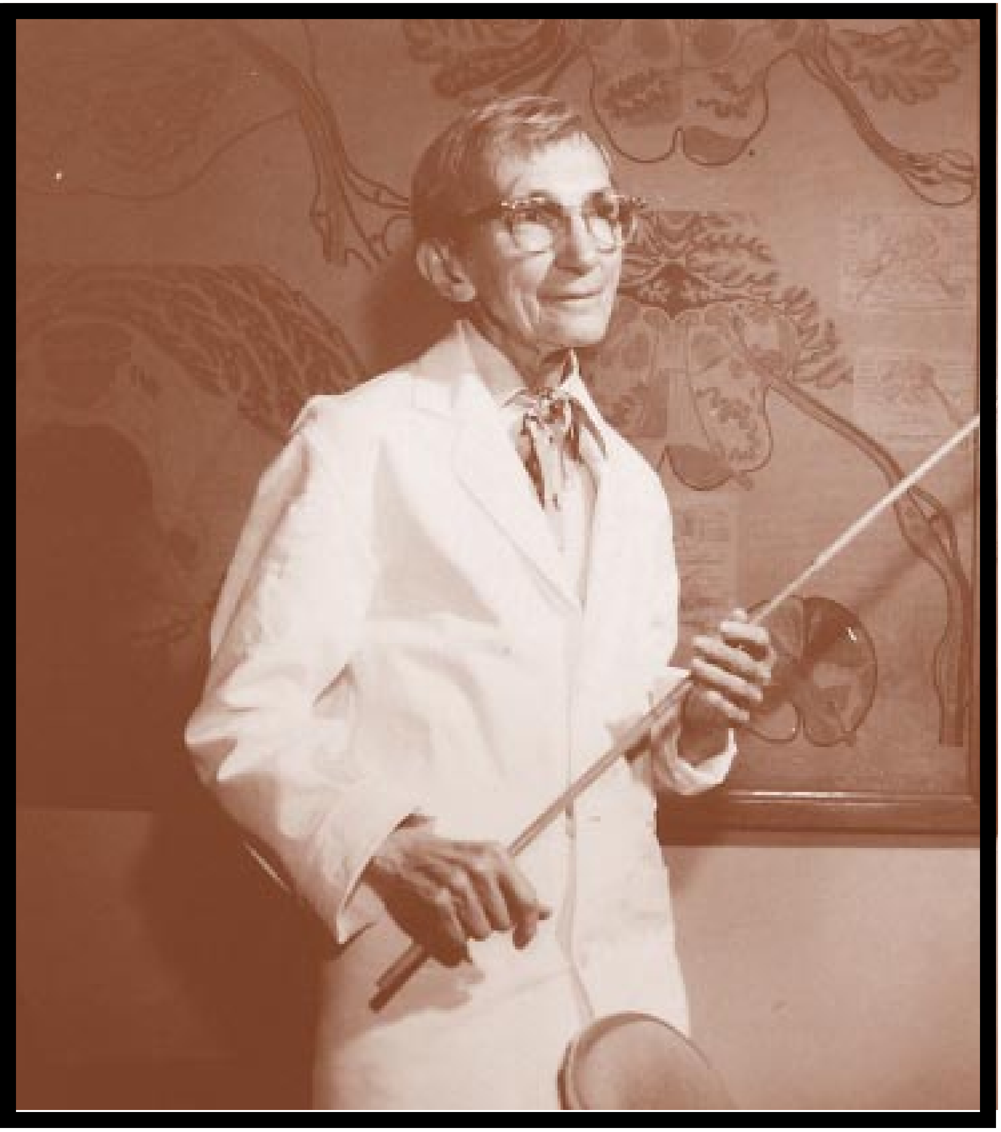


Elizabeth Caroline Crosby Papers, Bentley Historical Library, University of Michigan (Box 6, Teaching)

the Quiet GENIUS

Adrian's greatest scientist and her research on the brain

by brad whitehouse

When Elizabeth Caroline Crosby was born, her mother only made her one dress. It was the one her parents planned to bury her in. Lewis and Frances Crosby had already lost their first child in infancy, and when little Elizabeth was born prematurely, her mother didn't expect her to live long enough to justify extra clothes. Elizabeth was at times so blue that they would put her in the oven for short spells to bring the color back into her cheeks.

But somehow she held on. It was probably her determination to know that kept her kicking, a consuming drive for knowledge that would eventually make her one of the world's great scientists. Her mother and father had no way of knowing that in October 1888, though, and they were just glad to all be alive in their log cabin in Petersburg, Mich.

