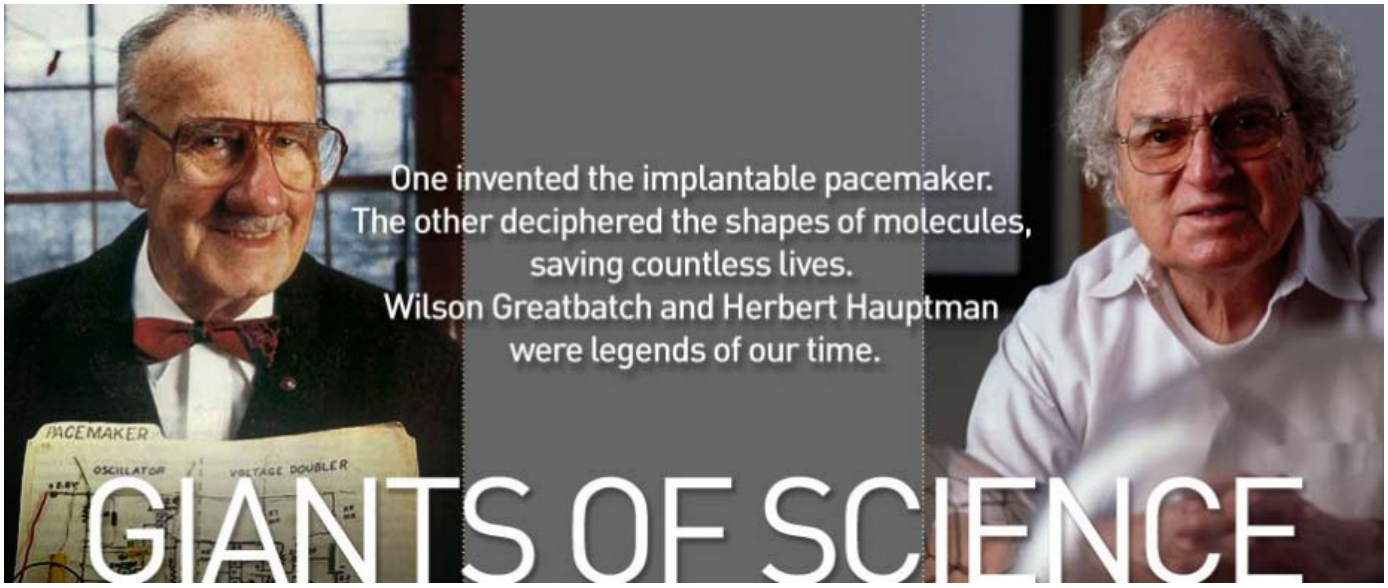

By CHARLOTTE HSU

In 2011, Western New York lost two of its greatest scientific minds: Wilson Greatbatch, inventor of the implantable pacemaker, and Herbert Hauptman, a Nobel laureate whose methods for deciphering the shapes of molecules propelled the development of modern pharmaceuticals.

Greatbatch, 92, died on Sept. 27. Hauptman, 94, died on Oct. 23.

During their long and distinguished careers, both served on UB's faculty and conducted research with UB colleagues. The two were friends, and no wonder. Each was a man of ideas, of limitless curiosity. Each believed in the power of science to change lives. Each solved problems that men and women of their generation once thought were impossible.

Together, Hauptman and Greatbatch helped lay the foundation for Buffalo Niagara's medical industry, building up a pair of venerable institutions that today remain two of UB's strongest partners: Hauptman-Woodward Medical Research Institute (HWI) and Greatbatch Inc.

Friends at UB remember Hauptman and Greatbatch for their intellect and bold achievements, and also for their generosity. Each man was an inspiration because he not only lived his own dreams, but encouraged others to do the same.

Jump to a story, video and timeline remembering Wilson Greatbatch >

Jump to a story, video and timeline remembering Herbert Hauptman >

The Humble Tinkerer

Wilson Greatbatch (September 6, 1919 — September 27, 2011)

The world was full of things that were broken, and Wilson Greatbatch spent a lifetime fixing them. His appearance was orderly—he wore a coat and bow tie, and combed his hair back—but his mind was a place where anything could happen. He was a man of ideas, many of them extraordinary.

