, teaching isn't about you. It's about the thing you're talking about. And I was so excited about that thing. [But] I had a stomachache before most classes because I was afraid of talking in front of people. But once we got going, it was such a joy that I kept with it.

I think I still, in the beginning of each new school year, go through that, (gasps), "Uh-oh, a bunch of people I don't know!" I'm still a shy person, but I know how to navigate it and I've had some good advice over the years. A therapist once told me, "You could reframe that. You could think of it as excitement instead of fear." And I thought, wow, that kind of works in a weird way. She said, "Just think of it as your way of getting ready, and don't condemn yourself for the feelings you're feeling. Just go, okay, this is what I do before a class and it spurs me to prepare." And lo and behold, when you learn to strategize and work with who you really are, you not only can work with who you are, but you start to transform yourself and you realize, I'm not really afraid of this anymore. I know how to navigate these waters.

So, even though I wondered at first if it was something I should do because it caused me a lot of angst, I took the advice of a friend who said, "No, this is good for you. You're going to prevail. You'll be able to do this. Stick with it." And I'm really glad I did.

Rabkin: And so are a lot of other people.

Keller: Well, thank you. I actually—I don't remember quite where this fell, but I was a TA for Pieter Folkens before I took on my own class.

Rabkin: So, was Pieter teaching in the new graduate program?

Keller: Yeah, I think he was. And John was smart. He tried to figure out how to—I didn't have a teaching credential; I didn't really have experience. So, he set it up so I was a TA and then I taught two summer session classes. And then I taught my own full class. So, by the time I got into the regular school year, a full ten-week class, I had some experience and I knew some things to do and not to do.

Rabkin: So, in the first year of the program, who was responsible for administratively setting up the program, creating admissions criteria, advertising, looking for people, creating the curriculum and all that?

Keller: With the exception of the very last word you said, "curriculum," I think it was John. I was blissfully unaware of how the people got there. He literally said to me, "I think your first class should be called *Field Sketching*. I said, "Okay, anything else?" And then, true to form, he said, "No, just take it from there." And then I guess also characteristically, I said, "Okay, great."

He gave us a lot of free rein and I would say that is one of John's brilliant qualities, is that he is willing and eager to give in to someone else's expertise, not that I would have called myself an expert at that point, or maybe ever. But he saw something in me that he thought I could do and he gave me the space in which to do it, and the opportunity to do it.

So, all that other stuff was taken care of by John and the Science Communication Program, the great umbrella that was over us. But the curriculum he left entirely up to me and my class. And when Ann [Caudle] came on board, which was not that long after me—I've tried again and again to tease apart when that was—but it was less than a year, I'm pretty sure, when Ann Caudle came on board. Same thing—we had our classes and then we had the two of us to confer about what people might need to learn and want to learn, in order to do this thing that we do that we both love.

Rabkin: At that point was Pieter Folkens no longer involved with the graduate program?

Keller: Yeah, he eventually was asked to leave by John. I think John determined that Pieter's particular style was not conducive to a good experience for the students, and for their general level of confidence. Whatever it was, I think that Pieter maybe was also ready to move on. So, he moved on and Ann and I took up the cause and were very happy to do so.

John asked me around that time if I wanted to be the director of the Science Illustration track of the Science Communication Program. And I said, "Wow, thank you. Let me think about that." I came back to him a few days later and I said, "You know, this is really hard to say, but I don't think I want the job. I would rather have more time for my freelance work and I believe that to be the director would take up a lot of time with things I don't know if I really want to do. I know they're worth doing, but maybe not by me." So, he asked Ann, and Ann said yes. And it's been great. She's a wonderful director. She was pleased to take on the job. And I'm more than happy to be the coordinator—

Rabkin: Is that your title?

Keller: I guess so. I think that's what my title officially was at UCSC and we kind of carried it over to CSUMB. It's been great. It suits us both.

Rabkin: So, the very first year of the certificate-granting program was—when?

Keller: In the 1983-1984 academic year. My sister, Gail, was in that first year. It was before I was on board and my sister, of course, as I said, went on to become a museum exhibit preparator at the Oakland Museum of California, and made excellent use of her certificate in science illustration. But it was a very small affair in the beginning. It was a few students, some scattered classes, not the intensely concentrated thing that it has become. And those graduate students were mixed in with undergraduates for a long time.

Rabkin: Even into the period when you and Ann took over the program.

Keller: Yes, even into the time when Ann and I were teaching in it. We had ten graduate students and some of our courses were devoted to those ten graduate students, but—I'm trying to figure out the percentage—but maybe half or most were where those ten students were mixed in with eight additional undergraduate students. And that was how we served the campus community, as well as our own graduate students. And then we also had classes that were devoted entirely to undergraduate students, so it was quite a menu.

Rabkin: Can you talk about the goals and purpose of the graduate program?

Keller: As it is now?

Rabkin: Well, let's start with as it was originally founded. What was your vision for it? What need was it serving? Why did it seem like a worthwhile endeavor?

Keller: Okay. It was John's vision. He's the one that thought that there should be a science illustration track to parallel the writing track in the science communication program. And as he described it to us, he was thinking of it as—he even used the words, at least in my memory: "A nineteenth-century drawing school that would create illustrations to accompany scientific texts." Very traditional media was what he described to us as his vision. We didn't have digital media at the time anyway.

So, we were happy to do that and we embarked on that. But, of course, as the years went by, it became more and more apparent that what we were not only trying to do with our students, but seeing done in the professional world, were illustrations that were explanatory and conceptual and descriptive of a process, not just a beautiful portrait of a panda, or whatever it was. It would be: well, here's the step-by-step cycle of how the T-cell comes in, and some kind of invader to the body is attacked and then overcome, and then you develop an immunity, etcetera. Such sequences of events would be important.

And then also, gradually, the digital world started picking up speed, and did for illustration and graphics as much as in every other realm. And it was we who went to John and said, "John, we have to start offering computer classes." We had to talk him into it. We finally got him to say, "Yeah, I think we need to do that." So we hired Larry Lavendel, who taught our first computer classes. The first computer illustrations were trying to make the computer act like traditional media, and they were awkward, and

there were only so many tools. But, of course, it got better and better, and now it's a huge part of our curriculum.

So, the original vision transitioned a great deal, from the kinds of things we were drawing in the beginning, to the kinds of concepts that we were trying to illustrate, and the media that we're using now. But I would say that the idea of preparing people for what is really being used out there has been the same. And communicating science, of course, has been a thread throughout the whole thing. So that hasn't changed.

Prospective Students

Rabkin: What kind of people were you looking for and getting as students in the program?

Keller: What we do when we ask people to apply is the traditional things you would think of. There's a transcript. There are letters of recommendation. There's a statement of purpose. But we also have a portfolio requirement to the application. And that tells us volumes. We can flip through that and know with one perusal whether or not someone is absolutely ready, pretty good and acceptable, on the fringes, or just not ready. It's just right there in the portfolio.

Rabkin: Are you looking for people with a certain amount of artistic/technical proficiency?

Keller: We're looking for a few things. One thing is that they have actually looked at science illustration and are trying to go there. Sometimes we get portfolios where someone is—all of their artwork has nothing to do with nature or science. And I'm just surprised. I think, do you know what science illustration is? Are you sure you want to

apply, because I'm not seeing anything that shows that that's even an interest of yours. So that would be at one end, I suppose.

What we're really hoping to see is some technical skill, some ability to be realistic where it's necessary—and those are really important words: "where it's necessary," because science illustration is not about being excruciatingly detailed across the entirety of the subject that you're portraying. In fact, that can actually confuse the viewer because there's no hierarchy of importance. So, as long as you take the thing that is most important to the concepts that you're trying to convey and make that the detailed area, while the rest is sort of the supporting cast, the matrix, the background, the stage on which this story is being told, then you've got something that the viewer can really approach and absorb and understand things from more readily. So that's a big plus—if someone can create some visual hierarchy. If someone can also create realism, we can tell them about how to moderate that. So, we do look for some realism.

We also look for a range of techniques. We want them to have tried out black and white; we want them to have tried out color as well, so examples of both of those things. We have also started asking them to cite their sources. We want to know if something came from a photograph, and where, or if they drew it from life, because that tells us a lot, when we're looking at that image, about what they are able to interpret. Sometimes you're clearing things up in a photograph. Or sometimes you're making the same mistakes that the camera—I wouldn't say the photographer—but that a camera can make. It can distort things because of the lens and the angle. As an illustrator, can you clear that up, or can you even recognize when that's happening? And then, drawing from life, of course, is an important type of interpretation, too.

And then, the big cherry on top, which we tell people if they bother to call us and ask, "What should I put in my portfolio?" We say, "Have one or more of your illustrations tell a story. Pick a topic in science and tell us something about it. Maybe it's a step-by-step. Maybe it's a diagram with call-outs and words on it. Maybe it's a special view of something that shows a cutaway, or being able to see over and under the water at the same time. Or maybe it's a special view, in terms of our eyes can't do this but our tools can, and here's how something looks under a microscope when you've taken the time to focus at all of the different levels and you've put it all together. Or, we know there are extrasolar planets. We don't know what they look like. Light doesn't even shine on those. That's what extrasolar means. But we know the chemical composition of those. If we shined our sun's light on them, what color might they be? This is what science illustrators can do. And so, if you've taken any one of those millions of scientific topics and just tried to tell us a story about it, that really helps a portfolio stand out.

We don't care that people know how to do everything. We have occasionally told people, "We think that you are good to go. We don't know if we have stuff that we can teach you." We don't want people to come and waste their time and money. There are some people out there that are already really good. That doesn't necessarily dissuade people. We talk to them about what we have to offer.

But we do want people to know the field, be interested in the field. We also pay some attention to their background. They don't have to have a degree in science. That was actually one of the perks about leaving UCSC and going to CSUMB, was that we could set our own entrance criteria. And at the time when we were at UCSC proper and part of the Physical and Biological Sciences [division], they really wanted us to highly favor people with a bachelor of science degree. They had to have a degree in some science

before they could be a part of our program. They'd let us squeak in, here and there, an art major, or someone who was maybe even majoring in something outside of those two: science or art. But we were strongly encouraged to take science majors only and give them preference.

But there are people who, by their application, have amply demonstrated that, while maybe their degree is in the arts or literature or math or something—well, I guess math is also a science—but they have demonstrated interest in the science side. So, if they're an art major, their work and their history and the extra things that they've done show that they're interested and somewhat informed about science, or vice versa. So those are things we look for. And that, I think, sums up as much as I can think of about our criteria.

Rabkin: Do you ever get applicants who look to you to be not quite ready, who you would encourage to do certain things to get more ready, and apply again?

Keller: Definitely. We've had people apply as many as three times before they got in.

Rabkin: Wow.

Keller: Like, I said, anybody who asks us, we're quite willing to tell them what they need to do. We've even had people come and shape their careers—I would say this falls into the category of something very amazing and gratifying to have had enough years to witness—but I had a student come as a high school student with her mom to a workshop I was teaching at the UCSC Arboretum. It was like a match to tinder. This is Logan Parsons I'm talking about. She just loved science illustration, loved that workshop. She got in touch with me later and she said, "I'm graduating from high

school and I want to know what I should do in college in order to come to your program when I'm finished?" And I said, "Oh, my. Okay. Here we go." And I told her a bunch of things that I thought would be ideal.

She graduated and she applied and she got into our program, did a brilliant job, graduated with flying colors, and after she graduated, embarked on a distinguished career in science illustration. And we hired her back to be our TA some years later. She did such a wonderful job teaching—not everybody is a natural teacher as well as a natural illustrator, but she was really wonderful. And then we actually had her teach one of the full-on courses, not just as a TA, but as the instructor. So that was from high school to colleague, and I got to see the whole thing.

Rabkin: What a great story.

Have your admissions standards or expectations changed since the program began?

Keller: Well, I think they've evolved. I don't know if I have on the tip of my tongue how they've changed, except that we do have more freedom at CSUMB to choose exactly who we think is ready and not feel beholden to anybody else in that decision-making.

We entered CSUMB as part of the Extended Education Program. We can get into the history of that. But now, we actually have an academic home at CSUMB. We're part of the College of Science. And so, while we're still self-supporting, we do have our colleagues in the College of Science that we are now starting to network with and create illustration opportunities for our graduate students with. And we have a wonderful dean who, I think, gets it. And not all of them do. I always think about something I

heard a keynote speaker, Warren D. Alman, say at the Guild of Natural Science Illustrators in 2011. He said, "Oh, you know. Scientists are always afraid of us because they think we're going to turn their perfect science into crap." (laughs) And I thought, oh, goodness. That does kind of sum up how scientists can sometimes be afraid of the art component, or the visual component, of telling about what they do to the world at large. And if you get administrators that are of that view, or who just don't have an opinion either way, then it can be hard to get them on board for your cause, and you've got a lot of convincing to do. But I think we've got a dean now who is excited about what we do. So, we're looking excitedly at the future with this person.

Rabkin: Great. How's that for a place to stop today?

Keller: Sounds good.

Rabkin: Perfect. Thanks.

Prospective Students

Okay, it's Monday, June 26 and Jenny Keller and I, Sarah Rabkin, are at my house in Soquel, California. I think I forgot to mention at our second interview that we were once again at Jenny's house on the Westside of Santa Cruz. But today, Monday, June 26, we're at my house for the third in our series of oral history interviews. And Jenny, last time when we finished up we were talking about the application process to the graduate program and what you and Ann Caudle look for in an applicant. And it's occurred to me to ask you about the other end of that process, about the students who apply, and why it is that they are seeking to enter into the profession of science illustration, what motivates them.

Keller: Well, of course I can't speak to individual reasons, necessarily. But it seems like, in general, this is the kind of thing that people just discover and it clicks. We like to joke that people have found their tribe, or, as you and I have used in other circles, found their long-lost littermates, because oftentimes they'll get to us and say that they have felt nerdy or strange their whole lives, and then they get to our program and they feel like, oh, my gosh, everybody thinks this is *normal*. (laughs) And what I mean by this is that it feels like science and art are a really natural fit with each other. And I think that that—well, of course, this is going to be my viewpoint—but I just think it's not surprising, because at one point in history you couldn't be a good scientist without also being something of an artist because you had to record, sometimes visually, the things you were observing. That was crucial for showing new landscapes, new species, things that were first seen through the microscope—all sort of things had to be recorded visually, and all the better if that could come from the scientist's own hand, the direct observer of the information. And there were times when—you know, Sidney Parkinson on James Cook's first voyage around the world was the artist on board, and he did over a thousand drawings on that voyage. And he didn't even make it home. He died at sea after they left Jakarta. But those drawings of plants found in Australia and New Zealand, etcetera, etcetera, were sometimes the only thing that made it home because sometimes the specimens that they had pressed got eaten, or damp, or— (laughs)

There's another really interesting example from history. During the mid-eighteenth century, Mark Catesby was collecting plants from the Carolinas and Florida etcetera. He put a lot of stuff in jars, specimens like reptiles and amphibians and things that you wouldn't press between sheets of paper. And they preserved things in brandy and they sent them home on a ship with a bunch of sailors who were really jonesing for a drink.

(laughs) And it sounds pretty horrifying, but the sailors would sometimes drink the brandy out of the specimen bottles, with whatever was in there, and of course it would ruin the specimen. So, it was really hard to get things home sometimes.

Rabkin: You know, in Asia some of the alcoholic delicacies come in big vats with snakes in them.

Keller: Oh, really? Well, there you have it. So anyway, back to our original question, the idea of having science and art go together is a really natural one, I think. And for some people, whether they come at it from the art direction or the science direction, they are, down to a person, delighted to be able to put the two together. And typically, they tell us stories like, "Well, I was doing my science and my fieldwork and my lab work and stuff and I thought, but where is this part that I so long for, am equally interested in, and it seems like it should be a part of it? Wouldn't it be great if I could illustrate my own research, etcetera, etcetera?" Or an artist who says, "I don't know. I just have never been able to stay away from the sciences and I love nature and all those stories of nature and science and illustrations that I see being done for them. That's the kind of art that I love the most and I want to do that." It just seems to hit, to strike a chord with certain people.

Rabkin: Thank you. That makes complete sense to me, of course.

Curriculum

Well, let's talk about the curriculum of the graduate program. Once it was firmly established as a graduate program, what were the courses that you expected students to take, and who taught them, and what skills were you wanting them to learn?

Keller: That's quite a detailed answer.

Rabkin: It's a lot.

Keller: Early on, courses were *Field Sketching*, *Introduction to Science Illustration*, *Botanical Illustration*, *Zoological Illustration*, and at least one class that was focused on color. Maybe there was also an advanced color class quite early on. And there was what we called an *Advanced Techniques* course. So, I was [teaching] *Field Sketching, Zoological,* the *Advanced Techniques* course, and Ann was [teaching] *Intro*, *Botanical*, and the *Color*—although there is spillover in all of those because, of course, in *Field Sketching*, is it okay to draw a plant before you've gotten to the *Botanical* class? Yes. So, it's like every other thing you learn: What comes first? Everything needs to come first.

Rabkin: And you were probably teaching some color techniques in the *Field Sketching* class.

Keller: Exactly. So, what we were trying to achieve is people having a broad base of knowledge in the kinds of techniques that they could use to illustrate the science that they brought to the program. And that is still one of the reasons why we need and expect people to have a strong background in science before they come to us. And it really makes sense because there's no way we could hope to delve into all the different corners of the grand overarching field of science. We can't really teach everybody about zoology and botany and mineralogy and physics—

Rabkin: Astronomy—

Keller: —and astronomy, and all these things. We have to try to make sure that they have a working basis so that they can talk to scientists. But then, beyond that, we let the

specialization in different scientific areas be up to them. We hold them to task to be accurate and we certainly correct them on anything that we see that is inaccurate. But, for the most part, we are training them to illustrate the science that they know and will learn as they work with scientists in the future.

So, we begin the curriculum in the beginning of the year with a very short survey of basic visualization techniques. They've all submitted a portfolio, so they have some skills already, but we want to make sure that everybody knows how to see light on a form, know what it does, know how to make something look furry or shiny, like I've described before. They learn what kind of measuring tools you can use to make an accurate drawing.

And that word *accuracy* just deserves lectures in and of itself because: what kind of accuracy are you talking about? This is something we address, that every illustration is "choosing" a portion of the truth to say accurately. And it basically has to let some of the rest go. A good example of that is a map. Any map is a flat thing, and we're usually talking about Planet Earth, or areas that don't necessarily translate to something flat. So, if you look at the example of a globe and a map of the world, you are already thinking, okay, so it's not round. We are sacrificing some information. Why would we do that? Well, it's not easy to put a globe in your pocket. You might want to draw straight lines of travel, like on a Mercator projection. There are specific purposes to which your illustration can be put so you just have to pick and choose. So, we talk to them about what to do when a client says, "I want this to be really accurate." Your job is to sleuth out, okay, what kind of accuracy is most important to them? You may not say it to them in those words. Or you may. But you need to know what information does your viewer need to get from this illustration? Another good example is all the ways we portray

molecules. There are ribbon diagrams and there's ball and stick, and there's space-filling, and orbitals—all this stuff that goes with chemistry, and all these conventions, and they're each talking about different things. And you choose according to what thing you're trying to say. And I forgot what our original question was.

Rabkin: We were talking about the curriculum.

Keller: (laughs) Oh, right. So, yeah, we talk to them about some basic things. We also have seminars—I'm getting into what we do currently, because it's really hard to stick to just the past—but we have seminars on what would be your elevator speech if someone said, "Huh, you're a science illustrator. What's that?" We call that Question Number One, because a lot of people don't know what a science illustrator is or does. And if you describe it to people, usually the second question is: Do we still need that? Do people do that anymore? And then I encourage people to make up an example, or to have an example at the ready that will convey right away how we do still need science illustration. A cutaway of the earth is a good example. You can't take a photograph of that. Anything that's from the Jurassic, (laughs) anything that has to do with extinct species—you can't take a photograph of that. And so on. And so, science illustration goes into the past; it goes into realms that we can't easily see. It also goes into the future. You might be asked to draw something that doesn't exist yet but that someone is planning on making or doing or describing. And these are good examples for our students to be able to spread the word about how what we do is really current and vital.

So, there's a lot of beginning stuff that helps people feel oriented to the field and oriented to just light and shadow, shading, what you can do with line art, what you can do with continuous tone art. And we start to introduce color right in the beginning.

Even though it's somewhat informal in the field sketching class, we found it's great to get people swimming around in something and then they really know what questions to ask and then they get their formal class.

So, there's that progression. The progression also goes from what I tend to call portraiture, to more explanatory, diagrammatic, conceptual type of art, as we go on. So, their first term would be: let's illustrate a beautiful image of maybe something that you can't see in a photograph. In the second term, they're trying to make those illustrations work with text; they're trying to show something step by step; they're showing a process. They're definitely doing work that could not be achieved with a photograph. And sometimes they're doing things like interpretative panels. They're illustrating articles.

And also, during that term we start bringing in some of the more practical aspects of being a science illustrator. And this was actually one of the nice things that changed for us when we moved from UCSC to CSUMB. UCSC would outright tell us not to include too much practical stuff in our curriculum because we were "not a trade school." And we would always try and slip it in there anyway, without telling them, because that's part of what our students need to succeed. They need to know about how to write a contract. They need to know about copyright law. They need to know about copyrighting their own artwork, as well as not infringing on the copyrights of other artists, etcetera. When we moved to CSUMB, one of the first things they said was, "Well, we're big on learning outcomes, and we want you to outline how your curriculum is going to really prepare the people who graduate from your program to be professionals in this field." And we thought (excited intake of breath) "Hallelujah! This is great. This is what we've been doing all along and are more than happy to expand

on." So, during that second term we bring in our art law attorney and he talks about business practices. We talk about contracts and we also have seminars on how to price your artwork. There's a lot of practical stuff like that that is getting people thinking in that direction.