She was sickly and small, but where her body lagged her mind flourished. The story goes that she actually learned to read before she could walk. Both of her parents were bright, and they were attentive to their young daughter. Her mother read to her nightly, and before she entered the first grade Elizabeth was reading "Jane Eyre" and "The History of the French Revolution."

When she graduated from Petersburg Union High School in 1907 (valedictorian in a class of seven), her father promised her four years of college and sent her off to Adrian.

The weight of legacy

In the spring of 2003, Dr. Sarah Newman, professor emerita at the University of Michigan and great admirer of Elizabeth Crosby, began the monumental task of cataloguing and packing the research materials that Crosby left in the Department of Anatomy and Cell Biology at U-M Medical School after she died in 1983. The materials weighed about six tons. Newman shipped them off to the National Museum of Health and Medicine in Washington, D.C., where the scientific materials of a number of internationally-known comparative neuroanatomists are being preserved.

The bulk of the materials were microscope slides – cross-sections of animal brains pressed between sheets of glass. Crosby collected them throughout her career at U-M, stacked them high on every table and desk in her office. Newman first saw the collection when she joined the faculty in 1970, 10 years after Crosby had retired but was still active as a professor emerita.

One reason Newman took such care with the materials was because they included specimens rare to science – panda and panther brains, for instance – but also because they were part of the legacy of the most prestigious scientist ever in her and Crosby's department, the Department of Anatomy and Cell Biology. Crosby was a pioneer in the field of comparative neuroanatomy, a scholar internationally recognized for her contributions to what we understand about the brain.

"The essence of comparativeneuroanatomy was to understand the fundamental structures, the essence of organization in vertebrate brains," Newman said. "That field was very big and productive in her time.

"Her work was absolutely fundamental to laying down the basic plan of the nervous system for vertebrates. We have so much more confidence understanding, say, the human brain, when we can see the repeated pattern over and over again."

Crosby brought to her work a penetrating intelligence, a tremendous capacity for long hours, and humility.

"She was a quiet, retiring, bashful-appearing *genius*," recalled **David Dickinson '42,** who was first Crosby's student and later her colleague at U-M, where he was a pediatrician and professor. "And she was a genius, there's no question about that. But she wouldn't get anywhere in politics…You know, if the faculty had a party, she wouldn't go unless she had to."

What is comparative neuroanatomy?

Crosby and other comparative neuroanatomists were trying to figure out the basic structure of the brain and the spinal cord (central nervous system) of vertebrates. It was a very productive field in her day, and she and her colleagues laid the groundwork for new phases of brain research.

Crosby certainly didn't draw attention to herself. In fact, this may be a big reason she was able to go so far in a male-dominated field. Personal ambition wasn't what drove her, and she was content to let others take the lion's share of credit—even when she had done most of the work.

Case in point: "The Comparative Anatomy of the Nervous System of Vertebrates, Including Man." The 1,800-page book, published in 1936, was so thorough and accurate that it is credited with effectively shutting the door on the descriptive phase of the field. The project began as a translation of the work of C.U. Ariëns Kappers, a leading neuroanatomist who Crosby had studied with in Europe. She was assisted by G. Carl Huber, her mentor and then colleague at U-M. Neuroanatomy was changing so much in that day that it turned out the manuscript had to be completely rewritten. The project took 10 years, and Crosby did most of the writing herself. However, when it was published, she insisted on listing herself as the third author.

Edgar Khan, a U-M neurosurgeon who collaborated closely with Crosby on a number of projects later in her career, put it this way:

"She was like Cyrano de Burgerac, who wrote love letters for another guy."

Scared little country girl

In school, Elizabeth was sort of a pet. She was small, quiet, brilliant and occasionally mischievous. At Adrian, she was well-liked, but she was known to cover the light under her door with a rug and study by herself late into the night.

She graduated in 1910, reportedly with honors in Latin and mathematics and as class valedictorian. Her father had promised her four years of college, but when it only took three she proposed a year of graduate school.

What Crosby did next makes it hard to accuse her of not making the most of her Adrian education, and shows her rare pluck. Her only background in science was one course in zoology from Professor Elmer Jones, but it interested her. She approached Jones (after whom Jones Hall is named), and he recom-

Elizabeth Caroline Crosby Papers, Bentley Historical Library, University of Michigan (Box 6, Family and Childhood Portraits)

Elizabeth Crosby's father had promised her four years of college. When she finished at AC in three, Professor Elmer Jones suggested the University of Chicago. So began a lifetime of achievement in the field of comparative neuroanatomy.

mended she look up C. Judson Herrick at the University of Chicago, one of the well-respected neuroanatomists of the day and a man Jones had studied under at Denison College. And so Crosby got on a train to Chicago.

