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