

JAMES BONNER

JAMES BONNER, Professor of Biology at the Institute, is one of the country's outstanding biochemists and plant physiologists. It was, however, by the merest chance that Bonner decided to go into the field of plant physiology at all.

When he graduated from the University of Utah in 1931 with a B.S. in chemistry, Bonner had his choice of a graduate fellowship in chemistry at the University of California, or one in biology at Caltech. The deciding factor in favor of Caltech was the memory of a particularly pleasant year spent here as a college junior in 1929-30. Bonner's father, head of the Chemistry Department at the University of Utah, took a sabbatical year in 1929-30. When he decided to spend it working in the Caltech laboratory of one of his old students, Don Yost, the two oldest Bonner boys came along with him as scholarship students at the Institute.

James Bonner arrived in Pasadena on a Sunday to start his graduate work. Though he had chosen to work in the field of biology, he had no clear idea of what he wanted to do in that field, and he headed immediately for the Caltech campus, impatient to talk over his problem with someone in the Biology Division.

The Biology building was locked, but Bonner saw signs of activity in one of the basement labs and pounded on the window. K. V. Thimann (now Professor of Plant Physiology at Harvard) and the late Herman E. Dolk, first Professor of Plant Physiology at Caltech, were hard at work in the lab. They stopped to let Bonner in. Then, since they were the only people in the building, Bonner sat on a stool in their lab, looking on, as they went ahead enthusiastically with their efforts to isolate a new plant growth hormone—a chemical substance produced in the growing tips of plants which is essential to the growth of the stem, flower stalks and other parts of a plant.

When Thimann and Dolk knocked off work for the day they invited Bonner home to dinner with them. By the end of the evening it was obvious to the new graduate student that there was no more exciting, stimulating or challenging field of biology than plant physiology.

Probably a good many other distinguished careers in science have been launched by just such unscientific methods.

There was, though, nothing capricious about Bonner's



decision to work in the field of plant physiology. He was trained in chemistry and interested in biology, and this was an ideal combination of the two—a biological subject which could be approached from a chemical standpoint.

James Bonner got his Ph.D. in 1934. He was the first graduate student to get a degree in plant physiology at Caltech. In that same year he went as a National Research Council Fellow to Holland and Switzerland.

In 1935 he returned to Caltech, and he has been on the faculty here ever since. His research, which has already resulted in the publication of well over 100 papers, has ranged over the whole field of plant physiology. He was in on the beginning of the Caltech research on plant growth hormones which led to the isolation of the growth substance, indoleacetic acid or auxin. This and related active substances are now produced synthetically and used universally to control many varied aspects of plant growth.

His work on growth hormones led next to a study of the role played by vitamins in plants. With A. J. Haagen-Smit, Professor of Bio-organic Chemistry at the Institute, and James English, Jr., now Professor of Chemistry at Yale University, Bonner then began a study of the substances given off by injured tissue that have to do with wound healing in plants. This work led to the chemical isolation of a wound hormone in pure form. This substance, which the Caltech group named traumatic acid, is also now produced synthetically.

In 1938 Bonner began an investigation of what makes plants flower—an investigation which is still going on and which has resulted in methods for the regulation of flowering in some kinds of plants.

During the war he was engaged in a study, for the

Emergency Rubber Project of the United States Department of Agriculture, of natural rubber production. The work involved basic research on the chemistry and physiology of rubber production in the rubber forming plant, guayule, which was shown to be a practicable source of natural rubber.

In addition to these projects, most of which are still continuing, Bonner has engaged in general investigations of proteins, enzymes and viruses in plants.

One of his major continuing projects, however, is the study of plant sociology. This is a logical extension of his original work on growth hormones, which, simply, are substances produced in one part of a plant which tell other parts what to do. Bonner's specific interest in plant sociology is in the chemical substances produced by one plant which tell another plant what to do.

