



## Biophysicist in Profile

### Mordecai P. Blaustein

Mordecai P. Blaustein, Professor of Physiology and Medicine at the University of Maryland School of Medicine, enjoys the excitement of new concepts. Delivering a presentation isn't just about imparting his insights to others; it's about communicating and sharing ideas. "Every time I'm invited to give a talk," he says, "someone will see things differently and give me a new way to look the problem."

For the young Blaustein, science itself was a new idea. He got his first chemistry set at age seven or eight and was fascinated by science "before I really knew what a scientist was." His father, a book publisher, did not directly encourage him to pursue science, but books did play a part in Blaustein's becoming intrigued by medicine while in high school. He was enticed into the hunt for answers to medical mysteries as he read about the life of Pasteur and others in Paul de Kruif's *Microbe Hunters* and then further hooked by *Anton van Leeuwenhoek and His "Little Animals"*. A pharmacist uncle gave him extra opportunity to "play with" and learn about chemicals.

Blaustein's early mentors included insect physiologist and developmental biologist *Howard Schneiderman* at Cornell University and *Daniel Tosteson*, at Washington University Medical School, who introduced him to the intriguing sodium pump in 1959, two years after its discovery. "Dan told me that if I didn't hurry up and come to work on this sodium/potassium ATPase that maintains low intracellular sodium, everything was going to be known about it and it would be too late. So I went to work on the pump—and I'm still at it!"

After medical school and an internship in Boston, Blaustein moved further into biophysics. As a naval officer, he studied neurotransmission with *David Goldman*—"father" of

the Goldman/Hodgkin/Katz equation, at the US Naval Medical Research Institute in Bethesda, Maryland.

Blaustein's next step in his scientific odyssey was a two-year fellowship from the National Institutes of Health to work with *Alan Hodgkin* in Cambridge, England. Blaustein planned to continue in electrophysiology, but Hodgkin's young colleague, *Peter Baker*, suggested that they study the sodium pump kinetics in squid axons.

Blaustein and postdoc fellow *Richard Steinhardt* "serendipitously" discovered the sodium-calcium exchanger. On "a dark and stormy night" when there were no squid to study, he was reading about *R. Niedergerk's* work on sodium-calcium interactions in the heart when he had a "Eureka!" moment. The exchanger was the missing link that explained how digitalis glycosides improve heart function. He was so excited he couldn't sleep that night!

"Alan Hodgkin helped me hone skills in thinking critically about research problems and taught me that I should trust my experiment if I know it is right," says Blaustein. This advice served him well in the challenges that lay ahead.

When he returned to the US as a faculty member at Washington University Medical School in 1968, Blaustein met German researcher *Harald Reuter*, who discovered sodium/calcium exchange in cardiac muscle. "It could have been a serious rivalry, but instead we became friends." A NATO fellowship enabled their collaboration at Reuter's lab in Switzerland. Their resulting manuscript cited evidence that arteries also have the same sodium/calcium exchanger and postulated that it played a role in hypertension. Rejected by multiple refereed journals, it was finally published in a non-refereed journal and did not gain wide acceptance until years later.

In 1977, Blaustein put together the pieces about that relationship to blood pressure. The plant compound ouabain, a cardiotonic steroid that inhibits sodium pumps, had been used in experiments in place of digoxin because it behaves similarly and is water soluble. Blaustein wondered if a similar hormone played a role in linking salt to high blood pressure. "I published my hypothesis that if we eat too much

salt, we secrete this hormone, and the blood pressure goes up.” His hypothesis was popular among clinicians, and his paper was frequently cited but did not immediately generate grant monies.

By 1979, Blaustein was department chair at the University of Maryland School of Medicine. His postdoc, *John Hamlyn*, studied blood plasma from people with untreated high blood pressure and found that their plasmas did, indeed, contain an inhibitor of the sodium pump.

Research on the sodium pump proliferated—but none got grant monies for Blaustein’s team to continue research on their own discoveries. Ultimately Blaustein collaborated with the Upjohn Company. Over a ten-year period, he, Hamlyn and their Upjohn colleagues purified the “ouabain-like hormone” from “tons of plasma” and discovered that it was, in fact, ouabain—an adrenal cortical hormone.

Publishing the findings was again a struggle. Blaustein attributes the skepticism to the realities that there are many “false positive” sodium pump inhibitors, and that new ideas are hard to accept. With years of accumulating evidence, however, “colleagues are coming to believe the story,” Blaustein says. This is reflected by recent research grants as well as awards he has received, from The Robert J. and Clara Pasarow Foundation Award for Cardiovascular Research (1991) to last year’s Novartis Award from the American Heart Association.

Much of his current work is more biophysical as he continues to try to understand calcium metabolism in cells. His lab does calcium imaging with calcium-sensitive dyes to measure levels of calcium in living cells.

Blaustein has made important connections through the Biophysical Society. “I tell my students that the Biophysical Society is the place to go for the best, most uniform, high-quality science.”

He is quick to credit “wonderful colleagues and collaborators.” Colleague *Bruce Krueger*, Professor of Physiology and Psychiatry at the University of Maryland School of Medicine, did his second postdoc in Blaustein’s lab in St. Louis and was impressed by Blaustein’s innovative projects. “Even more remarkable... was his ability to integrate multiple research initiatives,

leading to insight and productivity far greater than would arise from the sum of the individual projects.”

*Jason X.-J. Yuan*, Professor of Medicine and Vice Chair for Research for the Department of Medicine at the University of California, San Diego, notes that Blaustein “never let the administrative chaos interfere with his appointments and conversation with his fellows and students. Mordy told me many times, ‘it is good, but good is not enough; we need to make it perfect.’”



Blaustein and his wife, Ellen, negotiating San Francisco’s Lombard Street (“crookedest street in the world”) in a GoCar.

Blaustein acknowledges his wife’s important role supporting and encouraging him and often parenting alone. “I was not a great father,” he admits. “I think I’m a much better grandfather.”

His wife Ellen’s ventures have included directing the Goucher Management Institute, managing a private-label business at Black & Decker, and serving on the Maryland Attorney Grievance Commission. Their daughter Laura left a career with a talent agency to be a stay-at-home mom to the daughter she has with her physicist husband. Their son, Marc, is in biotechnology in Boston, is married and has a son and a daughter.

Blaustein acknowledges that it is tempting to live science day and night. When he does get away, it is usually through biking, hiking or collecting books that are mostly about science.