Math enthusiast wins Science Talent Search

What a birthday. On March 8, the day he turned 17, Christopher Mihelich of Carmel, Ind., learned he'd won the Westinghouse Science Talent Search and a $40,000 college scholarship.

When the prize was announced, the other finalists and the audience at the awards ceremony at the National Academy of Sciences in Washington, D.C.—a crowd with many distinguished scientists, including a Nobel laureate—burst out singing "Happy Birthday." Mihelich says the top honor surprised him; winners were announced starting with 10th place, and by fourth place he had given up hope. One of three mathematicians among the top 10 winners, he entered a paper proposing new methods for studying polynomial quotient rings.

Second prize, a $30,000 scholarship, went to Ravi Shah of Tempe, Ariz. He investigated repair genes from tumors that resist various cancer drugs. He had previously won honors in chemistry and math, and he placed first in his state, and third in the United States, in the National Spanish Exam.

Parker Conrad of New York took third place and a $20,000 scholarship. He compared the activities of two types of receptors in developing and mature nerve cells. In ninth grade, he started a computer consulting business, and he has understudied a role in a Broadway musical.

Fourth- through sixth-place winners received scholarships of $15,000 each.

Fourth-place winner Sohini Ramachandran of Fair Oaks, Calif., analyzed short sequences of DNA from American and Old World plant populations to determine whether the species could have spread with migrating humans. At 15, she was the youngest winner this year.

Travis Schedler of Carbondale, Ill., captured fifth place with his project on the quantum Yang-Baxter equation, which has implications for various fields of physics. His music inspires his mathematics, and he has performed in jazz choirs.

William Greenleaf of Rochester, Minn., the sixth-place winner, proposed changes in ultrasound methods of delivering DNA to cells for gene therapy. A paper on which he is first author has been accepted by a peer-reviewed journal.

Winners of seventh- through tenth-place awards received $10,000 scholarships.

Ann Kromsky of Corona, Calif., placed seventh with her investigation of how children learn language. Born in the former Soviet Union, she knows Russian, Ukrainian, and French and sings madrigals.

Eighth place went to Jonathan Kelner of Old Westbury, N.Y. He studied quark behavior using grids of random numbers. Kelner edits the school paper, plays varsity tennis, and founded a cancer fund-raising group.

Patrick Goodwill of Plano, Texas, placed ninth. A classical pianist as well as a chemist, he developed a silicon-diamond sensor he believes could dramatically cut costs of detecting contaminants in semiconductor processing.

Tenth-place winner Jesse Anttila-Hughes of New York used a mathematical model of the transmission of nerve impulses to simulate the disease myasthenia gravis. He has also won a scholarship to study in Japan.

Each of the remaining 30 finalists will receive a $1,000 scholarship.

Five finalists from earlier years have gone on to win Nobel prizes, said head judge J. Richard Gott of Princeton University, but only one of those laureates had made it into the top 10. Gott consoled the rest of this year's finalists by saying, "Statistically, this increases your chances of winning a Nobel prize."

Westinghouse winners (from left) Shah, Mihelich, and Conrad.

The 1998 awards mark the end of 57 years of Westinghouse sponsorship. Science Service, which administers the Science Talent Search and publishes SCIENCE NEWS, expects to announce the new sponsor later this month. —*S. Milius*

Stimulating clue hints how lithium works

Some 50 years ago, Australian physician John Cade observed the calming effect that lithium had on small animals. After testing the safety of lithium on himself, Cade ventured to try it on people suffering from the wild mood swings of manic depression.

Millions of prescriptions later, lithium remains the most popular choice for treating manic depression, although scientists do not understand how it quells mania or relieves depression. "It's still a mystery," says De-Maw Chuang of the National Institute of Mental Health in Bethesda, Md.

Now, there's a new clue to this riddle. Chuang and his colleagues have found that lithium protects brain cells from being stimulated to death by glutamate, one of the many chemicals that transmit messages in the brain.

The new data suggest that lithium may calm overexcited areas of the brain or, more provocatively, preserve the life of brain cells whose presence guards against manic depression.

This finding "potentially contributes a lot to the field," says Husseini K. Manji of Wayne State University in Detroit. "If we could figure out how lithium works, we could theoretically come up with better drugs and perhaps understand what's going on in manic depression."

Chuang and his colleagues tested the response of various types of rat brain cells to glutamate. Many normal cells and cells soaked in lithium for only a day died from a form of suicide that often results when this neurotransmitter overstimulates a brain cell.

Yet rat brain cells soaked in lithium for about a week committed suicide much more rarely when exposed to glutamate, Chuang's group reports in the March 3 PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES. The effect was seen in cells from several brain regions.

The delay in protection is particularly striking, notes Manji, since a hallmark of lithium therapy is that it can take a week or longer to benefit people. Consequently, scientists have been looking for the long-term actions of lithium on brain cells.

Chuang's team also examined the role of the NMDA receptor, the cell surface protein that glutamate binds to when it excites a cell. While cells soaked in lithium for a week had as many NMDA receptors as untreated cells, the treated cells responded differently.

Normally, activation of the NMDA receptor by glutamate triggers an influx of calcium ions, setting off a signaling cascade inside cells. However, cells soaked in lithium for a week let in far less calcium when exposed to glutamate.

In people with manic depression, lithium may correct a dysfunction of the NMDA receptor by limiting calcium influx, speculates Chuang.

Both Chuang and Manji also note that a small body of evidence suggests that people with mania or depression may lose brain cells. Lithium may thwart that cell death, they say. Indeed, Manji has some evidence that lithium-treated cells eventually begin to overproduce a protein that stymies the cell's internal suicide program.

If lithium protects brain cells from death by glutamate overstimulation, it may have uses beyond manic depression. This form of cell death occurs in strokes and in Alzheimer's, Parkinson's, and Huntington's diseases. Chuang is investigating whether lithium protects mice from similar neurodegenerative illnesses. —*J. Travis*