"I was a very scared and not-too-well-prepared little country girl, who had never seen an elevated terrain," Crosby said in a radio interview before she died. "Since I didn't know any science, and had very little preparation for it – although I had a good teacher at Adrian – I decided I would take anatomy."

When Herrick finally let her into his office, he told her if she wanted to study anatomy she'd need to catch up with a year of biology, chemistry and physics. Crosby, who thought she only had one year to spend, said "No. I came to study with Professor Herrick. Let me try."

So against his better judgment, he did.

"At first she was, of course, disoriented and confused, but within a few weeks she was doing as well as the medical students…," Herrick wrote later. "She did what I told her was impossible, and she did it with distinction."

Elizabeth Caroline Crosby Papers, Bentley Historical Library, University of Michigan (Box 6, Portraits)

Crosby was captivated by the challenges of the brain for her entire life. She was a leader in the group of pioneering scientists who used rudimentary equipment to figure out its basic structure. In the mid 1930s, she became the first female full professor at the University of Michigan Medical School.

Crosby worked with a frenzy. She was staying in the lab so late that Herrick worried about her health and took away her key. Soon after he caught her dragging equipment home so she could work late anyway, and so he gave up and returned it.

Crosby ended up completing her doctorate at the university. She wrote her dissertation on the forebrain of the American alligator, *Alligator mississippiensis*. It is still considered a classic. A few years after it was published, she was in Europe and stopped to see Italy's foremost neuroanatomist. It was the first day of the semester, and he was too busy to see her – until he heard her name. He spent hours talking with the author of the paper on alligators.

Crosby's work on the brain had begun. It was a puzzle that would captivate her for her entire life. As she stated decades later, "Neuroanatomy represented a real challenge to work out. From that time on, it has been my greatest interest."

Trouble with customs

In 1939, Adrian College awarded Crosby the first of many honorary doctorates she would receive. However, no other award ever helped her with the authorities in just the same way.

According to colleague Edgar Khan's account, Crosby received the doctorate on her way to Scotland, where she worked and taught at the University of Aberdeen during the early part of WWII. On her return trip to the U.S., it was in her suitcase. After the boat to Belfast set sail, an inspector spotted some of her papers. Crosby tried to explain that they were drawings of the brain, but when she pointed out that the inspector was holding them upside down, the woman decided that Crosby might be a spy, and that she'd have to be shipped back to Aberdeen.

Then she noticed the honorary degree.

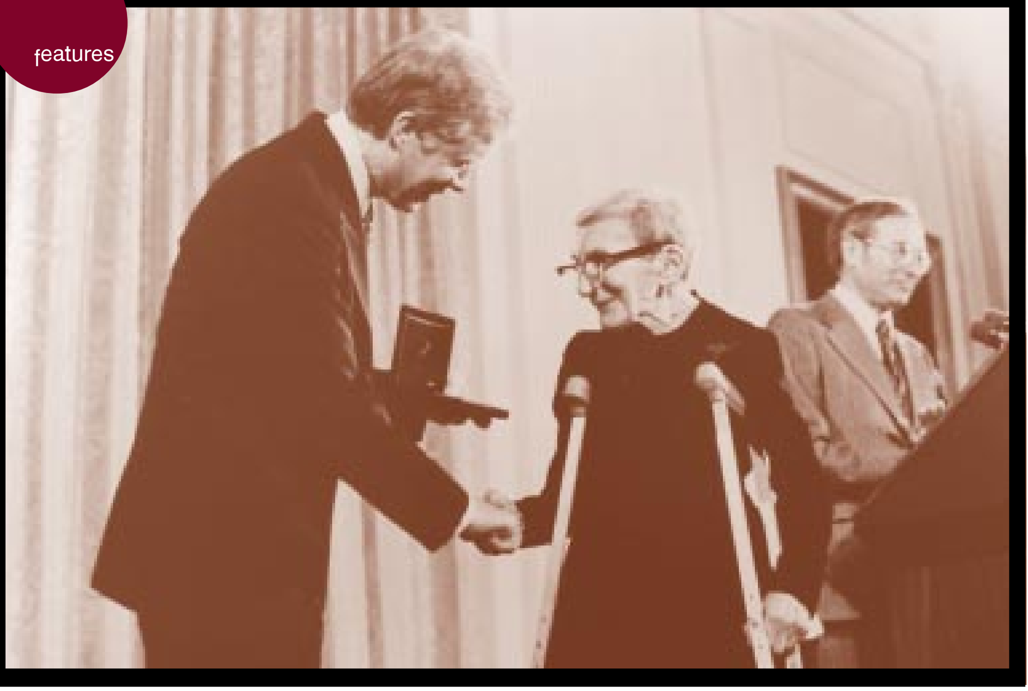
"It had her name in Latin and a large gold seal," Khan wrote. "The seal was more impressive than the letters from the deans at Michigan and Aberdeen, and she was allowed to continue her journey."

