

## GENERAL SCIENCE

# Origin of the Scientist

**Studies of science-talented young people show that drive towards science starts early. Opportunities in school, home and community are important in developing ability.**

By SHIRLEY MOORE

► A MOST ESSENTIAL ELEMENT in the origin of a scientist—his intense and continuing interest in exploring the puzzles of the universe—probably develops before he has ever had a high school course in science or mathematics.

Ninety-five percent of the 356 young finalists at the 11th National Science Fair-International this year were science-oriented by the time they were 14 years old and, presumably, had begun ninth grade.

This important initial interest in science had been catalyzed in 63% even before they entered seventh grade.

Seventeen percent were potential scientists before they opened their first grade readers.

These facts are drawn from the files of SCIENCE SERVICE, which conducts the annual event for outstanding high school sophomores, juniors and seniors from regional and area science fairs all over this country and abroad.

The records show that classroom courses, experiences provided in school or the influence of individual teachers sparked the original drive of one-third of the National Science Fair finalists. One example cited was a teacher of the second grade who had a nature table in her classroom to which all the boys and girls in the class contributed.

## Homes Stimulate Science Interest

The families and home environments of nearly one-fourth, 23.6%, of the talented young people stimulated their bent toward science. Parents whose own response to science was enthusiastic and who made books, materials and opportunities a natural part of their children's lives were most frequently mentioned as having fostered interest and growth in science activities.

The Kethley family of Decatur, Ga., illustrates the lively details that may be involved in the care and feeding of young scientists. During the past six years the three young Kethleys have exhibited 20 science fair projects and have brought home 18 ribbons, five gold keys, four medals, a plaque and a number of other prizes and honors.

John Bryan Kethley, 17, was a National Science Fair-International finalist in 1958 at Flint, Mich., and again in 1960 at Indianapolis. His most recent project work on the stem strength of *Vicia faba* plants included peeling 400 of the beans before planting them in crushed granite in a large herbarium on the kitchen table. For the sake of the beans, the Kethleys did without furnace heat and air conditioning in the kitchen. They also ate soup every Saturday for three

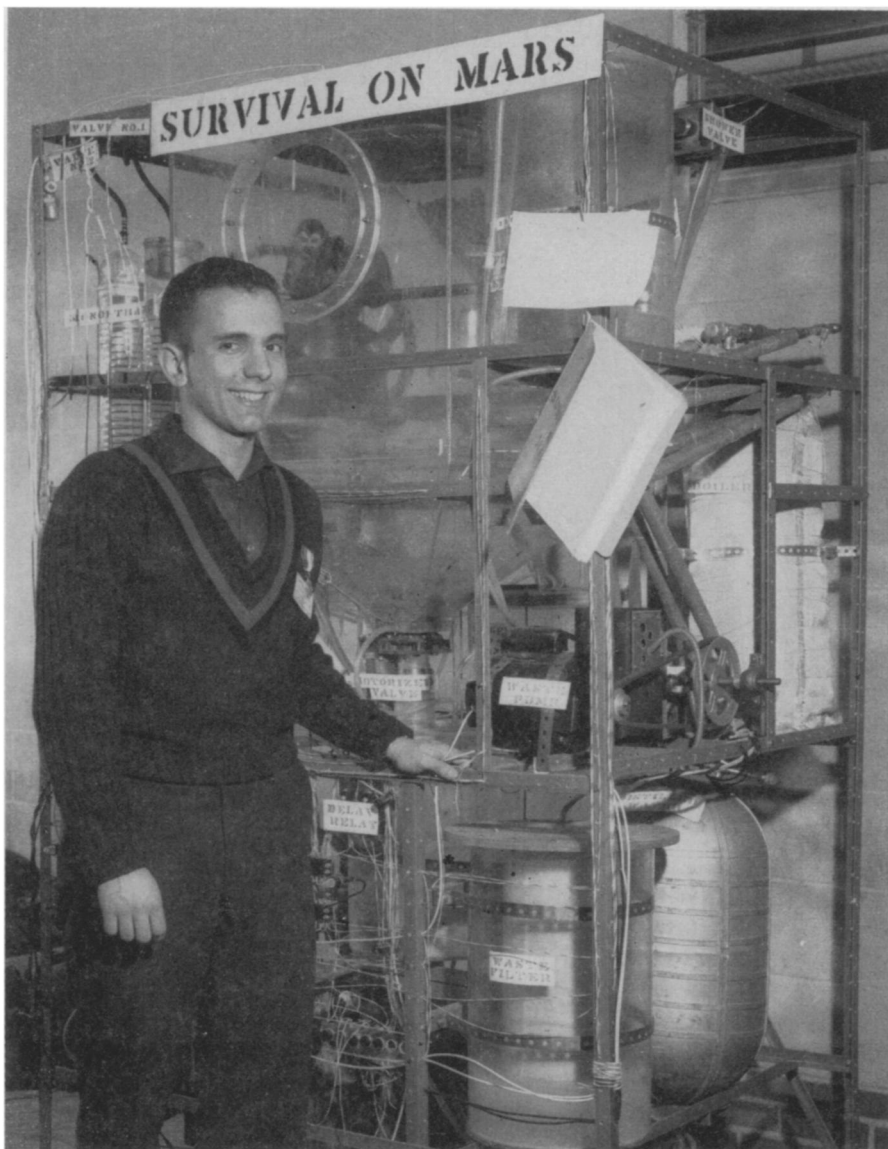
years, because weekly sessions with the bean project in the kitchen made more elaborate meals impossible.