In the third term, we allow people to specialize a little bit more. Up to that point, we've been saying a lot of, "Use this technique," and some amount of, "Try this subject matter." In the third term, it's a more free [process], so people can do more portfolio development in the direction that they want to go. Even though there are classes in zoological and botanical illustration during that term, we are very relaxed about those definitions, and you can include a lot in those classes, depending on where you want to take it. There's also exhibit work, preparatory work. And one of the big things is we still collaborate with the Science Writing Program at UC Santa Cruz. Those science writers collaborate with our science illustrators to create the online magazine called *Science Notes*. And this is the first time that our illustrators have been handed a topic.

Rabkin: As they would be in the professional world.

Keller: Exactly. Yes. Up to that point, we might have encouraged them one way or another, but even though they had to respond to a manuscript, they chose the manuscript. Now they're being given something that they just have to figure out how to illustrate, even if it's not something that they picked. And they have to work with the person who wrote that piece, who may or may not be visually astute, may or not have good ideas of what might further the understanding of the article, as opposed to just be a pretty picture. Typically, what you want to illustrate is something that the words are not quite able to accomplish on their own. So, the illustration students get to play that

role, where they are working with the author and the text, but also bringing their own expertise to bear, to try to make the images and text work together as well as they possibly can.

That, and the exhibit that we put on at the Pacific Grove Museum of Natural History, formerly at the Santa Cruz Museum of Natural History when we were still in Santa Cruz, is really the culmination of their spring term. It gets them out there, gets them talking to the public seeing their work; it gets their work published in an online magazine. It makes them have to work in a professional sphere, as much as we can craft that for them.

After that, they are ready to go on to their internship. The internship is actually a fourth term. It's a ten-week requirement that they go to a place of their choosing. We do not hand people internships. We consider it a part of their education to figure out what they want to do and then contact those people. We help. We write letters. We facilitate that. But they need to figure out where they want to go to be mentored by someone in the field. And it's as varied as—people have gone to an archaeological dig on the Isle of Cypress, to *Scientific American*, *National Geographic*, *American Scientist*, American Museum of Natural History—all sorts of institutions, magazines, and scientific endeavors. The [Arizona-]Sonora Desert Museum. The internship is the real culmination of their certificate, when they complete that. And if there's more to say about internships, I'll definitely let Ann speak to that [later in this oral history] because she spearheads that part of our program and so she'll have more things to say.

Rabkin: You mentioned the certificate. Are there drawbacks and benefits to being a program that grants a certificate, as opposed to a master's degree or some other kind of diploma?

Keller: Yeah, there are. The advantages to a certificate are: half the cost. It happens in one year instead of two. Right there, that's a big benefit to our students because this is a field where you can graduate and make a living, but it's not typically the kind of field where you're going to buy great big toys like yachts and things. It's not super lucrative, but if you love it, you're happy to do it, and you do—but this means that to be saddled with a huge amount of debt when you get out is not really going to help your success, right? So, we're very pleased that people can get out in one year. The year is incredibly intensive. We strongly advise people to have no other commitments during that year, no part-time job, no other things that they have to do. They need to live close by. It's usually a 24-7 kind of endeavor for people. They have access to our studio around the clock, and sometimes they are there round the clock.

Rabkin: Do you ever have students who are parents?

Keller: Yeah, occasionally we've had some that are parents, and they are depending heavily on their partner or their support system to take care of their kids when they're too busy to be the full-time parent that they might wish to be. We have had, literally, I think a handful, max, over all of these decades of running the program, of people who had a job at the same time. Very few, and when they pull it off, we draw stars all over their letters of recommendation because oh, my. I can't imagine being able to do it. It's very intensive, time-wise. It's a very intensive program and we pack a lot into that year. I feel like they are well prepared for what they're going to do next.

The disadvantages of a certificate are that it doesn't sound as good as a master's, and a master's opens some doors for certain kinds of teaching positions that a few of our students find that they want to go on to. What is really a disappointment for me is that we kept adding classes to our certificate program while we were at UCSC, yet still called ourselves a certificate program. And then that precedent was set. That number of units—and if you ask me the number of them I won't remember it, because I don't remember numbers—but that number of units was, by precedent, applying to that certificate. At other times during our history, however, we've investigated the possibility of becoming a master's and had it pointed out to us that we actually had close to enough units to be considered a Master's by any other measure. And certainly, in Europe, the master's programs in scientific illustration don't offer anything more than we do in terms of units and classes. But because of our own precedent, we can't just go back and say (and this is what I've been told), "Well, now we're going to call it a master's." So, we would have to add to it somehow, and that backs us up against the fact that we're already using a full calendar year, so we would have to figure out how to add on an extra term.

The other thing is that both Ann and I, who run the program, have the terminal degree in our field. I have a degree in natural science illustration; Ann has a degree in art. She could go on to get a master's. But at the time that we started this program, there wasn't any other program that I could go on to and study in my field. So, in order for us to run a master's program, we would need PhD's, which neither of us have. So, we'd have the prospect of trying to find maybe some other PhD who would be willing to run this for us.

So even though in some ways it would be of benefit to become a master's program, there were enough obstacles and some real disincentives in terms of the students' point of view—the cost in particular—that we just decided to keep it the way it was. We also have quite a bit of autonomy, running things the way we do, and if the larger university and other the PhDs had access they would have say-so. That was what we were up against with the Division of Physical and Biological Sciences at UCSC, when they wanted us to accept only students who had a degree in science, when we knew very well that there could be excellent science illustrators that might come from other fields. So, we're a little reluctant to give up that autonomy.

Rabkin: That makes sense. How has the curriculum changed over the years, between when you started it at UCSC and now?

Keller: Well, in a word: digital. (laughs) Of course, the computer arrived and has been incorporated into our curriculum in a big way, in a way that is really pleasing, I think, to all of us, even those of us who teach some of the more traditional classes, even so, we'll say, "Well, why don't you scan this and then manipulate this background so that you have a little bit more of a graded tone and then put the text over that?" I mean, we all talk that way now. And that was what I foresaw and hoped for with the advent of the computer as one of our tools: that it would actually become just another kind of paintbrush. And it really has. So, we use it when the capabilities of the computer are what we need, are an advantage to the goal we're trying to achieve. And then there are some things that are faster to do by hand, that we still do by hand, or are just better by hand. Or it's not uncommon for a student to begin something in a traditional medium, scan it, print it out, even work on it more by hand, scan it in again. The computer is just another paintbrush, as I like to say. So that has changed.

And then in the last few years, animation, or as we should say now, motion graphics, have come on the scene. And that has been incredibly exciting and wonderful for our students because they can create a layered illustration and turn that into an animation, and someone is going to go to their website and they can play it right there. You don't have to be there in person with your paper portfolio anymore to interview for a job. People can see your work in motion, if you've created it that way.

Rabkin: So, what would be an example of the kind of subject you might want to illustrate using those moving graphics? You mentioned a layered illustration.

Keller: Yeah, so there might be a before and after situation. So, maybe you show Yellowstone, a landscape before the reintroduction of wolves—and this has been a topic recently because there's been some assessment of what role the reintroduced wolves have actually played. But, just for the sake of example, maybe the increased predation on herbivores would change the landscape in terms of willows around streambeds and grasses and so on, and then that would affect the populations of other species. And so, you could see that play out in front of you, where the landscape actually changed. You might even have markers that show how the different species would appear and disappear. You can even change the size of those markers, so if the wolf icon at the bottom of your screen gets large, maybe that population is increasing. And you could have things move over time and so that icon could get smaller. Another elk icon might get bigger. And then you might have more raptors— You can explain things dimensionally and temporally. Well, it's easy to imagine different sorts of situations when being able to tell a story in that way would be even better than a single picture.

Rabkin: Do you have a faculty person who specializes in that field?

Keller: Yes, Amadeo Bachar, who was one of our own students. I think it was 2004 that he was in our program, and he said to me at one point while I was teaching him, in one of our classes he said, "Wow, Jenny. You have the dream job." (laughs) Meaning being a freelance illustrator and getting to teach science illustration. And I said, "Yeah, I do. This is the best part of it. There's some tedium behind it, but yeah, it's great." And so, he indicated that interest. At the end of his year I said, "Hey, you know how to do X, Y, and Z with our new scanner. Would you teach Ann and I how to do that?" Because he was already ahead of us in terms of using some of our new equipment. He said, "Yeah, sure." And boy, he doesn't know how important that moment was. We weren't trying to assess his abilities as a teacher, but because of his interest, I suppose, he came completely prepared. He had a handout for us. He had some examples. He showed us step-by-step how to do it. And it was a wonderful lesson that made us feel perfectly prepared for what we wanted to do. And I thought, wow, that was great. Thank you so much.

Well, eventually we were looking for a digital illustration teacher. Amadeo wasn't our first, but when we were in the position of looking for someone new we called him and said, "Hey, how would you like to take it from here?" So he joined us on the faculty. It has been a fantastic collaboration. We are so lucky to have him. He really does have that skill and interest in teaching well, in addition to illustrating well.

Rabkin: Are there any other instructors, besides you, and Ann, and Amadeo, who make up the main faculty of the program?

Keller: We three are the main faculty. We also always have a teaching assistant nowadays. We used to draw that teaching assistant from our current graduate class,

which was not as successful, I think, as what we do now. Because what we do now is we chose someone for whom it is an add-on to whatever else they're doing, not an add-on to trying to be in the program at the same time.

Rabkin: You used to have a teaching assistant who was concurrently a graduate student?

Keller: Yes, thank you for putting it that way. That's more clear. So, we have chosen, by and large, our teaching assistants from our past graduates, not every single time, but the times we haven't, we have been disappointed that the person didn't quite get what we were doing, even if they knew Photoshop, or they knew whatever it was that we were hiring them to teach. So currently we have Andrea Dingeldein, and she's fantastic. We had Logan at one point, as I mentioned. And Lucy Conklin was also one of our esteemed TA's. We always think that we could never survive if one of them ever leaves, and then somehow, we manage to, and then we love the new person equally and feel that we can't live without them. (laughs) So we are thrilled to have that help. It's been really invaluable, particularly in that digital class, because if you miss one command in a computer class you are completely lost. So, to have someone who can survey the room and do the sweep of people who are not quite getting it—it really helps those classes move along.

So, we've had our teaching assistants. We've also had—originally—and I can't remember what year he came on—Larry Lavendel taught our computer classes in the beginning. And that went on for some years. And then it was while we were at University Town Center, after we had moved to UC Extension, in about, I would guess, 2007, that Amadeo came on board.

Guest Instructors

Rabkin: And then you also have a retinue of guest instructors.

Keller: Yes.

Rabkin: Tell me about those.

Keller: Yes, and that makes me think that I should also mention that occasionally we've had a guest instructor teach a regular class for us. Usually it's someone who has been our TA for a couple of years and we feel like they're ready. Just this past year we had Jane Kim, also one of our graduates, who hadn't taught for us before but I felt really confident—she came and gave a lecture—and I thought, yeah, yeah, you've got it. She did a wonderful job this last spring teaching a course. So, her name belongs there.

And then our guest speakers—oh, we are so in love with our guest speakers. They've done so much for the program. I have to mention first Ed Bell, who for about thirty years was the art director of *Scientific American* magazine. And he recently, a few years ago, went on to do other freelance things after *Scientific American*, but—I guess it was in the mid-1990s that Ann Caudle cold-called the art director of *Scientific American*. She said she was so nervous. (laughs) She got his answering machine and said, "Gee, I don't know, but would you possibly consider flying out to California for not all that much money to talk to our graduate students?" And he said yes. Ed has turned out to be the most wonderful mentor to so many of our students over the years, brought them back to *Scientific American* for internships, and comes out for a week every year to give lectures and review portfolios, and then help coach people on the launching of their career. So, I have to mention Ed first.

Some of the others: Marc Paisin is one of the people who started the California Lawyers for the Arts—he's come year after year, bless his heart—to coach our students on all things having to do with the legal side of running a business and about copyright law and so on. I just don't know what I'll ever do if Marc decides he doesn't want to teach for us anymore, because he changes his lectures every year, keeps up with everything. He asks for the students' bios so that he knows what countries they've come from, so he can speak to the way things might be in different parts of the country, or different countries. So, he's just an incredible resource. But also, I still don't know how he does it, but he makes art law fun and interesting. He gets people involved. Time and again the students say, "I thought this was going to be the most boring lecture but I learned so much and I had so much fun." So, hugs to Marc. We're so grateful to him.

Another guest is Gloria Nusse. Gloria Nusse is a scientific sculptor. She reconstructs human remains to help solve cold cases for police departments. So, she has taught courses on how to put clay on a skull to reconstruct a human face, using data and depth markers, and knowledge about muscles. This isn't going to turn any of our students into the type of artist she is in one workshop, even though it's a full day. But it does give people a taste of how you can take scientific illustration into the realm of 3-D and perform different types of services for the scientific world.

We also have children's book illustrators, like Jim LeMarche, who comes to share his artwork and tell stories about the world of publishing. We have Noah Buchanan, who teaches our students over a course of a couple of workshops human anatomy and how to draw people accurately. Maryjo Koch is another natural history illustrator who has a lot of expert techniques to share about gouache. And she also has an incredible amount of knowledge about the book publishing industry and how to make a living with all the

different venues she has found to sell her artwork in, whether it is books, or greeting cards, or wallpaper. I think she's even maybe done some fabric. She's very inspiring.

And we've had Terryl Whitlatch, who is one of the creature designers from Lucas Films. She does fantasy illustration. John Dawson, who is famous for doing a series of ant articles for *National Geographic* and a whole series of panel postage stamps for the U.S. Post Office.

Rabkin: Did he do those habitat panels?

Keller: Yeah.

Rabkin: Like the tropical forests—

Keller: The Sonoran Desert, the Kelp Forest, etc. Yes. That's John Dawson.

Rabkin: Cool.

Keller: And then I also have to mention Chris Lay who runs the now-Norris Center, [formerly the] UCSC Museum of Natural History Collections. Chris has generously been willing to loan specimens to our students to draw from all these years, even though we're not officially a part of UCSC anymore. So that extensive natural history collection has been a huge resource. It's a lot of work on his part. He has to check things out and make sure they come back and get put into their proper drawers. He's also given lectures to our students on how you make a mounted specimen, and how you pin an insect, etcetera. Again, not because our students are necessarily going to go into taxidermy, but because it's really important to know what that taxidermed animal has been through before it gets to you and you're trying to use it as a reference for an

illustration. What is true about this creature and what maybe isn't? That's really important to know.

So those are some of our esteemed guest instructors.

Rabkin: Thank you. What a roster. Does CSUMB have a comparable natural history collection?

Keller: No, they don't, although they recently acquired quite a few specimens, and since we're now part of the College of Science, we're working out how those things could be accessed by our students. They have the issue of how to store them. CSUMB is, as you know, on the old Fort Ord. And even though they have a lot of land, actual building space is at a premium, so they don't really have an accessible place to store this collection, where they could have a person devoted to checking specimens out. So right now, we're still in the anticipation stages of that collection. But even at that, it's not going to match what there is at UCSC.

Changing Affiliations and Locations

Rabkin: Well, this might be a good time to acknowledge that for the past couple of interviews we've been kind of bouncing back and forth between referring to the Graduate Program in Science Illustration at UCSC and referring to it at CSUMB, and in between, making some references to the program as it was under UC Extension. So clearly, the program has been through a lot of changes administratively since it began. And I'd like us to talk about some of those changes, starting with some moves that you made while you were still under the aegis of the Physical and Biological Sciences

Division at UC Santa Cruz: you actually made some physical moves on campus. Can you talk about that?

Keller: We had to make a lot of moves on campus. We kind of got scooched around, where there was room, I suppose. We started out in the old Blacksmith Shop, which was literally, originally a blacksmith shop on the old Cowell Ranch. That building was part of the art department, and they had been using it as a ceramics studio for some time. So it was rather dusty and not very well heated in the winter. But we really loved it because we could walk to the Arboretum; we could walk to the Farm; we had eventually our own little specimen cabinet there. It just felt kind of rustic and fun. We'd even sometimes go outside and watch the cowboys round up the cattle in the field. It felt like a nature-centric kind of place to be, even if there were leaks in the roof.

But eventually we were moved up to the then-Applied Sciences—it's now called Baskin Engineering. That was in, I think 1992; we moved up to campus proper into a real building. And that was great. We actually, for the first time, got our own offices and didn't have to have our cars serving as our offices. (laughs) We, down to the last one of us, used our cars like our traveling office, where we had all kinds of books and specimens and skeletons and artwork and stuff in our cars at all times because that was the only way we could have it handy. We did have an office on campus at Crown College, [a long way from the Blacksmith Shop at the base of campus] but who is going to go up there and store stuff up there? So, we had one office devoted to all of us that we would hold office hours in. But it was little-used.

When we moved up to Applied Sciences, we got our own offices. We also got a little room devoted just to our specimens, which you'll have to ask me about later because it

leads to one of the really funny moments in my memory about the Science Illustration Program. And then we had our classroom—and it was an adjustment, because in the old Blacksmith Shop we had learned to project our voices because it was big and echoey and cavernous. And Ann and I both thought that, when we got into a real classroom, that we had to go "Whoa! [projects voice] Oh, whoa. I guess I don't have to yell at you!"

Rabkin: (laughs)

Keller: And people seemed so *close*. It was like, "Whoa, why are you guys all right up here?" (laughs) It was just such a strange adjustment for us. But we really enjoyed being in that building.

Then, from there, this was one of our least favorite moves—we were given two weeks' notice during the school term that we had to leave, and that we were moving.

Rabkin: Why?

Keller: Oh, one never asks why. It would always be because someone else wants your space and you have to give it to them. In this case, it was math that was moving into our space. So, we were being temporarily moved to the new Interdisciplinary Sciences building. Is that right??

Rabkin: Not Natural Sciences II, but the ISB building that was right next to it?

Keller: Not Natural Sciences II. I'm trying to remember the order of things. It was definitely not Natural Sciences II, but the part that's new and connected to it. So, we were there in a classroom that would eventually be taken over by physics. So, it wasn't

long after that that we had the physicists sharking outside of our offices, sizing things up and figuring out what office they wanted, and so on.

And then from there we moved to Kerr Hall, the third floor, which was a wonderful space. We had a beautiful classroom with trees outside the windows and excellent light. And it was from there that we were eventually told—this was now 2004, at the end of the academic term in 2004—we were told, "Now you're being moved to UC Extension and you have to move off campus and go to University Town Center in downtown Santa Cruz." And that was when it wasn't just a physical move but a transfer from our [division] to a different one.

Rabkin: That transfer was orchestrated by people in the administration?

Keller: Yes.

Rabkin: So, you were basically informed that the program would no longer be overseen by the Division of Physical and Biological Sciences, but that it would now move to Extension.

Keller: Yes.

Rabkin: And what do you know about the reasons for that move?

Keller: Well, there were budget cuts all around. Really important and wonderful things were being cut on other parts of campus. Journalism, I believe, was one of the things you think should never be cut, but was.

So, because of these budget cuts and because of word from our dean, I think John Wilkes was seeing the writing on the wall—that if we could make ourselves more

attractive to the campus at large, more well known, perhaps serving more students than we were, that might help us stay on campus. So, at the time, we had undergraduate students mixed in with our graduate courses. We had very few that were devoted just to our ten graduate students. Mostly, it was those ten graduate students plus an almost equal number of undergraduates, and we just taught them all together in the same class, and we expected higher caliber work from the graduate students, and it worked well. In addition to that, we were teaching wholly undergraduate-filled courses on various science illustration topics, to serve the wider campus community.

Rabkin: During fall, winter, and spring quarter, as well as summer session?

Teaching History of Science Illustration

Keller: Yeah. So, John came up with the idea that we could teach a history of science illustration lecture course, a big lecture course, and that that would serve ninety to a hundred students in a big lecture hall. And he asked me to teach it. And when he asked me, I laughed and I said, "John, I'm really flattered but I can't remember names or dates *and* I don't know the subject matter. (laughs) So are you sure that this is a good idea?" And he said, "Well, I think you can do it and we would give you some time to prepare and also some money to help you prepare." And, as I seem to have done in my life, I accepted, when in fact I was really pretty nervous about pulling it off. But maybe that's what you do as a science illustrator. You say, "Yes, absolutely I can draw your cephalopod." And then you hang up the phone and think, oh, I've got to look that up. So it was kind of in that vein that I said yes.

So I ended up studying hard and making thousands of slides to go with this course because there was a slide library on the UCSC campus, but they didn't have any science

illustration. The few things that they would have that would qualify as science illustration were woefully short of being able to teach a full class with. So actually, [I was] going to the California Academy of Sciences into their rare book collection and taking photographs, taking photographs of artwork that I saw in person, and a whole lot of artwork that I photographed from very good reproductions in books, and some things that I drew myself from examples. I made all the slides that were necessary for that class. And that was a big project. Fortunately, I knew how to use a camera, because that's how we did it at the time, with real film, real slide film and a real camera. And I would run two projectors at once in that class, so eighty slides times two, so often 160 slides for a lecture times the number of meetings you would have in a school term, minus some reviews and a midterm and final, and maybe a couple of guests and things. So that's how I came up with that number of thousands. I actually looked into it and thought, how many did I make?

So that was a big part of the project.

Rabkin: I was wondering if you ever ended up digitizing those slides?

