

Retrospective: Marshall Nirenberg (1927–2010)

BY NICOLE KRESGE

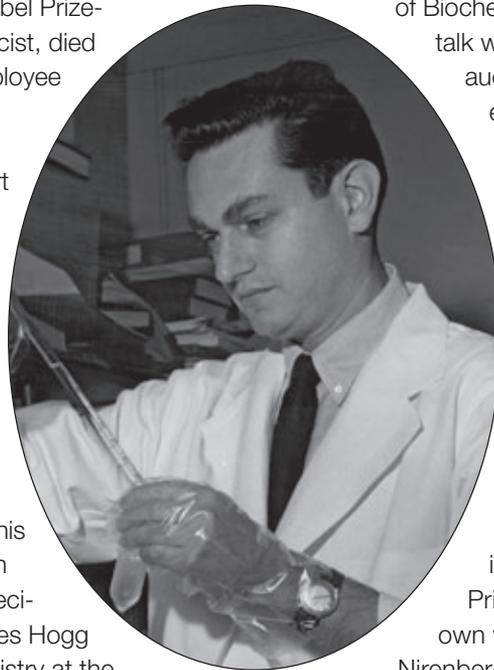
Marshall Warren Nirenberg, a Nobel Prize-winning biochemist and geneticist, died Jan. 15. He was the first federal employee to win a Nobel Prize in physiology or medicine, sharing the honor in 1968 with Har Gobind Khorana and Robert W. Holley “for their interpretation of the genetic code and its function in protein synthesis.”

Nirenberg was born in New York City in 1927. Early on, he developed an interest in biology and attended the University of Florida at Gainesville, earning a Bachelor’s of Science in 1948 and a Master of Science in zoology in 1952. During this time, he also developed an interest in biochemistry, which influenced his decision to pursue a doctorate with James Hogg in the department of biological chemistry at the University of Michigan, Ann Arbor. Nirenberg received his degree in 1957.

After graduating, Nirenberg moved to Bethesda, Md., to work at the National Institutes of Health, where he would spend the rest of his scientific career. He first did a postdoctoral fellowship with DeWitt Stetten Jr. and William Jakoby at the National Institute of Arthritis and Metabolic Diseases. Then, in 1960, he became a research biochemist in the section of metabolic enzymes, headed by Gordon Tompkins. Two years later, he became head of the laboratory of biochemical genetics at the National Heart, Lung and Blood Institute.

Initially, Nirenberg studied sugar transport, glycogen metabolism and enzyme purification, but he soon changed his focus to protein synthesis. Working with plant physiologist Heinrich Matthaei, Nirenberg developed a system to observe protein synthesis *in vitro* and was able to demonstrate the existence of mRNA. The system also allowed him to determine that a sequence of three uracil bases in a row coded for the amino acid phenylalanine. It was the first demonstration of the existence of codons.

He presented his findings at the International Congress



of Biochemistry in Moscow in 1961, but his talk was largely ignored. Luckily, one of the audience members persuaded the conference leaders to let Nirenberg repeat his lecture in front of a larger audience, and, speaking before more than a thousand people, Nirenberg convinced the crowd his findings were legitimate.

Once he made his techniques public, Nirenberg set about figuring out more of the genetic code. But, he had dozens of codons left to decipher and was competing against larger, better-equipped labs. Faced with the possibility of helping the first NIH scientist win a Nobel Prize, many NIH scientists put aside their own work to help Nirenberg, and, by 1965, Nirenberg and his colleagues had created a 64-square table containing the genetic code.

Nirenberg continued to make significant discoveries in neurobiology and genetics, studying gene expression, stem-cell differentiation and nervous-system development. In addition to the Nobel Prize, he received many awards and honors, including the National Medal of Science in 1966 and the National Medal of Honor in 1968.

“Despite his reputation for modesty, Dr. Nirenberg inspired generations of students and scholars who devoted their careers to studying the ‘code of life,’ genetics and neurobiology,” said Francis S. Collins, director of the NIH. “He not only was a scientist’s scientist, but a mentor’s mentor. During his life, he was awarded virtually every high honor reserved for science and medicine. Just last fall, in an occasion marked by a symposium in his honor, the American Chemical Society designated Dr. Nirenberg’s work as a National Historic Chemical Landmark.” ☾☾☾

Nicole Kresge (nkresge@asbmb.org) is the editor of ASBMB Today.

PHOTO BY N. MACVICAR, COURTESY OF THE NATIONAL INSTITUTES OF HEALTH.