Talent search winners announced

"Fish gotta swim; birds gotta fly," but it takes scientifically minded high school seniors to worry about the best way. It seems that rigid tails, such as sharks have, are more efficient for swimming than flexible ones. And even if birds don't adopt them, human-powered flying machines, gliders and windmills may be more efficient with better designed low speed airfoils. These are some of the projects chosen by the 40 winners of the 43rd Annual Science Talent Search.

Rubik's cube has 4.3×10^{19} starting positions, which is why it can be such a puzzle. But it can also be used as an aid in the teaching of abstract algebra. How cholesterol moves from one fat carrier to another in human blood could lead to new tests for risk of coronary disease. And an enzyme that may regulate plasma cholesterol may help treat cardiovascular disease. If magnetically levitated vehicles ever come into use, magnetic brakes for them may be provided. From plasmids in DNA to plasma physics in magnetic mirrors, from Pascal's triangle to packing problems in circles, from the effects of exercise on fiddler crabs to the mating habits of horseshoe crabs, from the inhibition of fatty acid metabolism to a new way of making ethanol, these and other projects won their authors invitations to the Science Talent Institute to be held in Washington, D.C., March 1 to 5, where they will compete for $89,500 in Westinghouse science scholarships and awards. The competition is conducted by Science Service, Inc.

This year's winners are 10 girls and 30 boys representing 19 states. They were chosen from 1,056 competitors. They are:

CALIFORNIA: *Michael Tai-Ju Lin,* La Jolla H.S., La Jolla.

CONNECTICUT: *Peter Augustus Mead,* Greenwich H.S., Greenwich.

FLORIDA: *David Michael Zielke,* Merritt Island H.S., Merritt Island.

GEORGIA: *Nathan Andrew Shapira,* Briarcliff H.S., Atlanta.

ILLINOIS: *Ann Renee Davis,* Mather H.S., Chicago; *Matthew Michael Zell,* Evanston Township H.S., Evanston.

INDIANA: *Maxwell James Brothers,* Bloomington H.S. North, Bloomington.

KANSAS: *Derek Alan Ott,* Shawnee Mission East H.S., Shawnee Mission.

MAINE: *Christopher Roland Montanaro,* Oxford Hills H.S., South Paris.

MARYLAND: *Margaret Van-Yu Meng* and *Jan Winter Rivkin,* Centennial H.S., Ellicott City.

MASSACHUSETTS: *Carmela Cristina Amato,* Mt. St. Joseph Academy, Brighton; *Roger Charles Hayward,* Falmouth H.S., Falmouth.

MICHIGAN: *Mark Christopher Hamburg,* H. H. Dow H.S., Midland.

MISSISSIPPI: *William Patrick Minyard,* Starkville H.S., Starkville.

MISSOURI: *Albert Fook Ming Chew,* Carl Junction Sr. H.S., Carl Junction.

MONTANA: *Douglas Edward Galarus,* Sentinel H.S., Missoula.

NEW JERSEY: *Brett David van de Sande,* Neptune Sr. H.S., Neptune.

NEW YORK: *Michah El-Yakim Sageev,* Amherst Central H.S., Amherst; *Sun Hye Yang,* Baldwin Sr. H.S., Baldwin; *Rachel Allison Altura, James Jacob Nahirny, Dina Taylor* and *Terry Yen,* Benjamin N. Cardozo H.S., Bayside; *Jonathan Michael Harwitz,* City Honors H.S., Buffalo; *Jeffrey J. Trester,* North Sr. H.S., Great Neck; *Eva Lana Assimakopoulos, Sandy Chang, Ira Joseph Haimowitz* and *R. A. Hiranya Jayatilleke,* Bronx H.S. of Science, New York; *Steven Joel Frucht,* Hunter College H.S., New York; *Jessica Gabrielle Riskin, Atom Sarkar* and *Bonnie Robin Zietchick,* Stuyvesant H.S., New York; *Eliahu Haym Niewood,* Yeshiva University H.S., New York; *Ken Chang Lin,* Plainview-Old Bethpage H.S., Plainview; *Daniel Paul Schrag,* Fieldston School, Riverdale.

OHIO: *Mark Robert Metzger,* Theodore Roosevelt H.S., Kent.

OREGON: *Ian Robert Gordon,* Stanfield H.S., Stanfield.

WISCONSIN: *Tamara Maureen Harvey,* James Madison Memorial H.S., Madison. □

Bone broken, Lucky needs retread

Wide World

Lucky, a 350-pound turtle, lies awake after synthetic rubber flipper surgery last week in Islamorada, Fla. However, she had a setback several days later when the bone plugged into the left flipper broke. Surgeon Patrick Barry (left), who implanted the $200,000 prostheses, will wait several weeks to decide whether to try another operation, according to Goodyear, the flippers' manufacturer. Researchers used a computer usually employed for designing tires to plan the flippers, which are made of conveyor belt rubber. Lucky lost her own flippers last April, when a shark bit them off while she was mating.

Frost rings used to date eruptions

Bristlecone pines are known to live as long as 5,000 years and are well-equipped to withstand the ravages of their harsh, subalpine habitat. Still, the gnarled trees are not immune to damage caused by extremes of weather. The rings of wood formed each year reveal the trees' response to climatic conditions during a particular growing season. In rare instances, frost damages the wood of mature trees, leaving a hairline-thin zone of weakened cells. These frost rings may allow more precise dating of volcanic events over the past few thousand years because they can be linked to eruptions strong enough to affect climate.

The two primary methods for dating eruptions are historical records and analysis of the volcanic debris encased in polar ice (SN: 6/19/82, p. 408). Valmore C. LaMarche Jr. of the Laboratory of Tree-Ring Research and Katherine K. Hirschboeck of the geosciences department at the University of Arizona, both in Tucson, assert in the Jan. 12 NATURE that the frost rings represent a third and independent record of "climatically affective eruptions." The finding may clarify the volcanic record; the other methods do not necessarily distinguish which eruptions exerted a cooling effect on climate.

The cooling itself results when an eruption propels large amounts of dust and gases into the stratosphere. The particles may remain aloft as long as two or three years, causing global cooling as they absorb incoming solar radiation and prevent it from reaching the ground. Because the short growing seasons of pines living at specific altitudes are well known, it is possible to date a frost event to within several days. The frost rings reflect temperature as cold as −5°C over as few as two successive nights.

The researchers examined bristlecone pines from seven locations in the western United States. They find excellent agreement between the dates of frost rings and known eruptions. For example, the great eruption of Etna on Sicily in 44 B.C. is reflected in frost rings formed in 42 B.C. They also pin down a disputed date for the eruption of Santorini in the Aegean Sea, an event that some archaeologists believe led to the demise of the Minoan civilization on Crete. The accepted date of 1500 to 1450 B.C. is based on Minoan artifacts found at well-dated Egyptian archaeological sites. However, the frost rings indicate that the cataclysm occurred in 1628 to 1626 B.C., which could mean that the event predated the end of the sophisticated Bronze Age culture. LaMarche says that the frost rings correspond closely to radiocarbon dates of samples such as legumes and shrubs presumably about the same age as the eruption. — *C. Simon*