Keller: Well, actually, we still want to do that and now it's really inexpensive. At the time, I was sorry that we had made several copies of each one because it was just more work. But now, that has proven to be a great thing because we can send one whole set off to some other country where, probably, some poor person is doing it for not enough money, but we can actually get them digitized for an amount that we can afford. And we do want to because it's a real resource that we don't really use that much anymore. I have digitized a few of the lectures myself with equipment that they have at CSUMB, so that I could get back to them. But we would like to use them some more.

So, there was the creation of the slides. And then I had to put together a reader, which I had never done before because I didn't have that kind of class. And I had to create a website, which I had never done before, so that people could review the work on the website, and communicate with people that way. I also had to hire a teaching assistant for a lecture course, which I had never done before, and do interviews to get the right person. And I had to figure out how to use Scantron, which I had never done before, (laughs) to have the students do their exams with this computer-read kind of special means, because I was only given one TA for my hundred students. So, we had to run it ourselves. And I mentioned that before, how we did the evaluations. But the thing I was looking for in my TA was experience reading papers, reading and grading papers, because, again, that isn't something that I do, teaching illustration. So, we worked together on all those things—reading the papers—and I made the course materials.

And you know, it was so much work. I will say here, truly without exaggeration, that in preparation for that course I worked seven days a week for five months, with two days down for a time when I was too sick; I had the flu. But I worked on it night and day because there was so much to do and learn. But it was an incredibly gratifying experience, because for me personally to view history through the lens of looking at science and art and human endeavor in both of those realms was so heartening, compared to how I had ever been taught history before, which was through: here's who conquered whom; this is another war and another war. That seemed to be all history was about. But to look at it through, wow, how exciting it was to be able to look through a microscope for the first time and discover microscopic life, and to track the movements of the stars, and to discover deep-sea creatures—I mean, it just really, honestly made me fall in love with my species. I liked and loved humans more after

looking at all these amazing things. And it's not that the worlds of science and art don't have their politics and their intrigue and their backbiting and all their unfortunate aspects of human behavior. But it was so much more interesting and soulful to me personally: the amazing artists who discovered things, and explored places, and so on. So, there was that aspect of it for me, personally, and I hope for my students.

Also at the time at UCSC you were able to designate more than one breadth requirement for a course. If that was reviewed and approved, you could have a course that would satisfy more than one breadth requirement in a student's major. I succeeded in having the *History of Science Illustration* course satisfy an art requirement for science majors, and a science requirement for art majors. I suspected that it would be the case, and I think it really turned out to be true, that people were thrilled to be there, because there were a whole bunch of artists going, "Whew! I'm so glad I get to do my science requirement this way. This is great. Look at all this artwork," and the science majors thinking, "Wow, I wasn't so sure I was going to be able to take an art class, but this is my field and it's talking about what I love. And look at all this great artwork." So, I felt like I had a lot of happy people in that class.

And I also got to have a lot of freshmen and sophomores. Oh, how I love them. They rose to the occasion in the most commendable way. I already mentioned some of our esteemed guests that were coming to talk to our graduate students. I asked those same people, "Gee, while you're here, would you be willing to give an additional lecture for an additional stipend to give a talk to my history class?" And oh, my gosh. Having the forensic reconstruction artist talk to these students—I would tell them ahead of time, "Please think of some interesting questions." They also were heavily coached on how to be polite to our guests. I said, "I don't want to hear one zipper! (laughs) I don't want

you to leave early unless you are very quietly going in and out of the back doors. Because these are my colleagues and they're doing us a favor and this is going to be really cool."

So, for example, when Gloria Nusse was there giving a lecture, one of the students said, "Oh, my gosh. You're dealing with human remains, possibly from a crime. Do you ever just get creeped out?" And Gloria said, "You know, no, I don't. I am so fascinated by what I'm doing that the wow factor for just studying humans is always going to surpass the ick factor for me. But moreover, for me, I feel like I am this person's last chance to tell the world what happened to them, and that it is a big responsibility and an honor to try to be the person that tells that story for someone, especially someone who might have been the victim of a crime."

Again and again my guests would tell these heartfelt stories about the work that they do and the things that they have learned and the stories that they have been able to share with the world that mean a lot to all of us.

And my freshmen and sophomores got to be a part of that. The reason I keep going back to the fact that they were younger in their tenure at UCSC, my students in those big lecture classes, is that—and I'm sad to relay this—but the administration got wind of the caliber of guests I was having in this course and they specifically told me not to do that anymore. They said, "You're wasting this on these underclassmen and they don't need it." And I said to them, "If they're not going to get it now, when are you thinking that they would get to be privy to this amazing information and stories? These are my colleagues, and actually some of them are doing it gratis, just because they're nice enough to do it."

I ignored them. I did it anyway. I continued to do it the other time that I taught the class and no one followed up, so— I had students in that class become science illustrators. It changed the course of their careers. Not that that was my goal, but they discovered something that resonated with them. I felt very proud of that class and I just loved those students. They were fantastic. The questions they asked were brilliant.

Rabkin: What was it like for you delivering lectures—

Keller: (laughs)

Rabkin: —after having taught in a smaller setting?

Keller: I was terrified. I got up that first day in front of that sea of people and I thought, oh, there's just no way to do this except to come clean with a disclaimer. I said, "All right, you guys. I am used to teaching little classes of eighteen to twenty people and I've never done this before. And I'm a little nervous. So, this is my first time. (laughs) Be nice to me and I'll be nice to you." They just laughed. And we went from there.

And I think it actually, in retrospect, was a good thing to do because I did go on to say—I said, "Even though I haven't done this before, I'm really excited to share with you what I know and what I've learned about this field that I love so much. So, let's go." And we did. It worked out well.

But it was—oh, living from lecture to lecture for me, because even while the course was going on I was still making slides. I was just barely keeping up because there was so much to do. So, it was stressful. I even showed snippets of videos and things in that class. That was not that easy to do at that time. I had to have a VHS tape queued up to

the part I wanted to show for us to see the video I wanted on the screen. But I really put my heart into it because I thought it was a really wonderful topic.

And John had said that if we did this, that we could potentially save the program and stay on campus.

Rabkin: That serving that many undergraduate students might convey to the administration, to the dean of physical and biological sciences, that you were carrying your weight in the university?

Keller: Yeah, and also being more universally useful, I guess, to the campus, and to the department. And so, in the times when I felt just overwhelmed or incredibly fatigued by the enormity of the task I thought, I am saving the Science Illustration Program. But that was not to be.

Rabkin: I'm going to stop you there and change batteries in the recorder. Thanks, Jenny.

Keller: Okay.

Rabkin: So as someone who was accustomed to teaching small classes where interaction was the name of the game, and who then had to make a transition to teaching some lecture classes, I'm really curious about what that transition was like for you, how you learned to give lectures, and what that felt like?

Keller: What did I do? I had a tiny bit of advice, (laughs) I think it was from a book called *How to Do Everything*—

Rabkin: (laughs)

Keller: And I looked up how to give a lecture. And it said, "Look at your audience." I thought, oh, okay. Because when it's a small group, you naturally look at them, I was really that new to it that I would find help in a book like that. I thought, oh, okay. So, I looked at people. That was enormously helpful because they're looking back at you. And you end up seeing familiar faces and you start even knowing some names, even in a group that large. And so, all of a sudden there we were together. And that made me feel much better, much more at ease.

Also, the slides themselves are incredibly helpful because I have them in a certain order, and I either anticipate what is next, or the next slide comes up and it reminds me of what I wanted to say next. So, it's an incredible aid to carrying a lecture through the flow and all the different points you had intended. It wasn't that I never forgot something, but it made it a lot easier. I had my images to babysit me through every lecture.

Rabkin: Yeah, that makes sense. So, after all this effort of creating the course and learning to teach it, you had the opportunity to teach it on two separate occasions. And then what happened?

Moving to UC Extension

Keller: I taught it in 2003 and in 2004. But then in 2004, at the end of that academic year, Dave Kliger, who was then the dean of the physical and biological sciences, forced John Wilkes's hand to make a major cut. And John had to cut the Science Illustration Program and send us to UC Extension, which was very disappointing for us, of course, but worse for our future students, because tuition went from in-state to out-of-state

tuition for everybody. So, it went from something between seven and nine thousand per year, to something closer to twenty thousand, which is an incredible leap.

Rabkin: And even California state residents had to pay that out-of-state tuition?

Keller: Indeed, they did. Everyone had to because we had to become fully self-supporting. So, our salaries, all of our equipment needs and updating of equipment, all of our operating costs, even our rent on the space in the building at University Town Center, which was not insignificant, all of our administrative help, everything, had to come out of that money that the students paid. And we did it. We managed to not only survive, but stay in the black.

Rabkin: Did you have to change the number of students you took every year?

Keller: Yes, we did. And that was difficult, but more so, I suppose, from our point of view than from the students', because our graduate students were accustomed to being in classes of eighteen to twenty, except for the few courses that included just the ten of them. You know, as any instructor at the university level will tell you, a graduate student is a lot more work than someone who comes through one of your courses as an undergraduate. So, from the teacher's perspective, we went from ten to fifteen, all graduate students. So that was a lot more work for us.

And it was also difficult, the move, because it was portrayed to the public in a way that wasn't particularly accurate. So, by what we've said so far, it's clear that we were serving quite a number of undergraduates—the ninety or so that were in my big lecture course, as well as the numbers that were in our solely undergraduate science illustration courses, and also those mixed in with our graduate students. So, we were

serving a large number of students. Our graduates were also performing magnificently in the wide world. They were getting internships at *Scientific American*, *National Geographic*, the American Museum of Natural History, the Monterey Bay Aquarium Research Institute, *American Scientist*, California Academy of Sciences. And many of them were going on from those internships to get equally impressive freelance clients, or even, in some cases, be hired as permanent staff of those same institutions. They were in all the top magazines and types of publications and institutions that science illustration could even go. So, we were doing really well, by all accounts. We were serving a lot of students, including a lot of undergraduates, with our graduate students. The program was doing very well in terms of where our graduates were going and what they were doing.

There was an article in the *Chronicle of Higher Education* that talked about the program itself and its merits, and then the fact that it was being, in a sense, demoted, to an Extension program. And I don't know if it was in response to that, or if he would have written this anyway, but there was a response to this situation written by Dave Kliger which appeared in *Nature* magazine right about the same time. One of the things he said was, "Well, we had four faculty members devoted to ten graduate students. And that was a luxury that we just couldn't afford right now." I can't remember if he actually said three or four faculty. But to call us "*faculty* who were devoted to *ten* students" was very misleading, because we were all part-time lecturers, devoted to hundreds of students, not four of us devoted to ten.

Rabkin: So, your appointments were not full-time appointments, as lecturers?

Keller: Eventually some of us were full time, but for the most part we were paid as course-by-course lecturers, which is not very much. Your workload is quite high, to be considered full time as a lecturer. And we were serving a lot of students.

So that was—we didn't bother to try to respond to that—you know, anything that we were to write back would simply feel like we were, I don't know—

Rabkin: On the defensive.

Keller: Yeah, thank you. It would feel like being on the defensive. So, we just moved on and made the best of it. And we did very well at UC Extension, although that was not to last more than five years either because of UC Extension's own problems.

Rabkin: How long were you at Extension?

Keller: Five years.

Rabkin: Five years. And what happened with Extension?

Keller: Well, Extension turned out to be a good thing overall. Our first year was just barely filled because suddenly there was a huge jump in tuition. So, we did end up with our complement of fifteen students and were grateful for that. I don't think that there were a lot of extras. We usually have about forty to fifty applicants for fifteen spaces, but that first year we were happy to make up our full fifteen. And I think that probably what happened out there in the wide world was people who had been planning on it suddenly thought, "Whoa! I don't know if I can afford more than double what I was planning on paying."

Anyway, after that first year, however, we were right back up there with our applicant levels, and we continued in that way, and had virtually no change in anything that we had to do. In terms of our curriculum, we were able to bring our microscopes and our specimens with us. We had written grants to buy those microscopes. We also bought our own specimens and things. These were not things that came from Environmental Studies or the Division. So, with our grant-acquired microscopes and so on, and our old Macintosh computers, we had what we needed to run the program.

Rabkin: Did you have to add some equipment for the five additional students you'd be carrying? New microscopes?

Keller: No, because what we started doing—and it has worked out ever since, fingers crossed—but we had ten microscopes and, by the way, they're beautiful things. They're Leicas. They are like the Ferraris of the microscope world.

Rabkin: These are dissecting scopes?

Keller: Yes, they're dissecting scopes, each one of them equipped with a Camera Lucida, so that you can see, not only the specimen you're looking at, but a piece of paper set on the table adjacent to the microscope onto which you will be drawing and essentially tracing some of the outlines of the things on the stage. They are quite beautiful. But we only have ten of them. But what we've done now is assign two microscope partners to each microscope, and we assign those partners based on, hopefully, complementary degrees of interest. So, either they're about equally interested, or one is extremely interested—that's basically all they want to do—and someone is more like: "meh." So, we sort it out. And we have two other microscopes left over, in case there's ever a need when two partners want one at the same time. So, it

works. And we didn't have to buy any more computers because at that time there were computer labs already in the University Town Center, which we used for our classes. So, it was good. We were set up well and we were self-supporting.

But, as I understand the circumstances, UC Extension was actually millions of dollars in debt when we arrived. I've heard the number twenty-nine million dollars in debt—not a small amount. Others could go into the reason why that was the case when we got there. They were initially thrilled that we weren't adding to that debt, and we were actually in the black and contributing a little bit, moneywise. But there came a point in 2008 when they came to us and said, "You have to come up with a 40 percent profit margin, or you're out of here. We're going to cut the program."

Rabkin: You not only had to be self-supporting; you had to generate—

Keller: We had to have a profit margin of 40 percent, which as I've been told—I've never run a small business—but that would be admirable for even a business, much less an educational endeavor. So, we did our best to, at least on paper, figure out how we could increase our profit margin—

Rabkin: How?

Keller: Oh, everything from increasing tuition, to cutting down on things that cost us money, forgoing much-needed updates on certain kinds of programs and things. I don't think any of us were going to take a salary cut, but we already make such spectacularly modest salaries, that wasn't even in question. So, we, on paper, managed to look like we could get somewhere around a 30 percent profit margin.

And right about at that point, there was a high-level meeting to which neither Ann or I were invited, but someone who was a friend of ours was. And when that person came back—and I won't mention the name—but I said to him, "Um, you don't have to tell us what was said, but having been there and knowing what you know, what would you suggest we try and do right now?" And he said, "I would look for another institution." And I said, "Really? We've been jumping through hoops. We've been— We think we're gonna—" And he said, "Listen, you know when your administrators are behind you and when they're not. And I would suggest you try to move." I had never even heard of a program hopping from one institution to another. Neither of us had even heard of such a thing. But I said, "Thank you so much, because we kept trying to do what they wanted, and I'm now understanding that it's not going to be. They don't want to continue this."

There was also some talk of moving us to Silicon Valley. And maybe that would have made them more amenable, or not. I don't really know. Ann might have more information on that, or not. But I think she would agree that we both felt that moving to San Jose, where other UC Extension programs were all being moved, would have deprived us of a lot of the natural resources and institutions here upon which our program depends. We go to the [Monterey Bay] Aquarium; we go to the Monterey Bay [Aquarium] Research Institute; we go to the Seymour Center; we have all these connections to UCSC which we still maintain and have been incredibly valuable to us: the Arboretum, Environmental Studies, the Norris Center, and so on.

A New Home at California State University, Monterey Bay

So, we decided we wanted to stay here [in the Monterey Bay Area] and we put together a proposal to go make our case to CSUMB. We put together a little PowerPoint; I gathered quotes from many of our esteemed internship hosts; and we went and gave our presentation. I think it was in early March of 2008. And when the lights came up after our presentation—we also had Alison Galloway with us, by the way, who I believe was genuinely sorry about us having to move; she had to be the messenger of the bad news and the sort of interface between us and Kliger—they turned to her, and she was kind enough to come with us, and said, "So *what are you doing*? You have these quotes from people all over the world. You're internationally known. Your students are doing excellent work. You're not only not costing anything, you're making some money. Why are you cutting this program? Why would you possibly get rid of it?"

Ann and I both sat back at that point and looked at Alison and thought, yeah, that one's on you. You got to explain that. She managed to say something about moving to Silicon Valley and this kind of budget—I don't know what she said. It never made sense to me, of course.

Rabkin: What was Alison Galloway's relationship to you at that point, when you were at Extension?

Keller: She was our [Vice Provost of Academic Affairs]. Kliger was the dean and I think Alison Galloway was next below him, and above us.

Rabkin: And she had some oversight over Extension.

Keller: Yes, she did.

Rabkin: At this point, you were no longer in the Division of Physical and Biological Sciences. You were in UCSC Extension and she had some kind of administrative authority in relation to that.

Keller: Yes. And the university, I think—well, of course it was a big loss to the university because the university was more than happy to trot us out when they wanted to put us on the cover of the *UCSC Review* and they wanted to champion their efforts at interdisciplinary education and so on. They loved having us as a poster child. But then we got cut, even when we were performing so well. So, it was a mixed decision, I'm sure, in places where I can only guess—

Rabkin: So, you made the presentation to CSUMB—

Keller: So, we made the presentation and they said, "Huh, this sounds like a great program." So, they made the proposal to the Academic Senate [at CSUMB], and Ann Caudle and I were invited to the meeting of the Academic Senate when they were actually going to vote. Ann and I were sure that they would vote and then later tell us what their verdict was. But they voted right in front of us and we both just wanted to run for the door. (laughs)

Rabkin: (laughs)

Keller: Because we were just so afraid that they might say, no. We had been cut before and moved and so on. And there, that vote occurred right in front of us. And it was 100 percent unanimous. Every single professor from the entire university, who was present, raised their hand, and we teared up! Then they applauded and I said to Ann, "Oh, I don't think we're in Kansas anymore." And then the dean of humanities, who was also

one of the deans who brought us on, blew us kisses, and I thought, wow, wow, they're blowing us kisses and applauding. They were so thrilled to have us, and they've been very good to us. You know, it's an institution, and an institution is a big, bulky, cold, horrible, unthinking thing. But there have been some wonderful people there that were very interested.

I forgot about the part where they came and observed us. There were steps to this process; it wasn't just our presentation. But that dean that blew us kisses—it turned out that she was very keen on literature, and I didn't happen to know that, but the lecture that she happened to see me give started out reading from a famous piece of literature that I wove into the description of the assignment that they were about to do, so I think I won her heart-— (laughs)

Rabkin: (laughs)

Keller: —by bringing in all disciplines to the illustration work that we were about to do.

So, we moved to CSUMB at the start of the 2008-2009 academic year. We were incredibly fortunate to also be able to move our annual exhibit to the Pacific Grove Museum of Natural History. And Lori Mannel, who was the director of that museum at that time, apparently—I wasn't there but Ann said she clapped her hands and said, "Oh! I've always wanted that exhibit!" So, she said, "I will make room for your exhibit the very first year," which is, you know, if you've been in on any of the planning for a museum, not an easy thing to do because they plan exhibits years in advance sometimes. So, for her to scooch things aside so that we could have the month of May and part of June was quite a feat. So we didn't miss a beat with our exhibit. It worked out very well.

Oh, and I have to say, too, that part of our case when we went to CSUMB, because we were going to become a part of Extended Education, which is the CSU's version of UC Extension. They are complementary programs in the two institutions. Since we were going to continue to be self-supporting, our five years in UC Extension actually saved us. Of course, it would have been better to never have been cut from UCSC, but since we had a track record of supporting ourselves, we could say, "Look here, we can do it. We can continue to do it." And so, they were unafraid about taking us on and worrying whether or not it would succeed.

Rabkin: When you moved from the UCSC campus to UCSC Extension, you had to make some major changes in terms of tuition you charged, and adding, by half again, another bunch of students. How about when you moved to CSUMB? Were there big changes you had to make to adapt to that new institution?

Keller: They tried to get us to take more students.

Rabkin: To go up from fifteen?

Keller: They did. But we have managed to hold the line because of various reasons. One is that for our instructors and our number of courses to adequately meet the needs of graduate students, where there's a lot of advising, a lot of extracurricular discussion and help, there are internships to manage, and websites to help them with, and positions to help them find, and helping our graduates after they leave, even—it's a workload issue. But also, from our pool of applicants there tend to be ten or so really strong candidates—we think these people are definitely ready. And then there are a few more that we think, yeah, these look pretty good. And finally, there's a zone there where we feel like, okay, these last couple of candidates we feel like we're right on the

edge of that margin of readiness. So, if we were to up our numbers, we would be accepting more students who aren't really prepared. And the quality of the program, we feel, would suffer because we would have to be catching up people who aren't really prepared for hitting the ground running in September and not stopping until we finish with our coursework in June.

And then, in addition to that, the field of science illustration is a relatively small field. The Guild of Natural Science Illustrators' Annual Conference has an attendance of, you know, in a good year maybe 150 people. There are a lot more people in the guild than that, but we number in relatively small hundreds, as opposed to the very many hundreds and thousands that might be in other fields at other conferences. I wouldn't say that there are a lot of staff positions for science illustrators out there. It's mostly a freelance world, and so there's some competition for that work. And we could potentially oversaturate the field by adding even five more science illustrators to the pool, you know, figuring that other institutions are adding somewhat to that pool too, every single year. So, we have arguments against growing, and currently our classroom can only hold the number we have and it's not easy to move us. We have thousands of books, and the microscopes, and tables that need to be dismantled before we can move them through a doorway. We have—

Rabkin: Are these the same tables that started at UCSC?

