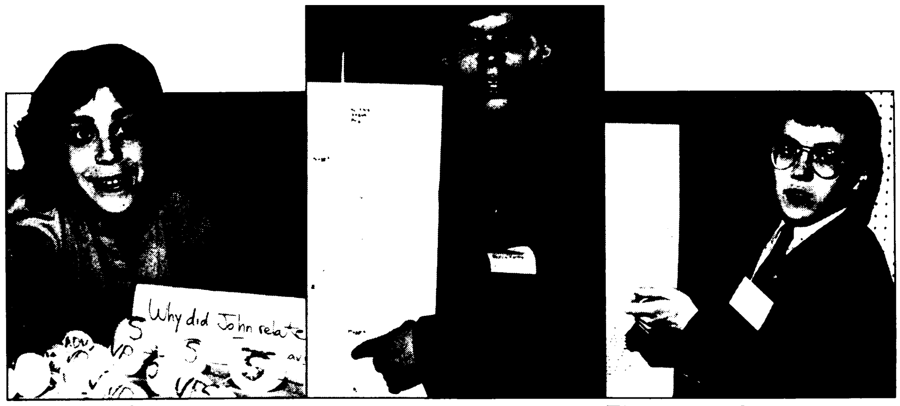
Precocious 10 share $74,500 in awards



Photos: William E. Carnaham

First place: Gordon. *Second place: Kantor.* *Third place: Gurel.*

"Al heard that Bob knew that Carl died yesterday," intones Reena Beth Gordon with as few telltale inflections as possible. "Now tell me, what happened yesterday?" There are at least three correct answers: Al heard, Bob knew, Carl died. Yet when asked that question, most people will almost invariably answer identically: Carl died. Why? People interpret ambiguous sentences in the syntactically easiest way, she found. Gordon's research brought the Harvard-bound 15-year-old a $12,000 scholarship this week as top winner in the 41st annual Westinghouse Science Talent Search.

Gordon was among 40 high school seniors selected to compete for Westinghouse Electric Corp. awards (SN: 1/30/82, p. 71). Eight scientists, including Science Service President Glenn Seaborg (a 1951 Nobelist in chemistry), judged the students on the research projects that brought them to this five-day session of the Science Talent Institute in Washington. This competition, administered by Science Service, seeks to "discover and develop scientific and engineering ability" among high school students. And the judging was intense: One student jokingly referred to it as "grueling interrogation." But there were also lighter moments, encounters with congressmen and Vice President George Bush—and the awards, presented Monday night at a black-tie banquet. The top 10 shared $74,500 in college scholarships, the remaining 30 took home $500 cash awards.

Like Gordon, Ronald Marc Kantor, 17, is a New Yorker. He captured second place and a $10,000 scholarship by numerically modeling pressure profiles for axisymmetric magnetic "bottles" that are being postulated to contain future fusion-reactor plasmas. Beginning last summer as an intern with Harold Weitzner of the Courant Institute at New York University, Kantor wrote computer codes to model plasma-stability profiles that Weitzner had analytically derived. Then Kantor tested the codes on computers at the National Magnetic Fusion Energy Computer Center in Livermore, Calif. The budding physicist told Science News that he hopes to publish his work in Physics and Fluids.

Third-place winner Ogan Gurel, 17, is another New Yorker (though a native of Ankara, Turkey) and $10,000 scholarship winner. The "universal" software (programing) development system he created will run on any 16-bit microprocessor. Called APLSIMUL, Gurel's system structures the programing environment, he said, so that writing and correcting computer programs is simplified. Helen Elaine Getto, 17, placed fourth and was awarded a $7,500 scholarship. She simplified the hemoglobin molecule in red blood by substituting manganese III for two of the molecule's four iron atoms. The young Chicagoan then went on to isolate what appears to be the "relaxed" form of hemoglobin.

Fifth place, and another $7,500 scholarship, went to Theron William Stanford, 17, of San Marino, Calif., for mathematics research into the likelihood — which he found to be 0.8073 — that any two randomly chosen integers would share a common, unitary devisor. Sixth place, and a $7,500 scholarship, became the prize of Mitchell Tsai, 15, of Kent, Ohio, for a microcomputer examination of the "Jupiter effect." Rest easy. His calculations reconfirm Dietrick Thomsen's assertion (SN: 2/27/82, p. 142) that a major planetary conjunction will cause no major physical disturbances on earth.

The remaining four each receive a $5,000 scholarship: Seventh-place Niels Phinn Mayer, 17, of Corona del Mar, Calif., developed a low-cost waveform recorder to capture nanosecond-rate signal transients for display and computer analysis. Eighth-place Noam D. Elkies, 15, of Stuyvesant H.S. in New York determined what he believes is the lowest mathematical boundary for an "order-n sum-distinct set." A first-place award winner in the 1981 International and U.S. Mathematics Olympiads, Elkies is also a prodigious composer who is about to have the world premier of one of his works at the Juilliard School of Music in New York. Ninth-place Saechin Kim, 17, from the Bronx H.S. of Science in New York submitted research conjectures and theorems involving three generalizations of "perfect numbers." A study of the function of inner-surface proteins in red-blood-cell-membrane binding sites garnered Lynne Page Snyder, 18, of Smithtown, N.Y., tenth place. □

A membrane path to oxygen-enriched air

Oxygen is one of the most important chemicals used in industry. Often it is just taken from the air, but many industrial processes require oxygen-enriched air. Now, a research company has developed a method of producing oxygen-enriched air that requires less than one-third of the energy of traditional cryogenic methods.

Ian C. Roman of Bend Research, Inc., Bend, Ore., described the novel process recently at the Ninth Energy Technology Conference, held in Washington, D. C. The research was supported by the Advanced Energy Projects Division of the U.S. Department of Energy.

The method depends on a liquid membrane in which a solvent contains carrier molecules, usually transition metal complexes, that selectively and reversibly bind oxygen. The carrier transports oxygen from air across the membrane and leaves nitrogen behind. The resulting product is 88 percent oxygen. Most of the energy requirement is for maintaining a pressure difference across the membrane. Usually, the product side is kept at a lower pressure.

Roman says membrane separations are low-energy processes, but they failed in the past because the selectivity and flow rate through conventional membranes made of polymers were too low. The liquid membranes under development have an oxygen permeability twice that of silicone rubber and a selectivity 15 times higher.

"It's not a new idea," says Roman, "but now we have something that appears viable." In 1960, P. F. Scholander tried using hemoglobin in aqueous solutions, but the approach was impractical because hemoglobin is unstable outside the body.

Processes in which the new oxygen-enrichment method may be useful include nonferrous smelting, welding, medical treatments, wastewater treatment and combustion of natural gas. The researchers also note there is a great potential market for oxygen-enriched air in the synthetic fuels industry. They report, "One estimate places U.S. oxygen demand for converting coal to liquid and gaseous fuels at nearly 10 times the current oxygen production of 60,000 tons per day by the year 2000. Much of this oxygen demand could be satisfied by oxygen-enriched air of the proper oxygen content."

Researchers are now interested in developing thinner membranes to achieve higher oxygen fluxes, perhaps using hollow fibers instead of a microporous polymer as a support. They are also looking at ways of extending membrane lifetimes. Bend Research is filing patent applications on the process. —*I. Peterson*