Eugene Braunwald

Escaping Death and Prolonging Lives [Part 2]

Ruth Williams

In the last issue of *Circulation Research*,[1] we heard from esteemed cardiologist Eugene Braunwald (Harvard Medical School and Brigham and Women's Hospital, Boston, MA) about his family's escape from Nazi-occupied Austria.

Braunwald arrived in the United States with his family in 1939, aged 10. He went on to become one of the most influential and highly regarded clinical cardiovascular scientists of the last 50 years. It is safe to say that through his research, Braunwald has contributed to the survival of countless heart attack patients across the globe.

In part two of this interview, we learn how Braunwald's passion for cardiology developed and how at 80 years of age that passion, as well as his work ethic, show no signs of diminishing.

Prolonging Lives: A New York Education

So, a New Life in Brooklyn Began. . .

Thankfully, we were out of danger, but my parents were now concerned about our future as strangers in a country that, contrary to current belief, was not yet out of the depression. We were as poor as the proverbial church mice, and my father had to figure out how to support us. I don't know how, but he always managed to put bread on the table. Life was nothing like it had been in Vienna before March 1938. But, my father was a very enterprising, strongly motivated, and hard-working man, and after a few false starts, he managed, with my mother's help, to create a second successful wholesale clothing business.

Tell Me About Your School Days in Brooklyn

I started in an elementary school and did well. In fact, I was the class Valedictorian, which was quite an honor for a relatively recent arrival. Then, I went off to Brooklyn Technical High School, an elite public high school that required passing a very tough entrance examination.

You Were Already Leaning Toward the Sciences. At What Point Did You Decide to Study Medicine?

I started high school with the desire to become an engineer. It was the "in thing" to do during World War II. Also, I was good at mathematics, so it seemed like a good choice. But, as time passed, I began to think more about medicine. While engineering seemed interesting, it was largely impersonal, and I felt that medicine would be a career in which I could work directly for and improve the lot of people in distress. I had seen many such people and thought that medicine might be a better fit for me. By the time I entered college at New York University, I was premed and a Biology major.

What Was College Like?

It was not a particularly pleasant experience. I began in 1946. The war was over, and there were many returning veterans, who, appropriately, were given a higher priority for medical school admission than us younger students. Also, medical schools had strict Jewish quotas. This meant that there was extremely intense competition to enter medical school. It was necessary for me to get straight As to be considered as a serious candidate. The odds were obviously against me. I had to work extremely hard, not fewer than about 90 hours per week. I was on a full tuition scholarship, and because I couldn't afford to live on the campus, I was what was called a "subway" student. College life was simply achieving the highest possible grades. I missed the reflection, discussion, and exploration, as well as the social development that comes with a more normal college life. I completed high school and college in 5 years because I entered the accelerated programs that had been established for the returning veterans but for which nonveterans were eligible.

There Was One Upside to College—You Met Your First Wife

Yes. We met during our third year. We shared strong interests in classical music, as well as medicine. Nina went on to a brilliant career, becoming the world's first woman cardiac surgeon and the first surgeon of any gender to successfully replace a human heart valve.[2] She passed away in 1992.

And You Both Made It Into Medical School at New York University

Yes. I was admitted to NYU Medical School on May 1, 1948, the last student admitted to our class. I remember this date well because it was the most important in my professional life. We were married in 1952, straight after medical school. We had three daughters who were born during our years at the NIH.

Tell Us About Your Children

They are accomplished professional women, one in clinical Psychology, the second, a clinical investigator in Diabetology, and the youngest, a health law attorney. All three are married with children. There are 7 grandchildren. Elaine, my second wife, and I see them frequently, because fortunately they all live nearby.

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All Heart

You Had Your First Taste of Research at Medical School. Were You Hooked Immediately?

Yes. I had the opportunity to work in Bellevue Hospital's cardiovascular research laboratory, which was directed by my first mentor, Dr. Ludwig Eichna, during my final year. I was one of two students in my class of 120 to take a research elective for an extended period. Then, after medical school, I did an internship and clinical fellowship in cardiology at Mount Sinai Hospital (I completed my internal medicine residency at Johns Hopkins Hospital), followed by a postdoc fellowship with Professor André Cournand at Columbia University and Bellevue Hospital. Cournand, my second great mentor, was the father of clinical cardiovascular hemodynamics and a Nobel Prize winner. His was the premier laboratory for human cardiac physiologic research of the era.

I learned many research principles from Professor Cournand. This experience and his support paved the way for my being accepted into the Laboratory of Cardiovascular Physiology run by Dr Stanley Sarnoff in the intramural program of the (then) National Heart Institute, now the NHLBI, in Bethesda, Maryland. Sarnoff was a brilliant cardiovascular physiologist and a master of experimental design, who taught me an enormous amount.

What Were You Working On?

We worked on elucidating the determinants of myocardial oxygen consumption[3] and coronary blood flow[4] in the intact dog heart. With important collaborators,[5] I continued working on this after I left Sarnoff and established my own laboratory at the NIH.[6] Those experiences led me to think hard about myocardial ischemia—an imbalance between the two subjects that I had studied: the heart's oxygen needs[3] and its oxygen supply.[4]

When and Why Did You Leave the NIH?