Keller: Indeed, they are, the ones that were made for us by our beloved woodworkers that were on staff at UCSC. Steve and Dan Ornellas made our tables; they made our microscope cabinet; they made our wooden drop boxes; and they made our cork boards, which have traveled with us to every single location, and had to be ripped off of

walls and typically trimmed down and reinstalled and reshaped and cut up to fit new walls again and again and again.

Rabkin: What do you use the cork boards for?

Keller: Oh, critique. So, people pin up their work during a critique. But also, we save beautiful prints of work that our students have done and we make reproductions of our students' publications that have appeared, and we tear up publications and print out from publications great examples, and from professional illustrators, to help our students see what they're aiming for. And we cover the walls with those. Every assignment has a new mural of artwork to guide and inspire. We use the boards for that too, as well as for just announcements and things.

Rabkin: Thanks. So that was a little bit of a tangent I took you on. You were talking about how hard you are to move as a program, and that it involves moving all your specimens and microscopes and cabinets and tables and cork boards, etc. And that's another reason why it would be hard to expand—

Keller: We would have to move to a whole new space. We don't mention that because an institution will say, "Oh, good. Well, go be in this garage." They won't see that as an obstacle, probably. But it's not an insignificant effort to move us.

Rabkin: As well you know after— (laughs)

Keller: Gosh, after doing it for so many times I think, I don't know if I could do it again. (laughs)

Rabkin: Jenny, is there anything else you'd like to say now about changes that happened because you moved to CSUMB?

Keller: Well, I think I've already said that CSU allowed us to be as focused as we would want on learning outcomes, which was a welcome change. They also allowed us to choose from our applicant pool to our heart's desire, without necessarily favoring those with a degree in some sort of science. Although that is still the case, we still end up taking more science majors than others typically, we are not bound to that. We choose whoever we feel is ready.

Rabkin: Great. Do you want to take a little break?

Keller: Sure.

Working as a Freelance Science Illustrator

Rabkin: Okay, we are rolling again. Jenny, I'd love it if you could tell me about some of your professional activities outside of the graduate program. I know there are a lot of them. Why don't we start with your plein air oil painting experience?

Keller: Okay. Yeah, in addition to be a science illustrator for books and magazines and publications, I've become enthralled with plein air oil painting, thanks to my friend Cleo Vilett, who, way back when in the mists of time, was one of my graduate students and has since become a wonderful colleague and dear friend. She is a magnificent painter and invited me to come take a class with her in Tuolumne Meadows in Yosemite one summer. It was very spur of the moment, and she said, "I have an extra easel and we'll find you some supplies." So, I didn't even know if I was going to be in the course. I wasn't even on a waiting list. I just went with her. And we had to pretend

that we were romantic partners because the campground would let a partner stay in the campground with you in your spot, in your tent, but not just a friend. So, we got that designation added to our credentials. (laughs) I went to the first class meeting and Chuck Waldman, the teacher, said, "Well, Jenny. Yes, you're in. We have a space." So, I bought a plastic plate from that concession store in Tuolumne Meadows, and I was off and running with Cleo's paints and—

Rabkin: The plastic plate was your palette?

Keller: That was my palette, yes, thank you. And I had some of the brushes that I had used in college doing oil painting. They were still around. And I really loved it. And you know, before doing that I would look at paintings that people had done en plein air, outdoors, on site, and think, well, that's sort of okay. I think I could do better than that. (laughs) And then *afterwards* (and I've heard other artists say the exact same thing), afterwards you look at some painting that someone's done outside and you think, well, that's pretty good! Because it's really hard. It is so challenging. The light's changing. The wind's blowing. Sometimes people are coming by. The sun is beating on your head. And oil painting is so much slower than watercolor. You have to mix a color before you know if you've gotten the hues right. You're stirring and stirring and stirring and then you go, oh, no. That's not right. And you add a little bit more of something and you stir and stir and stir. Nah, still not right. You add a little more of something and then, oh, too far. So, it's like you're baking a cake out there, whipping stuff together and trying to get the colors right.

I have a story about Cleo that (laughs) is just so typical. We were on Tioga Pass one year. We did this course many times because we love the teacher and love doing this

together. So, we were on Tioga Pass, all out there with our little easels, and the wind came up. It blew Cleo's easel over right into the dirt—just *crash,* to the ground. She says, "Oh, no!" So, she rights it, and dusts things off, and thinks that her painting is undamaged enough to continue with.

Then she wipes her eye with her glove and knocks out her contact lens, and it falls in the dirt. And so, with her other hand, that hopefully doesn't have too much paint on it, she picks it up. And, I think this is very ill-advised, but she licked it off and then stuck it back in her eye so that she could see. And it stung. So, she's crying a little from that. And then the wind came up again, knocked her easel over again, knocked the painting off of it, blew the painting away, face down in the dirt, and broke the easel. So, Cleo leans down to get the remains of her project, and her pants split down the back.

Rabkin: (laughs)

Keller: (laughs) And at that point, she just lay down in the grass and cried. And Chuck, our teacher, came over, and he had witnessed all of this from a distance. He said, "Get up, Cleo." And she said, "No! It's too hard." And he said, "Get up. There's no crying in plein air." (laughs) So she did, but it's just—yeah sometimes it's a lot more than the painting. You just try to deal with what happens out there. I love telling that story because Cleo is a superb artist and does more in those situations than most of us can. And even *she* would cry now and then.

But in spite of its hardships, oh, it's so wonderful. I thought I knew about color before I started doing oil painting outdoors. I'd done a ton of stuff outdoors and a lot of watercolors. But oil painting requires, in a way that watercolor doesn't, that the value of your zones—your near ground, middle ground, your background, and all the nuances

within each of those—are really spot on. And when you get them right, it's quite spectacular.

The other thing is that a photograph, even as good as photography has gotten, tends to flatten things and turn colors kind of blue. And when you're out there, you see all sorts of nuances of purple and pink and yellow and green and so on. It's that color palette that makes us stand in front of Impressionist paintings and go, "Oh! My gosh, it just is so moving and beautiful and feels like real life!" Because our eyes see things differently than the camera does. So, it has really informed my illustration work, and I feel that it has made me a better teacher for my students because now I take them out and I say, "Okay, you want to put that creature in the landscape? Let's make sure your landscapes rise to the occasion of this incredible work that you're putting into—the tiger or whatever it is that you're putting in the landscape." Because most science illustrators, that's where they fall short. They don't even know that it's not very well done, the landscape. I would make the grand exception of those illustrators who paint diorama displays in museums. They *have* to get that atmospheric perspective and color right. And that's what makes us draw our breath in appreciation and amazement, when we stand in front of those things, is that it feels so real, that light. That's what the Impressionists were doing.

So, plein air painting has really been a real education. And it has led to some actual commissions of work that are large oil paintings, some of which were for the newly created Norris Center for Natural History on the UCSC campus, which came about because of, as I've already mentioned, the hard work of people like Chris Lay, Karen Holl, Jenny Anderson, and Larry Ford.

Chris and I worked together quite a bit on the museum itself. And I said, "You know what you need? You need some big landscapes of California, and I think you need me to paint them." And he said, "Um, okay." I was very pleased later that Karen Holl said, "I can't imagine the museum without those paintings now." My vision, and hopefully this is what they do, is that while you're indoors they give you a sense of the outdoors, and of California, the natural history that Ken Norris's course was all about.

Rabkin: And specifically of scenes within the Natural Reserve System, and/or places that the Natural History Field Quarter students visit?

Keller: Yeah, we chose the Mojave Desert, of course, because that was near and dear to Ken's heart, as were so many places. But you can't think of Ken Norris and the Field Quarter without thinking of the Mojave Desert. So, there's a big one of the Mojave Desert. There's also Mono Lake and there's the Big Creek Reserve. And actually, I hope to do more, but I'm proposing that right now. So that's been exciting, to take that oil painting plein air work into the studio and create big landscapes that get to be a part of a permanent display.

Rabkin: Do you want to talk about any other exhibits that your work has been in, places where your work has been exhibited?

Keller: One of my favorites was at the Museum of American Bird Art in 2014. They contacted me to be a part of an exhibit called Looking Closely: the Art of Observation. And their catch phrase for this was about artists exploring nature who begin with direct observation of some sort. The other artists in this exhibit were some of my all-time heroes, and I was so honored to be a part of it. One of them was David Sibley. Many people will recognize the name from his numerous field guides about birds and the

beautiful artwork that he does for all of those guides. There was also Lars Johnson, who is a Swedish artist, who I've always admired. His field sketches are like no other. He can get the patterns of birds, and the movement of birds, or a whole flock of birds, when I would just be figuring out a single form. It's really incredible. That's a name worth looking up, if you haven't heard of him before. Clare Walker Leslie is the person who wrote a book called *The Art of Field Sketching*, which I used in my courses for many years. She was a contributor to the exhibit. And then someone who is new to me, Larry Barth, who is a sculptor of birds, and his sculptures look like live birds. They live and breathe. It was remarkable to see how he could create, out of a piece of wood, something that looked like wind was blowing on feathers. He's a master of both realism and simplicity. So those were the other artists in this exhibit, and we got to do a kind of—what would you call it? A forum, an interview of all of us live?

Rabkin: A panel discussion.

Keller: Oh, thank you. That's the word: panel discussion. With a live audience and they filmed that. So that's out there somewhere, and it was in conjunction with this exhibit. Also, it was an especially fun exhibit because when I flew out to the Boston area to be a part of the opening of the exhibit, I got to go to Harvard and see the Blaschka Glass collection.

Rabkin: The glass flowers?

Keller: The glass flowers, indeed. As someone who taught the history of science illustration, of course I covered the Blaschka father and son who made those incredible glass botanical references for Harvard. And there they were. So, I got to do some fun things in conjunction with that too.

There was another great exhibit that, Sarah, you will be able to chime in on here because it was for our illustrated-journal-keepers gathering group, and it was at the New Mexico Museum of Natural History and Science in 2010. We called it Drawing on Nature, and we put in a whole bunch of our field sketchbooks and journals. That was exciting, to be a part of that museum in Albuquerque and do something with our journal gang, as I call them for short.

Rabkin: And that's a group that started meeting in 1996 in the little rural town/village of Guilford, Vermont.

Keller: That you and—

Rabkin: —Clare Walker Leslie pulled together. Clare and I had met at a gathering the previous summer, of naturalist writers, in Crestone, Colorado, which convened in honor of the nature writer and artist Ann Zwinger. So, Clare and I were both there, and Clare was quite interested in pulling together a similar kind of gathering, but one that focused on and brought together people who were interested in visual representations of the natural world, especially field sketching. And so, she and I put our heads together and listed as many people we could think of who might be interested in participating in something like that and came up with quite a list, which you were, of course, on. And our first meeting, which was our only meeting at that point and, as far as we knew, might be the only meeting we ever had, was at Clare's family's second home—they live in Cambridge, Massachusetts, but they had a farmhouse and some land in Guilford, Vermont. And there were what, a dozen of us?

Keller: Yes, twelve. I think there were twelve of us.

Rabkin: A wonderful group of people. At the end of our weekend together we decided we'd like to do it again, and a couple of people stepped forward who are both landscape architects at Yellowstone and Grand Teton National Park, respectively, and they pulled us together for a gathering the following summer, and that's continued to happen, year after year, continually since 1996.

Keller: And we've gone to some spectacular places. We went to Doe Bay on Orcas Island in the San Juan Islands. We've been to Yellowstone. We've been to New Mexico, back to Crestone. Where else have we been?

Rabkin: We've been two or three times to the Oregon Institute of Marine Biology up in Charleston, Oregon, near Coos Bay. We were on the Rocky Mountain Front in Colorado, in Hannah Hinchman's stomping grounds. We had one very cold, foggy gathering at the Marin Headlands, which was quite a shock and a surprise and something of a disappointment to many of our arid Western inhabitants and East Coast people, who thought they were coming to sunny California (laughs) and landed at the Marin Headlands in the midst of a very thick fog. And actually, when you were talking about layered illustrations, I remembered a drawing, a sketch that you did while we were there, of the beach we were staying near—

Keller: Oh, yeah.

Rabkin: It was the most wonderful thing. It was a sketch of this beach—and because the sun was coming in and out of the fog, as it tends to do in that area, you had a sketch that showed it both in the sun, and then you had an overlay that was like tracing paper or something, that created the fog very realistically, using traditional media with no animation and no digital intervention required.

Anyway, yes, so one of the years that gathering turned into a celebration of this exhibit in Albuquerque that we'd all been invited to be a part of, and we had all sent our journals, packed very carefully, to the museum.

Keller: Oh, yeah. That was a hold-your-breath-and-pray kind of thing, because each journal represents months of work and experiences and much more than the original that might be displayed on any one open page. Yeah, there was a lot of insurance when we did that exhibit. (laughs)

Rabkin: Yes. I really liked it, though, that they didn't want copies of pages. They wanted the whole books exhibited. I think it gave that exhibit a really three-dimensional and personal feeling, and people were fascinated. And they did a nice job, too. The museum, I remember, had a photograph of each of us and a little bio, or some quotations from us about why we do what we do.

Keller: Yeah. And actually, that reminds me of another exhibit that's worth mentioning, which I was a part of in 2010, which came as a result of a trip I took to the Brazilian Amazon. It was put together by Pedro Salgado, who was one of my graduate students way back in 1989. Pedro had gone on to create his own science illustration program in his native Portugal, in Lisbon. And his dream had always been, since fish are the love of his life, to go to the Amazon and study fish and take a whole bunch of artists—science illustrators, field sketchers, people involved in some way in journalism, or movie-making, or photography, everybody involved in these creative arts—on a trip up the Amazon to do what we do, in that place.

In 2009, I got an email from Pedro, out of the blue. He said, "I've finally done it. I've put my trip together and I've saved a place for you and Ann. Will you come?" And I

thought, whoa, you don't say no to that. I said yes immediately. Ann had circumstances that prevented her from going, so I asked Pedro if I could bring a friend. Pedro and Company had to vet this friend beforehand to see if she was (laughs) worthy. I suggested Cleo Vilett and they said yes. Cleo and I were thrilled to have each other because everyone in Portugal speaks Portuguese and people in Brazil speak Portuguese too. So, we basically mostly didn't know what was going on and had to kind of bumble along together and it was really nice to have a friend.

Rabkin: Everybody else on the trip was a native Portuguese speaker, either from Portugal or from Brazil?

Keller: Indeed, they were. Now, amongst that group was, of course, Pedro, who spoke English and translated for us when he had time. There were also two other of my past graduates who had come from Portugal after Pedro: Pedro Fernandes and Filipe Franco. And so, we had people to translate for us, but we were mostly roaming around on our own.

And there was a point where Cleo comes up to the edge of our canoe and says, "I see a striped snake. Is that of concern?" (laughs) And no one answered her. Later on, we identified that snake to be of high concern, when we were able to look it up. But fortunately, she had gotten out of the water anyway. (laughs) So we had some adventures.

When all of that sketch material, and the recordings, and the film that was made, and so on found their way at the end of the trip back to Lisbon, Pedro—and this had been his

plan all along—put on a spectacular multimedia exhibit in Lisbon[15] (I forget at which museum), but he did the same thing as we did in Albuquerque: we sent not only our sketchbooks, but even our ratty hats that we had worn, our sketch kits—everything.

There was a glass-topped shallow case for each artist to display all their stuff and some sketchbook pages. And then the artwork was also displayed in large reproductions as well as originals and the movie and the soundtrack. It was quite an experience to scan some of my pages at 2000 dots per inch so that they could be blown up to fifteen-foot banners. I did one page spread that was a map of—we went up the Rio Negro and also down past Manaus, and then over to the Solimões. So, we went basically on two parts of the Amazon River, very different in character. I drew maps of those two branches of the river, and then painted little icons of things we saw along the way. So, here's some little river otters, and here's the dolphin, and here's where we saw the beautiful kingfisher and the caimans, so there are all these creatures and experiences illustrated along the way, all over these maps. So that was one of the ones that they blew up big. I never got to see this exhibit in person. I couldn't go to Portugal at that time, but friends of mine took a lot of pictures. That was a very exciting exhibit to be a part of.

Rabkin: What happened to those banners?

Keller: I have no idea. I got my original stuff back in the mail. I don't know where all the created stuff went but the sketchbook itself is back in my hands and is one of those treasures of an experience that these things become.

Rabkin: Didn't that group also go to Portugal at some point, or some similar group of artists?

[15] See http://www.grupodorisco.com/amazonia-exped

Keller: Oh, so again, Pedro, powerhouse that he is. So, this group was a gathering of a lot of his artist friends and colleagues in Portugal. The trip that was to the Amazon, of course, went over to Brazil. The group that went over to Portugal (from the U.S. and other countries) was the Guild of Natural Science Illustrators that has an annual conference. Pedro agreed to host the conference in the year 2000 in Portugal.

Rabkin: Is this normally a North American organization, or is it an international one?

Keller: It's an international organization but it's really localized in North America because it started on the East Coast, and even now probably has more East Coast members than West Coast members. But everyone is welcome and people from all countries join and come to the conferences.

So, when we were in Portugal, Pedro pulled out all the stops. We started in Lisbon and then we went to the historic town of Évora, and then Pedro and I did an extra four-day add-on for people who wanted to stay longer, and we went to the southern tip of the country, to a little town called Sagres, where it basically looked like the coast of California. (laughs) It was a long way to go to get to the coast of California (laughs). It was actually the coast of another country that happened to look like here, of course. But we had a lot of adventures there, seeing the Hoopoe bird—

Rabkin: *Upupa epops*! (laughs)

Keller: Thank you. That's the one. It was incredibly hot and I was scrambling, trying to teach in that situation because—you know, you have a sense of responsibility as the teacher that you don't as a participant. And we had people of all ages. And when it's 100-and-something, and we've been out on the beach for some number of hours, I think,

I hope don't lose someone on my watch! And so, I was passing out wet sarongs and hats and towels.

There was one night where we had gone into town and spent some time at a bar having fun. And then we came back out to this lone little house on the cliff that we were staying at. The house had two small bedrooms, very small bedrooms, a tiny lab, and a common area. And there were twenty-five of us.

Rabkin: Oh, no!

Keller: So, a number of people were out in tents. But that night the wind came up, so as we pulled up to our tiny abode on a cliff above the ocean, at the south of Portugal (laughs), the tents were being uprooted and blowing over the cliff. And people were lunging for their tents. I'm praying they don't just umbrella-out and take that person off.

We ended up with every single person inside. People were sleeping on countertops; they were sleeping in aisleways and under tables. I remember Frank Ippolito had a very tiny one-person tent, that just for a little imaginary sense of privacy that he set up indoors. As I squeezed by him on the way to my sleeping spot; I looked through the mesh and said, "Good night, Frank." And he said, "Good night." (laughs). So, we all stayed indoors after that. It was quite the adventure. And there was one toilet for all those people. Cooking for all those people on a tiny stove—the trip it was maybe not so well thought out in the particulars, but that's when it becomes an adventure.

Rabkin: Well Jenny, we've been at it for a long time. We should probably wind up. Is there anything else you'd like to say about professional activities before we shut down for the day?

Keller: Oh, no— There's some books that would be worth mentioning sometime, and that's probably the only other thing I would go into, the story of one or two of those, perhaps.

Rabkin: Do you have the energy to do that now?

Keller: Well, do *you*?

Rabkin: Sure.

Keller: Okay. Well, I would mention *Field Notes on Science and Nature*, which is a book that came out in 2011. It's edited by Michael Canfield, who teaches at Harvard. He called me out of the blue. Apparently, it was a recommendation from one of my past graduate students. He was looking to put together this book to talk about all the different ways that people take scientific field notes. And I guess one of my students said, "Oh, you should call Jenny." And when he called, he caught me in my office, maybe even on my way out the door, and that was one of those conversations that sticks in your memory as a remarkable encounter because we talked for an hour and a half that first call, just excitedly bouncing ideas off of each other and basically hitting it off. Finally he said, "Well, would you like to be a part of this book?" and I said, "Yeah, I'd love to. It sounds great."

So, what an enjoyable collaboration that was, I think, from both our points of view. I am not a writer, and I had to write something, in addition to doing the drawings for my

chapter talking about drawing in the field. And he's an editor. It was marvelous to have someone edit my writing, like I have felt when I've been privileged to have had you, Sarah, edit my writing. Oh, my gosh, what a relief: you writer people help us make the words sound the way we want them to sound.

Rabkin: I, of course, would beg to differ. I would say you are very much a writer.

Keller: (laughs) Thank you. I hope very much one day to aspire to that, to deserve that.

Well, so this is another example of when I was so honored to be a part of a project. Because E.O. Wilson was writing the foreword and some of my heroes, like Jonathan Kingdon, were making the contributions to this book. And I'm very proud of how the book turned out because I think it really is a resource for people who do this kind of thing. And it comes at it from so many different ways—everything from people taking digital notes in the field, to analog, to photographic—the kinds of changes that have happened over time, the pitfalls and the advantages of each one. Also, it feels to me like it celebrates the journal, the field journal, as an important factor in the scientific inquiries and discovery of things about nature.

I can't help but think of this really recent example of—they were trying to find some—they called it the Eighth Wonder of the World—these pink terraces that were in New Zealand that had been lost to a major earthquake. This was just in the news last week. There was a geologist by the name of Ferdinand Von Hochstetter, who in 1859 had recorded the location of these terraces. Ever since they got covered up by this volcanic eruption and ash, the ensuing earthquake, they thought that they were now under a lake. But when they got out his journals they realized, "Oh, my gosh. We've been looking in the wrong place." And so just now they are starting to excavate, and I think

they're going to find them in a place that they hadn't even been looking, because someone wrote it down in their journal.

