EDUCATION

Junior Scientists Start Early

Kindergarten is a good place to start encouraging future scientists. Educational experiments and science fairs are being introduced in elementary grades with surprising success.

➤ IT IS A LITTLE HARD to believe, but kindergarten is not too early to start being a scientist! In fact, some experts think that youngsters should begin having fun with science in nursery school or, better yet, even earlier at home.

In short, the people who are looking for the next generation of scientists have concluded that you have to start them young. In one survey, of 387 National Science Fair finalists, nearly 10% report their first interest in science was sparked by the time they entered elementary school. More than 50% feel their interest had already been captured by the time they were in sixth or seventh grade.

So, on the basis of a variety of studies, surveys and good guesses, educational experiments are being set up to provide as much encouragement as possible to hoped-for little scientists and technicians. These experiments are not limited to special schools or classes for gifted children, but, perhaps even more important, are geared to stimulate the interest of average children. No one can know how many of these may turn out to be productive scientists or the competent technicians and laboratory assistants we need in such numbers.

Exceptionally Talented Children

Exceptionally talented children are "naturals" as far as scientific interest is concerned, and probably their chief need is for an abundance of attractively presented information and experience. According to Dr. Paul Witty of the International Council on Exceptional Children, these children have "insatiable curiosity" and "unusual interest in such things as number relations, atlases and encyclopedias."

Christopher B. is an example. His favorite books, from the age of two until he taught himself to read, were the dictionary and the telephone book. At six he knows an astonishing amount about paleontology and pursues his subject through the *Encyclopedia Britannica,* H. G. Wells' *Outline of History,* and any other expert works he can find. No one would bet on his being a paleontologist when he is 30, however, for his interests already include astronomy, mathematics, and simple chemistry and physics. But, if he is not frustrated too badly somewhere along the way, the prospect of his being some sort of highly creative scientist is excellent.

Or take Robert Strom, who has won such an improbable amount of money on the CBS-TV quiz program. He is ten years old, in fifth grade, and has been absorbing his amazing fund of scientific knowledge from many sources including his brilliant older brother. In addition, his parents, brother and teachers have encouraged him to experiment with the things that interest him, and have tried to keep his activities as balanced as possible.

So, gradually, we are learning what average and above-average children need, very early in life, to give them the best opportunity to mature at their highest potential level.

Science in the Schools

During the school year a visitor to New York or Washington or Emporia, for instance, can see science-in-action among surprisingly well-informed kindergarteners or among small boys and girls in the elementary grades. Simple laboratories, imaginatively adapted to the interests and abilities of these age groups, are giving young children the opportunity to show that they can readily grasp simple scientific concepts and capably demonstrate them.

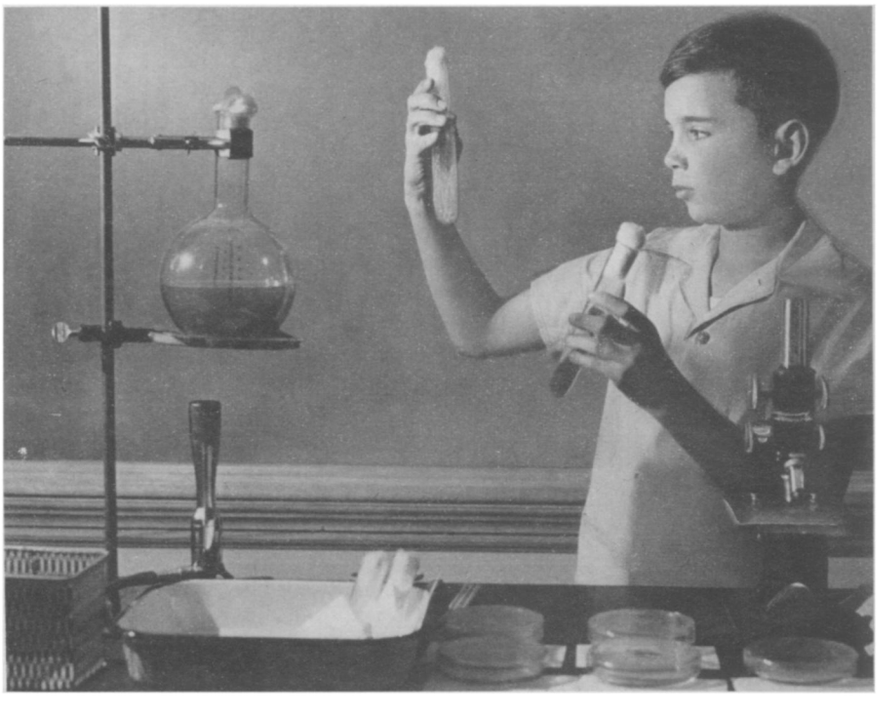
In a New York school, a little girl brought in some peanuts from her grandmother's plantation in the South. The children and the teacher talked about how peanuts grow, what peanuts can be used for, and how. One question flowed into another until the morning was climaxed by borrowing a food grinder from the cafeteria kitchen so they could make and eat their own peanut butter then and there.

In Emporia, youngsters cook up such things as fudge, using lab accessories like beakers, ringstands and Bunsen burners as familiar and useful tools.

They distill water, learn about frictional electricity by playing with balloons, and know something about air pressure after an experiment with an egg and a milk bottle.

In a Washington kindergarten, children are having a wonderful time seeing what prisms, magnets, air, water and heat can do. Second and third graders have tracked down the characteristics of about 35 chemical elements, and they can claim a nodding acquaintance with atoms and molecules.