According to his mother, "John does not think of Stone Mountain as the world's largest hunk of exposed granite. He thinks of it as a source of crushed rock for growing beans. He has used two-fifths of a ton of granite, and has spent about 2,300 hours growing and testing 3,000 beans in 400

boxes which were sterilized in the dishwasher."

John's father, Prof. Thomas W. Kethley, head of the Bioengineering Branch at Georgia Institute of Technology, has not only encouraged his own brood but also has worked with the Georgia and Atlanta Science Congresses for many years, probably counseling more young people toward success in science activities than has any other scientist in the state. Mrs. Kethley claims no scientific ability or training, only dedicated enthusiasm as an audience.

Although John has been exposed to science all of his life, he reports that his own interest became focused when he was 12



**FUTURE SPACE SCIENTIST**—David Joel Wilson Jr., 18, of Athens, Ala., won a Second Award at the 11th National Science Fair-International for his ingeniously designed system for maintaining life on other planets. He discussed his ideas with the Wernher von Braun group at the Army Ballistic Missile Agency and spent nearly 1,000 hours perfecting his project.

years old, largely inspired by his father. Next fall he will enter the University of Georgia to prepare for a career of university research in botany.

Some of the finalists apparently are self-starters. Impetus created by their own inherent curiosity, observations and private excursions into research launched 11.8% of these students.

One boy, for example, traces his beginnings to a fossil he discovered in the driveway of his home when he was five years old. This spring, Stewart Peck of Davenport, Iowa, as a 17-year-old high school senior, returned for the second time as a finalist to the national fair.

Now an ardent speleologist, he was selected by the U. S. National Park Service and the National Speleological Society as the head of a biology team which is carrying out a complete zoological study of Wind Cave, South Dakota. His work on unusual cave beetles has been published in speleological journals and his reports were presented at the national speleological convention. Stewart is looking forward to a career in zoology or geology.

### Equipment Arouses Interest

The earliest interest of another 11.8% was caught by scientific equipment ranging from elementary chemistry sets and similar kits to telescopes and amateur radio equipment. Science was discovered by 7.6% in books and magazine articles, and by 5.5% through what they saw and heard at science fairs and science club meetings.

The remaining 4.4% of the group were inspired by adult scientists; television science presentations; films, trips and tours; Boy Scout activities; and similar opportunities.

David J. Wilson, Jr., 18, of Athens, Ala., for example, mulled over his ideas for physical survival on other planets, then took his plans and conclusions to the Wernher von Braun group at the Army Ballistic Missile Agency for criticism and comment. The interest and encouragement given him by these professional scientists launched David on nearly 1,000 hours of dedicated work on the project that won him a Second Award at the 11th National Science Fair-International. Chosen by the U. S. Information Agency to participate in the American entry in the Berlin Industries Fair, David and his "Survival on Mars" project will go to Germany in September.

### Science Career Plans

The career plans of this group of young people include 21% in the medical sciences, 13% in physics, 12% in engineering, 10% in the biological sciences, 8% in as yet unspecified specialties, 7.6% in chemistry and 6% in science or mathematics teaching. A large proportion hope to teach at some time during their professional lives or to combine teaching and research.