I had the experience just a few weeks ago in the Field Quarter, where we were out on a dirt road and we got both of our vans stuck running-board deep in the sand. The instructor and the TA's that were present said, "Jenny, would you lead the students back across the desert to our camp way over there, and we'll keep a few people here to deal with this, and that way the students don't have to spend their whole day trying to dig out the vans?"

And I said, "Sure," and I thought, well, I'm really glad that I drew our camp yesterday (laughs) because when they said, 'over there,' I said, "Okay, just to be sure, it's this watershed and not that one." We were a good couple of hours' hike away from where we needed to be, and the Granite Mountains are toothy and varied, as rocks are. But the day before, I had done a drawing, as a demonstration, of the rocks above our camp. So, when I looked through my binoculars I thought, "Oh, there's home. That's the beeline." Because you don't want to end up out in the hot desert longer than you have to. Water does run out. You know, you want to be a safe leader.

So, when we got close enough I showed people my sketch. Because I was leading them up to that point. And then I said, "Okay, everyone, I want everybody to know where we are headed, even though we're going to stay together." I said, "See the toothy part and the roundy part?" And they went, "What?" And I opened my sketchbook and said, "This." And they looked and went, "Oh! Oh, okay. I see that." And I said, "That's where we're going." (laughs) And I thought, oh. Field journal comes to the rescue! It was one of those examples of how they can be so useful.

Rabkin: (laughs) Object lesson in the value of a sketch.

Thank you. That's great. I know we could talk more about the *Field Notes* book, but why don't we also mention one of the other books that I know is particularly important to you that carried some of your work: the Jennifer New book.

Keller: Oh, yeah. *Drawing from Life: The Journal as Art*. What I love about that book is that there's such a variety of people that contributed to it. So that came out in 2005, and Jennifer New got people as varied as David Byrne, the musician, and Linda Barry, the cartoonist; Hannah Hinchman, who is another field journalist and a friend and colleague of mine, and then me, as representing the science illustrator. People who make their journals out of photographs; people who are experts in textiles and coming up with textile designs. It's just such an incredibly broad variety of people coming together, creating this, as she put it to me personally, "This stack of papers that, even bound or not, constitutes a working book. How does this stack of papers work for you?" That was, I thought, a great premise around which to build a book. And it was, for me, exciting to read all the other entries, as it was in *Field Notes in Science and Nature*, to read all the other contributors' work. I also was already a fan of Jennifer New, because she had written a book about the young artist and journal keeper Dan Elden, who was a young journalist in Somalia and kept amazing journals about his travels being a news reporter, and was tragically killed in Somalia. And his books, including *The Journey is the Destination* and the one that Jennifer wrote called *Dan Elden: the Art of Life*—I'm a big Dan Elden fan and I knew that Jennifer would do a sensitive and relevant treatment of this book, *Drawing from Life*, that I got to be a part of. That was one of my favorite books that I've gotten to contribute to.

Rabkin: Great, thank you. Would this be a good place to stop?

Keller: I think so. We've been talking for a long time.

Rabkin: Thank you so much, Jenny.

Part II

Ann Caudle and Jenny Keller

Majoring in Art at UC Santa Cruz

Rabkin: This is Wednesday, June 28, 2017 and this is Sarah Rabkin. And I am at Jenny Keller's house in Santa Cruz, California with Jenny Keller and Ann Caudle, to talk about the Graduate Program in Science Illustration. And Ann, we want to get you introduced here. So, could you tell us a little bit about your professional background, your particular interest in scientific illustration, and whatever training you have that seems relevant.

Caudle: Well, sure. I started out at UCSC in the fine arts program and instantly found myself kind of in a situation where everyone was doing more expressive things, and I was drawing pebbles and things I found on the ground, and feathers, and dead birds and that whole sort of thing.

Rabkin: So, you were an art major at UCSC?

Caudle: I was an art major and looked at rather askance (laughs) because of the subject matter. And ended up with a professor, Hardy Hanson, who was amazing and also very, very sympathetic to that sort of thing. He wanted people to be able to observe

first, really know what they were drawing—observe the light, the quality of the light, the shadows, the textures—all of those sorts of things that went along with what I was loving to do.

Rabkin: And you were in a distinct minority as someone who wanted to do that?

Caudle: Oh, absolutely. Absolutely. And he was so very, very supportive, I went on to do my senior show at a gallery that he was associated with in Los Angeles. And it was all dead birds. (laughs) And then went on to be just an artist that tried to make-do, for a while. I was doing all sorts of crafts: I was doing stained glass; I made jewelry; I did artwork for different galleries and for different exhibits. And slowly began to get very, very much involved with science illustration-type things.

Rabkin: Can I back you up for just a second?

Caudle: Yes.

Rabkin: I wanted to ask about the dead birds.

Caudle: The dead birds were my inspiration, actually. (laughs) I had been taking classes, and I was at that point where I suddenly began to worry about subject matter. What I am I going to do? What am I going to draw? I have this series of things to do. And I was with my eventual husband and we were at McHenry Library. And I was explaining my dilemma—what am I going to try? And you know the big windows there, how the birds would fly into them?

Rabkin: (gasps)

Caudle: And we were standing there and he reached down and picked up a sparrow: "Why don't you draw this?" And that started that whole series and what ended up being my career, really, in science illustration.

Rabkin: How did you find the rest of your subjects?

Caudle: The cat dragged one in. (laughter)

Rabkin: So, you didn't just stand around at the big base of the windows at McHenry Library waiting for the birds to die?

Caudle: No, I did not do that.

Rabkin: So, you acquired your subjects through various means.

Caudle: Through various means. And did some very expressive, but very detailed, and very observant kinds of drawings. Watercolors.

Rabkin: Wow. And what year was it when you graduated?

Caudle: I graduated in 1971.

Rabkin: Okay, thank you very much for doing that backup. And then we had got to the point where you were sort of doing this and that, jewelry, whatnot—supporting yourself.

Caudle: But always constantly doing artwork. And I ended up doing illustrations for several magazines and then went on to work with the Monterey Bay Aquarium before they opened. So, I was hired to do the Drab, the Dull, and the Changeable, the different fish, because they had already licensed the color illustrations from Eschmeyer's *Pacific*

Coast Fishes, in order to get enough ID labels up for the opening. And then later on I stayed on and replaced those images piece by piece, along with Jenny doing some of those things.

Rabkin: Were you on staff at the Aquarium?

Caudle: No, I worked from my home studio and was considered an independent contractor for that.

Teaching for the Science Illustration Program

As far as coming on board to the Science Illustration Program, there was Jenny and Pieter Folkens, and Kendal Morris.

Keller: Kendal Morris, who I'm so glad you brought up because I forgot to mention Kendal.

Rabkin: Please do. Kendal was actually my classmate in the writing part of the Science Communication Program. I didn't realize she was involved with instruction.

Keller: Yes, she did teach some classes and Ann, maybe you remember how long she taught? I don't.

Caudle: What I was aware of was that she was teaching the intro class and she taught the 1989 class, because I remember her working with Pedro and all of those. I think after that she decided that she wanted to move on. So, I'm not sure if she left in 1990, or if it was 1991, but I'm pretty sure it was 1990.

Keller: Yeah, I think it was not a particularly long tenure, maybe more like maybe a year—

Caudle: Yes, and she was the first coordinator of the program. And I remember because we worked together looking at applications and that was in 1987. And I remember at that point there were only five students in the program, in the illustration track. And then in 1987, when selecting the class of '88, we had to call to see if we could *possibly* have seven people in the program.

Rabkin: Call the administration.

Caudle: Yes. And then by 1989 we settled on the ten students. At any rate, Pieter Folkens was—it looked like he might be leaving, or it wasn't quite a perfect fit. So, John was looking around for another instructor. And he came to Hardy Hanson and Don Weygandt in the art department and inquired about who might be a good choice. I had done some teaching already at the university and I was doing the Aquarium work, so they thought that I would be a good fit. So, I got a little handwritten note—that was before emails—got a little handwritten note from John saying, "Could you please come by? I'd like to chat with you."

Rabkin: Where were you at this point?

Caudle: I was here in Santa Cruz, living where I live now. So, I haven't moved away. And I came up to Crown and spent about an hour with him in that tiny little office in Crown, with all of those books that went up to the ceiling and filled every square inch.

Keller: Books that made you feel like if there were an earthquake you would never get out—

Caudle: No, never. Never get out. This would be sad. (laughs)

Rabkin: I spent many an hour in that office myself.

Keller: (laughs)

Caudle: Anyway, he launched into how I could teach the color class. And I said, "Fine, sure." Panicked, of course. The next thing I know—and I don't know if this was a few days later or that day, but I think it was a few days later, I remember all of us in the Crown Courtyard around that picnic table talking about what we were going to be doing. And I was completely overwhelmed. Everyone knew what they were doing. And I was just sort of taking it in.

Rabkin: This was you and Jenny—

Caudle: —and Pieter and John. And, I think, Kendal must have been there. Or maybe she had left because I don't remember her presence really strongly in that situation. The only reason I know when that was, as I was telling Jenny, Pieter said, "Oh, let's all go camping." And I said, "But I have an eighteen-month-old baby. I can't do that." (laughs)

The Birth of a Collaboration

But what was so cool is that very soon after that—it may have been that afternoon—

Keller: It was that very afternoon we both, unbeknownst to each other, ended up at Mervyn's in the Capitola Mall, or in front of Mervyn's at the Capitola Mall—

Caudle: In the breezeway.

Keller: —and said, "Oh, hi! Oh, hi, it's you!" And we proceeded to chat about a little of this and a little of that. And we kept thinking we were going to say goodbye now because we were just passing each other on the way in and out of the store. And we stood there for an hour and a half.

Rabkin: Wow. Had you only just met each other?

Keller: We had just met. And we hit it off immediately, even during that meeting in the courtyard. And then running into each other became an excited back-and-forth exchange of ideas. And it's been that way ever since. (laughs)

Caudle: I know it was the most sparkling conversation and felt like were completely on the same page and enjoyed the same thing. And how could this not be the best relationship? (laughs) So that was pretty great. And then Jenny continued to be very, very supportive. We shared office hours up in Crown, and at that time nobody came to our office hours, so it was just the two of us, and we'd chat about what was going on in Pieter's classes and what had come before. And just, you know, bonded.

Rabkin: And that was the beginning of a long and happy story.

Caudle: Exactly. (laughs)

Rabkin: What year was that when you first connected?

Caudle: That was 1986. Spring of 1986.

Ann Caudle: Teaching Science Communication

Rabkin: Wow. And what was the year when there were first graduate students in the program?

Caudle: Now, that I have to piece back together, because I know that there—let's see, let's go backwards. There were ten students; in 1988, there were seven; in 1987, there were five. But I think that when it first started out, there were just about three. And those students—there were just a few classes that were specific science illustration classes and the rest was filled out by art classes and other things that seemed relevant to the program. And I remember talking to the folks in 1988, maybe 1987—anyway, some of the first graduates that I got to know—and they were talking about how difficult it was to bridge that gap between being in a science illustration program and taking art classes, because there was a great deal of prejudice against illustrators. And one person, one of the graduates, was telling me that her art instructor said, "I would really applaud this piece. I would think that this was a really wonderful piece that you did, if I didn't know who did it—"

Rabkin: What?

Keller: Oh, my gosh.

Caudle: —because I know that you are heading towards "science illustration," (and illustration was such a nasty word) "and I just can't accept it as an art piece."

So that was really, really rough. We were down in the Blacksmith Shop for our first classes. It was really a wonderful place, but totally rustic. It was a shared space with the art department. And my class was in the morning and then there was a break until 2:00,

and then some of the art classes came in. And I was still there when one of the teachers came in and she looked at me with this look of horror because she recognized me from the art department.

Rabkin: From your undergraduate days?

Caudle: Mm, hmm. And she said, "But Ann, you're one of us! What are you doing here?"

Rabkin: How could you have gone over to the other side?

Caudle: Exactly, how could you have gone over to the other side? It was chilling. (laughter) So I'm sure it wasn't very comfortable for our illustrators, on the whole, to go into the art department classes. So, it was time for us to have our own classes. It was definitely time for that.

Rabkin: Interesting. As far as you know, does that prejudice still exist among fine arts people, toward illustration?

Caudle: I'd say it's pretty prevalent. I'm sure that there are areas where that is a little more acceptable, to go back and forth between art and illustration, but I think it's very prevalent.

Rabkin: So, there is—some people, at least, see a bright line between the two fields?

Caudle: We actually had a student who was an amazing artist and he confessed that he had two desks in his studio, one for his art and one for his illustration, so that he didn't blur the lines between the two.

Rabkin: And how do *you* see it?

Caudle: Oh, absolutely. It's totally fluid between the two.

Keller: I agree. I've always felt like it was a very unnatural division, because there is such a continuum between the two things, and the types of creative thinking that go into both of those are very similar, and in my opinion, very similar to the kind of thinking that goes into scientific inquiry. So, in fact, I even had, as part of a lecture once—I found a book online—you know, when you're on Amazon and it says, "Oh, and you might also be interested in *this* book"—and this book was entitled, *How to Get Ideas.* And I thought, really? That's a lot of hubris. And it was only like $6.95 or something. I thought, okay, tell me how to get ideas. And I ordered it. It laid out some very distinct steps of the creative process that you could use to help yourself. And I thought, well, yeah, that is pretty interesting, I never really took it apart that way. But when I was looking at that list I realized how incredibly similar it was to the steps that they lay out when they are talking about the scientific method and empirical inquiry and so on. And so, in my history course I laid them out. I showed the first list of steps, I think the scientific set first, and then I showed the creative steps up on the screen next to that and said, "I think this is one argument for why the people who find these two fields, the art and the science, go together so well; perhaps this is one reason, is that the method of inquiry is really similar."

So yeah, I think that artistic endeavors and science illustration endeavors are incredibly similar, not different at all, in my opinion.

Rabkin: Interesting, yeah.

Ann, can I ask you a little bit about teaching? You mentioned that you had done some teaching before you came into the program. I'm curious about your relationship to teaching and your motivations for it. What was your relationship with teaching like?

Caudle: Well, it was a rocky start because I'm terribly shy. I think Jenny and I have that in common. (laughs)

Keller: Yes, we do.

Caudle: I was the kid in class that they tried to "break me" of shyness by having me do all sorts of extracurricular things—making presentations. In one notable one they had to take me to the nurse's office because I was going to faint.

So, the idea of teaching was difficult. I started at UCSC; I was part of the fifth-year program, the original fifth-year program that was kind of experimental at the time.

Rabkin: Tell me more about that.

Caudle: I don't know a lot about it. I didn't stick it out. There were some personal reasons that I left eventually, but one of the key points of it, parts of it, were that you to teach a class. And that—I made myself sick thinking about it, but I loved it. I really, really enjoyed it. I felt like I had some wonderful role models, especially with Hardy Hanson, on how to approach things. It was really delightful, but very hard work. I was scared every time I went to teach.

Rabkin: What were you teaching?

Caudle: I was teaching a drawing class. So, then I went back and did—I taught children and I was nervous doing that. I would do workshops and Star Wars arts and crafts, and oil painting, and sewing—(laughs)

Rabkin: Under whose aegis was that?

Caudle: This was a combination of the City of Concord, their arts program; and Santa Cruz Parks and Recreation. I was the graphic designer for Santa Cruz Parks and Recreation for several years, so I was part of their little family, and I would teach these classes, and slowly got to the point that the night before I taught a class it was possible for me to actually watch the movie instead of sitting there going, "Oh, my God! Tomorrow I'm going to teach. What's going to happen?" (laughs)

Rabkin: Like you're going into surgery, or something.

Caudle: (laughs) Exactly.

Keller: Very much like that. You've got it.

Caudle: And then taught in the SPECTRA program, which brought artists into the city schools, which I just adored, thrived in. I would go from kindergarten to sixth grade to fifth grade—back and forth, five classes a day and 500 students.

Rabkin: Were you losing some of your anxiety at that point?

Caudle: At that point, where do you have room for anxiety? It was pretty wonderful because if this class didn't work, this hour-long class, there was going to be another one right down the hall. (laughs)

Rabkin: So, you were just getting acclimatized, kind of baptism by fire.

Caudle: Absolutely. And I began to realize that if I left out a single phrase, that the group didn't get what I was trying to say. So, I began to piece a lot of ideas together about how to approach that and I was always trying to set people at ease by doing a demo and making terrible mistakes during the demo. And the kids would moan and I would look sad. (laughs)

Rabkin: This was on purpose? (laughs)

Caudle: This was on purpose. (laughs) And then we'd fix it and there would be great joy. It was really satisfying because you could teach a kindergarten class, and I would get up and draw a circle and they would (dramatic intake of breath) wow! So, could this be any better for someone who was shy? And so that was really, really helpful.

And interestingly, a lot of those things still ring true when I'm teaching.

Rabkin: I was just going to ask you if your experiences with children have carried over into teaching graduate students.

Caudle: It absolutely helped me because when I had a group of these young people around me, we were all in it together and I was accessing my inner child. And when I'm with our graduate students, I could get really nervous still. So, I gather them up in front, if I possibly can, and we make bad jokes, and we just play. I find it really helps when you're doing serious work, and you're working really, really hard, and you've got so many deadlines, and people are going through struggles, personal struggles, to still maintain that: We're here in it together. Isn't this a funny thing we're doing? Isn't this crazy? Isn't this wonderful? So that makes it a delight.

Rabkin: I'm getting the impression from both of you that playfulness and humor are really important components of what you do as teachers.

Caudle: Absolutely. This [professional science illustration] is hard work. It tests us at every turn. We're struggling to work with clients that are difficult, we're doing tasks that we've never done before, because it's always brand-new; there's always another thing that we have to learn. And if we don't have those tools that allow us to just remember how fun it is, what we're doing, how satisfying it is—there's another thing around the corner and let's just forget it. Remember, what was it—Chris Carothers—saying, "I learned that" (I maybe have the wrong person here) "whatever piece I was working on for the newspaper was going to be lining the garbage the next day, and that made a little bit easier way to handle it." Well, this is not quite the same thing, but it does give one a sense of perspective.

Rabkin: Yeah. Boy, that's sort of a double-edged sword, isn't it?

Caudle: Mm, hmm.

Rabkin: I mean, on the one hand, it could be kind of demoralizing to think that this piece, whether it's verbal or visual, that you have really worked hard to perfect to the best of your ability, is going to wrap fish or whatever, in a couple of days. On the other hand, I could see how it could give you some perspective and lower the anxiety level.

Caudle: Whatever it takes to get through.

Rabkin: Yeah.

Keller: Yeah, it's like that saying, "Take the work seriously and don't take yourself too seriously."

Rabkin: Mm, hmm.

Keller: It really does help because there's everything that a career normally includes. There's joy and excitement and then there's tedium and stress. And this is your life, so if you can infuse it with a little bit of humor, you're just going to enjoy the whole thing a lot more. We do that a lot with our students. I think we enjoy the teaching and the learning that way, and I hope that we're modeling that for them.

I actually, when I'm being interviewed for a potential freelance project, will try making a little joke. I mean, it's not like completely planned or conscious, but I realize that I do that during those times because I want to see if the person I'm considering working with has a sense of humor. For a short project, it's like, well, you can just get through it and that may not matter so much. But sometimes it might be a book, or a museum display, or it might be hundreds of illustrations. And that could be a relationship that lasts years, and you want to have some congruency there, and a little bit of playfulness goes a long way.

Caudle: Yeah, there's this sense of: will they throw the ball back?

Keller: Yes! (laughs) Exactly.

Caudle: And that says a lot, it really does. It says a lot about who they are, how they will be to work with, how responsive, how willing they are to meet you in the middle.

Keller: Mm, hmm.

Rabkin: Do you coach your students in these kinds of strategies?

Caudle: Yes, yes. Jenny has a whole presentation on this for one of the seminars, on strategies.

Keller: They might feel like we coach them to within an inch of their lives, but actually some of this impetus to do this came from watching John Willkes, who would even coach his graduate students on what to wear to an interview, nice shoes and— And I've come to the point of describing it, to recognize that yes, one is an artist and you can have a little bit of expressiveness there, but that you want to have those people be able to see you as fitting somewhere within their professional sphere. And so, if you're too far outside of that sphere they might not be able to see you as a professional colleague. So, we talk to them about that. We talk to them about saying thank you. We talk to them about being responsive—and as time has gone on, responsive means more and more immediately responsive. Back in the days of paper, of course, we would wait a week or so before hearing back from someone about a phone call or so on. And now, we actually consider having only hours or a couple of days go by before you should respond to an email. It changes. Things have kind of speeded up.

What else? So, there's that. Of course, we coach them about presenting their portfolios. And what else can we think of?

Caudle: Well, certainly a lot of those very, very practical things. And also, their insecurities and how to get through those.

Keller: Right.

Rabkin: Hmm. Can you be more specific about that?

Caudle: Well, I find, and I think you do too, that many of our students—many of the people who do very detailed and close illustration-type work are shy people. And they meticulously craft something privately and then they put it out there. They don't have to be on stage. They don't have to talk about it. They feel that they don't. And so, they come to the program—now, not everyone; a lot of people are bold and very, very confident. But there are such a number of shy people that it's really nice to kind of—since we are both shy—be able to say, "Yeah, we're here to say, we're standing up here doing it and we're feeling maybe nervous too. And this is how we handle it. This is what we do; this is how we got through it. And we're all going to get through this together." It seems to put people at ease. I don't know that it cures anybody of this particular shyness, but I think people learn that even though they feel uncomfortable inside, that other people are feeling similarly, and that even though they feel like they're an imposter, that if they were doing it right, the right way, they would feel very comfortable and they would know what they are doing at every turn. That's not the case. I feel it's really important to model that, to model fallibility and model: "I don't know, myself. Let's figure out how we would do it." Anyway, that has certainly played into teaching, as far as those personal feelings.

