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The Biophysical Society Newsletter (ISSN 0006-3495) is published six times per year January/February, March/April, May/June, July/August, September/ October, and November/December by the Biophysical Society, 9650 Rockville Pike, Bethesda, Maryland 20814-3998. Distributed to USA members and other countries at no cost. Canadian GST No. 898477062. Postmaster: Send address changes to Biophysical Society, 9650 Rockville Pike, Bethesda, MD 20814-3998.

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Biophysicist in Profile



Elizabeth Komives

Someone might have guessed when eightyear-old Elizabeth Komives tested at a seventh-grade reading level that her academic talents would pay off. A decade later, a challenge-hungry Komives went on to attend MIT because it was the only school that did not actively pursue her. Fortunately, when the Biophysical Society did, Komives agreed to serve and bring her skills to the Society Council and to the Molecular Biophysics subgroup.

Born in East Lansing, Michigan, in 1960, Komives was the second of four girls. Her father, John, then a graduate student at the University of Michigan, and mother, Margaret, who taught tailoring at a technical college, had their hands full, with a mere five years separating the youngest Komives sister from the oldest. Elizabeth, Genie, Monica and Clair spent their childhood amid dolls and

streak in racing their small sailboat out of the Milwaukee Yacht Club – and habitually winning, Komives hastens to add.

Meanwhile, Komives pursued her studies with the same drive and spirit. A straight-A student with a dream of working in the medical field, she had no tolerance for poor teachers. "I was mean to them when they didn't know what they were talking about," she confesses. In her town's only high school, Komives was one among about a third of the student body that was college-bound and elected to take more math and science classes. It was in this setting that Komives got her first taste of "phenomenal science teachers," as a student in Mr. Hugdaal's twoyear chemistry sequence, the latter half of which roughly approximated the University of Wisconsin's freshman chemistry curriculum, and Mr.Lindberg's Bio and Anatomy & Physiology classes. "I still have never met anybody who had the kind of science teachers we had," Komives gushes.

When Komives returned from a visit to the University of Wisconsin, Madison, where her older sister and everyone else from her high school who attended college had gone, she knew that the hard partying lifestyle was not up her alley. Breaking with town tradition, she looked elsewhere for a school that would promise "fewer temptations" and settled finally on MIT after batting away other suitors. "I didn't want to be the one that they recruited," she scoffs.

In a nod to Mr. Hugdaal, Komives describes how she breezed through chemistry at MIT, though she concedes that

> "everything else was really hard." This difficulty had much to do with the load she was carrying: in four years she earned a Bachelor's degree as well as a Master's degree. "It wasn't really a

program," Komives explains, but simply an effort to get her senior year paid for by acquiring graduate student classification. She lost no time and began doing undergraduate research in genetic toxicology while still in her freshman year.

During her time at MIT, Komives volunteered at a local hospital. Her aspirations to practice medicine dissipated

A self-professed "goofball," Komives admits she was the family troublemaker.

tea sets and learned to sew under their mother's tutelage. A self-professed "goofball," Komives admits she was the family troublemaker.

In '68, the Komiveses moved to a small town in Wisconsin. It was here that the ambitious siblings found expression for what seemed a hereditary competitive

when she was exposed first-hand to the depressing nature of the work. "I realized I really needed to be on the positive side, developing cures." Shifting her career goals, Komives told her mentor in the fall of her sarily have to be people who praise you a lot," she explains. "It was a fun challenge to go into his office to talk to him about what you were working on, because he was al-ways five steps ahead of you, and the idea was that

> you should eventually get to where you were as far ahead as

"I realized I really needed to be on the positive side, developing cures."

fourth year that she wanted to switch to a different MIT professor's lab for the rest of graduate school. It didn't seem to go over well, but it was not until January— decidedly past the admission deadlines for most other universities—that Komives learned the extent to which this announcement had angered her mentor: abruptly, she was notified that she was not welcome to continue in MIT's graduate program. school still accepting applications was the University of California, San Francisco (UCSF). Komives applied and, once accepted, packed up her work and moved across the country.

At UCSF, Komives found not simply a new mentor, but a new culture. Discouraged after MIT, she began working with Paul Ortiz de Montellano. "I know," she jokes, "it sounds like he ought to be slashing dragons or something." Though not a dragon-slayer, de Montellano was nonetheless something of a heroic figure whom Komives credits as "single-handedly rehabilitating me after my MIT experience."

Under Ortiz de Montellano, Komives investigated how compounds with carbon:carbon triple bonds inactivate cytochrome P450. "She was a very strong positive force in the laboratory, helping to establish a cult of hard work and at the same time helping to socialize the research group," de Montellano recalls. "Her enthusiasm, extroverted personality, and keen interest in science were infective."

Throughout her time in Ortiz de Montellano's lab, Komives never knew quite where she stood with him. "Amazing mentors don't neceshe was." When the time came to pick a postdoctoral fellowship, Komives made a list that was testament to her uncertainty. It contained three tiers, each with three names of molecular biologists. Timidly, she asked Ortiz de Montellano which tier she should aim for. He pointed to the top of the paper.

Grateful for the opportunity to apply early this time, Komives immediately sent out letters and applications to the three top-tier scientists, among them Harvard's Jeremy Knowles. At a Gordon Research Conference a few weeks later, Knowles spoke with UCSF faculty members about Komives. Next thing she knew, he was on the phone offering her a position.

