The search for inhibitors that distinguish between enzymes of normal and neoplastic cells has not been easy in view of the general similarity of the metabolism of the two types. Most effective in the treatment of cancer have been antimetabolites that interfere with either folic acid enzymes or enzymes involved in nucleic acid biosynthesis, or both. The most effective folic acid antagonists are the 4-amino derivatives of folic acid, aminopterin and α-methopterin, which prevent the conversion of folic acid to folinic acid (citrovorum factor). In this way, folic acid is prevented from acting as a formylating agent in biochemical one-carbon transfer reactions. Folic acid antagonists are especially useful in the treatment of acute lymphoblastic leukemia (*31*). The purine antagonists include 6-mercaptopurine, azaguanine, 2,6-diaminopurine, thioguanine, 6-chloropurine, and the pyrazolo pyrimidines.

A more specific attack on blocking purine metabolism has been made possible by the work of Buchanan and associates (*32*), who have characterized the enzymes and elucidated each step in the biosynthesis of purines. The antibiotics, azaserine and 6-diazo-5-oxy-L-norlucine (DON) are structural analogs of glutamine and block the enzyme that utilizes it in purine synthesis. The ability of these antibiotics to block the synthesis of nucleotides is quantitatively related to their blockading of the growth of certain types of neoplasms (*33*). Many other types of enzyme inhibitors are being investigated for possible use in cancer chemotherapy.

Summary

The use of chemical reagents as enzyme inhibitors has yielded information concerning the mechanism of inhibition and the role in catalysis played by active groups on the protein apoenzyme, the coenzyme, or the metal component. Inhibition analysis has also furnished valuable clues concerning the architecture, chemical properties, and catalytic mechanism of the active site of the enzyme. In many cases, *in vivo* effects of inhibitors can be closely correlated with *in vitro* inhibition of purified enzyme systems. The effects of antimicrobial and anticancer agents, insecticides, and drugs can often be explained in terms of enzyme inhibition. The design and synthesis of new inhibitors offers great promise when applied to the control of undesirable organisms and to the prevention and cure of disease in the immediate future.

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J. W. Scott, Zoologist

John W. Scott was born on a farm in Lewis County, Missouri, on 1 July 1871. From the local schools he went on to graduate from the University of Missouri and later received a master's degree in psychology at the same institution. After some experience in high-school teaching he came to a major decision: he wanted to learn all that there was to know about some field of science, and he chose zoology. In taking his Ph.D. at the University of Chicago and throughout the rest of his life he was keenly interested in all branches of animal science. He could truly be called a general zoologist.

In 1913 he was appointed chairman of the department of zoology at the University of Wyoming, and his subsequent scientific interests were centered around this state and institution. He once said that he was determined to master any subject that he undertook, and he set about learning all that there was to know about Wyoming. For 40 years he walked, rode, and drove over every corner of the state, collecting, photographing and observing. With this knowledge, he helped lay the foundation for the study of animal ecology in the area, and he summarized it in a chapter in Shelford's *Naturalist's Guide to the Americas.*

To master meant to understand, and his understanding of nature included affection. In his spare time he was an ardent fisherman, and he soon became an ardent conservationist. As president of the state Izaak Walton League, he worked for the adoption of a model fish and game law and was later asked to help put it into effect as executive secretary of the State Fish and Game Commission. He was made an honorary national president of the Izaak Walton League and served as chairman for its Conservation Education Committee, which became the present Conservation Education Association, of which he was also honorary president.

His early scientific work was concerned with the embryology of the marine annelids which he studied at the Woods Hole Marine Biological Laboratory, where he was an instructor in the

invertebrate course for several years. However, his major research interest soon changed to parasitology. Beginning at the Kansas State Agricultural College and later as research parasitologist at the Agricultural Experiment Station of the University of Wyoming, he at first concerned himself with parasites of livestock, demonstrating the insect transmission of swamp fever in horses and working extensively with *Sarcocystis tenella* of sheep. Later he became interested in the parasites of wildlife, particularly the tapeworms of the genus *Diphyllobothrium* and the coccidian parasites of the sage grouse. Working out the life-cycle of the latter led to the first description of the mating behavior of the sage grouse, the discovery of one of the highest degrees of social organization in gallinaceous birds, and a comparative behavioral study of two related species. At the time of his death he was working on two problems: one on the relationships between *Diphyllobothrium cordiceps* and *D. latum*, which he concluded were physiologically and morphologically distinct, and the other on the races of *Eimeria* in the sage grouse, which developed in isolation conforming to the isolation produced by the social behavior of the host.

