

## Biophysicist in Profile



*Kathleen Giangiacomo*

The quiet farmlands of Pennsylvania provided Kathleen M. Giangiacomo with a lab of her own in a backyard that, coupled with her parent's influence and a love of music, helped her develop a passion for research and collaboration that continues today. Born in 1959 outside of Philadelphia, Giangiacomo grew up among students studying to be farmers, where few women had careers. Her mother Kathleen was a school nurse who made Giangiacomo aware of the discrepancies between men and women and inspired her to reach beyond the traditional roles that women were filling. When Giangiacomo said she wanted to be a nurse, her mother responded "No! Be a medical doctor!" "Managing a family and having any sort of career was much harder for my mother," Giangiacomo says, "plus, men (weren't expected) to help in the household back then."

Giangiacomo's father, William was a high school biology teacher who used his teaching skills at home as well, introducing Giangiacomo to science at an early age. She enjoyed growing plants and performing photosynthesis experiments, winning first place in science fairs during elementary school. Despite these successes,

Giangiacomo says that subtle gender biases in her early education may have filled her with doubts about her ability in the math and sciences. She picked up on them even in elementary school when she recounts a teacher in third grade saying "We're talking about electricity today. Boys you will know about this, but girls you won't." Even with her father's influence and her abilities in science, Giangiacomo grew up believing she would be a musician. She started piano when she was eight years old and soon became so enthralled with it that she practiced every spare minute, sometimes until the early hours of the morning. In middle school, Giangiacomo tackled the French horn. Throughout high school she practiced both instruments and participated in district orchestra and band. Giangiacomo even studied with a member of the Philadelphia orchestra, driving into the city every weekend for those lessons. "Much to my parents' chagrin," who Giangiacomo says, "wanted me to be a doctor. But, I was very intent on pursuing a career in music." Giangiacomo credits the discipline and attention she paid to understanding music with preparing her for a research career in biophysics.

When choosing a college, she selected Temple University because it had both good science and music performance programs. Although she knew she had an inclination for science, she continued to play French horn in the Temple marching band. "I did not have the heart to break away from music," she says. Once her pre-med courses started, however, she reconsidered. Inspired by her freshman organic chemistry course, she "was fascinated by how molecules react with one another and change into something different." The realization that those sorts of reactions occur in biolo-

gy and define us as living beings (was) a revelation for me," she explains. This revelation made Giangiacomo realize that research, and not simply science, was what she liked. "I like asking questions and learning how to ask those questions, (with) scientific methods," she explains. She believes that had she pursued a different career, she would have eventually ended up a scientist and credits the faculty at Temple for the scientist that she is today.

Once she switched to research, Giangiacomo began working in the Biology Department, performing secretarial functions for Professor Bill Harvey. When Harvey saw Giangiacomo's first exam score, he said, "You should be doing more than this!" and set her up with a research project in his lab. His work on membrane transport fed Giangiacomo's fascination by the

link between biochemistry and biophysics.

Learning that one could be a scientist without going to

medical school was a huge revelation for Giangiacomo because where she grew up no one really knew anything about research careers in science. After completing her degree at Temple, Giangiacomo wanted to learn more about a PhD program and what being a grad student entails before making the "big jump." She took the following year to work with David Ellar in England to study potassium transport in *Manduca sexta* midgut. By far the most important thing Giangiacomo discovered, by observing others in the lab, was how much she enjoyed the scientific process of asking scientific questions and designing experimental approaches to attempt to answer them.

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After this experience, she was convinced she wanted to pursue a graduate career in research.

Returning to Pennsylvania, Giangiacomo looked for a job while applying to graduate schools. She took a cell biochemistry course at the University of Pennsylvania, and was captivated by Leslie Dutton's lecture on photosynthesis and electron transfer. "I was just hooked by the fact that light was absorbed by a molecule that's now a separated charge across the membrane," she says. The lecture cemented Giangiacomo's decision to attend UPenn for her PhD and fortunately, "Les was very happy to have me be a student in his lab." There, Giangiacomo studied electron transfer in a bacterial photosynthetic reaction center.

Dutton became her PhD mentor and a big influence on her life, advising her on how to navigate her research career and teaching her how to make quality presentations. Giangiacomo says that subtle gender biases in her primary and secondary education may have filled her with doubts later on about her ability to comprehend the material in Dutton's lab, where they used electron parametric resonance to study the different states of the hem groups in the BC1 complex. However, Dutton was confident in her abilities and insisted she had no choice but to understand it. "Les made me get over my fear of these hardcore, physical techniques, just so I could understand the process," she explains, "that was an important realization for me." "I was very fortunate to have him give me my first introduction on how to do experiments in the lab and keep a notebook," she adds, "big important training step."