Endlessly curious, he approached even day-to-day problems with a scientific framework. On one occasion, he tracked down scientist Esther Takeuchi in the research division of his company, Greatbatch Inc.

"I need a pH meter," he told her.

He was using chicken manure to fertilize his garden and the droppings were causing his pitchfork to corrode. He

needed the pH meter to measure the acidity of the soil so that he could find a way to stop the deterioration.

Takeuchi, now a UB faculty member, smiles as she recounts the story.

"I miss him," she says. "The world is a sadder place for him having passed away."

No problem was too small for Greatbatch to address. Likewise, no problem was too huge. The one the world will remember him for solving was enormous: In the 1950s, he invented the implantable cardiac pacemaker, a life-saving device that uses electrical impulses to regulate the heartbeat of patients whose hearts are pumping too fast, too slow or erratically.

A humble tinkerer who saw the hand of God in human works, Greatbatch came across his most famous discovery by chance.

It was 1956 and he was an assistant professor and master's student in UB's electrical engineering department. While building a device for recording heart sounds, he grabbed the wrong resistor from a box full of them. When he installed the part, the circuit he was constructing emitted a broken pulse.

Other scientists might have missed the significance. But Greatbatch recognized the pattern at once: It was an electrical rhythm capable of driving a heart.

"The thing went 'blip' and then it waited a second and then it went 'blip' again," Greatbatch said years later, recalling the moment in a video interview. "And I said, 'Oh my good heavens. What did I do? I've got to tear it apart.' And then I looked at it again and said, 'Oh that's a pacemaker.'"

External pacemakers that drew power from electrical outlets existed in the 1950s, but Greatbatch believed he could embed his circuit into a device small enough to implant.

The next few years flew by in a whirlwind of invention.

In the wood-heated barn in Clarence, N.Y., that served as his workshop, Greatbatch fashioned 50 prototypes that doctors then implanted into animals and humans. His primary partners on the project were a pair of surgeons at Buffalo's Veterans Affairs Medical Center: William Chardack and Andrew Gage, the latter of whom would go on to serve as a UB medical professor for more than 40 years.

At the time, the thought of burying a gadget in a patient's chest was radical. But the idea caught on and a company called Medtronic licensed and began manufacturing the Chardack-Greatbatch pacemaker, to great success.

The device turned out to be the first of many inventions for a man who later would tell lecture halls full of UB students to keep their minds open to far-fetched ideas: Nine out of 10 things he tried didn't work, Greatbatch would counsel, but the 10th paid for the rest.

In science, as in his private life, Greatbatch was no agnostic. He had strong opinions about right and wrong, and believed that people should use their talents to help others. What mattered most was not money or recognition, but doing good.

That philosophy was deeply ingrained at Wilson Greatbatch Ltd.—the predecessor to Greatbatch Inc.—which Greatbatch established in 1970 to develop longer-lived batteries for medical devices.

Brimming with ideas and curiosity, Greatbatch would walk the halls, querying researchers about their experiments and telling them about his own. He welcomed risk-taking in science—a notion sometimes difficult for companies to embrace. He knew employees by name and decided that the company would pay for the children of any worker to go to any college they wanted.

Wilson Greatbatch, inventor of the implantable pacemaker

"If I demand to be paid for what I do, whether it be in the form of money or peer approval, I'm asking to be paid for what I feel is an act of love. The reward isn't in the results. It's in the doing."

— Wilson Greatbatch in 1995 in R&D Innovator

GREATBATCH INC.

Greatbatch Inc., a leader in the design, development and manufacture of components for implantable medical devices, is one of UB's strongest business partners. Founded by famed inventor Wilson Greatbatch, the company has supported UB research, employed UB graduates and provided mentoring for UB students. In 2009, Greatbatch Inc. received UB's Vital Partner Award in recognition of the firm's longtime collaboration with the university.

"He really believed that the company and the employees were on a mission—that our goal was to develop good products that helped the patients and that did right by society," says Takeuchi, who became a notable inventor in her own right while working there for 22 years. When she left Greatbatch Inc. to join UB in 2007, the firm provided some financial support for her university work.