In 1968, after 13 wonderful years, I wanted to become more involved in medical education and left the NIH to become the founding Chair of Medicine at the medical school at the University of California San Diego (UCSD), which was still in its planning stage. My goal was to help develop a medical school in which the barriers between preclinical science and clinical medicine were minimized. I think that the UCSD Medical School was the first, or certainly one of the first, to accomplish this. By starting a school from scratch, we were able to break down these barriers. The school's organization-unique at that time-fostered translational research (before that term was popularized). The continuum between preclinical science and clinical medicine is now routine in all schools. Looking back, it was a great opportunity to participate in a successful educational experiment.

Teaching Medical Students the Fundamental Approach of Basic Science Is Important, You Think?

Absolutely. I think that it is essential that we teach clinical medicine from the perspective of normal versus disturbed biology and physiology.

As Well as Teaching, You Continued Research at UCSD?

Fortunately, I had sufficient time to continue my research at UCSD, and my colleagues and I showed that it is possible during the development of a myocardial infarction, secondary to coronary occlusion, to improve the balance between myocardial oxygen supply and demand and thereby reduce ischemic damage.[7] We also showed that reperfusion following infarction can save threatened myocardium. And now, of course, early opening of the occluded coronary artery by angioplasty and stenting has become routine in the management of patients with acute infarction.

You Have Received Many Awards and 14 Honorary Degrees. Which Do You Consider the Most Important?

The work on myocardial oxygen consumption and ischemia[6] was the basis for my receiving the Wiggers Award from the American Physiological Society, named for Carl Wiggers, considered to be the world's greatest cardiovascular physiologist of the 20th century and the first Editor-in-Chief of *Circulation Research*.[8] I had the opportunity to interact with this legendary figure when I was a postdoc in the Sarnoff laboratory.

You Got Interested in Cardiology in Medical School. But Did You Ever Think About a Different Area of Research?

Not really. I mentioned my early interest in engineering. In many ways, cardiology is not unlike engineering. Both fields deal with pump function and the flow of liquids. Had I not been admitted to medical school, I would probably have trained in bioengineering. However, if I were to start over today, I would choose a career in neuroscience, because the next 40 or 50 years are going to be all about the nervous system, just as the last half century has been about the circulation.

What Did Your Children Think of the Move?

Our daughters had lots of friends in California and were not thrilled. So, we bribed them.

How?

They each had a horse in California, so we had the horses transported across the country. We built a house in a Boston suburb and included a stable and riding area for the horses.

Your Research Took a Clinical Turn After San Diego. Tell Me About That

After I came to Boston, I thought that the time had come to take the concepts from isolated cardiac muscle and animal research and apply them to patients. If our ideas about protecting threatened myocardium were any good, they should be applicable clinically[9]. After all, I'm a physician, and improving clinical care was my motivation for entering medical school in the first place.

In 1984, we set up a clinical trials study group called TIMI (Thrombolysis In Myocardial Infarction), and in the first 15 trials, that was exactly what we studied. Later, we conducted

trials in related areas. To make a long story short, we are now up to TIMI trial number 56. We complete approximately two trials each year. Nowadays, most of the trials are international and some are enormous, involving more than 25,000 patients, 1000 hospitals, in 46 countries, and on all continents (except Antarctica!).

You Are Still Involved in the Research? How Hard Do You Work Now?

For 28 years, I led the hectic life of a Chairman of Medicine with a faculty of more than 700 and served on many medical school and hospital committees with lots of administrative work. I devoted about a quarter of my time to research. In the last few years, I have been able to spend closer to 90% of my time in research, which was my first and has been my most enduring professional love. Fortunately, I don't have to attend evening meetings any more.

I still work 7 days a week. If I get going early in the day, I can put in a good 10 hours. Then, in the evening, I read medical journals, review manuscripts, and listen to music.

Are You Taking Some More Holidays, At Least?

I get invited to lecture in interesting places around the world. I usually travel with Elaine, and we use these opportunities to stay a few extra days, relax, and do some sightseeing. In 2 months, we're off to Turkey with our eldest granddaughter, and then on to Jordan.

The Next Generation

Given Your Own Work Ethic, Would You Say That Hard Work Is Important for Success in Science?

Yes, it is necessary to have fire in the belly and the motivation to work hard. Research is a serious business that requires a lot of, often total, dedication. Unless you have insatiable curiosity about what you are studying, and the willingness to work hard to answer the questions you have posed, I think it's unlikely that you will be successful.

What Other Advice Do You Have for Young Scientists?

You should conduct research for research's sake, not for other gains. Not because you will get promoted or you'll be famous or you'll earn more money, although those things will naturally come to you if your research is successful!

Also, when you are starting your own research group, it is important to be a good team builder. I have been extremely fortunate in that I have had, and now have, extremely well-motivated and brilliant colleagues, many of whom started out as my trainees.

Research is no longer a one-person show as it was when I was a postdoc. If you take a look at many excellent articles nowadays, there might be a dozen or even more authors, involving four laboratories on two or three continents. It's a very different situation from Andre Cournand's small, but dazzlingly successful, research laboratory in the 1950s. Actually, Carl Wiggers did not accept, even for review, any article submitted to *Circulation Research* with more than three authors!

There Are Always Low Points in Research, So What Were Yours? How Did You Overcome Them?

I have experienced a number of *dry* periods in my research career, and that's always difficult. But, since I became a Laboratory Chief at NIH, our group has always conducted several studies or trials simultaneously. Therefore, we have always had something else that would make up for lack of success in one area, a balanced portfolio you might say. I have been and remain today constantly energized by the "thrill of the chase," and I realize that the joy of discovering something that makes a real difference is infrequent. That's what makes it all the sweeter when it does happen.

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