Those who have chosen non-science professions and those who have made no choice at all account for an additional 6%. Careers planned outside of science include law,

political science, linguistics and missionary work.

It may be predicted that most of the finalists actually will become professional scientists and/or educators. Half of them may be expected to remain in the field of their present choice.

SCIENCE SERVICE studies of former finalists show that almost all those who are old enough are attending college or graduate school, taking other types of training or engaging in professional work.

Of 352 college undergraduates in one study, 91.8% were majoring in science or education. The 8.2% of the students majoring in non-science fields had chosen religion, social sciences, art, journalism, literature, economics, commerce, music and speech. Of these already employed, about 88% were in scientific, educational or closely allied fields.

### Finalists Studied

A study of 295 finalists drawn from the earliest National Science Fairs, 1950 through 1955, recently was completed by G. L. Daniels, associate professor of science at the University of Montana. His doctoral thesis, "Occupational Choices of Former National Science Fair Exhibitors," was submitted to Teachers College, Columbia University.

Done in cooperation with SCIENCE SERVICE, this detailed study shows 82.2% of the men and 63.6% of the women in scientific or science-related occupations. Various combinations of teaching and/or research are included in the plans of 76.9% of the men and 68.6% of the women.

College was attended by 96.9% of the men and 91.5% of the women in the group.

According to the report, almost 60% of both men and women stated that they were influenced in their choice of career by science fair activities.

"Others probably experienced increased awareness of science career possibilities through their participation," says Prof. Daniels.

### Decisions Made in High School

Career decisions were made most frequently during senior high school years. Women were slightly more inclined to postpone definite choice until they were undergraduates in college, however. In the most frequently chosen professions of this group, more than half of the decisions came during senior high school or before. Women chemists chose their career distinctly later than men, and psychologists of both sexes made late career decisions.

Approximately half of both sexes entered the fields they had chosen in high school. Those who changed their plans usually did so when they developed new interests in college. Marriage changed the minds of 18% of the women.

Prof. Daniels found one-fourth of the women still active in their professions, one-half planning to resume their careers and one-fourth apparently lost to the occupations for which they were educated.

His data also show that over half of these talented young people came from "favored"

economic backgrounds, that approximately half had at least one college-educated parent and that there was a strong preponderance of first-born or only children among the group and especially among those pursuing science careers popularly thought of as "difficult."

### New Finalists Show Old Pattern

The newest additions to the roster of highly promising young scientists, the 356 finalists of the 11th National Science Fair-International, are much like their predecessors, even in their choice of hobbies.

In addition to nearly universal leisure activities in science, the hobbies listed most frequently include individual sports such as fishing, hunting, camping, tennis, swimming, hiking, skin diving and speleology; music; reading; electronics and amateur radio; collections; arts and crafts; photography and microphotography; astronomy; and team sports.

Tabulating the occupations of their fathers, 35% are listed in professional jobs, 31% in clerical-sales-service work, 18% in managerial positions, 8% in factory or unskilled jobs and 4% in farming.

A little less than one-third of their mothers are employed. Of those who work outside their homes, 53% are in professional occupations such as teaching, law and medicine; 37% are in clerical-sales-service jobs; and 6% are working in factories or doing unskilled work.

### College Educated Parents

Two-thirds of the finalists come from homes where at least one parent continued his or her education beyond high school. Some college training was received by 58% of the fathers and 48% of the mothers. College was completed by 42% of the fathers and 26% of the mothers. Advanced degrees were achieved by 23% of the fathers and 7% of the mothers.

The ideas that inspired the outstanding projects exhibited at the National Science Fair-International came from a variety of sources. According to the finalists, 35% of the ideas came from their reading, 24% from their own observations and curiosity, 15% from school, 7% from scientists, 4% from science equipment and 3.5% from their families. Other sources mentioned were science seminars and summer programs, and jobs in laboratories.

Such statistics as those reported in the Daniels and SCIENCE SERVICE studies are heartening to individuals and organizations dedicated to helping science-minded young people. They offer significant support for the creative planning, effort and funds that are being invested by families, schools, communities and Government agencies all over the world.

*(Copies of the summary, conclusions and recommendations contained in Prof. G. L. Daniels' report are available upon request and receipt of self-addressed, stamped, long envelope. Write Science Clubs of America, 1719 N St., N.W., Washington 6, D. C.)*

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