By the end of his life, Greatbatch had accumulated more than 325 patents. He adapted a long-lived lithium-iodine battery for pacemaker use, studied ways to battle cancer and AIDS, and crafted a solar-powered canoe that he sailed on the Finger Lakes for his 72nd birthday.

Starting in 1994 and continuing for 16 years, he visited UB annually to share his love of invention during the Engineering Career Institute, a course that helps aspiring engineers navigate the transition from school to industry. In the end, blind and losing his hearing, but still sharp, Greatbatch would come in using a walker, said Dean Millar, who teaches the class.

Greatbatch was born in an era when films were silent and telephones had only recently become popular. But all his life, he embraced new technologies, teaching himself to use a computer long before the machines were commonplace.

One of his last great projects was promoting nuclear fusion as a source of clean energy. The method he preferred required a non-radioactive isotope of helium called "helium-3." Helium 3 is rare on Earth, but is thought to exist in large deposits on the moon.

For men with narrower minds, this might have posed an insurmountable challenge. But for the man who dreamed up the implantable pacemaker, the answer was simple: "We need to set up a space station on the moon," he told a magazine interviewer in the 1990s.

Where others saw problems, Greatbatch saw solutions. The world was better for it.

WATCH VIDEO

Wilson Greatbatch: Lemelson-MIT Lifetime Achievement Award Winner

Curiosity and a true passion for innovation led Wilson Greatbatch to become one of the greatest inventors of our time. In this video from the Lemelson Foundation, meet Greatbatch.

Related Links

New York Times Obituary: Wilson Greatbatch, Inventor of Implantable Pacemaker, Dies at 92

National Inventors Hall of Fame Profile: Wilson Greatbatch, 1986 Inductee

The Venerable Toolmaker

Herbert Aaron Hauptman (February 14, 1917 — October 23, 2011)

When he told the story of how he calculated the circumference of the Earth, Herbert Aaron Hauptman would light up with wonder.

It was an old experiment he replicated: Using only simple tools and the impressive computing power of his mind, he recorded the slightly different times of sunset at two locations on a beach and used that data to deduce the dimensions of the planet.

It was simple geometry. But to Hauptman, it was astonishing. Throughout his life, he appreciated the world on a mathematical level, said George DeTitta, a friend and structural biologist at Hauptman-Woodward Medical Research Institute (HWI) and UB.

As a child, Hauptman searched for order in classical music and delighted in the patterns he discovered. Later, as a mathematician at the Naval Research Laboratory in Washington, D.C., he turned his attention to decrypting another enigma: the structures of molecular crystals.

The work was in a field called "crystallography," and Hauptman excelled in it.

At the time, scientists knew that when a crystal was struck with an X-ray beam, the beam would scatter, forming a distinctive pattern. In 1953, Hauptman and chemist Jerome Karle published a monograph showing it was possible to invert that relationship—to use the X-ray diffractions to divine the atomic structures of molecules within a crystal.

Using mathematical probability theory, Hauptman and Karle devised equations that translated the patterns into a molecular map showing the precise positions of every atom. The finding was revolutionary, not least because the shapes of molecules dictate how they work in life-saving drugs.

Initially, however, the mathematical tools that Hauptman and Karle created were met with hostility. Many crystallographers did not believe what the partners had achieved could be done. At the Naval Research Laboratory, Hauptman's superiors began pushing him to change his focus.

Herbert Aaron Hauptman, Nobel Prize-winning crystallographer

"All I had to hear was that here was a problem that no one could solve...that was even impossible to solve in principle. Once I heard that, then there was no letting go."

— Herbert A. Hauptman in 2008 on WNED-TV

"They wanted him to turn the laser into a killing weapon and he didn't have any desire to turn the laser into a killing weapon," says Bill Duax, a structural biologist at HWI and UB who remembers Hauptman as a die-hard liberal who visited schools in developing countries to teach his methods.

In 1970, Duax traveled to see Hauptman in Washington, D.C., with Dorita Norton, the research director of the Medical Foundation of Buffalo, a small, nonprofit biomedical research institute where Duax worked.

Over slices of pecan pie made by Hauptman's wife, Edith, the three discussed Hauptman's career. The conversation helped convince Hauptman to move north later that year. In Buffalo, he joined UB's biophysical sciences faculty and the institute, succeeding Norton as research director in 1972.