Giangiacomo's interest in electron transfer in a bacterial photosynthetic reaction center is more focused on the specificity of some of the molecules in the binding

site. This is an area of interest that has stayed with her. Now one of Giangiacomo's major research focuses is understanding the molecular basis of alpha-KTX specificity

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(peptides from scorpion venom that block potassium channels). A major focus of her lab is to understand the molecular and structural underpinnings of the specificity, so they are doing the experimental side in her lab, purifying peptides and measuring the binding interactions.

While in Dutton's lab, Giangiacomo became friends with Marilyn Gunner, a more senior fellow graduate student, now a professor of physics at CCNY. Gunner provided excellent advice about how to navigate research in graduate school. Still friends and collaborators, Gunner has also taught Giangiacomo much about electrostatics in proteins.

After finishing her PhD at UPenn, Giangiacomo did a postdoctoral fellowship at Merck with Owen McManus, her postdoctoral advisor, in Greg Kaczorowski's group of membrane biophysics and membrane biochemistry. "With Owen I learned a lot about single channel analysis and I also learned how to carefully and precisely describe what it is that you are observing," she recounts "which is a very important thing to learn as a scientist." He had a big influence on her development as a scientist and they continue to communicate today. Giangiacomo also began collaborating with Maria Garcia, who was a senior scientist at Merck. "She was great, not only as a collaborator there, but also as a mentor and a role model because she's probably the first female scientist I had met who had a permanent position," says Giangiacomo.

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From watching Garcia, she learned how to manage a lab. At Merck, Giangiacomo also worked with Chris Miller, now at Brandeis University. Giangiacomo says Miller has always been a good friend, giving her helpful advice about her career, as well sharing reagents and scientific advice. Miller says that he admires her "as the Ultimate Heroine of bilayer recording of single channel." "While carrying out her early work on mechanisms of K channel block by scorpion toxins, she was working with a toxin that had such a slow off-rate that each experiment required something like 50 hours of recording from a single channel membrane," he explains "how she maintained sanity under these conditions eludes me!" McManus, who also worked on this project, agrees and says, "Kathy was undeterred by this challenge and was able to produce high-quality recordings lasting up to 40 hours with round-the-clock changes of solutions and tapes. This determination was apparent in other activities, including her lunchtime runs where her speed was only maximal!"

After that postdoc, Giangiacomo was married and looking for a job, but also wanted to start a family, and was not quite sure how best to proceed: Should she take a couple of years off and have the family, or should she get the job and delay the family?

"The truth is," she says "that I started looking for jobs, but then I became pregnant." Continuing to interview throughout her pregnancy, Giangiacomo discovered

that teaching was very important to her. "For me, research and teaching are intertwined," she explains. "I derive great pleasure not only from making new real discoveries in my research, but from finding the clearest way to explain concepts in biophysics...indeed when I am able to do this for a lecture, I often learn something new myself!" As it turned out, one of the interviews was at Temple and they offered her a

position, "I was quite happy to take it because it was like coming back to my roots, to a place that I thought had given me a lot," she says.

Giangiaco continues to enjoy working at Temple, and what she enjoys the most is the student population. "We have a very diverse group of students and you can learn a lot from the students here," who she says, "are very energetic and a joy to teach." Currently at the medical school, most of her teaching is to medical and dental students, although she also teaches a graduate biophysics course. Giangiacomo enjoys teaching the medical students because she gets to be a role model to the women in the class and also, the area that she teaches (not her area of research) is endocrinology. "I have the chance to raise their awareness about women's health-related issues, which is a big thrill for me," she explains. Among other topics, she teaches lactation. The female students come back to Giangiacomo and say, "we love that you talked about this, you're the only person in the whole medical school who talks about these women's health-related issues." It is a thrill for Giangiacomo to hear from students that they enjoyed her lecture and that they

learned something new about these issues.

Although Giangiacomo is a very accomplished biophysicist, she is most proud of being able to balance her family and her research career, "Raising children and keeping your research going and doing a pretty good job of it...I'm pretty proud of that!" she says, "I don't know where we will be in the future because my children are still growing and so is science, but I'm happy to be able to balance it and do a good job at both of them."

Giangiaco's husband Ted is also a biophysicist whom she met while she was at UPenn and he at Johns Hopkins.

