In an odd twist of fate, the man responsible for one of the most familiar instruments in medicine—the gel electrode used to monitor heart rates—was kicked out of the University of Chicago medical school his first time around.

Odder still, with time out for military service and a visiting professorship at Oxford, he still works there—almost seven decades after he first set foot on campus.

by Katie Scarlett Brandt
Donald Rowley is no stranger to the atypical, as many people who phone his Hyde Park home can attest. Those who ask to speak to “Dr. Rowley” receive a prompt but polite “Which Dr. Rowley?” His wife, Janet Rowley, is a well-known geneticist and one of the most liberal members of President George W. Bush’s Council on Bioethics.

The two didn’t always share the same title. Married the day after Janet graduated from medical school in December 1948, Donald was still about a year short of earning his MD. “Our friends enjoyed introducing us as Dr. and Mr.,” he said. During a time when the quota for females in a class was three out of every 65 medical students, the pair was an anomaly.

They met 11 months earlier on the university’s ice-skating rink. Donald, recently returned from a postwar stint in the Philippines, was taking a break from grad school when he spotted Janet struggling to skate. “She needed help. She was clumping around,” Rowley said. A Minnesota native and hockey player, he made it his business to assist.

Now, from behind a thick pair of glasses, Rowley talks about the Chicago campus that he remembers: One where the ice rink was under Stagg Field, not on the Midway. Where 63rd Street was a “real eye-opener,” filled with jazz music, tumultuous activity and bars that by law didn’t allow women to sit at the actual bar. “Naturally, I had a forged ID,” Rowley said.

In 1941, tooling down the Midway in a Model A Ford jalopy shortly before the start of his freshman year, Rowley caught his first glimpse of the university. He had earned a scholarship for tuition—$300 back then—but was overwhelmed by the ornate gothic buildings looming before him.

It wasn’t long before Rowley overcame his initial impression and took control of his education. If he considered a class unnecessary, he skipped it. The professor in a social science course one day called on him by saying, “You, young man in the skivvies shirt.” Rowley left the class after that, having “better things to do,” and never went back.

Generally, Rowley found the biological sciences sequence “riveting,” did very well in chemistry and not so well in the physical sciences. The med school admitted him in 1943 and expelled him 18 months later in ’45 for reasons Rowley cited as “asking too many questions, arguing and other defects of character.”

“I was perfectly willing to call a fool a fool, and I’d tell them so,” he reasoned, adding that college professors had failed to prepare him for medical school. “They taught you to argue and raise questions. Medical school was all memorization.”

A year before he started medical school, Rowley had enlisted in the Army, as virtually all medical students did on the eve of America’s entrance in World War II. It wasn’t until he was expelled from
Chicago that he left for military duty. He still recalls the parting words of then Dean R. Wendell Harrison: "Rowley, being dismissed from medical school isn't the end of the world, but at least try to get an honorable discharge."

With the dean's words in mind, Rowley boarded a boat of 5,000 troops headed for the Philippines. Six weeks later—after a stop in Honolulu, where he risked being court marshaled after jumping ship ("The important thing there was that we did not get drunk and did not bring back alcohol," he said)—he arrived in northern Luzon to work at a first aid station for Japanese prisoners. His time wasn't exclusively devoted to the injured, though. In a camp positioned between mountains and isolated beaches, Rowley learned to body surf and bought an old outrigger canoe.

**Autopsies and a Mercedes Benz**

When he returned safely to Chicago, Rowley convinced Pathology Chairman Paul Cannon to let him work in his laboratory, where Rowley managed his own project and studied amino acids, protein metabolism and nutrition with Cannon. "He was a smart man," Rowley said, calling Cannon a "father figure." Rowley's individual project led to the publication of two single-authored papers in the *Journal of Immunology.*

In 1950, Donald and Janet both won highly competitive internships with the U.S. Public Health Services, after which they moved to Bethesda, Md. There, Donald worked at the National Institutes of Health as an immunologist. Four years later, the NIH offered Rowley tenure. He said that he "started looking elsewhere the same day."

Rowley continued where he'd left off when he returned to the university in 1954. Cannon remained chairman and insisted that if Rowley wanted to join the pathology department, he must know some pathology to justify his position; so, he committed Rowley to studying cadavers.

Through autopsies, Rowley noticed that only certain arteries tended to be clogged in diseased hearts and asked why. His peers proposed a wide range of hypotheses, and Rowley did too, taunting the "fat boys" in charge by suggesting acts like shaving as the cause of artery disease. However, he also explored real possibilities. He considered high-tension points in the arteries, where plaque accumulated like sediment at a river bend, and started making correlations between plaque build up and fatty foods.

It was during the next four years that Rowley made a monumental medical breakthrough. With the help of a young genius lab assistant who had an amplification of Rowley's own "variety of character defects," he figured out how to measure people's heart rates—no matter whether they were mobile or motionless—and birthed something that hospitals use by the thousands to this day.

