News of Science

Genetic Recombination in Bacteria

A remarkable observation bearing on the mechanism of genetic recombination in bacteria has been published by E. L. Wollman and F. Jacob [*Compt. rend. acad. sci.* **240**, 2449 (1955)]. It had been demonstrated by Lederberg, by Cavalli, and by Hayes that recombination in *Escherichia coli* involves two mating types, F^+ and F^-, the latter being characterized by inability to mate with other F^- strains. It was believed that recombination involved pairing between an F^+ and an F^- organism followed by the transfer, by an unknown mechanism, of genetic material from the F^+ donor to the F^- recipient. The transfer was followed by crossing over and incorporation of a portion of the donor's genes.

A variant of F^+ called HFr (high frequency) is characterized by a 1000-fold increase in the frequency of recombination of certain linked genes, thus making quantitative studies much simpler. In the Hayes strain the HFr character affects the recombination rate of the linked genes $TLAzV_1LacGal$ (Threonine and Leucine requirements, Azide sensitivity, Virus T1 sensitivity, Lactose and Galactose fermentations), giving recombination frequencies of the order of 1 to 10 percent of the initial number of the HFr parent, but it does not affect the unlinked character S^s (Streptomycin sensitive).

The experiment involved crossing $HFrT^+L^+Az^sV_1{}^sLac^+Gal^+S^s$ with $F^-T^-L^-Az^rV_1{}^rLac^-Gal^-S^r$ and selecting recombinants with the characteristics $T^+L^+S^r$ by plating on a medium that lacked threonine and leucine and contained streptomycin. These recombinants were then tested for the presence of other markers from the HFr parent, with the result that, of the $T^+L^+S^r$ recombinants, 90 percent were Az^s, 75 percent were $V_1{}^s$, 40 percent were Lac^+, and 25 percent were $Gal.^+$

The kinetics of recombination were then studied by removing samples of the mating bacteria at various times after mixing the two bacterial populations and interrupting the mating process by violent agitation in a homogenizer to separate the mating pairs. The population was then assayed for recombinants. It was found that there was a lag period of about 10 min before the first $T^+L^+S^r$ recombinants were formed, after which the number of such recombinants increased rapidly, reaching a maximum by 50 min. Disturbance of the mating pairs during the first 10-min period prevented introduction of these HFr linked gene loci. The azide locus was introduced simultaneously with the T^+L^+ loci, as was expected from the close linkage noted in the preceding paragraph. The V_1 locus arrived about 11 min, the Lac locus about 18 min and the Gal locus about 29 min after the start of mating.

These experiments suggest that the HFr segment of the bacterial chromosome is an organized structure containing a linear array of gene loci, and that these loci penetrate into the bacterial cell in a predetermined order at a slow enough rate so that the procedure can be interrupted by mechanical treatment at various times. The interruption of the mating process does not prevent the genetic fragment that has already entered the recipient cell from being incorporated in the recipient's nucleus. This mechanical separation of mating pairs has an end-result similar to that observed in the phenomenon of transduction in which a bacterial virus serves as a vector for the transmission of fragments of genetic material from a donor bacterium to a recipient bacterium.—M.H.A.

AEC Technical Libraries

The Atomic Energy Commission has announced that technical libraries of nonclassified data on nuclear energy and its applications have been shipped to 23 nations. These comprehensive collections, each containing the equivalent of documents that would fill 250 ft of library shelving, were developed by the AEC Technical Information Service as one of the several commission projects supporting the President's Atoms-for-Peace program. Fifteen of the libraries were shipped from the document distribution center at the AEC's Oak Ridge Operations Office on 11 July; eight libraries had been sent earlier.

Each gift library, weighing approximately 1000 lb, consists of approximately 6500 AEC research and development reports, 5000 of which are on microcards; 22 miscellaneous books; 34 bound volumes of scientific and technical texts on nuclear theory; and 11 bound volumes of abstracts of some 50,000 reports and articles published in this country and abroad. Each collection also will include approximately 55,000 index cards, which will be shipped later.