Rabkin: Great, thank you.

Keller: Yeah, we have a lot of phrases that come out and this little pile of bits of wisdom has been added to over the years from our students themselves, and our fellow colleagues. It doesn't necessarily matter what it is you're afraid of, or you're thinking privately to yourself: yeah, I know I want to do this but I think x, y, or z is going to trip me up. Maybe someone is thinking, well, yeah, but I procrastinate. Or, I'm really, really afraid of writing a contract; or, I don't know what to do when I have a question and I

don't want to tell the client that I don't know something; or, I'm bored with the process of research; or, I want to spend all my time on research and I'm afraid to move to the next stage; or, I keep starting over. We have a list of these sorts of things that might be foibles for people.

And we point out that this is primarily a freelance profession, and so when you go out there, you're going to be not only the employee but the boss. You want that to be a nice relationship, not a battleground. And you have to learn to work with yourself, and that's why we call it the work strategies seminar. We've had people talk to us afterwards saying, "It was like the elephant in the room. I'm so glad we talked about that because it was always assumed in whatever I did up to now, or what I was thinking before, that I would just figure this stuff out."

And so, we talk very practically about things that you can do, and people offer up their own strategies—everything from: be your own fearless twin, to get someone to call you who is a member of your personal pit crew and have them ask you if you've started; or whatever it is that works. We have a long list of things to try and we suggest people try some things and treat it like a project. Don't let the emotion that surrounds how we view ourselves get in the way of doing this thing you want to do.

And we always make sure to point out that we have seen all sorts of different types of personalities make it in this field. I learned pretty early on that I would even think privately to myself, oh, this person is such a great illustrator, but I don't know if they're going to be able to talk to a client, and then have seen that same person, just by being practical, go to the A-list of some major magazines by just plugging away at it. So, I

truly believe that any type of personality, with enough strategy and work, being practical, calling in help when you need it—you can do it.

Rabkin: So, if I'm hearing you right, your philosophy is kind of to take the mystery and the mystification out of people's foibles, real and self-perceived: to name them, to acknowledge that no one person is a perfect personality, that all of us are working with flaws and limitations, or self-perceived limitations—kind of put it all out there, so that people in the class know that that's the assumption, that nobody is perfect. And then to talk really strategically about, okay, how do you work with this foible; how do you work with that foible? How do you become your own best boss, knowing what you know about your strengths and weaknesses?

Keller: Exactly. And to call on each other for that. And Sarah, one of the things that I love to end that talk with is something that came directly from you. Maybe you made it up, maybe you heard it somewhere. But it was: "Don't ask yourself what's wrong with you. Ask yourself what you need." Which just reframes things in such a positive way. Like, wait a minute, what do I need to proceed? What do I need so that I can do the thing I want to do? And then you start having something that you can act on.

Rabkin: What's an example of a student reframing their own struggles in terms of what they might need in order to proceed? Can either of you think of an example, actual or hypothetical?

Keller: I can think of one, which actually I share, which is a student saying, "I was struggling with this illustration and I thought, what is it? Why can't I figure this out?" And it wasn't that they didn't have enough reference material. It wasn't that they were

having trouble with the medium. All of a sudden, by asking themselves: why, why, why—

Rabkin: Why am I so stuck?

Keller: Why am I so stuck?

They were *cold*.

Rabkin: Oh.

Keller: Oh, I'm freezing, or I'm hungry. The answer is that can be anything, but it can be as simple as, I think I need to find a way to be warmer while I work, and then all of a sudden, the ideas start flowing. So, it can be really simple. It can be really profound. Can you think of any, Ann?

Caudle: Well, it's more of a general thing. We see, the first term, people are not making their deadlines or they're frantic about things. It's a real struggle. They're having self-doubts. It's this hard, hard work. And then we go to the second term, and it's even harder. There's more stuff to do. And then, we see the third term, this sense of confidence and calm. "I can do it and I can make it through." I think a lot of what we're hoping to do with all of this working with our foibles and trying to figure it out is say: "You can do this. You are capable of doing this. And here's the path and we'll help you with it and we'll work together." And by the end of the year, it's palpably different in the room. It's as if they have grown up.

Rabkin: Oh. Interesting. And we're talking about nine months, more or less.

Caudle: Yes, and it feels amazing. It feels amazing.

Keller: It does. And one of the amazing things is that in the beginning those strategies almost feel like a work-around. And then, after you've done it a few times, you start owning it and feeling like, well, I don't really have a problem with procrastination anymore. I do this— And then you start to change. I think that if you set out to determinedly change yourself, that can be really difficult. But if you think, you know what? This is fine the way I am. I tell my students to treat themselves as a sometimes-difficult, a little eccentric, but beloved and absolutely necessary, valued colleague: So, I love working with this person. They kind of do this unhelpful thing, so I'm going to remind them to stay on track here. I'm going to get them that help. I going to— And then eventually you start realizing that that colleague, yourself, doesn't have a problem with that thing anymore.

Rabkin: Hmm. Wow. So, you learn how to take care of yourself as a professional.

Keller: Exactly.

Rabkin: Lovely. How about we take a break?

Keller: Sounds good.

Internship Program

Rabkin: So, great. Ann, give me some information about the background of the internship program and how it really got off the ground.

Caudle: Well, when we came on board with Science Communication, the science writing track had established both internships and established guest speakers that had come in. There was a budget for that. And as we started to build our program, the

science illustration side, there wasn't much of a budget set up for bringing guest speakers on.

And at some point, it became pretty obvious that we weren't going to go any further unless we started to raise our profile a bit. And John and I met and talked about it quite a bit. And he eventually said, "If you can show Dean Kliger that you could bring some top-notch people in, then maybe he'll give us the money for that to happen." And he said, "Choose people that are involved with publications that Dean Kliger gets in his mailbox." So, I went to the newsstand and bought every science magazine that I could find, including some of the big ones, and even *Ranger Rick*, which is a children's science magazine. It was pretty cool at the time, pretty great. And I started making cold calls. I can't believe that it was possible for me to find the numbers of these art directors. It must have been another world back in 1996.

Rabkin: And at this point you did not have a budget to offer.

Caudle: We did not.

Rabkin: It was a kind of chicken-and-egg thing: if you call them to come, they will maybe give you the money.

Caudle: Now this is if we can get them to agree to come sometime, then we might be able to get a budget.

Rabkin: So, you weren't able to offer them money up front and say, "I can pay you five hundred dollars."

Caudle: No.

Rabkin: Okay.

Caudle: So, we had originally had guests. We chose people that were nearby, a botanical illustrator from San Francisco; maybe some of the guests that John brought on board that had visual capabilities, for example, Larry Gonick and his books of little cartoons that talked about big topics like physics.

So, I started making cold calls and called *Scientific American*, *National Geographic*, *Natural History* magazine, *Ranger Rick*. I went through the list. And all I could say was introduce this tiny little program in Santa Cruz and say, "If we could pay your way and your expenses and offer you a stipend of a hundred dollars, would you say yes? Would you come?" And they said, yes! They said yes. The first one was Ed Bell from *Scientific American* and that was an, oh, my gosh. This actually could work.

So that year, 1996, we had—*Natural History* had to bow out because the art director was leaving and there was a change of his organization there. But we had *Scientific American, National Geographic, Ranger Rick*. I'm not sure if that was the same year that we were able to bring a staff illustrator from the American Museum of Natural History here from New York, but it was in that time period.

So that lucky group got all of these amazing guest speakers. Because I have to tell you, when we showed this list to Dave Kliger, he was noticeably impressed. (laughter) I remember thinking, we go! This is great. And he actually gave us quite a bit of money, which we ended up splitting with science writing. But we certainly had enough to use for our group.

Rabkin: So, you could fly these people out, put them up for a couple of nights—

Caudle: In some cases, maybe a couple of nights, yeah.

Rabkin: Why do you think they were willing to come to this, as you say, little program?

Caudle: I really don't know. I know as we got to know Ed quite a bit better, you know, from *Scientific American*—he is a person who wants to give back and is a natural mentor. He had been mentored and he felt like this was a great opportunity to do that himself.

So, all of these wonderful presentations. And Ed came and said, "I understand that there's internships, that you are doing internships." And up until now, the internships had been very small, local kinds of things, very practical, working with a researcher, etcetera. He said, "I'd like to take an intern." And so did Chris Sloan and so did Donna Miller. And so did our guest from American Museum of Natural History.

Rabkin: Where were those two middle people from, Chris and Donna?

Caudle: Chris was from *National Geographic*; Donna Miller was from *Ranger Rick* magazine. Every one of them took interns.

Rabkin: Fabulous. Wow.

Caudle: And in the case of *Scientific American*, the intern that he took was hired, before she was finished with her internship, to become an assistant art director.

Rabkin: Fantastic.

Caudle: And that sort of just blew the whole thing open to a whole different level. And so, many of those magazines took interns again. But we could bring in guests. The visibility was higher. I think that made a big difference.

Rabkin: What kind of feedback did you get from intern sponsors from the various publications and organizations? What were you hearing about your interns?

Caudle: Well, they were falling in love with them. (laughs)

Keller: I love that part of our internship program, because the culmination of each student's internship is that the internship host is required to write a letter back to Ann that simply says what they did and how well they did it. And these letters come back—

Caudle: They are unbelievable.

Keller: They're wonderful. Some of them are funny. Some of them just extol the virtues of this person, praising them to the skies and how much they want to keep using their services. And you probably, Ann, have this huge collection of these things by now, because Ann is where all of these things land.

Caudle: They're wonderful. And some of the things that happened—*Scientific American* continued to take interns for years. And they ended up hiring so many of our graduates, it was amazing. And the same with *National Geographic*. In fact, that was the first internship they had ever had, so they started an internship program because it was so successful. And then, we had several people go to Cornell Lab of Ornithology. And you mentioned earlier, Pedro Fernandes was the intern for Cornell one year, around 2007. His work was so stunning they put an exhibit together to show it off. And among the attendees was a person who said, "This is so important. This is so amazing I'm going to create a fellowship so that this can be a paid internship." So, it's become a very, very sought-after internship, where people are there for three to six months, and they are paid, and it's extraordinary.

Rabkin: Wow. So not all of the internships are paid?

Caudle: Not all are paid, no. In the case of *Scientific American*, they were paid for the kind of work that they were doing; whatever work they were doing they were paid on a freelance basis, what the freelancers were doing.

Rabkin: I see.

Caudle: Many pay for housing or are paid in—well, certainly in experience. There's just so much amazing experience that people gain from this. But it has been life-changing for many people. Some have gone on to stay on and work at the place that they interned. And it becomes the basis of their freelance context. From there, it goes on to other things.

Keller: And being in that environment, whatever it is, definitely can put our students in the position to network and hear about things that they might not hear about otherwise. Like, I'm thinking of Cleo Vilett, who was interning at *Scientific American*, and into her inbox came an announcement about a staff position at the American Museum of Natural History. And by the time she looked at it, it was, I think, two hours until the deadline for applying.

Caudle: Oh, that's right!

Keller: And she got into gear, and applied, and got that job and had it for two years, where she was doing museum exhibit preparation work in a science illustration vein for years, for the AMNH, but she wouldn't have heard about it if she hadn't already been in that environment where those missives were being sent around.

Caudle: The American Museum of Natural History has had some really interesting scenarios. I think it was Utako who went to that museum and she ended up finding a place to stay in the home of the art director of the magazine.

Keller: Right.

Caudle: And he saw her work and said, "You've got to do work for us!" And she ended up doing some amazing illustrations for them, several major illustrations. It was wonderful. And then very recently, Andrew McAfee went off to the Carnegie Museum. And I was waiting for letters of completion and I contacted Andrew and I said, "I know you were there. Where is your letter of completion?" And he said, "Well, they hired me. And I'm in the position that I would be the one that would write my letter."

Rabkin: (laughter)

Caudle: So, I said, "Well, I would really like a letter from him. Make it good." (laughter)

Rabkin: So, he wrote about himself in the third person: "Andrew was a really fine addition to our staff." (laughter)

Are there other specific stories that come to mind about internship experiences?

Caudle: You know, the problem is that there are so many that it's very, very difficult to even start to single things out. You know how your memory works? Those things bubble to the surface? It's a river.

Rabkin: Exactly. Sure.

Keller: Oh, gosh. I think of the adventures they have had and we have been in proximity to. Stacey Vigallon went to Sri Lanka—

Caudle: Oh, my gosh.

Keller: —to illustrate a field guide to a natural reserve in Sri Lanka. And did a magnificent job and started a small art school for the children there and she was sending back pictures. She ended up finishing a couple of weeks early, or maybe she was going to stay on longer, but anyway, she came home. And then the tsunami hit.

Caudle: It completely wiped out the area where she was.

Rabkin: Oh, my goodness.

Keller: She had come back to the States to finish the book and get it published and ready to send back.

Rabkin: So, the reserve for which she had written a guide or illustrated a guide was no longer intact.

Keller: It was more of a legacy than what it was originally intended for.

Caudle: Yeah, that's pretty interesting.

Keller: There are a lot of amazing experiences that people have had.

Caudle: Justin [Hofman] went off to be on board one of the *National Geographic* explorer ships that go all over. And he ended up staying on and doing that for years and years, and that became the signature thing of his starting career.

One of our students this year—talk about perfect matches—she's a very unusual and very talented illustrator whose very favorite thing is to draw parasites. So, while everyone is starting out learning how to do some of the color techniques that invite some really beautiful illustration, she's drawing worms that crawl into your skin. (laughs) She found an internship this year. She's going to be going off to—it will be her second internship of her group—and she's going to the Institute of Parasitology in the Czech Republic.

Rabkin: Wow!

Caudle: Could this be any more perfect?

Keller: They are so happy with each other.

Caudle: It's like, "We found you!" And she's going, "We found each other."

Rabkin: Did she have any connections with the Czech Republic, or was it just parasitology?

Caudle: I have no idea. It was parasitology.

Rabkin: Wow.

Keller: "Parasitism is the sincerest form of flattery." (laughter) That was what one of the T-shirts said this year that students wore to class and it was very popular.

Rabkin: Great. (laughs)

Caudle: So, they ended up with some marvelous internships that just seemed to fit perfectly. And people do more than one if they want to. It's a ten-week requirement, but

there's nothing to say that you can't expand that. And more than one internship began when we were finding positions for people at a smaller publishing company, or an organization that had a smaller project that didn't meet ten weeks. And so, we solved that by: "Just go ahead and do that. That's a wonderful experience. And try something else that will give you a little bit of insight about another part of the field." And some people were very set on doing several internships, so that they have that broader footprint of experience. So, for example, our young person who is going to the Museum of Parasitology is also going to China to a natural history research area. And she's excited.

Rabkin: She sounds like an adventurous person.

Caudle: I guess she is.

Keller: She is. Yes, she is. I also think of Erin Hunter, who had two internships. I think the first one was at AMNH. And she called me after that one and said, "I'm tired and I've been kind of sleeping on couches, and I've signed up for this other internship, and I just want to go home to my fiancé." She was essentially saying, do I really have to do the second one? I said, "Yeah, you do because you said you would. You go do it." And she ended up in her second one, which she had planned, was with Sally Ride Science. That ended up being such a windfall for her. They loved her; she loved them. And she ended up doing numerous books for them after her internship ended, and worked for them for years. And it launched part of her specialty of her career, which is illustrating children's science books. So those different experiences—I mean, the first one you'd think, wow, that's pretty high up there. That's going to be great. It was actually the

second one that just happened to show her a window onto something and a group of people that was in accord with what she ended up wanting to do.

Rabkin: And if it hadn't been for you nudging her, she might not actually have done it.

Keller: Yeah, she thanked me. I thought, oh, I've got to go make her go do that, even though I could understand she was tired and wanted to go home.

Caudle: And then there were some interesting things where people are disappointed because they wanted a particular internship. We had one young man, who all his life wanted to intern at *National Geographic*, or wanted to work for them, and came to us with that internship in mind, and worked on his entire portfolio with that in mind. And for some reason, I don't remember if they weren't taking interns that year, or what the scenario was, but he did not get a *National Geographic* internship. And he was devastated. We had lots of long conversations. And I said, "You never know. There's no guarantees that going there would have been the experience that you wanted it to be. And you never know what's just around the corner."

So, he ended up taking an internship that was rather small, or in his estimation. I wish I could give you all of the particulars. It was probably in Montana; I think it might have been the Cody Museum, but it was a little museum of natural history that hired him. He did extraordinary work for them and then ended up using the work that he did there to go on and do bigger projects. It was a perfect fit for him. And his disappointment—he was able to get through that.

And that's one of the things I have to share with people, that they will have some goal that they might not be able to actually achieve as far as going to a particular place, but

to keep an open mind, especially because you don't know what you're going to learn, and that it may not be the thing you thought you were going to learn. And sometimes a tough internship, where it wasn't a great fit, or there were personality problems—it becomes exceedingly important for them to know how to manage it, what to do. So, it's an interesting situation.

Rabkin: Do your students ever end up in competition with each other for particular internships?

Caudle: What more often happens is one of the students will overhear, or know that one of their cohort is desperately seeking an internship at this particular organization, but they happen to want to do that as well. And so, they will be a little hesitant to apply because they don't want to be competitive. And we encourage them to just—we talk about this right up front: "If this happens, if someone else is going for this internship, you just all have to do it. You just have to do it and go ahead and apply and see what happens. There's life after whatever happens."

Rabkin: So, then they have to deal with the fallout.

Caudle: They have to deal with the fallout.

Rabkin: Interesting.

Keller: And that brings to mind one of the coaching kinds of things that we do. The very first day, on orientation days, we tell them—we're in a big table all circled around. We push all the big drawing tables together, so we are literally twenty people looking around at each other. And we say, "You're looking across the table at your future colleagues. And you can support each other. You can call on each other, and you

should, because some of you are going to become art directors. Some of you are going to be managing businesses that need a partner. You're going to be calling on the person that you know who is an expert on illustrating fish, or parasites, or whatever it is. So, you could think of this as an adversarial thing, but you're probably going to get further if you think of it as a bunch of people who are your colleagues and your peers that you can work together with."

And we've had students go on and have long-lasting business relationships with each other, and reunions at the annual GNSI [Guild of Natural Science Illustrators] conference. They do exactly that. Even though there's this internship thing, where sometimes they might be applying for the same thing, we hope that by that point we've established enough of a camaraderie amongst the group, and a helpful attitude, that I don't think it ends up doing any lasting damage when there are some overlaps there.

Caudle: I was just thinking about the most recent Guild conference in Santa Cruz—

Rabkin: This is the Guild of Natural Science Illustrators?

Caudle: Yes. The class of 2015—(laughs)—it seems like the more recent classes I'm getting a little bit hazy on. Anyway, almost the entire class came back to go to this conference and see each other. And they followed each other around and were a marvelous group. It was so exciting.

Keller: We were so excited about that conference. Perhaps partly because it was held in Santa Cruz, a lot of our past graduates treated it as a chance to come back to their old stomping grounds. We counted fifty-one of the participants in that conference, which—

Caudle: It's a small conference, too.

Keller: It's a small conference. They *were* our graduate students. We have a picture of this giant crowd of people, with Ann and I amongst them. We like to joke that we're taking over the world. (laughs) There they all were.

Rabkin: Do you do anything to facilitate connections, collegial connections, between students from different years, as well as students within a given cohort?

Keller: We certainly let them know about each other if there's some reason to connect people. And they have worked on projects together. Cleo Vilett hired someone from a later year, Jane Kim, to work on murals with her. Or maybe it was the other way around. Maybe Jane hired Cleo.

Caudle: Jane hired Cleo. Jane also hired one of the grads from her class.

Keller: So anyway, we do put them in touch with each other. We love it when people get in touch with us looking for illustrators because we are Illustration Central. We can put the word out to our alumni list, or a select group of people, or help hand-choose an illustrator who will be perfect for the job.

Rabkin: Does that happen often?

Caudle: Often. Yes, quite often. People get some wonderful work from that.

But as far as connecting with each other, as the years have progressed and there's so much more social media, and email, and our website, we find that people will come into the program having combed through the alumni list, looking at the gallery, looking at every piece, and having rock-star crushes on some of them, and going, oh, my gosh.

Rabkin: "I want to draw like so and so."

Caudle: Yes, this is my favorite person, my inspiration! So, it is really fun. Jane Kim happens to be one of those people—she's very visible and has done so many wonderful exciting things with her migrating mural project and the Wall of Birds mural project at Cornell. Oh, when this year's group found out that she was going to be teaching one of the classes, they almost—

Keller: Fanned themselves with excitement. (laughter)

Caudle: It's great.

Annual Science Illustration Exhibit

Rabkin: Well, I'm wondering if this might be a good time to move on from internships and talk about another aspect of the program that Jenny has touched on, but not a whole lot, and thought you might have things to say about—and that's the annual exhibit.

Caudle: Oh, the exhibit! Well, I don't know what we can say except what an exciting thing it is for all of us. Hard work, but whoa!

Keller: Oh, gosh. Every year we can't believe that we pull it off because it is a lot of work. I counted up—this year we had 65 framed pieces, and including clay sculptures and other types of mounted works, it was 119 works of art, total. It is quite an endeavor to put it together. The students help frame and they learn a lot about how to do that.