Knowles, whom Komives retroactively dubs her "scientific father," encouraged her to take risks—to find a new question she wanted to answer, pursue people who could help her job advertised that year. As circumstances would have it, her application followed right on the heels of Chemical & Engineering News' publication of a blacklist of all-male chemistry departments. "By the time I had gone through my fifth or sixth interview knowing I was being considered as 'the token woman,' it was refreshing to get to the University of California, San Diego (UCSD)," where there were already women on the faculty. At all her interviews, Komives had proposed two research projects - one conservative, the other "fascinating but crazy." At UCSD, the latter proposal was taken up with enthusiasm. Komives knew then that there was "an excitement about cutting edge science" here that was unique among universities. When UCSD faculty members expressed completely uncharacteristic accord about Komives, the deal was sealed on both ends.

Since joining the UCSD faculty in 1990, Komives has upheld a strong commitment both to outstanding science and to her students. Colleagues Susan Taylor and Andy McCammon both emphasize how Komives combines "high standards for quality of research and rigorous quantitative thinking" with "legendary enthusiasm and generosity" and indefatiga-

"You just have to try out. You have to volunteer in a lab, you have to volunteer in a hospital, and you have to find out what it is that you like."

tackle it, and embrace novel methods of research. Using crystallography and infrared spectroscopy to examine site-directed mutants, Komives studied how triophosphate catalyzes its reaction, seeking to elucidate more thoroughly the interactions between the enzyme and the substrate.

When Komives decided it was time to look for a job, she covered all her bases, applying to every academic ble "energy, energy, energy." As a member of the Steering Committee for UCSD's Molecular Biophysics Training Grant, Komives has collaborated with Taylor to build up the biophysics community on campus. A pioneer of new techniques in mass spectrometry, Komives is currently working on three projects, all pertaining to the biophysics of protein:

and reprints as a significant source of revenue. The opportunities in moving more and more toward webbased publishing are still emerging. One of the greatest advantages of electronic publishing is that animations, movies, and very high-resolution figures can now be linked to articles, and we will try to do this routinely in the future. Supplementary material is available from many journals, but accessing it can be a deterrent for the normal reader. Links within BJ articles (either online or in a PDF) to supplementary figures will make these figures a much more integral part of the article. We will continue to explore ways in which electronic publishing will enhance the presentation of scientific results.

Another direction that we will pursue is publishing more minireviews that briefly summarize recent advances and emerging areas. These reviews will complement the original research articles that have been the main basis for BJ. We also want to have more structural articles published in BJ, so that BJ better represents biophysics overall. Tools such as x-ray crystallography, NMR spectroscopy, and three-dimensional electron microscopy have been powerful developments to emerge from biophysics, but articles employing these techniques are currently underrepresented within BJ.

Last, but certainly not least, I want to personally thank Bob Callender for his exemplary service to both the Biophysical Society and *Biophysical Journal* over the past five years. It is only by assuming his responsibilities that I realize how great his effort has been over the previous period.

1. Miller, J. D., E. C. Scott, and S. Okamoto. 2006. Science communication. Public acceptance of evolution. Science. 313:765–766. [Abstract/Free Full Text]

2. Science and Engineering Indicators. 2002. National Science Foundation, Division of Science Resources Statistics. http://www.nsf.gov/statistics/seind02.

—Edward H. Egelman, Editorin-Chief

Profile (Continued from page 3.)

protein interactions. The longest running of these projects focuses on how thrombin interacts with thrombomodulin, which alters the substrate specificity of thrombin, turning it into an anticoagulant. The second project spotlights the LDL receptor-related protein, "absolute nightmare" at over six hundred kilodaltons. Komives' group is working steadily to pick it apart, to learn what interactions take place and the reasons behind them. This protein is involved in Alzheimer's, which gives Komives heart: "I think it's really worth studying—even though it's really hard!" The group's newest project, which has taken off running, is concerned with the interactions of the transcription factor NF-kB with IkB, one of its inhibitors. "What I'm working on now has nothing to do with what I did as a postdoc or as a graduate student," Komives laughs, stressing again the importance of not feeling confined to one's previous areas of focus.

Komives' introduction to the Biophysical Society might be called a fortuitous accident. Trained more as a bioorganic chemist than as a biophysicist, she had been drifting gradually towards the biophysical element for some years through her work on protein:protein interactions. But it was not until 2000, when Andrew McCammon nominated her for the Barany Award, and she was selected, that she saw the Society up-close. Komives came to the Annual Meeting for the first time solely to receive the award, and "it was like a Eureka experience. Here are all the people that I've always wanted to interact with....they're all here at this meeting, and... oh! I'm a biophysicist, I never realized that!" She has been an active member of the Society every since.

Komives is involved most heavily with the Molecular Biophysics subgroup, and is also a member of the Intrinsically Disordered Proteins subgroup. She was elected to Council after being urged to run for the office by then-Society Secretary Jill Trewhella. "You can't really say no to Jill," Komives explains fondly.

In her free time, Komives enjoys helping out with church-related activities, something she's been doing since she was a teenager. She volunteers with a youth group for high school girls and advises a summer camp. Her passion for social justice issues is also manifest in much she does, from her travels to institutions to recruit under-represented students and familiarize them with opportunities available at UCSD, to her completely independent initiatives. She has been working for some time on developing a school in a poor neighborhood in Tijuana. "It started about ten years ago now," she explains hopefully, "and they built it floor by floor and grade by grade. It started with one room and the first grade, and now it's four floors and eight grades." What time remains Komives spends with her family, which now includes four nieces and nephews. She looks forward to a visit to Wisconsin next summer for her parents' 50th wedding anniversary.

Komives' varied experience in multiple areas of science, spanning multiple states, has reinforced in her a conviction she tries to impart these days to her students: "You just have to try out. You have to volunteer in a lab, you have to volunteer in a hospital, and you have to find out what it is that you like." It is certainly safe to say that using her own life as an example, Komives makes a convincing case.