As a teacher, Scott had a gift for presenting a clear organization of a subject, but his outstanding capacity was for friendships. He was an idealist in human affairs and could understand and appreciate any quality except selfishness. Those whom he inspired share his belief that the pursuit of knowledge is an honorable occupation whose end is general and individual welfare. He died on 15 August 1956 in Laramie, Wyoming.

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News of Science

AAAS Awards

The following awards were presented during the recent AAAS annual meeting in New York.

The AAAS-Anne Frankel Rosenthal memorial award went to Jacob Furth, associate director of research at the Children's Cancer Research Foundation, Harvard Medical School. The award, consisting of $1000, is from funds provided by the Rosenthal Foundation.

Furth was born in Hungary and educated in Germany, where he began his professional career. He came to the United States in 1924. After a year on the staff of the Henry Phipps Institute in Pennsylvania, he was appointed to the faculty of Cornell University College of Medicine, where he remained until 1948. Then for the 4 years he served as chief of the pathology and physiology section of the Biology Division of the Oak Ridge National Laboratory. In 1954 he was appointed to his present position at Harvard.

Herbert C. Kelman, research psychologist at the National Institute of Mental Health, received the $1000 AAAS Socio-Psychological Research award. Kelman was born in Vienna 29 years ago. Following receipt of a Ph.D. degree from Yale University in 1951, he was given a fellowship by the Social Science Research Council and spent a year at the Phipps Psychiatric Clinic of Johns Hopkins University. From 1952 to 1954 he served as a U.S. Public Health Service research fellow. Then, after a year at the Center for Advanced Study in the Behavioral Sciences at Stanford, Calif., he assumed his present position.

Kelman's prize winning study was a theoretical and experimental investigation of social influence. Social influence or social pressure sometimes leads a person to change his attitudes or behavior, but this conformity takes place at different levels. A person may conform because he expects to be rewarded for conforming and punished for nonconforming behavior. He may conform because he wants to maintain good relations with other people whose behavior or attitude he copies. Or, he may conform because he really believes that the ideas or actions are good and proper. Kelman analyzed and studied experimentally some of the factors involved in these three kinds of compliance with social influences. Kelman was a college roommate of Yehudi A. Cohen of the Albert Einstein College of Medicine who received the award last year.

The AAAS-Ida B. Gould memorial award for research on cardiovascular problems was presented jointly to C. W. Lillehei of the University of Minnesota School of Medicine and his associate Richard Allison DeWall. The award is being given for Lillehei's leadership in the field of open heart surgery through the preparation of oxygenators of various sorts, including the pump oxygenator that was originated by DeWall.

Neal E. Miller, James Rowland Angell professor of psychology at Yale University, and James Olds, associate research psychologist in the department of anatomy at the University of California, Los Angeles, received the 29th Newcomb Cleveland $1000 award for their experiments with animals which show that certain areas in the brain apparently govern feelings of punishment and gratification. The prize-winning papers were "Learning and performance motivated by direct stimulation of the brain," by Miller, and "Effects of hunger, sex, and tranquilizers on localized reward systems in the brain," by Olds.

Miller and his colleagues at Yale have shown how different emotions and drives may be aroused by stimulating certain places deep in a primitive part of the brains of rats and other animals. They have studied reactions that seem to be like pain and fear, flight, rage, hunger, sex, and thirst. Olds, working with Milner in Montreal, discovered that electric stimulation of other points deep in the brain can act as a reward. Thus, while the animals used by the Yale group would work to escape direct stimulation of the brain, Olds' rats would work to get it. Since Olds found that his reward effect could be influenced by drives, he could use it as a means of studying the location of various "drive centers" in the brain. The work going on in the Yale and California laboratories and that in other laboratories is fitting together to begin to give a picture of how motivations are aroused deep in the brain.

Population Changes

Families are becoming larger in the United States, the Metropolitan Life Insurance Company's statisticians report. An increasing number of couples are now having a third or fourth child. The annual rate for third births has climbed from 1.8 per 100 married women under age 45 in 1940–41 to 3.1 per 100 in 1954–55. For fourth births, the rate in-