The individual collections duplicate material now available in 42 repository libraries in the United States, three in the United Kingdom, and one each in Belgium and Canada. The 23 countries to which the libraries have been shipped are Italy, Spain, Australia, Sweden, Greece, Egypt, Burma, Denmark, Austria, Philippines, Finland, Turkey, Netherlands, New Zealand, Portugal, Peru, South Africa, Israel, Norway, India, Argentina, France, and Japan.

Itching, a Primary Sensation

The sensation of itching (pruritis) has long been a physiological puzzle. In contrast to the sensations of pain, touch, heat, and cold, itching has consistently demonstrated an indifferent response to physical stimuli. It now appears, from experiments reported by R. P. Arthur and W. B. Shelley [*Nature* **175**, 901 (1955)], that itching is a primary sensation, distinct from pain; in contrast to the other primary sensations, it is not engendered by physical modalities but by chemical stimuli. In the work reported, the proteolytic enzymes were found to be implicated as the true stimulus for itching. The most active enzymes (mucunain, papain, chymotrypsin) produced itching with the shortest latent period and the longest duration. Increasing their concentration in solutions decreased the latent period and increased the duration and intensity of action. Pain was never observed. The mechanism of the pruritogenic action is unknown; but a synthesis or release of an active compound from epidermal cells, perhaps intracellular proteinases (cathepsins), is suggested. Experiments indicate that histamine is not implicated. —W.L.S., JR.

News Briefs

■ The idea of a control over the weather through artificial "seeding" of clouds is scheduled for a new series of tests. In the past, the Office of Naval Research has carried out a varied program to arrive at some conclusions about controlling weather through seeding with dry ice particles from aircraft and with silver iodide crystals from ground generators. An interested party to the series of experiments and tests was the Weather Evaluation Board appointed by President Eisenhower.

In April some results were announced

on a series of tests carried out by Operation SCUD sponsored by the Office of Naval Research and conducted by a group of specialists at New York University [*Science* **121**, 629 (29 Apr. 1955)]. These tests were conducted along the East Coast and extended from operational areas as far north as Massachusetts to others as far south as Florida. The evaluation of the results from Operation SCUD was by an outside group headed by John Tukey at the Forrestal Research Center, Princeton, N.J. On the basis of this evaluation, a statement was released which said, "No evidence of any large-scale meteorological effects due to seeding."

The feeling developed within the President's Advisory Committee on Weather Control that while wide-area control was not effective, there might be possibilities of success in an operation of somewhat limited scope. Thus plans have been laid for Operation OVERSEED, which will test cloud-seeding methods from the foot of Mount Washington, highest of the White Mountains in New Hampshire. The project will begin in the fall. Silver iodide crystals will be dispersed by 10 generators used in Operation SCUD and by other types favored by commercial operators.

■ Scientists assigned to the Air Research and Development Command from the Geophysics Research Directorate of the Air Force Cambridge Research Center began balloon launchings on 5 July at Orlando Air Force Base in Florida to study the electric charges set up by thunderstorms. Information was telemetered to ground-based receivers and collected for future studies of basic facts concerning the tremendously powerful electric impulses that are generated.

Two other Air Force bases aided in the project. Radar stations at Patrick Air Force Base, Cocoa, Fla., and at Pinecastle Air Force Base, Orlando, checked the height and position of the thunderclouds and tracked the balloons in flight.

The effect of lightning discharge on the normal earth's electric field was studied simultaneously with the balloon investigations. Instruments mounted on mobile trucks were used in the lightning discharge tests.

■ Chemists at New York University have synthesized chaulmoogric acid, until recently the drug most commonly used for the treatment of leprosy. Their findings are reported in the 20 July issue of the *Journal of the American Chemical Society*. Because chaulmoogric acid has been largely replaced in leprosy treatment in the last 5 years by synthetics, any therapeutic benefits of the work are secondary, according to Kurt Mislow, assistant professor of chemistry in the University College of Arts and Science. He and I. V. Steinberg, former N.Y.U. research fellow, published the report.