Heart rate epidemiology intrigued Rowley. Even today scientists can't list for certain all of the effects heart rate has on a person. But accurately measuring them over 24-hour periods was not an easy task in the 1950s. Prior to the modern gel electrodes, patients wore clunky metal plates on their wrists or ankles and had to remain completely motionless in order for physicians to conduct EKGS.

Rowley began exploring ways to monitor a heart rate for 24 hours, seeking a normal heart rate reading and the subsequent distribution of a normal heart rate. He began with a watch, reasoning that because heart rates were measured at the wrist (where the radial artery pulses), and people wore watches at their wrists, the latter should somehow be able to track the former.

During the early experimental stages, a "shabby, ill-kempt student" wandered into Rowley's lab. His name was Peter Stoner, and he'd started at the university at age 14. At 17, after a few years of work in the physics department, he approached Rowley.

The employment office warned Rowley not to take Stoner on, saying he was unemployable. But Rowley saw himself in the young student and invited him to join the lab, which they converted into an electronics workshop.

"[Peter] wasn't bound by any rules or laws," Rowley said. He wouldn't punch in or out, so Rowley had his secretary do it. When Stoner's manias led him to order a red leather chair for himself, Rowley asked the secretaries to pass all suspicious orders to him.
And then one day purchasing called. They wanted to know why Rowley’s lab had placed an order for a $7,000 Mercedes Benz, an item that the secretaries had thought, in 1958, was laboratory equipment.

Stoner’s eccentricities were matched by his genius. He’d taught himself about transistors, and when Bell engineers came to help on the project, Stoner taught them about transistors, too. In the next six years, the engineers who came and went through Rowley’s lab soldered wires to dimes, filled tubes with mercury and placed electrolytic-coated dimes on their wrists and forearms and over their upper sternums, at the apex of their hearts, in attempts to gain noise-free readings. Like conventional, large metal electrodes of the time, they picked up only scrambled electrical signals when the subject moved.

It was Rowley who serendipitously observed that a dab of gel could go a long way. The electrolytic gel was a perfect electrode, he realized, so long as the wire did not touch the skin, which resulted in altered electrical resistance.

Rowley covered a dime in the coating paste, attached it to his chest and immediately gained a reading free of electrical noise from his muscles. From there he tested the readings by applying sharp blows to his chest, doing push-ups and other activities. The gel-coated electrodes provided perfect readings each time, and by 1959, Rowley’s lab had been converted once again, this time into a nurse’s station that could report 24-hour heart rates.

Swimming trunks and a lab coat

Rowley has received little personal acknowledgment for the three papers his lab produced on the electrodes, despite the fact that the devices are in use worldwide. In the 40-odd years since, he’s only been asked twice to speak publicly about his breakthrough.

In 1961, Rowley spent a year in England as a visiting scientist at the University of Oxford, where he worked with Sir Howard Florey, the man responsible for first manufacturing penicillin from the liquid in which it grows. Rowley returned to Chicago and in ‘73 became research director at La Rabida-University of Chicago Institute. At the time, the institutions were more than affiliated. Rowley saw 40 students earn their PhDs during his tenure there and cites the time he spent in the lakeshore children’s hospital and research center as the highlight of his years at the university. “Invariably it was a great experience for students who went there,” he said. “I had no trouble recruiting almost anyone I wanted.”

One of those students, Hans Schreiber, works in the office combined with Rowley’s today. “It was fantastic,” Schreiber said of their work at La Rabida. “You ate together, you interacted all the time, and you really can’t do it any other way.”

Rowley ran the research program like many highly successful software companies often function today—an unconventional idea at the time. “They criticized us; they thought we were a club,” Rowley said. He set up volleyball and soccer games, lake swims, ping-pong tournaments, pizza parties, luncheons and student-run biology conversations at his own house.

“You can get so much more out of that than out of a hasty interaction on the way to a meeting,” Schreiber said.

Once, as Rowley departed the lake after a swim one afternoon clad only in his swimming trunks and lab coat, he happened upon a new student approaching the building. When the student saw his unusual dress, Rowley remembered, the man said he knew he wanted to work for a director like that.

Rowley said the goal then, as it is now and always will be, is to have fun. “Janelia Farm is on a grand scale what we were on a mini scale,” he said, referring to the innovative research center that this fall will cull graduate students from the University of Chicago and Cambridge University in England to work as a close-knit team on cross-disciplinary projects on a brand new campus in Virginia.

Janet Rowley interacts with her students in a similar way. “She understands and uses the same devices,” her husband said. “It creates very high morale.”

Four children, five grandchildren and countless students later, Rowley, now 84, remains in Hyde Park. “I’m a dinosaur,” he said. But students still come to him for help on their papers, and he continues experiments in the lab.

During physical check-ups when nurses apply gel electrodes to his chest, Rowley tells them who’s responsible for the electrodes: “I invented those, you know.” In response, he usually receives laughs and raised eyebrows, he said. But like many other things in his life, he doesn’t seem to take their reactions too seriously.

Today’s gel electrode is now commonplace in ERs and cardiology suites worldwide, thanks to a Chicago alum and faculty pathologist. Photo by Dan Dry