With Hauptman in the lead, colleagues with different expertise worked together to advance crystallography. Duax, who had an eye for pattern recognition, hunted for patterns in X-ray diffractions, which are recorded on film as spots of light of varying intensity. DeTitta, a postdoctoral fellow Hauptman hired in 1973, helped convert Hauptman's hand-written notes into computerized algorithms for solving molecular structures.

Confirmation of the work's importance came the morning of Oct. 16 in 1985. Hauptman was swimming at the YMCA when Duax phoned: Hauptman and Karle had won the Nobel Prize in chemistry.

"We celebrated," remembers Duax, who bought champagne and caviar for the occasion. He smiles. "We're still celebrating."

With the Nobel Prize, requests poured in asking Hauptman to appear as a guest speaker. During a talk with UB's graduate group in advanced scientific computing, Hauptman wrote a large equation on the board. Chalk dust flying, he told the audience that solving the equation would solve a central problem in crystallography.

The words caught the attention of Russ Miller, a young UB professor who had co-founded the advanced computing group and would go on to found UB's Center for Computational Research. After Hauptman's lecture, Miller approached DeTitta to discuss the presentation. What followed was one of the most exciting and fruitful times of the scientists' careers.

Leveraging Miller's skills in supercomputing, a team that included Hauptman, David Langs, Charles Weeks and DeTitta cracked important mysteries in crystallography. They used high-end computing systems to solve the equation Hauptman had chalked, in effect devising ways to apply Hauptman's mathematical tools to deciphering the shapes of ever-larger molecules.

In 1994, in the midst of this work, the Medical Foundation of Buffalo was renamed the Hauptman-Woodward Medical Research Institute in honor of Hauptman and Helen Woodward-Rivas, an early philanthropist.

"It is literally the case that methods that (Hauptman) developed had an impact on the development of every modern drug that's currently out there," DeTitta says. "The methods took us from a position where the study of molecules with more than seven or eight atoms was a tour de force, to the point where we literally look at structures with tens of thousands of atoms routinely."

At the institute, Hauptman created an atmosphere where people felt they could explore any line of inquiry —however radical, however extraordinary. Today, the 18 professors and 10 graduate students in UB's structural biology department, which opened at HWI in 2001, are pursuing not one kind of research, but many.

Some—like DeTitta, who is perfecting techniques for growing crystals—are toolmakers in Hauptman's tradition. Others are studying viral and bacterial pathogens, the molecules that cause disease. Duax is working with high school students from Buffalo to investigate whether bacteria that have existed for 3 billion years may rely on a genetic code simpler than that of later species. In biology, this is a wild idea, one that defies all convention.

Hauptman himself continued working into his 90s. His mind remained sharp; he could still sing "Ode to Joy" in German and recite large portions of the "Rime of the Ancient Mariner," both of which he memorized in his youth.

HAUPTMAN-WOODWARD MEDICAL RESEARCH INSTITUTE (HWI)

Hauptman-Woodward Medical Research Institute (HWI), an independent, nonprofit biomedical research institute, is one of UB's strongest community partners. Inspired by Nobel laureate Herbert Hauptman, HWI scientists build understanding of the roots of disease by studying the structure of molecules. The institute houses UB's structural biology department and attracts scientific talent from around the world to Buffalo.

WATCH VIDEO

Herbert Hauptman: Portrait of a Laureate

Herbert Hauptman's courage to challenge conventional wisdom in crystallography changed the way scientists around the world study and develop drugs. In this clip from Toward

At the institute, with his mane of curly white hair, Hauptman was hard to miss. He was a man of another generation. He would sit down with his thoughts, a yellow legal pad and No. 2 pencils. These were his laboratory. He never learned to use a computer, though computers were what brought his work to life and gave it utility in drug design.

He succeeded because he did what he loved and trusted his colleagues, his friends, to do what they did best.

Castle Films and WNED, meet Hauptman.

Related Links

New York Times Obituary: Herbert A. Hauptman, Nobel Laureate, Dies at 94

Nobel Prize Autobiography: Herbert A. Hauptman, Co-Recipient of the 1985 Nobel Prize in Chemistry

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