Of chief importance is the insight the synthesis gives into the molecular structure of certain fats. Of all the seed-fat acids, chaulmoogric is unique in being a cyclic, unsymmetrical structure. Its two stereoisomers are the same when they are represented in a projection formula but are different, structurally, in space. One form is the mirror image of the other, but the two are different when they are viewed in three dimensions, and only one of the forms, the dextrorotatory one, occurs in nature. Besides synthesizing the natural form, Mislow and his colleague determined its spatial arrangement and thus, automatically, that of the unnatural or levorotatory form.

Scientists in the News

THOMAS M. RIVERS, vice president and director of the Rockefeller Institute and director of the institute's hospital, will retire in October after 33 years of service. However, he will continue his association with the institute on an emeritus basis. Rivers graduated from the Johns Hopkins Medical School in 1915.

After serving as resident in pediatrics and instructor in bacteriology at Johns Hopkins, he joined the Rockefeller Institute in 1922. He became a member of the institute in 1927, director of the hospital in 1937, and has been vice president and director since 1953.

Rivers is an authority on virus diseases and a leader in medical research in this country. He is a member of the National Academy of Sciences, the Board of Health of the City of New York, the Public Health Research Institute of New York, and the Advisory Committee of the National Foundation for Infantile Paralysis. During World War II he held the rank of commodore in the U.S. Naval Reserve and was in charge of the Naval Research Unit at Guam.

With the announcement of Rivers' retirement, Detlev Bronk, president of the institute, also announced two new appointments: FRANK L. HORSFALL, JR., a member of the institute, has been named vice president for clinical studies and physician-in-chief, and DOUGLAS WHITAKER, now provost and professor of biology at Stanford University, has been appointed vice president for administration.

Simultaneously, Bronk announced the merging of the institute's department of the laboratories and department of the hospital. The former positions of director of the institute and director of the hospital will not be filled because of this reorganization. This fall the institute plans to add an academic program to its long-established work in medical research. The first class, which will be made up of graduate students on fellowships, from the institute, will enroll in September.

On the occasion of his 70th birthday, ALFRED KÜHN, director of the Max-Planck-Institute for Biology in Tübingen, was awarded an honorary doctor of medicine degree by the University of Göttingen, and was also presented with the Gauss-Weber medal.

RALPH F. FUCHS, professor of law at Indiana University, will become general secretary of the American Association of University Professors on 1 Sept. He succeeds Ralph E. Himstead, who died on 9 June.

The association has a membership of more than 43,000 teachers in 968 colleges and universities. The general secretary is the chief permanent officer of the association, and is in charge of its central office, which is in the American Council on Education Building, 1785 Massachusetts Ave. NW, Washington 6, D.C.

J. A. STRATTON, provost of Massachusetts Institute of Technology, and MERVIN J. KELLY, president of Bell Telephone Laboratories, have been elected chairman and vice chairman, respectively, of the Naval Research Advisory Committee of the Office of Naval Research. Stratton succeeds JOHN A. HUTCHESON, vice president and director of the Westinghouse Electric Corp., and Kelly assumes the vice chairmanship previously held by Stratton.

A. B. KINZEL, vice president of research for the Union Carbide and Carbon Corp., whose tenure with the committee recently expired, has accepted appointment for an additional 3 years. FREDERICK SEITZ, director of physics, physics department, University of Illinois, was also recently appointed a member of the committee.

Other members of the Naval Research Advisory Committee are A. V. ASTIN, director, National Bureau of Standards; R. E. DYER, director of research, Emory University Hospital; J. C. HUNSAKER, head of the department of aeronautical engineering, Massachusetts Institute of Technology, and chairman of the National Advisory Committee for Aeronautics; I. R. RABI, department of physics, Columbia University; WILLIAM R. SEARS, dean of the Graduate School of Aeronautical Engineering, Cornell University; E. H. SMITH, director, Woods Hole Oceanographic Institution; E. N. STEPHENS, vice president, central research department, Minnesota Mining and Manufacturing Co.; J. E. W. STERLING, president, Stanford University; and GEORGE D. STODDARD, former president of the University of Illinois.