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There are people who march to a different drummer, and then there's Caroline Kane, who seems to march to her own band. At UC Berkeley, Kane leads a team that studies transcription elongation as a regulator of gene expression in eukaryotic cells, and an HHMI-funded program for mentoring biological science undergraduates with a focus on minority students. Yet Kane has never held a tenure track position at Berkeley, and only last year was promoted to "Professor in Residence in Biochemistry."

Her longtime friend, 2003 ASCB President Suzanne Pfeffer, says, "The world of science is hard enough but it's even harder if you are writing grants as an adjunct professor. And yet, Caroline was able to secure funding to do first class research, win awards for her teaching and get a special HHMI grant for her minority mentoring program, with none of the traditional support available to a regular faculty member."

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According to Pfeffer, Kane's "wrong" move in traditional career tactics was in returning to Berkeley when she married Michael Chamberlin, who was already a senior tenured faculty member in Molecular and Cell Biology there. This put Kane in the difficult category of "faculty spouse." Pfeffer says, however, that Kane, "made it okay for herself. On campus, she always has been incredibly generous with her time. She insists on volunteering to be an advisor for many undergraduates and graduate students, and she also volunteers to teach a freshman course on science and society along with her departmentally assigned course. Now that Caroline's finally been allowed into the Academic Senate at Berkeley, she's even chairing a committee there. It's always been important for her to contribute to decisions about academic issues." Her contributions extend beyond Berkeley; for the ASCB she has served for many years on the Women in Cell Biology Committee, and was recently elected to the ASCB Council.

Kane's colleagues consider her an inspiration and a model. Says fellow WICB Committee member Sandra Masur, "Caroline has got what I call 'a clean mind': that is, she's very analytical but with a dry, midwestern sense of humor and a strong moral compass. Caroline is clear about the human aspects of opening doors for the next generation in science."

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Caroline Kane's midwestern roots are in Ohio where she was raised in the Columbus suburb of Gahanna. It was still the edge of farm country when the family settled there in the mid-1950s, Kane recalls. As one of five children, she was a collector of spiders and small creatures, and especially lightning bugs, which she tried to dissect and analyze. "I wanted to figure how things work, so when they stopped blinking, I carefully cut them all up. I couldn't have been more than six, so finally I had to ask my mom what made the light. Mom was amazingly tolerant of all the bugs and things we kids dragged into the house. She said, 'That's chemistry.'"

Becoming a chemist, or in her case a biochemist, was not easy for a girl in the 1960s. "My science and math teachers in junior and senior high school were equally encouraging to both the boys and the girls," says Kane. The 1966 valedictorian of Gahanna Lincoln High (and a 2003 inductee to its Hall of Fame), Kane found more stereotypical reactions at Ohio University in Athens than she had in high school. "I was usually the only girl in my lab sections and the only special attention I remember was being hit on by the TA. When professors asked questions in class, it was always the boys who were called on, not me. When I went to talk about graduate school, a couple of professors asked me, 'Do you really want to do that? Aren't you just going to have kids anyway?'"

Kane was serious about graduate school but limited by the ROTC commitment of the man who would become her first husband. He deferred active service to attend graduate school at North Carolina State University in Raleigh where Kane earned a Masters in Genetics. His Army commitment brought them next to Ft. Hood, Texas, for three years.

Unable at first to find a teaching or lab position, Kane took the only job she found—working in the Music Department at Woolworth's. She can still recall the Top 100 Pop and Country & Western charts for most of 1970. "I really enjoyed most of the people I met at Fort Hood," Kane says. "This was during Vietnam. I'd been anti-war since college, but never anti-soldier. I'm still in touch with an ex-Green Beret who told me, 'Always do what you want to do and then make as much trouble as possible in the service of good'."

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Kane, who would soon be single again, chose Berkeley for her PhD. Her advisor, Stuart Linn, was interested in DNA and chromosome repair in mammalian cells. Using "hardcore" biochemistry, Kane isolated a human endonuclease specific for abasic sites. After finishing her doctorate in 1979, Kane joined the lab of the late Harold Weintraub at the Fred Hutchinson Cancer Research Center as a post-doc. His lab was focused on globin gene expression. To explore the change in transcription regulation from embryonic to adult globins, Kane built a monoclonal antibody library against non-histone chromosomal proteins in chicken red blood cells.

"Both Hal and I were young and ambitious and if our approach had worked, it would have been a real breakthrough," Kane recalls. "We raised a lot of monoclonal antibodies and some of them were useful, but scientifically, I guess it was a wash-out. But the Hutch was just the best place to be a post-doc and this was the first time I'd been at a purely research institution. I loved it but I missed students. I missed teaching."

Kane also missed Michael Chamberlin. After six months logging many miles between Seattle and Berkeley, Kane and Chamberlin decided they had to marry and live in one place. The logical place was Berkeley where Chamberlin was already well established. Kane brought her monoclonal library back from Seattle, set up as an independent "post-doc" and, step-by-step, began to build a research career, first as a research biochemist and then as an adjunct member of the faculty. Her research gained traction after Kane added yeast genetics to her biochemical approach and began to see how the elongation of RNA polymerase II transcription units could play such a decisive role in what the cell actually does with its genetic instructions.

Elongation adds yet another dimension of complexity to genetic expression along with other newly-appreciated regulators such as junk DNA, spliceosomes, chromatin dynamics, chromosome remodeling, and protein folding. Yet Kane isn't dismayed at the multi-dimensional picture that's emerging of the nucleus. "I don't think there's going to be a unification principle in the nucleus and probably not in the cell," says Kane. "Transcription elongation has to coordinate in a regulatory way with DNA metabolism and all of the RNA processing machinery. The cell also makes decisions to speed up the polymerase, to slow it down, and to stop it altogether. It adds a level of complexity but the cell changes what's important for regulation depending on what's rate-limiting."

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Kane and Chamberlin are avid outdoors-people, indulging their enthusiasm for all recreation aquatic four times a year at their home on the big island of Hawaii. On the mainland, they like to bicycle and play golf. ■