And I'll just insert in this moment, and then let Ann go on about what comes to mind for her, but when you asked about gratifying and exciting moments and experiences in this program, I have to say every year: the exhibit. Because not only is it wonderful to

pull it off, but in that moment when it is our opening night and the students arrive, and all the work is up on the walls—and even though they've helped put it together, and in some cases helped install things—suddenly their work is there under glass and the gallery lights are on it, and the guests start to arrive, and the room fills with people, and business cards are being snatched up, and we're connecting someone who wants marine illustration with someone who did this piece over here—you see this look in the students' eyes. Every year I see them respond: they see their own work in a professional light, the public view their work and be so impressed. It's very gratifying.

Caudle: Yeah. Totally. And people sell work and they get book deals. It's just a wonderful experience. It's also a big part of the curriculum in that last term. Everybody has a particular job to do for the exhibit. It could be publicity and reaching out the Guild of Natural Science Illustrators, and writing an article about it, and gathering the artwork for it. Or it could be doing some design work for the nametags, or being part of the demo, the public demo, on one of the Saturdays.

So, everybody is responsible for a piece and we're very careful about telling everybody what goes on behind the scenes, the part that they're not seeing, so that they would know how to put a museum-quality exhibit together from start to finish. And that's, I think, hugely valuable, and a lot of people have gone on to do exhibits and feel like they were well trained.

But my favorite part is when Jenny and I work—we have all of these sixty-some pieces, sixty-two to sixty-seven pieces, and they're all different sorts of subjects and different styles. And we spend several hours arranging them so that there's some sort of resonance between patterns and color and value, and so that each piece is better

because of the piece that's next to it. And we've gotten this sort of a shortcut—we just quietly work and move things around and all of a sudden, we're going, "Yeah! Oh, that was a good idea. Oh, I was thinking of that, too!" (laughs) It surprises me every time that it actually happens. And then to sit back and go, wow, we like this. And then to see the students—

Keller: They come in and they go, "I never would have thought that the illustration describing the oil slick would go so well with the illustration that talks about the fur that is used in cosmetic brushes, but yeah, it works!" (laughter) And we have so much fun putting it together. It's tiring, but sometimes we'll be working with an area thinking, okay, the theme here is kind of coming together, but now we've got this piece that—I don't know where it's going to fit. And I'll look over and Ann will pick up a piece and she'll be heading one direction in the gallery and I'll think, oh! Yes! I know where you're going. Oh, it's perfect!

Caudle: (laughs)

Keller: And we joyfully exclaim that that's where that piece belongs and it's just a really nonverbal creative endeavor that, if this is your kind of thing, it's a really deep version of that kind of thing.

Rabkin: And you two are longtime collaborators now, and you almost know each other's thoughts before they happen.

Keller: Yes, since 1989, when our first exhibit happened.

Caudle: Yeah. That's pretty amazing. And so, we're used to people thinking, oh, this looks really good. But they have no idea what's going on, what it entailed. It's not that

you just put it up and it suddenly worked. And we have, at CSU this year, not only are we under—our financial plan is in Extended Education but now we're also part of the College of Science and they have a new dean at the College of Science. And he came to the exhibit this last year and just was bowled over. He really enjoyed it. But one of the things when I just wanted to say, "Thank you!" was when he said, "This was really curated. This was really put together well." And I thought, yes! It was just so wonderful to have someone else see that particular piece of hard work.

Rabkin: Because people don't always think about what goes into curating and mounting an exhibit. They see the work itself, and if the curation has been really expert, the work is shown off to its best advantage and the curation becomes sort of invisible to people, unless they're really thinking about that.

Keller: Exactly. It's like good design—when something is designed well you take it for granted and then you just look at the content and move along. It's also a good point to acknowledge the wonderful relationships we've had with our colleagues at the Santa Cruz Museum of Natural History and the Pacific Grove Museum of Natural History, who, of course, are there knowing how the museum end of that whole thing works. And so, Paul Van de Carr at the Pacific Grove Museum of Natural History is expertly attaching these things to the walls and making creative decisions along with us, and that's just part of the joy of working in that environment, is those talented people.

Rabkin: One of the elements of that exhibit that people often comment about is, not only the visual work, but the little pieces of verbal interpretation that the students post next to their work. Could you say a little bit about what you do to encourage the students to do that and how that goes?

Caudle: Well, people don't know what goes into an artwork. The world is so visual. There are so many artworks out there in the world and so many illustrations and artworks and things, that people don't tend to realize what goes into the creation of them. And it's so easy to make a decision about what you feel about a piece. You glance: I'm interested in this; I'm not interested in that. But our goal is to get people to look and notice and really understand that a human being did this, and that there were decisions being made, and that this isn't just something that a computer put together. And so, we encourage people to talk about something that really is personal to them about doing the piece. And it could simply be the research—what made them so interested in doing this particular illustration. Or, it could be a story about how, while they were doing this on the beach a seagull came and tried to steal their pencil! (laughs) But every time, it's so much fun to see, because at the exhibit people are looking at artwork, and then they read the anecdote, and then they look at the artwork again.

Rabkin: Yes.

Caudle: And then they *really* look at the artwork again. It's just—it's so much fun. The artists don't tend to understand why we're asking them to put the anecdotes in there, but I think they see that as soon as the exhibit happens.

Rabkin: It adds a whole other dimension. I know, for me, it's one of the really memorable facets of that exhibit. And sometimes the stories are really funny, like the guy who bought the oysters or whatever to draw, and then forgot and left them in the car, and they didn't really survive the overnight in the car. (laughs) He had to get some different oysters to draw.

Or, there was the woman who saw the lovely-looking cactus fruit and reached out to pluck it off the plant and ended up with an illustration of her self-inflicted injury. But people also telling stories about what inspired them to do a given illustration, that this was something they grew up with; it was important to their family lore, or their history or whatever.

Keller: Sometimes some more backstory of the illustration itself, so they'll go on to almost create a mini-article about this issue in conservation, or some new venture in the field of science, as well as, of course, the process of creating the illustration. We let them go anywhere with it. We give them examples of these types of captions that have come before and give people a reasonable amount of leeway as to the length.

One of my favorite ones that stuck in my head from many years ago, was when someone said, "It is amazing to draw something for twenty-five hours and then discover something new about it in the twenty-sixth hour." I felt that pretty much says it, that yeah, when you read that you realize, wow, they spent twenty-five hours staring at this thing. It's also making the point that you can just continually discover new things. So, that particular one sticks in my memory. There are so many. I love reading them.

I always go—we have a big opening night reception and we've been all involved with every stage of all of these parts that go into the creation of the exhibit—but I always make a point to go visit our exhibit on a quiet moment by myself, after it's all up. That is sometimes when I really get to commune with each work of art and the things that the students said about it.

Rabkin: Yeah. Well, we've covered a lot of ground and you guys have put in a lot of energy. There are some subjects I want to make sure that we get to before we stop. And one of them is just stemming from your long collaboration with each other. I know over the years you've had some experiences together that have become part of the lore of the history of your program.

Favorite Stories

Keller: (laughter)

Rabkin: And there are one or two stories that I know one or both of you wanted to be sure got told. (laughs) You're both smiling. So, I'll let you choose.

Keller: I think we need to start with Night of the Living Deer.

Caudle: Yes, I think that would be a good decision. (laughs)

Keller: Okay, we nicknamed it that after the movie Night of the Living Dead because it has to do with dead things. So, when we were at UCSC, housed in what was then called Applied Sciences and is now Baskin Engineering, we had a little room off of our classroom in which we kept our herbarium specimens, and our Riker-mounted insects, and our skeletons that we had gotten from Carolina Biological Supply, etcetera. But we also had a used—and the key operative word here is *very used*—freezer. I guess also it's important to note that it was an upright freezer, which turns out to have been a bad choice.

Caudle: (laughs) That's certainly part of the story.

Keller: So, we kept things in the freezer. It's actually really helpful, when you're describing the anatomy of a bird wing, to have a real bird. You take it out of the freezer and you thaw it a bit, so that people can see how a bird wing moves, and then you tuck it into its plastic bag and put it back into the freezer. And we did have a collecting permit, and so for salvage we would find things. And so, the freezer became stuffed with, oh, all sorts of things: A Night Heron. A very small deer. A bobcat. These things were found as road kill. And so there they all were.

One morning, it was a Tuesday morning, I arrived and Heidi Noland, who was then my TA, met me at the door of the building and she said, "Something is really wrong." I said, "What?" And actually, I was just at the door of the building and I could answer my own question because I could smell that something was wrong. She said, "I think something has happened to the freezer." Tuesday was the first day of our week, and so that meant that this thing could have died and stopped freezing our specimens as long as four days ago. We never knew exactly how long it was, but it was plenty.

So, Ann, you have to take it from here.

Caudle: So, I must have arrived a little bit later. And I noticed that there was an ambulance and a hazmat team.

Rabkin: (gasps)

Keller: They were in suits. The police cars were there because of the nature of the smell—it smelled like dead bodies and people in other parts of the building were calling the police. It didn't help that this little room that was off of our classroom happened to

be, and actually have a door to, this vent that went all the way up the how many stories of Applied Sciences.

Rabkin: (gasps) Oh, no.

Keller: So that that smell was efficiently dispersed throughout the building.

Caudle: I believe the ambulance was there because more than one person was getting severely ill from the smell.

Keller: Yeah, and at some point in this, maybe as you were arriving, or right before, I went in knowing that it must be the freezer. And I felt the freezer and from the outside, it felt hot.

Rabkin: (gasps) Oh!

Keller: And stupidly, I opened it to peek inside. (laughter) And dead thawed bodies are one thing but they also exude fluids. And so, a portion of the gush of that fluid came out during my quick peek inside the freezer and rapid slamming of the door. Some of that came out, so we kind of knew what we were in for. It formed a big puddle on the ground. But when the hazmat team came in to deal with this—the freezer had coils on the back, as an upright freezer would. So that just meant that they couldn't put the freezer on a dolly, leaning against its back. They decided that for stability they would put the freezer on its *side* on the dolly, and then proceed to try to get it out of this little room and through the classroom, and then out to the waiting truck, or whatever they had, to take it off site. But halfway on their little journey through the classroom, the freezer door flipped open and all of the contents spilled out into the classroom. And Ann and I at this time were in our offices in hiding and we could hear them.

Caudle: We could hear cursing and screaming. I remember looking into the classroom from the hallway and seeing them halfway though, the deer sloughed on the floor, and one the guys was so upset that he kicked the freezer a bunch of times (laughs) and was cursing. And then, one of them came over and closed the door so we couldn't watch. (laughter)

Rabkin: Oh! Where were your students at this point?

Caudle: Well, we had to dismiss class.

Keller: I guess we did. I don't remember.

Caudle: And then they had the cleanup. They had to pour that bioenzyme whatever that they dump on toxic spills, bioactive toxic spills. And we didn't hold class in that classroom for a couple of weeks. It took a long time for the smell to dissipate. And even when we returned, we had to kind of bite our lips and be brave.

Keller: Pretend.

Caudle: Be brave. We're science illustrators; we can handle this.

Rabkin: Was the smell still being broadcast by the ventilation system through the building at that point?

Caudle: Well, we were not very popular in the building and I imagine that there might have been a little bit of that, but it hopefully was not as bad as it was in our classroom.

Rabkin: You mean you were not very popular after this incident occurred?

Caudle: Or during. Yeah, once they found out where it was coming from. So, after that, we were not awarded another replacement freezer, and we proceeded to give all of our specimens to the Natural History Program to keep in their freezers, and that just became where they were owned and housed.

Rabkin: What a story. Well, since you mentioned the year 1989 at one point, I thought I better ask if you have an earthquake story related to the program.

Keller: Oh, that's right, we were teaching at the Blacksmith Shop in 1989. So that was before Night of the Living Deer, because we were up on campus by 1992. But in 1989, we were still teaching in the Blacksmith Shop, and I was holding class one day after the earthquake and some sort of official operations-looking people came into the classroom and said, "You need to leave this building." And I said, "Well, we're in the middle of class." And they said, "You're not allowed to inhabit this building. It's been condemned." And I said, "Everyone, I think we need to leave."

So, what it turned out to be was that they needed to take down the old chimney in the Blacksmith Shop. After they kicked us out, they deemed that the structure was sound but they had to take down the bricks that actually were the chimney that was part of the original Blacksmith Shop. So that was part of my experience of the 1989 earthquake and its effects on our program on campus. I can't remember where we held class during that time.

Caudle: There were a lot of people staying home for a while.

Rabkin: So that original chimney did not actually fall in the quake, but they were worried that it would come down.

Keller: Yes, they were worried that it would. It was cracked and it looked scary. But we just kind of peeked in after the earthquake and said, "Well, okay." And we went in and had class. And then they got around to us and said, "You can't be in here."

Caudle: Oh, my gosh. Well, I know that one of our incoming students for the next year, 1990, tells the story that she had come to Santa Cruz a year early in order to get residency here, which would help with her tuition. And that she had stored all of her artwork under her bed, where she was staying, and that in the process of the earthquake happening the water main broke, the water pipes broke, and all of her artwork was flooded.

Rabkin: (gasps) Oh.

Keller: That sounds like a tragedy. Well, she got into the program anyway. That's lucky.

Caudle: She did and she did well.

Keller: It's so fun to talk about the funny experiences. We've had funny and heartwarming—you know, the freezer story was not that funny at the time; it's funny now. But then there are also experiences of just coming into the classroom during a really busy time of year to find that the students have all, not only spent the night in the classroom (they have 24-7 access to the studio so that they can do their work into the wee hours if they need to), but coming into the classroom and finding that they had not only spent the night, but set up tents.

Rabkin: (laughs)

Keller: (laughs) A whole bunch of little camping tents on the parlor table, over there in the corner—

Caudle: Sleeping bags under the table.

Keller: Sleeping bags. They just made a party of it. And we've had students decide to go to the Monterey Bay Aquarium Halloween party dressed as a shoal of krill. (laughs) So there were six of them that decided to be krill but then they decided they would personalize it a little bit. So, we had "sporty" krill, and "science" krill, and it was kind of like the Spice Girls—I don't know, they spiced it up so that each one was a little bit personalized. And then they roamed around the party in the Aquarium as a little herd. And other clever stuff—like one of our students sewed a giant red squid, which is with us today, living on the couch in our parlor. Squidly, is this magnificent work of art that one of our students made as just a decoration. Maybe it was part of her trip to the Aquarium that Halloween, I don't know. Lots of fun Halloween stories and funny things that people have done. Yoga classes. And belly dancing classes.

Caudle: That very year, the yoga and the belly dancing—the first ones, one of our group was like a camp counselor, or camp entertainer or something. She would think of projects or things for people to do, and they would go take trips together.

Rabkin: In all their spare time.

Caudle: In their spare time. So, they went to the La Brea Tar Pits—

Keller: Over a four-day—

Caudle: —over a four-day break, from Thursday, to when classes began. And they were so good about it. They took their computers and their sketchbooks and they took photographs of things at the Tar Pits, and then they would sit at a café and do homework projects.

Keller: Gather reference material and meet people on their way. The afternoon class on Thursday would typically be our wrap-up for the week. We'd walk out to the parking lot and a group of them would be getting into their loaded cars and heading off to Yosemite to camp in the snow. They weren't even necessarily prepared or experienced with that. There might be a few in the group that were and then they would all teach each other how to do it and off they'd go. Really a lovely kind of camaraderie.

And what are some other fun things that have happened?

Caudle: It's always interesting to see young people who have been in their environment for all their lives and haven't seen the greater world, the big world, come and experience that. We had a couple of situations where young people ended up going, "Are you really going to eat that thing?" (laughs)

Keller: Oh, right! I know what you're talking about! (laughs)

Rabkin: Meaning?

Caudle: One of them—we had a gathering for our orientation and we all brought food. And there were things like bean salads and all of that. I remember, in particular, this young man having scooped up something and put it on his plate, he poked it—

Keller: —with his fork.

Caudle: —with his fork. And he looked at me in panic and said, "Ann, what is this?" I said, "It's a bean salad." (laughs)

Keller: And we also had, at that luncheon there were, I think, tamales. And that was, Tom said, "What is a tamale?" And we showed him how to unwrap it, and it became one of our fun things to do that year, was to show Tom new foods to eat that he never happened to have encountered in his native Mississippi, that we were very familiar with on the West Coast.

(laughs) And I think of another example—we, for some scattered amount of years, some stretches here and there, have taken our graduate crowd to my family's land just north of Butano State Park, near Pescadero, for an overnight camping trip, sometimes during the school year, more often as a kind of a celebration at the end, a time to be together and have our funny little ceremony. And one group got there and I think there was someone in the group who we knew was not very appreciative of the UCSC mascot, the banana slug. And others in the group decided to, not only search for banana slugs immediately upon arrival at my family's cabin, but they found a bunch of them, as one does in a redwood forest, and put them all over their faces and eyeglasses. They were like body art. And we have pictures of people who used banana slugs as earrings and (laughs) the banana slugs, of course they don't care what they're crawling over. But the person who was a little bit shy of the banana slug—

Rabkin: (laughs)

Caudle: No, she was terrified of banana slugs—

Keller: She was nonplussed.

Caudle: And, in fact, when she heard that she was coming to an institution whose mascot was the banana slug, she wasn't sure she was going to cope.

Rabkin: How did she react to this demonstration of slug love?

Keller: (laughs) I think I remember her sort of squealing and backing away, but becoming somewhat inured at the same time.

Caudle: I think she was also saying by that time she'd been acquainted with banana slugs several times. So, she was saying, "It's okay, I can handle it."

Rabkin: Do you tend to get students right out of college?

Caudle: Sometimes. In one class, we might have a couple of people who have just graduated, just earned their BA's, in the same class with someone who is sixty-two.

Rabkin: Wow.

Keller: And everything in between.

Caudle: And everything in between, which I love because the different life skills and experiences just adds to the mix and we learn a lot from each other.

Keller: I love that. We've had, during some years, as many as five countries represented in our cohort of fifteen students. Something that we're very proud of is that the international community is aware of us and this is a destination for people who want to learn how to become a professional science illustrator. We adore our foreign students and sometimes they have gone back to their countries and told their friends, and then

had those people apply and come out. So, we have had generations of people from different countries come out.

Rabkin: In the decades that you've been running and teaching this program, have you seen any shifts or changes in the attitudes of the students you bring in, or the kinds of students, or their relationship to the work?

Caudle: That's an interesting question.

Keller: One thing that I said—something similar to this came up a little earlier, and Ann, one thing I said was just something I've noticed is that in the beginning we had to show people where the recycling bin was and encourage them to use it. And then as time has gone on, that's a given, and they ask where it is. And that's just emblematic of people's increasing awareness, all of our increasing awareness, of the fragility of the natural world and the importance of conservation. And I think that people's illustrations have also centered more on that, and some of the successes and tragedies that have characterized *Homo sapiens*' relationship with other species on this planet.

The Impact of Social Media

Rabkin: Yeah. How about the advent of cell phones and social media?

Keller: Hmm.

Rabkin: How has that, if at all, shifted the social interactions, or the attitudes, or the activities of your students?

Keller: Well, actually something that's really significant about that and I'm so glad you mentioned it, is that the Internet has absolutely transformed research. So, in the

beginning, we were struggling to find reference material and we were all keeping clip files of old magazine photos. And we'd save everything of a polar bear in one place. And we would access similar clip files that were being kept by the California Academy of Sciences and so on. Because then, as now, a reference to a text in a library that has the designation ILLUS. could refer to anything from a photograph, to a chart, or a graph. And so, we were all over the library chasing down false leads, looking for a picture of a polar bear.

And now, oh, my gosh. Even in 2009, when we were moving to CSU, we were a little concerned that the library there was really not up to the caliber of the library at UCSC and the whole UC system. It actually turned out to be not an issue, because that was right as things were getting underway in terms of being able to look stuff up, including images, online. And of course, while we are extremely careful about not infringing on the rights of artist-photographers, as well as artist-illustrators, and we teach our students about that—if you have enough photographs, you can create something that's original, taking a piece from this and a piece from that, and turning a pose and adding a paw that was hidden in the grass, and so on. So, I would say that's been a huge change over time.

Social media—well, Ann, you have a lot to do with our website and how to keep that running, and then some of our graduate student TAs have been, I think, really helpful in getting Ann and I up to speed about maybe posting things on Instagram and getting that going.

Rabkin: Do you encourage your students to create their own websites? Is that part of the curriculum?

Caudle: Yes. And we encourage them to do all of the things on Facebook and Instagram and other forms of social media in order to promote their businesses.

Keller: We had a special guest lecturer this year on social media. It was actually someone that one of our newest teachers, Jane Kim, someone she knows, who is really good and has helped her with her own marketing. You know, in the beginning, I think especially for people of our age, when social media and other digital-everything started to come online, there was this feeling that, oh, my gosh, you've got to adopt everything or you're going to be left behind. And now we're seeing that whole thing mature, to the point where people are saying, "Yeah, you know, I don't do this or this. I pick and choose. I do Instagram and I do LinkedIn. But I don't do other things." I just consider that a maturation of the medium, because there's too much to do it all, and there are advantages to having some strategy about how you approach it and the time you spend on it, and what actually gets seen, and actually ends up coming around and benefitting you in some way in your career. So, this year, we actually had a guest marketing lecture about how to use those media. But we've been talking about these things longer than that.

Caudle: This year we also had—I got to see in action how people were using things like Instagram. One of our students in October—I overheard her saying, "I want to participate in InkTober," where people are participating in doing ink drawings every day and then they post them?

Rabkin: Okay. So that's like a visual version of something like NaNoWriMo, which is national novel writing month, which takes place in November?

Caudle: Yes.