Giangiaco says that they "share a common interest in biophysics and understanding b i o l o g y , "

although Ted has more of a background in math and physics. When Giangiacomo joined Temple as a faculty member, Ted made a career change and is now a math and physics teacher at Radnor Senior High School. The two continue to work together in the lab during the summer and on his

days off, "He's a good colleague because he has a lot of practical judgment about experiments, so we talk about my science a lot together," she says.

The couple has two children, a daughter Frances, who is 11, and a son Jimmy, who is 9. Before their children were born, Giangiacomo and her husband used to camp and go mountain climbing in the White Mountains in New Hampshire. A long distance runner, Giangiacomo has also managed to run a marathon, but now trying to balance a career and family makes it hard to train. Frances has just taken an interest in running, so Giangiacomo now has a chance

to teach her how to run. Giangiacomo also loves to bake, "I bake a mean apple pie, when I have time. When you have to do all of these things, I've learned to be more efficient in the lab,

and all that efficiency comes in at home, too, so I can actually manage to bake some cookies before I go to work."

Giangiaco believes that there remain many challenges for women in science. Her experience has shown her that making the transition from being a postdoc to a tenure track position in academia is a major challenge. Additionally, the question of whether to have a family is a challenge. "It's a very hard thing to do, and a lot of women want to do both," she says "I have to thank my husband for being so supportive and for helping me in my career and in my home life because without his help, it wouldn't have been possible." She believes the other big challenge is academic climate: knowing how to negotiate, and get the resources or the collegial interactions that you need to really excel in academia. Giangiacomo hopes that through the Committee for Professional Opportunities for Women (CPOW), a Biophysical Society Committee of which she is a member, women can educate each other and make a better, more diverse group of scientists.

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*Kathleen Giangiacomo*, hiking the Presidential Range near Mount Washington in New Hampshire.

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Giangiaco mo believes that CPOW is a really important part of the Society and she is honored to be a part of it. "I think, as I've learned from my career path, it's important for women to be recognized and to be visible. "For many women, CPOW is also a place to network and to mentor." The Committee is hoping to do more of that by utilizing the CPOW web pages on the Society website. "We're going to tap into one of the databases that is being developed so that we can find out about the scientists in biophysics," she explains, "and if we want to know who the women scientists are, we can find out who's doing what, so we can learn more and recognize those women who are making contributions to science." Giangiacomo is working on this project with James Cole, Ishita Mukerji, and Jackie Tanaka. She also hopes that the website will help with improving the academic climate for women scientists, ""We have a diverse group of scientists and diverse groups work best under different types of conditions, so it'll help everyone if we work to improve academic climate."

Giangiaco mo believes that BPS Annual Meeting is particularly important for younger biophysicists because it shows

them how they can use biophysics to learn about biology. She remembers going to her first meeting, "It was in Baltimore, and I was just awestruck by all the different ways that you can use biophysical techniques to understand biology. For me, it was my introduction to biophysics." Giangiacomo is the CPOW representative to the Program

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Committee, which helps to plan the Annual Meeting. Although it is a lot of work, she has learned a lot from the other scientists on the committee, particularly about " the diversity of biophysics that we have in the Society."

Currently, Giangiacomo is collaborating with Benoit Roux at Cornell; who has developed a molecular dynamics approach for developing models of the toxin channel complexes that are based on experimental results. Giangiacomo is hopeful that with this collaboration they can make a general model of toxins with the channels that will help design new toxins that are selected for channels that do not have blockers. She says that these toxins are very important in helping us understand the role of the different potassium channels in different cells.

She is also continuing her collaborations with Maria Garcia. Right now they are working on a new way to define the mem-

brane topology of the maxiK channel, which is not well defined. Giangiacomo, Garcia says is "fully committed to understanding important basic aspects of ion channel function and her data are always of very high quality." She calls Giangiacomo a "superb scientific collaborator...her scientific collaborations with other laboratories has always been fruitful...after many years of collaboration, I can only hope for more."

Giangiaco mo feels very fortunate to also be working with Carol Deutsch at UPenn. "She's also been a great mentor and friend to me. We're collaborating just informally, or maybe a little more formally now." Right now the two, along with Marilyn Gunner, are looking at how electrostatics and pKa's influence tetramerization to the KV channels. Giangiacomo says she is very lucky to have these collaborators because "When you're at Temple, where sometimes resources are a little slim, the collaborators help a lot...the biggest thing that I've learned is don't be afraid to ask for help, to reach out for collaboration and advice. Because if you reach out, I've found, there are plenty of people in biophysics willing to help and give you good advice, which has helped me a lot."

Giangiaco mo's ability to orchestrate the many aspects of her life has benefited her family, the Society, and the greater scientific community; and she makes it appear as easy as playing the piano she loved years ago.