

**HIGH SCHOOL SCIENCE** teachers attend in-service laboratory courses at The University of Arizona, brush-up sessions designed to make them more valuable to the school systems where they teach.

*Thinking Ahead in Science Calls For*

# Teaching the Teachers

**R. W. Hoshaw and E. B. Kurtz**

We all know that the United States is getting more and more crowded. Now there are only 187 million of us; by 1980 we will number 245 million; and by the year 2000 some predict there will be 330 million Americans.

Most everyone is also aware that the farm labor force is going in the opposite direction; the number of farm workers is no larger today than it was around 1850, over 100 years ago! Obviously a few farmers can produce more food for more people than ever before. We have reached this high level of agricultural technology through education, research and communication. Vocational agriculture, 4-H programs, the land-grant college system, and many other forces have been at work.

But what of the future? How will the needs of our huge population be met? How can we, in agriculture, *think ahead* and anticipate future needs and emergencies? The spiralling population tells us our farms must double present yields by the year 2000. But now we are too ignorant to know how to do this. We don't know enough about the basic agricultural fields — botany, chemistry, mathematics,

physics and zoology — to find the answers to our future problems.

## **Must Start With the Young**

It has become very clear to many of us that future developments in agriculture hinge on the training of our children now in the public schools and those still in the diaper stage. Some of these children will make big discoveries that will advance our agricultural technology so that yields can be doubled.

Although it is our *children* who will make the discoveries, it is *our* job now to

get them off to the best possible start in learning, thinking, and discovering. We must give them the best education we can, not just in college, but in kindergarten, elementary, junior high and senior high school. Indeed, it is too late by the time our children get to college. *Their future depends to a very large degree upon the science education our children receive in the public schools.*

Therefore, we must take a serious look at what is going on in the public schools. We must look closely at the science training that our public school teachers receive, and we must do all we can to help in both places. Our duty is clear. We must see that our children get the best education possible in the elementary and secondary schools so that the future needs can be met. To ignore this duty, or delay action, can lead only to a major catastrophe.

## **Teaching the Teachers**

The challenge is an obvious one. But what are we in the College of Agriculture doing to meet it? What are we doing to give our children a better education in science? One answer is better training for our children's science teachers.

Botanists at The University of Arizona have long been interested in basic research and ways to improve science teaching. One major event gave great stimulus to our desires. With the enactment of the National Science Foundation Act in 1950, it became the responsibility of this foundation to develop and encourage a national policy for the promotion of basic research and *education* in the sciences. This was long before sputnik came along!

From a meager beginning the National Science Foundation has grown rapidly and now gives financial support for many kinds of programs. These include Summer

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The authors are members of the Department of Botany and active in the teaching projects which they discuss here.

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and In-Service Institutes for both elementary and high school science teachers. You may know a teacher who has attended such a program at The University of Arizona or another institution.

### Planning Careers in Science

It also gives high school and college students a chance to attend programs to prepare for careers in science. The National Science Foundation has not been alone in its efforts to improve education in the sciences. Other organizations have sponsored programs as well.

The Department of Botany, in cooperation with several other departments of the

### From an Authority

Interesting corroboration of the Hoshaw-Kurtz thesis was contained in a UPI story out of Washington, published in *The Tucson Daily Citizen* on Jan. 23, 1963. It said in part:

A prominent American chemist told a House committee today that the only way to produce more graduate scientists is to produce more qualified high school graduates.

Dr. Albert W. Noyes, Jr., of the University of Rochester, said youngsters in many states attend small high schools where science is poorly taught.