Working with Reed Gray (now Biochemist with the Pineapple Research Institute of Honolulu) Bonner set out to discover why a low desert plant known as brittle bush always grew with no neighboring plants around it—and discovered that its leaves gave off a chemical which inhibited the growth of nearby plants. By its toxic action the plant helped determine what other plants would grow in association with it—and assured itself of adequate food and water.

Not only did this work result in further evidence that the sociology of plants is chemical, as opposed to that of animals, and man—which is psychological—but it resulted in the isolation of the substance in the leaves of the brittle bush which inhibited the growth of other plants. Gray and Bonner produced it synthetically and discovered it could be used successfully as a selective weed-killer.

If there was a certain element of chance in Bonner's becoming a plant physiologist, there was never any question of his becoming anything but a scientist.

James was the oldest of the seven Bonner children. Both his father and mother were chemists. Not until the children reached school age and went out into the world did they know of such things as sugar, salt and water. In the Bonner household things were called by their right names, and what they asked to have passed at the dinner table was sucrose, sodium chloride and H₂O. As soon as each of the children got to be about six or seven years old he began to be taken regularly to his father's chemistry laboratory at the University of Utah, where he was allowed to putter around, wash test tubes and generally soak up the atmosphere. Naturally, then, the Bonner children grew up to believe that what people do in the world is work in laboratories. Most of them have grown up to do just exactly that.

James has been Professor of Biology at Caltech since 1946. His wife, Harriet, is herself a Ph.D. (mathematics). They have two children—a girl, Joey, who's 3, and James, 1.

Lyman, the next to the eldest Bonner, got his Ph.D. in Chemistry at Caltech in 1935, taught at Duke University, and is now Technical Director of the Allegheny Ballistics Laboratory.

Priscilla, the only Bonner girl, missed out on Caltech but got an M.S. in biochemistry from the University of Illinois. She is married to an organic chemist, James Horton, who is Associate Professor at the University of Utah.

David got his Ph.D. at Caltech in 1940. He's now Associate Professor of Microbiology at Yale.

Robert was a graduate student first at Brown University and then at the University of Wisconsin. After a short time at this, however, he had to confess that he got very little pleasure out of life in a laboratory—in fact he thought it was downright dirty work. The rebel is now an applied mathematician, working for the Carter Oil Company in Tulsa, Oklahoma.

Walter, who got his Ph.D. at Caltech in 1946, went first to Harvard and has now been in England for three years as a biochemist at the Molteno Institute of Cambridge University.

Francis got *his* Ph.D. from Yale in 1944 and is now Assistant Professor of Chemistry at Brooklyn College.

Two sides of the family

Of the six brothers, three (James, David and Walter) are biochemists of one kind or another, and three (Lyman, Robert and Francis) are physical chemists—or rather, two of them are physical chemists and the third is the renegade mathematician. Though the whole family rarely manages to get together anymore, the three biochemist brothers remain fairly close and see a good deal of each other, as do the physical chemist Bonners.

The two family groups have other distinctive characteristics—to the point where they would seem to be a psychologist's delight. The biochemist Bonners have always been terrible spellers, for instance, while the physical chemists have never had any trouble in this department. The biochemists are all average-sized men; the physical chemists are all roughly six feet in height. The biochemists are avid skiers and mountain-climbers; the physical chemists are sedentary.

Among the biochemists, James is by far the *most* avid skier and mountain-climber. He still remembers Utah as an ideal place to live because he could put on his skis at the kitchen door and be gone all day without having to take them off until he got home. And mountain-climbing, today, often occupies as much of his time as his plant research. In fact, he's almost as proud of the fact that he has been elected to the American Alpine Club, served on the executive committee of the Southern California Chapter of the Sierra Club, and (in 1948) was chairman of the club's Rock Climbing Section—as he is of his numerous scientific honors. Specifically, these include the vice-presidency of the Western Society of Naturalists (1946), vice presidency (1947) and presidency (1949) of the American Society of Plant Physiologists, chairmanship of the Physiological Section of the Botanical Society of America (1949), and election to the National Academy of Sciences in 1950.