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Biophysicist in Profile

Taekjip Ha

Whenever one begins to feel too self-important, all one needs to do is go home. That's the lesson Taekjip Ha has learned from his children. Despite Ha's many accomplishments and awards, whenever he cannot answer one of his children's questions, they are quick to chide, "You should know, Daddy; you're a famous scientist!"

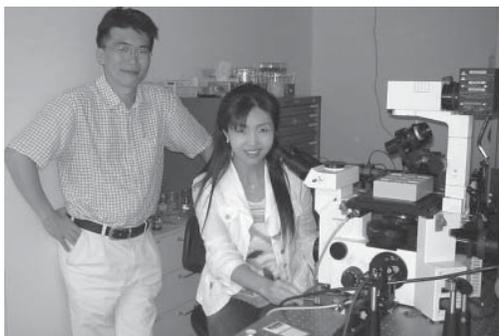
Science is a family affair in the Ha household. Dad is Professor of Physics and Biophysics at University of Illinois at Urbana-Champaign (UIUC), Co-director of UIUC's Center for the Physics of Living Cells, and a Howard Hughes Medical Institute investigator. Mom (Sua Myong) is Research Assistant Professor in the Institute for Genomic Biology at the University of Illinois, Urbana, and a member of her husband's research team.

"I never imagined that I would be working with and for my husband, since we come from two very distant areas of science," says Myong. "I was trained as a molecular biologist and TJ (Taekjip) as a physicist. In the beginning, I joined him simply to help out setting up his new lab as I was finishing my dissertation." Soon her molecular biology skills were tapped for a project Ha had begun as a post-doc at Stanford, making mutations and doing single molecule fluorescence measurement with the protein, Rep helicase.

This first project they worked on together "took off with an amazing start," Myong recalls. The Rep protein displayed a completely unexpected behavior of a repetitive "acrobatic" movement on DNA. "Looking back," says Myong, "this was one of the most exciting times we shared as a two-scientist family."

Like his wife, Ha finds the thrill of discovery compelling. "If you do new experiments," he says, "you always find something previously hidden. The joy of being the first one to discover it is very exciting." Their children have also caught that joy and started drawing their parents' single molecule traces on their art work and made various designs of the saw-tooth pattern.

Separation of work and life away from the lab is essential, however, and sometimes even requires taking off his Blackberry and limiting work contacts to his Razr phone. Ha plays soccer or basketball with his 6-year-old son, watches song and dance on YouTube with his 12-year-old daughter, or takes his children to dance lessons. The family goes to museums, restaurants or shopping.



Taekjip Ha and his wife Sua Myong in the lab.

They travel, with one trip a year combining a scientific event and family time. This year, it was in Hawaii; last year, Europe. Ha has also blocked out family time in January when his and Myong's third child is due.

Ha received his Bachelor of Science in physics from Seoul National University in his native Korea. He came to the US to begin work toward his doctorate in physics at the University of California, Berkeley. His goal then was to do research in condensed-matter physics. One doctoral advisor was staff scientist Shimon Weiss, who studied quantum optics of semiconductors. Under Weiss' guidance, Ha built a near-field scanning optical microscope that enabled high time and spatial resolution.

Ha's searing curiosity and his entrance into biophysics were nurtured by Weiss. Though not a biophysicist himself, Weiss was a visionary who saw the potential for the techniques Ha was developing to be used in single molecule research; he urged Ha in that direction. Ha relished his almost daily discussions with Weiss, talking two to four hours at a time about ideas. "My job was mainly to shoot them down." That appealed to Ha, who says that he has always been kind of a rebel. "But Weiss has so many great ideas that one out of ten would survive." With this creative mind, Weiss was an excellent mentor who gave Ha opportunities, encouragement and respect.

No doubt Weiss, now a biophysics research professor at the University of California, Los Angeles, also shaped the kind of mentor Ha has become. Ha's first student, Sean McKinney, develops new fluorescent proteins as Research Specialist in the lab of Loren Looger at the Janelia Farm Research Campus. McKinney says of Ha, "He was always energetic and excited about the science he and those around him were doing, always asking questions... I was hesitant about making the transition from physics to biophysics, but he kept things exciting and challenging. I don't think I could have had a better advisor." Myong reflects that three phrases that best describe Ha are "a patient mentor, a persevering researcher, and an amazing memory bank."

The future research prospect that Ha anticipates most eagerly is the process of DNA replication and repair to get sequence correct. "We are still working on small pieces – how helicases unwind DNA for one or maybe two proteins – but in the cell, the enzyme does not function in isolation; all have to work together. I would like to have a complete understanding of the process."

Ha does confess to a secret. "I love Biophysical Society meetings—especially poster sessions," he explains. "I bump into people I know every two meters. It's a great place to catch up." That love will serve him well in his position as



Ha with his family.

Program Chair for the Society's 2010 Annual Meeting in San Francisco.

Ha is also proud of the field of single molecule biophysics, noting that other single molecule researchers don't hide information for fear of losing their edge to someone else. "There's a small chance that somebody will scoop you in more conventional fields of research, but almost no chance of getting scooped by telling somebody about your work in single-molecule investigation." Understanding the big picture comes one nanometer at a time. "You cannot avoid feeling that you are putting together the final pieces of the puzzle and participating at the forefront of discovery."