Rabkin: So, this is InkTober.

Caudle: InkTober. So, she said, "Oh, I've always wanted to do this. I've never gotten around to it, but I think I'm going to do this." And the next time I saw her, she had been doing these lovely little whimsical drawings that were gorgeously accurate, and yet she'd created additional parts and kind of fantastical things. And she'd started a business. She was posting them on Instagram, and then she started selling them, and for the rest of the year, that was something that she did on the side, to help pay for her tuition and her expenses. She utilized the classroom to package and post them. So, wow, this is really something that is useful for people who are freelancing and need to fill in with a side business, or certainly to reach out and have people notice.

Keller: And other students saw her doing that and thought, oh, I could do something similar, but different. So, then someone over here is creating enameled pins from the artwork that they've done, and an online way of getting those things manufactured, or printing posters, or things to sell that are all based off of their artwork. They learn from each other, as well as learn from us, of course.

We not only encourage that; it's one of the reasons that we continue to say, "Being together in person is better than just simply having an online program." You can certainly learn something from an online course, and I'm not knocking those; it can be an incredible resource. But the kind of synergy that goes on in the classroom when we are all together, all fifteen students, and sometimes all of the instructors at once as well— because our offices, our doors of our offices open right onto the classroom, so we are all together all year, laughing at things that are said and sharing in the culture that is created with each new group of students over the course of the year, supporting each

other, knowing what's going on, and of course getting ideas from each other. And someone will bring in some stray bit of something—it could be having to do with their incredible carnivorous plant collection that they brought with them, or their pet amphibian, or their penchant for spiders, or they happen to be extremely well-versed in art history and they bring in work of a historical artist and say, "Look how this person used a spot of red to sparkle up all these heavy tones!" And then suddenly you see sparks of red in someone else's artwork. There just is nothing like being together.

Rabkin: Yeah, you're together in the classroom and you also go on field trips together, do you not?

The March for Science

Keller: Yes, we have a field sketching course, so that involves about nine or ten field trips over the course of ten weeks. And then we take other field trips back to UCSC, where we still have friends and collaboration colleagues. We mentioned *Science Notes* and the Norris Center. And sometimes we come up with other things. There might be a really interesting exhibit going on that some of us decide to go to, and we'll do some extra field trips.

Caudle: This year the March for Science—that was a huge piece.

Keller: Yeah, so some of the students—I thought they might be interested in seeing—I was making a brain beanie, which is akin to the pussy hat that was in the Women's March, which was the little pink hat with the ears. When the March for Science was in the works, being planned, the buzz online was to make yourself a brain beanie, which is a little hat with those sort of wormy shapes on it that make your head look like a brain. I

think it might have originally been for zombie costumes on Halloween, but we all thought, well, that's a good nerdy science brain.

We brought in sewing machines and we had a workshop to make our brain beanies, and then we went up to the March for Science in San Francisco on April 22, 2017, to be a part of that show in support of science as an endeavor, which is hardly believable that we should even need to make a stand for that. To our students' credit, and we were proud of them, that they took that opportunity to also have a booth at the science march.

Tell about the booth. How many of them—it was eight of them?

Caudle: At least eight of them. They got the idea because they realized that some of the Association of Medical Illustrators were having a booth, so they contacted them and asked, "How do we do this?" So, they set up a booth. They brought prints of their artwork. They had a sheet on which people could put their names and contact numbers if they were interested in finding out more about science illustration.

Keller: Or an artist in particular.

Caudle: And this artist in particular. And it became this huge experience in which there was group camaraderie.

Keller: With the whole enterprise.

Caudle: Enterprise, exactly. And also connecting with the science community and the scientists that were there. It was a very valuable experience. And it was good on so

many levels. It was so good to see so many aspects of who they are as illustrators, and scientists, and human beings being addressed at the same time.

Rabkin: Did your students make signs for the march?

Caudle: Oh, yeah.

Keller: Oh, yes. We had signs. We even had—some friends brought their dogs and the dogs had placards named "Observation," "Reason," and "Deduction." That was quite popular.

And it was exciting to see that the science illustration booth at the March for Science was mobbed. I kept trying to take a picture of it, but I couldn't get a picture of our students in the frame because there were so many people crowding up and being interested in what the students were showing.

Rabkin: Thank you. That's great. Well, we're closing in on when we need to stop, and I know, Jenny, that you had a few things that you wanted pick up from previous interviews, and there may be aspects that Ann wants to chime in about too. One of them had to do with the guest speakers you were telling me about. You wanted to be sure to round out what you had to say about that.

Keller: Yeah, I don't know if I remembered to say that the guest speakers are many of the people who've come time and again and are professionals, longtime professionals in the field of science illustration or related aspects of it, like being an art law attorney. But I don't know if I remembered to mention that some of our guest speakers have also been our past graduate students—like Erin Hunter and Reed Psaltis and Eliza Jewett, etcetera—doing talks on their experiences, being a professional in the field. Jess Huppi

went from feeling during the program, the beginning parts of it, that she wasn't sure if she could even do this, to being very successful and coming back to talk to the students. And Eliza Jewett has helped review portfolios. And Reed Psaltis is now one of the people who comes to give workshops on how to create a wire maquette and then paint melted clay over it and create a 3-D model of the creature that you're trying to envision in a particular pose, or what it might look like in its environment, or what its cast shadow might look like. So, we've had some valuable graduate additions to our guest instructor list and I wanted to mention some of those names.

More on the *History of Science Illustration* course

Rabkin: Thank you. You also didn't get to say everything you wanted to say about the *History of Science Illustration* class.

Keller: Oh, I just was wanting to say that one of the things that was so exciting about it and exciting to share was that viewing history from that way, from that viewpoint, ended up incorporating a lot of milestones in science, and successes or achievements in human endeavors.

Then things such as inventions, like lenses themselves, and eyeglasses, and of course, the microscope and the telescope, had so much to do with being able to view other worlds and even extending the working lifetime of people who had learned so much up to the point when their eyesight started to fail. At one point, one could use eyeglasses to continue your professional work without having to give it up because you couldn't see.

Of course, people think of the printing press when they think of the history of great inventions, but most people don't think of the woodcut in conjunction with the printing

press as being incredibly instrumental in being able to convey visual knowledge. Writing, of course, was actually something that you could do by hand. And you can write with different styles of handwriting, but as long as you've got the letters correct, you're not actually changing content. So, what the printing press did was allow something that was already possible, to be done much faster, and for a wider audience.

Rabkin: And instead of having a bunch of monk scribes sitting around in a monastery and copying manuscript, you could turn the books out at a much faster—

Keller: Exactly, which was hugely important. But at the time, you couldn't really make a—as it was sometimes phrased, "an exactly repeatable pictorial statement"—you couldn't make an exact copy of an image. When the ability to carve a piece of wood and then create an exact picture copy evolved, that kind of changed everything. Because copying a drawing by hand is kind of like the game of telephone: if you whisper something to someone, and they whisper it to someone else, and they to someone else, that information ends up being changed. And illustrations are like that. You can copy an image by hand as exactly as you can, but maybe the thorns are a little longer on this one, and then with the next person that might be a little bit more exaggerated, and you can get to the point where you have disinformation. So imagery and words combined were what really made the printing press the incredibly momentous thing that it was.

Rabkin: The printing press *and* the woodcut.

Keller: Yes, with the two together you could show someone how to build a windmill, how to create a working piece of machinery, how maybe to conduct an experiment just the way someone else did, etcetera. It was exciting for me to learn, from an illustrator's

point of view, that illustrations had a huge amount to do with why the printing press was so successful.

Rabkin: Great. Thank you. Let's take a quick break.

Administrative Issues

Okay, so Ann—you have a unique role in the program. You are the director of the program and with that, I imagine, come some particular responsibilities. Can you tell me a bit about what's involved in directing the program?

Caudle: Well, it's an interesting situation in that the science illustration program is a program with not a capital P.

Rabkin: What does that mean?

Caudle: That means directorship is not really—I'm not really the director. I happen to be in a spot that looks like the directorship, but I do not have "director" on my business card. I have "senior program specialist." And while I was on campus at UCSC, John was the director of the program—

Rabkin: I see, because you were a track or a subset of the Graduate Program in Science Communication.

Caudle: Exactly. He was the director and I was the coordinator for the entire time that we were on campus. It was only when we went to Extension that that changed into an honorary kind of directorship. So, because of that—and each of those particular scenarios—on campus, Extension, and then CSUMB—my role is a little bit hazy. I end up doing so many of those things that you expect a director to do. I mean, I am for the

most part selecting the graduate students; I go to meetings; and I'm meeting with marketing. And whenever there's a problem, they come to me first. (laughs)

Rabkin: So, you're meeting with various administrators from the institution that is your home institution.

Caudle: Yes. And as the program has developed, Jenny and I are in the trenches working with students, managing our curriculum together, doing all of those things as our primary jobs. And then, there's the other stuff that I do, which is things like all those meetings and kind of attempting to organize things.

Rabkin: Do you oversee a budget?

Caudle: I do, to a certain extent. Especially at CSU, it's under the purview of Extended Education, and they're watching it, for the most part, and then they come to us and say, "Well, I think we need to increase enrollment because you're getting close to the top of your budget." So, it's not a very easy-to-define role.

Rabkin: And that's because you really are the sort of primary administrator, in terms of your expertise and oversight of the operation of the program, on a daily basis and from year to year. And at the same time, you're always under the aegis of some other institutional unit, administrative oversight. So, you are a director, but your hands are, in some ways, tied, or there are people you are responsible to.

Caudle: Exactly.

Rabkin: Is your title now director of the program?

Caudle: It's senior program specialist.

Rabkin: Senior program specialist. And Jenny, you are—

Keller: Coordinator. But actually, on my card I am program specialist.

Rabkin: Hmm. Okay, so there's a lot of bureaucracy that goes into establishing these names, what you can and can't call yourself.

Keller: Exactly.

Caudle: Exactly.

Keller: And at CSU they had a particularly, I think, difficult time figuring out how to classify us, since we are a combination of faculty and staff. So, they came up with those titles and they don't really suit, exactly, what we do. So that's why we go ahead and call ourselves director and coordinator. It makes so much more sense because that is really what we do.

Rabkin: I see.

Keller: Officially, however, it's a little different.

Rabkin: I have a list here of topics that Jenny told me would be particularly good to have you in on the discussion about. And one of them is the whole topic of internships. And I think maybe it's a nice segue from what we were talking about earlier, about coaching your students to function as professionals in the world of freelance illustration. The internships must be kind of a stepping stone to whatever they do next, among other things. So, I wonder what you'd like to tell me about how those internships are set up and how you get students into them, or how you get students to get themselves into them.

Caudle: (laughs) It's more that. It's definitely that. I tell students that if we were to hand them an internship at the end of the year, that that would not be as valuable an experience as what they're doing, which is basically figuring out who they are, as illustrators, what their strengths are, trying to figure out where those skills and talents can be used out in the world, and making contacts, which is very much like finding freelance work. So, we have a seminar at the end of the first term and talk about strategies, talk about what has gone before, what others have done, but to not treat that list as a shopping list, more to give them ideas and suggestions about what they're going to do. Because the idea, of course, is an internship is that stepping stone between being a student and a professional, and it is such a useful thing. It allows people to make those contacts and get some real-life experience.

Rabkin: So, you provide them with a list of the institutions and organizations and so forth, where previous students have gone to work over the years in internships.

Caudle: Yes.

Rabkin: How many of those are there? Are we talking a dozen, a couple of dozen?

Caudle: Hundreds.

Rabkin: Hundreds of different placements! Wow.

Caudle: Exactly. Many of them are one-time-only internships. Someone has found an internship in an organization that has never had an intern before—this was their first. That's a really exciting and interesting position to be in.

Rabkin: So, they are pioneering that internship. Wow.

Caudle: Absolutely pioneering. And others go to internships that have happened many, many, many times. And that's an entirely different thing.

Rabkin: Mm-hmm. Where there's a formal internship program already established and the organization is just plugging the new person into that.

Caudle: Right, exactly. Let's stop for a minute.

Final Reflections

Rabkin: Well, as we conclude the interview, I just want to invite both of you to add anything you'd like about—in looking back over your experiences so far, teaching in and overseeing this program—anything about your teaching experiences, or philosophy, and what you've learned in the course of this time. Whoever wants to start.

Keller: I could speak to that, I think. It's hard to encapsulate a teaching philosophy, if I do have one. But if I do come at it from the point of view of experiences, that helps, I think. One thing I would say is the longer I do it, the newer it gets. I have been astonished, year after year, to first learn and then be reminded of the fact that every group is completely different, and has its own personality, and there are always new things to learn about science, of course, and illustration as well. And the people, of course, and what their interests are, and what they're learning and doing, and wanting to become when they enter this field. I've thought that the most important thing for me is to try to be a generous teacher, and give over anything I have to give, and be honest about my personal experience, and show enthusiasm, which is natural for me, because I have a lot about this field. But then, to kind of offer it up—and that's the material and your experience and whatever guidance you might be able to offer. And then, also kind

of step back and get out of the way, and let the process happen, and let the material be the thing that takes hold and catches someone's interest and inspiration.

Really early on in my teaching career, a student gave me a valuable lesson just by saying what was on his mind. In the beginning of classes, I often like to ask a question just to get to know people. And that runs the gamut from—what's your favorite color (and you're not allowed to use the name of the color in describing your favorite color), which gets people talking about experiences and things they've seen and so on. One time the question of the day was, "What would you do on a Saturday that was completely open to you and you could go anywhere in the world?" And everybody in the class was saying things such as, "Oh, I'd love to go for a hike. I love nature. I'm really interested in science." All the sorts of things that you might expect. Then one person really stood out from the group and said, "I *love* the city! I love the noise and the excitement and the cars and the smell of diesel." We were like, "Wow!" I actually learned from that moment, and that's not even the moment I'm heading toward in this story. But I thought, wow, you can love the city. It has changed my view of cities ever since because I thought, this could be something that is exciting, that one could love and enjoy. And that was a lesson right there.

What happened later in the term, was also a real lesson for me, and a wonderful moment. Because this was a field sketching class and we were going out to natural environments. And typically, what we would do is we would arrive at say, Lighthouse Field, and scatter, and people find something they would want to draw and sit down. And I would run back and forth trying to track everybody down, and offer—

Rabkin: And help them with their drawing.

Keller: Yeah, help them, offer whatever I could with whatever it was that they had chosen to draw. And so, I came upon this young man who had told us he loved a city environment and he was sitting on the cliff looking out at the ocean. He had started a drawing, but he had paused and was just staring out to sea, quietly looking at the environment. I walked up and sat down next to him and didn't say anything. I just sat and looked out at the ocean as well. And I just waited. Finally he turned to me and he said, "This is nice." And I said, "It is. It's beautiful." And he said, "No, it's *really* nice." And he said it with such feeling, looking at me, that I thought, wow, now you have the city *and* nature too. And it wasn't because of me. It was simply bringing people to it. It was giving them the opportunity to take some time and slow down and look at the natural world, just like Ken Norris had us do: slow down and check it out. Take time to look at it. And I thought, wow, this experience gave this person something they didn't have before.

Rabkin: Thank you. Ann—

Caudle: Well, I certainly can't say anything as eloquent as that. But I just wanted to say that this experience of teaching in this program has been one of the greatest privileges I can imagine. And it was something that I didn't expect. I'm eternally grateful to John Wilkes for creating this idea of the program and for inviting me to participate in it. Every day that I'm working with the students, I am just overwhelmed with all of these different individuals and all of their dreams, and who they could become and who they want to become, and seeing that happen, seeing them blossom in ways they never imagined. It is wonderful. It's a wonderful experience.

At the beginning of the year, I interview each one of them. We have a one-on-one chat, and I have them fill out some questions, sort of as conversation starters. And they are anything from: "What's your dream?" to "What's the most wonderful thing that you could do as an illustrator?" to "What are your goals?" to "What's hard for you?" to "What do you feel is really easy for you and that you're really good at?" We even go to, "What's your favorite movie?" We have this wonderful conversation, which I look forward to every year. And it's sort of the pivotal point of how we talk about internships and how we proceed in the future.

When they tell me about the films that they like, and you put two or three of them together, and you say: I know how this person tells stories. I know what they're relating to. I can feel the rhythm of their ideas. I can see how they compose pictures, or that sound is really important in their lives, and music. And so, all of that sort of sets the tone of the year.

So by the end, when you're sending them off and they have gone from being challenged and hesitant, to being confident and going off to these wonderful internships, and then their lives, it's like living an entire lifetime in a year. It's like raising an entire family in a year, and then sending them off. And I've had so many of those opportunities. It's been a wonderful experience for me. And I hope that that joy is something that students are feeling as well, and that they continue feeling that and come back and share what they've been doing.

Rabkin: I understand that you two, not long ago, ran a survey of your alumni. Would you like to talk about that?

Caudle: Well, we asked as many questions as we could possibly think of that would help us understand, both what we're doing well, and what we could improve. And so, we sent out the questionnaire to all of our email list, and that goes back to students that were here in 1989 to present-day. We sent it out through Survey Monkey and then we waited to see what would happen. And when we got the results, it was so satisfying, I can't even tell you. It was wonderful. And Jenny, your favorite text analysis Word Cloud was about the question, "Knowing what you do now, would you do the program again?" And the highlighted words, the largest words, are "Program" and "Absolutely." And right between "Program" and "Absolutely," is the word "Love." (laughs)

Keller: Yeah.

Caudle: So that was great.

Keller: Even though this survey was a required endeavor for us as a program, as part of our external review, it ended up being something that, as those things should, helped us find out things that our graduates could tell us, and frame our own questions, and assess what we feel is most important about what we do. And then we got this added benefit of some really lovely feedback, with the word "absolutely" being the biggest one. It was like, yeah! We love you too. (laughs)

Rabkin: Wonderful.

This program was born at UC Santa Cruz and it spent a lot of its formative and important years there. I wonder if there are any ways in which the program was informed or fueled by the uniqueness of UC Santa Cruz as a campus.

Caudle: Well, I'm not sure how to answer that, except that I do feel that being one of the early students—I know there were many who came before me—there was a sense about the campus of being completely unique, and open to ideas, and loving nature, and the whole beginning of campus where—we're not cutting down that tree; we're not putting a parking lot there; we're going to nurture and be stewards of the environment. And I feel that the opportunity for John to start this program in this environment seems like such a natural fit. And there we were in the forest, and could walk right outside of our classroom and be in nature, and wander out and look at the ocean from the campus.

Keller: I talked about how from the Blacksmith Shop we could walk to the Arboretum and to the Farm and so on. I think my mind went to just the same place that yours did when Sarah posed this question, which was: actually, both of us were students at UCSC in relatively early years—you, with Hardy Hanson, and me with Jasper Rose and Mary Holmes. Some of the founding faculty of UCSC were our instructors, and then we both ended up becoming instructors at UCSC. So, the outlook and personalities of those people, I'm sure, influenced Ann's teaching and definitely influenced mine. And UCSC, seen as a place where there would be small individual colleges, where instruction would be a little bit more personalized in the narrative evaluation system, where you would converse about someone's strengths and weaknesses, rather than just putting a letter grade on it and having that try to say everything—that carried over, I think, from not only being at UCSC as teachers when we were, but from our prior experience as students of UCSC, and as students of the founding members of UCSC.

Rabkin: Thank you. Is there anything else either of you would like to say?

Keller: There's only one thing that I might add, which was actually one of the most lovely things that a student ever said to me. I bring it up because I think it's something that I want to go forward with forever.

As I've mentioned before, I help teach drawing workshops to the Natural History Field Quarter. And so, it was one of my Field Quarter students, in 2012, after a workshop on how to match color in your field sketches, we'd wrapped up and he headed toward the door as everyone was exiting, and he turned around and said, "Jenny." And I looked up. And he opened his arms and said, "Your open heart." And that was all he said. Then he just smiled and shrugged, and went out the door. And I thought, that would be the thing I would want the most as a teacher, is to have an open heart, especially at this point, after having taught for twenty-six years. To have a student say that they felt that meant the world to me.

Rabkin: (choking up) Thank you. Ann, anything else?

Caudle: Well, I'll just add that that feeling that you're talking about, looking at them—of a whole brand-new person to open up to—oh—I'm not sure if I remember where I was going with this (laughs) but that's one of the reasons that each year we can be at the end of the year and thoroughly exhausted, thoroughly worn out from the whole experience of getting them to this point, and then, look at the stack of new students, the folders with their names on them, and still feel like, oh, I wonder who this is going to be? I wonder what this year is going to be like? And feeling that bit of excitement, even with all of the exhaustion—Sisyphus, you know, pushing (laughing) starting over again. So, that feeling that you're talking about is definitely a huge piece of why we do this, why we bother.

Keller: It's been such a privilege and an honor. And to do it all with you, Ann, I have to say.

Caudle: Yeah. From Mervyn's to here. (laughter)

Rabkin: Thank you both so much. This has been a great pleasure and a great privilege for me.

About the Interviewer and Editor:

Sarah Rabkin has been doing contract interviewing and editing for the Regional History Project (RHP) since 2008, shortly after officially retiring from a career teaching in UCSC's writing program and environmental studies department. She has a bachelor's degree in biology from Harvard University and a graduate certificate in science communication from UCSC. Her journalism and literary nonfiction have appeared in a variety of regional and national publications; she is the author and illustrator of *What I Learned at Bug Camp: Essays on Finding a Home in the World*, published by Juniper Lake Press. In addition to working for RHP, Rabkin currently leads retreats and workshops on writing and sketching, works as a freelance editor, and occasionally returns to teach at UCSC.