



EMBRYOLOGY ALUMNUS ANDREW Z. FIRE SHARES

NOBEL PRIZE

Andrew Z. Fire, who discovered RNA interference (RNAi) while at Carnegie's Department of Embryology, along with Craig C. Mello of the University of Massachusetts Medical School, was awarded the 2006 Nobel Prize in Physiology or Medicine on October 2.

The Fire-Mello discovery that double-stranded RNA can quash the activity of specific genes is a major breakthrough in modern molecular biology. RNAi is now used as a research tool and for the development of products that could combat diseases such as cancer and HIV.

"Every one of us at Carnegie is thrilled for Andy, for the institution, and for the promise this discovery has for advancing our understanding of basic molecular processes and helping cure disease," said Carnegie president Richard A. Meserve. "Andy's work is a vivid example of how Carnegie's commitment to freedom of research can yield extraordinary results for humanity." Fire was employed by Carnegie for 17 years. He joined the faculty of Stanford University in November 2003 to be closer to his family.

THE DISCOVERY

In 1997 the Fire-Mello team found that by specially designing RNA with two strands they could silence targeted genes. The single-stranded RNA molecule of messenger RNA, also known as "sense" RNA, conveys information from a DNA template to the machinery that "turns on," or expresses, a specific gene. The Fire-Mello RNA molecule has two strands similar to the famous double-helix structure of the related molecule DNA. One strand of the double-stranded RNA molecule is sense RNA, with a structural sequence that is the same as the nucleotide sequence in the target gene. The other strand, known as "antisense" RNA, has a complementary sequence to that in the target gene. When the double-stranded molecule is



The Nobel Prize Medal for Physiology or Medicine.

A model of ribonucleic acid, RNA, appears upper left. There are several forms of RNA; all are involved in protein synthesis.

Andrew Z. Fire (top right) appears at a press conference about his shared Nobel Prize on October 2.



(Image courtesy Andrew Fire.)

Carnegie alumnus and Nobel Prize winner Andrew Fire stands with members of his Carnegie lab in 2001. Fire is in the center in the blue jacket.

Fire (center) is congratulated by students in his Stanford office.



(Image courtesy Linda A. Cicero / Stanford News Service.)

introduced into an organism, it interferes with the message-carrying process and shuts down the gene.

RNAi also exists naturally as a defensive mechanism in cells. Using RNAi, scientists now routinely “knock out” specific genes to prevent their expression, observe the disruptions to normal processes, and thereby help determine what the gene does. The method also opens up the possibility of treating various types of diseases by either shutting down the disease-causing gene or by directing researchers to appropriate pathways for developing new drugs. The Fire-Mello discovery is patented and has been widely licensed in the U.S., Europe, and elsewhere.

THE MAN BEHIND THE PRIZE

Fire, a California native, received an A.B. in mathematics from the University of California, Berkeley, in 1978. He went to the Massachusetts Institute of Technology (MIT) for graduate work, studying RNA polymerase type 2 transcription under Phillip Sharp, a Nobel laureate in gene research. Fire received his Ph.D. from MIT in 1983 and won a Helen Hay Whitney Fellowship to conduct research on the nematode *Caenorhabditis elegans* at the Medical Research Council Laboratory of Molecular Biology in Cambridge, England, under the guidance of Sydney Brenner.

In 1986 Fire was appointed a staff associate at Carnegie’s Department of Embryology, ordinarily a nonrenewable junior faculty position. However, Fire’s research progress was so significant that he was promoted to the position of staff member. Staff members at the department automatically receive an unpaid part-time position in the Department of Biology at The Johns Hopkins University. Fire joined the faculty of Stanford University in November 2003, but maintains strong ties with Carnegie as a Carnegie Investigator.