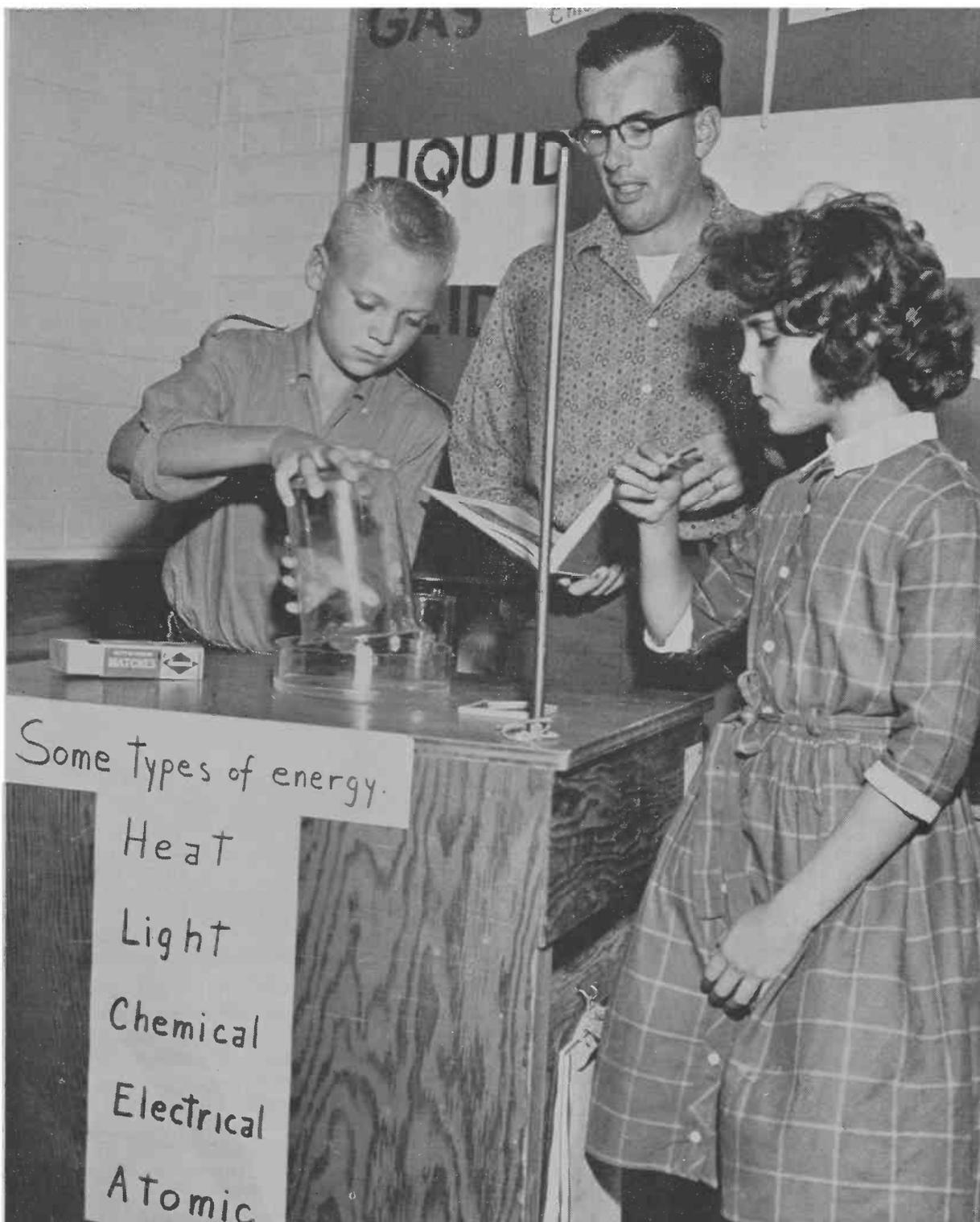
"A great many students are never given the opportunity to decide whether or not they like science because they have been exposed to little of it," he said.

university, has developed specific programs for science teachers. President Harvill encouraged this work in 1956 when he appointed the Science Education Committee. Several botanists have either served on this committee or have participated in programs organized under its guidance.

The first Summer Science Institute for high school teachers at The University of Arizona was in 1957. Since that time, some 300 teachers have attended our Summer Science Institutes and studied special courses in botany, chemistry, mathematics, physics and zoology. Each of these 300 teachers now instructs 150 students per day, so a total of 45,000 students are benefiting *each year* from their teachers' institute experience.

### Evening Courses on Campus

We have a special interest in science teachers in our own state. During the school year the Botany Department sponsors an In-Service Institute program for teachers within 70 miles of Tucson. Teachers come to the campus one evening each week for special courses in science. This program promotes a healthy exchange of ideas and problems in the teaching of science. For many scientists



**TODAY'S YOUNGSTERS** have great curiosity about science, which is why their teachers must go back to college to learn new things about science and how to teach those things most efficiently. This photo was taken in an elementary school in Tucson School District No. 1.

this is their first look at problems of today's public school teacher. Here both university scientists and public school teachers can work together toward better teaching in the schools which will produce the scientists of tomorrow.

Most of our work in science education has centered upon the high school. However it has become clear that the crux of the problem is in the elementary school. Our In-Service Institutes for elementary teachers, many workshops with teachers in the schools, and a year of teaching fifth grade science in an elementary school, led us to this conclusion.

Since science in the classroom is no better than the teacher, we began to take a serious look at the science training which future elementary teachers receive in college. To determine if college science

can be taught in a better way to future elementary school teachers, we have an experimental course under way.

Through the cooperation of Tucson District No. 1, 20 volunteer teachers, grades 1 to 6, are now attending a weekly three-hour seminar on chemistry and biology. We hope these teachers can learn to present science in the way we feel is best. If they can, we will have a good basis for improving the training of future elementary school teachers.

### Only Future Can Tell

Have these programs with public school teachers improved science teaching? This question is not easily answered. But how else can we hope to advance our scientific know-how to the level required for the decades ahead? Although it may not be obvious now, tomorrow's cry will be for more FOOD. This can be produced only by agricultural scientists who have received the best in basic science teaching at *all* levels.