Elementary schools even have their own science clubs, affiliated with Science Clubs of America like the high school clubs, and their own science fairs. Some cities are finding that they must now have large prefairs for the junior element, as well as full scale science fairs for high school students. In the junior fairs, there are exhibits on the "how" of simple mechanics, gravity, fire, a thermometer, a compass and the solar system. The story of teeth, seed germination, prehistoric animals, volcanoes, weather, and



BEGINNING SCIENTIST—This youngster, shown becoming familiar with the potentials of chemistry at an early age, is now a grown man. This is a picture of Walter Shropshire of Washington, D. C., taken when he was a fifth-grade student. Today, he is completing his academic studies leading to a Ph.D. in biochemistry at George Washington University.

how a fish breathes—to name just a few of the hundreds of subjects children find it rewarding to explore—are all on display.

Because it is being made possible for these youngsters to think of science as an integral and enjoyable part of their experience from the very beginning of their education some of them are likely to accept naturally the idea of devoting their lives to it.

No way has yet been devised to predict the future careers of children, at least not with any degree of certainty and not before late high school or even college years, but such an atmosphere of stimulation tries to insure the full development of whatever scientific talent a child may have. It is also designed to allow those with a special bent toward eventual careers in science to explore some possibilities and try on a few "for size."

Tests for Scientific Aptitude

At such tender ages, of course, the "scientific" interest is ordinarily confined to a special subject, or series of subjects, and does not involve any realistic notions of a scientific career. But the initial interest in beetles or butterflies or stars or rocks may —and often does—lead to a wider and more intense interest in later years.

Tests are now being developed to try to identify gifted students and potential scientists by the time they reach junior high school. Dr. Harold A. Edgerton, and Dr. Steuart H. Britt, are authors of the aptitude examination designed each year for the Science Talent Search for the Westinghouse Science Scholarship. Dr. Edgerton has designed a test to facilitate finding potential scientific and technical manpower at the sixth and seventh grade levels.

By scoring children's experience in science-related activities and their science vocabulary, Dr. Edgerton believes some children with potential for science can be discovered and given particular encouragement. This would include a chance for increased activities in science, such as reporting to their classmates on experiments they have done and on science news, and "encouragement to prepare exhibits for classroom, school and regional science fairs," says Dr. Edgerton.

However, the years during which the majority of youngsters become "really excited" about science come between the ages of 12 and 15, as shown by SCIENCE SERVICE-Science Clubs of America studies of Science Talent Search winners and National Science Fair finalists. This is when they begin to think seriously about college training in that general direction, or even in a highly specialized field.

Critical Years

Eighth and ninth grades have been shown to be a critical point for these college and career decisions, and many schools are now testing the academic aptitude of all pupils in these grades. Measurement of other aptitudes and attitudes are equally important, of course, in identifying and stimulating potential scientists and technicians, and skilled guidance is particularly valuable at this point. Many schools are now emphasizing individual counseling at eighth and ninth grade levels, since it is during these grades that students first choose to study subjects essential to their later educational and professional development.

It becomes increasingly clear that parents, schools, universities, communities, industries, government, foundations and scientific groups—and anyone else concerned with developing America's scientific skills and talents—must all work together in searching out and stimulating this ability almost from the cradle. Apparently "Yankee ingenuity" is more than a myth, for bright ideas and imaginative solutions to local problems are springing up all over the country, to be adapted and modified and improved from place to place.

Interest is running very high in some towns, and the younger generation is responding with enthusiasm to such activities as science fairs.

As a matter of fact, these efforts are so successful that at one fair a mother, obviously weary from sitting up with a science fair project and its tireless young experimenter, looked quizzically at a poster on the school bulletin board, announcing a new organization to encourage science-youth activity—then she tottered down the hall, murmuring "Encourage! . . . I wish somebody would tell me how to DIScourage it once it gets started!"

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ENGINEERING

Size of Raindrops Measured Exactly

➤ THE SIZE of raindrops is being measured accurately and automatically using a device invented by A. Nelson Dingle, meteorologist at the University of Michigan's Engineering Research Institute, Ann Arbor.

The instrument is called a "raindrop spectrometer," and it can record the sizes of drops above one-hundredth of an inch in diameter. It consists mainly of two black boxes mounted at the ends of two arms and associated electronic equipment.

RAINDROP MEASURER—University of Michigan meteorologist A. Nelson Dingle, left, and technician Arvy W. Wagner watch the whirling arms of an instrument they developed to measure the exact diameter of raindrops.

One box contains a light source, the other a photoelectric cell. As the arms whirl around three times a second, the photocell "watches" a spot in the light beam. When a raindrop passes through that spot, the amount of light seen by the photocell indicates the drop's size.

Because it is spinning so rapidly, the instrument scans a path about six yards around every second, thus observing more drops than if the arms were stationary.

After a test run, dials on the electronic equipment show how many drops of each size fell in the sampling area. By measuring as many as 180,000 of them an hour, Mr. Dingle and his associates hope to learn the exact distribution of drop sizes.

It takes a million average cloud droplets to form the average raindrop, and meteorologists are interested in how millions of billions of droplets are combined into billions of raindrops during a single storm in nature.

In developing the instrument under a grant from the Air Force's Cambridge Research Center, the Michigan scientists devised a slender needle that dripped drops of a certain size for use in testing and calibrating the spectrometer.

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