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National Medals for molecular biology

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President Bush announced eight winners of the 2002 National Medals of Science, the nation's highest honor for lifelong achievements in science and engineering, on Wednesday (October 22). The honorees included biologists Evelyn M. Witkin, Barbara McClintock Professor Emerita at Rutgers University, and James E. Darnell Jr., Vincent Astor Professor at Rockefeller University.

The National Science Foundation, which administers the awards, cited Witkin's discoveries of how cells act to repair or resist DNA damage. "I was overwhelmed, very honored, and of course, gratified" by the medal, said Witkin, who has worked in genetics since the 1940s.

In a key finding in the early 1970s, Witkinidentified a way that cells respond to DNA damage by increasing their mutation rate. Although this may harm individual cells, it helps populations of them evolve to a more resistant form.

The system, called SOS response, operates when DNA damage holds up genetic replication. This leads a protein called RecA to attach itself to the DNA. RecA then acts together with another molecule - probably the nucleotide precursor dATP, according to Witkin - to cleave a repressor called LexA, allowing the genes to continue the replication process through the damaged region, all the while inserting new changes in that region. RecA's action thus increases the mutation rate about 100-fold.

Similar systems, in which DNA damage activates banks of genes, later turned out to operate in response to other kinds of cellular stresses, such as oxygen toxicity or heat, Witkin told us. Such mechanisms may also operate in cancer.

Rockefeller University's Darnell, who heads the school's Laboratory of Molecular Cell Biology, was honored for 4 decades of work on gene regulation. His achievements include discovering pathways by which cell receptors signal genes.

"These signals are sent in reaction to changes in the cell's external environment in the body. As a result... the genes may express a message for a specific hormone or other protein, or halt gene expression or activation," explained Rockefeller President Paul Nurse in a prepared statement. Darnell was at a conference abroad and unavailable for comment.

In particularly far-reaching findings, Darnell in the mid-1990s identified a cell-signaling route, the JAK-STAT pathway, that helped to clarify the biology of human cancers including multiple myeloma and head and neck tumors, Nurse said. This "promoted a flurry of research into the ways cells receive signals to become and remain specialized, to respond to growth factors and to deal with infection."

Other National Medal winners include a physicist who worked on magnetic resonance imaging (MRI), the medical scanning technology whose history sparked controversy earlier this month when the Nobel Academy conspicuously passed over one of its other noted developers, honoring two otherMRI inventors instead.

Physicist Richard L. Garwin, a senior fellow for science and technology at the Council on Foreign Relations who received the Medal of Science, said his research in the 1950s, predating MRI's medical

use, helped to speed the scanning process. "My contribution was really a minor one," he told us "My real contributions have to do with particle physics." Garwin was also cited for his research on particle physics, superconductors, military technology, and arms control.

The other medal winners are W. Jason Morgan of Princeton University and Edward Witten of the Institute for Advanced Study, both for physical sciences. Medals in chemistry, mathematics, and engineering, respectively, went to Stanford University's John I. Brauman, Stony Brook University's James G. Glimm, and Leo L. Beranek, who is retired from BBN Technologies, in Cambridge, Mass.

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