Before she left Scotland, her gardener there made a big request. An elderly man, and perhaps worried about the war, he asked Crosby to take his daughter with her. The girl was one of two that Crosby, with the help of her friend and colleague Tryphena Humphrey, raised to adulthood.

Evolution of a mind

There's a copy of a Newsweek article from 1955 in Crosby's file at AC. It mentions that she was a world authority on neuroanatomy, but what it's really about is how she was the best-liked professor at U-M Medical School. Shy, partially deaf (from scarlet fever as a child), and diminutive, she won her students over with lively, no-nonsense lectures recited from memory. Students from other classes often sat in. As Newsweek quotes one male pupil, "How many teachers do you know who get a bouquet of roses at the end of the semester?"

Crosby worked her way into U-M by increments. After graduate school, she actually returned to Petersburg to care for her ailing mother. She taught high school, where she was the unlikely



Elizabeth Caroline Crosby Papers, Bentley Historical Library, University of Michigan

Crosby receives the National Medal of Science from U.S. President Jimmy Carter in 1980.

coach of the boys basketball team, and became superintendent of the four-room school. (While she was there, she got the school on the prestigious state university list of high schools, by impressing the inspector with a Morse code machine that linked the classrooms.)

But she could not forget her work in science. She tried to make do with a makeshift laboratory her father set up in the attic over the garage, but it wasn't sufficient. With characteristic verve mixed with humility, she approached G. Carl Huber, director of anatomy and professor of the anatomical laboratories at U-M, and requested a "corner to work in." She was given a student assistantship, and then a junior instructorship. After 16 years at U-M, she became the first full female professor in the history of the medical school. The way she put it? "I got promoted – the way people do."

There were actually two phases of Crosby's career. The first was completely academic. But her expertise in the human nervous system proved to be too useful for medical professionals to pass up. U-M's pioneering neurosurgeon Edgar Khan, for instance, began a long and fruitful association with Crosby. After she retired from U-M in 1958, she split her time as an active professor emerita at U-M and the University of Alabama at Birmingham, and continued to offer her vast knowledge to the field of medicine.

The White House

In 1980, President Jimmy Carter addressed the audience during a formal ceremony in the East Room of the White House.

"We are in the midst of an age of discovery, not of continents, but of new knowledge," he said into the microphone.

Twenty of the top scientists in the country were in the room, waiting to receive the National Medal of Science. One of them was a stooped and elderly lady on crutches. When it was her turn, a towering Marine offered to help Elizabeth Crosby get up the steps, but she refused. Slowly but surely she made her way on stage to receive the nation's highest honor for contributions to science, a crowning achievement for a lifetime of work. She was 91 years old.

According to Robert Husband, professor emeritus of biology at AC, something similar happened during a visit to the Adrian campus later in her life. When he saw her struggling with her crutches, he tried to help.

"She slapped away my hand and said, 'If I accept help, I'll never get used to walking,'" he recalled.

Husband has deep respect for Elizabeth Crosby. That's why he named a fund for AC biology faculty in her honor. He views her as Adrian's most outstanding science graduate, which is what made her opening remarks on campus seem so remarkable to him.

"We gave her the usual big introduction, you know, everything we knew about her, and she said, 'You know, if you live long enough, and you work at it, you'll accomplish something,'" Husband said.

"A lot of people who get famous take credit for a lot of stuff they don't do," Husband said. "She was just the opposite. She'd help others, and then say, 'Put your own name on it, I don't care.' The point is to put it in front of the scientific community. She was an excellent role model, I thought."

Ed Lauer, an Adrian colleague

In addition to her major contributions as a scientist and a teacher, Crosby was a mentor to many doctoral students, many of whom went on to work and publish with her during their careers. **Ed Lauer '23** (1902-1994) was one such person. He led an almost parallel life to Crosby, growing up in Petersburg and becoming a teacher and administrator there as well. Then he went to the University of Michigan, earned a doctorate in neuroanatomy, and enjoyed a long and productive career as a professor in Crosby's department. He and Crosby collaborated on many projects, including the book "Correlative Anatomy of the Nervous System," co-written with a third author and contributors.

After Lauer retired, he got a reputation for selling lab coats. When medical students finished the cadaver dissection in gross anatomy, they usually didn't want their lab coats anymore. Lauer gathered them up, laundered them, and sold them to incoming students to help him maintain the department library.