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of fermentation of xylose, chosen to compare these bacteria with the *Bacteroides* and *Butyrivibrio* spp., were formic, acetic and lactic acids in the equivalent proportions 10:17:1. Succinic acid was not determined.

Antisera were prepared by inoculation of formalized suspensions into rabbits. Cross-agglutinations were found between the culture isolated directly from the rumen and the isolate from the culture of a sheep rumen bacterium. The two isolations from cultures of cattle rumen bacteria appeared to be serologically different from those of sheep. The one isolate tested was also different from the culture of *Bacteroides* sp. from which it was originally isolated.

In biochemical properties the bacteria resemble *Bacillus circulans*, but no motile colonies have been noted, although the growth was very thin and spreading on plates. It is not known whether the organisms play any part in rumen metabolism, although they must at times be present in fairly high numbers to have been isolated along with the cultures of *Bacteroides* and *Butyrivibrio* since these were taken from quite high dilutions of rumen contents. Appleby<sup>1</sup> isolated from the sheep rumen along with other proteolytic bacilli one culture, identified as *Bacillus circulans*, which liquefied gelatin. The Gram-negative sporing bacterium isolated by Gray<sup>2</sup> from the sheep rumen is said to resemble *Clostridium kluyveri* in properties. The present bacteria are somewhat similar in morphology to organisms described by Gutierrez<sup>3</sup>, which were ingested by the rumen protozoan *Isostricha prostoma*, and possibly served as a nitrogen source for this protozoan.

We would like to thank Dr. K. I. Johnstone of the University of Leeds for obtaining one single-spore culture and for instruction in his micromanipulation technique to one of us (M. R. P.), Miss M. Carvoek for the acid analyses, and Mr. S. O. Mann for discussion.

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<sup>1</sup> Gainer, C., *Bact. Proc.*, 60, G, 103 (1947).

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GENETICS

A New Physical Method of creating Chromosomal Aberrations

RECENT observations in this laboratory<sup>1,2</sup> have indicated a wide and unusual spectrum of effects which can be obtained from a radio-frequency source in the megacycle range. In order to minimize dielectric heating, it was necessary to reduce the mean power input and therefore we have used a pulsed radio-frequency source at 27 Mc./s. The pulses are of the order of  $5 \times 10^{-5}$  sec. Most of the effects described herein are produced with between 80 and 180 pulses per sec.

For microscopical and genetic studies we used two electrodes separated by an air gap of 3-15 mm. The

electrodes were coupled to the primary radio-frequency source. There is a peak-to-peak voltage of about 1,000-1,500 V. The microscopic and genetic preparations were insulated from the electrodes by two layers of glass. It can be observed that a large variety of substances, including iron, carbon, silver, oil, fat droplets, starch grains and mammalian cells, will react to this field in two ways. First, any asymmetrical particle will be oriented with its long axis along the lines of force. Secondly, after orientation (which, of course, is not observed in symmetrical particles such as spheres) these particles will form chains along the lines of force as though they were iron filings between two poles of a magnet.

One of the most dramatic demonstrations of this effect can be seen when motile bacteria or protozoa are in this field. When the field is impressed, the micro-organisms can migrate only along the lines of force. As soon as the field is turned off, they resume their random movement. This can be repeated as many times as desired.

The thermal component is obviously sufficiently low so as not to affect the viability of these organisms or mammalian cells. In a larger, immobilized

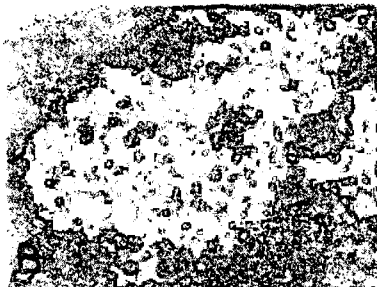
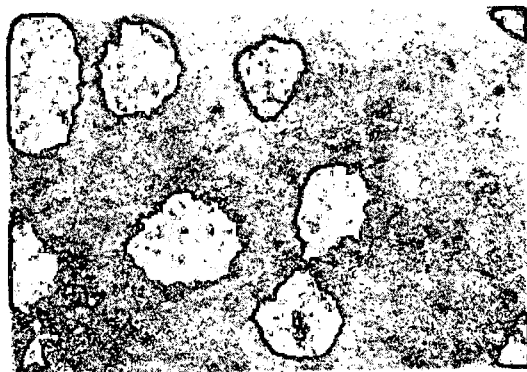


Fig. 1. Squash preparation of garlic root-tips 24 hr. after 5 min. of exposure in the electromagnetic field. A, Resting stage of an irradiated cell showing two nuclei linked by a chromatic bridge and no cytodieresis; B, metaphase with linear shortening of chromosomes; C, bridging

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note →

micro-organism we were able to observe intracellular orientation of subcellular particles. This led us to believe that this force might be used as a powerful and controlled mutagenic agent. Growing garlic root-tips in water were placed in a field between two insulated electrodes. No temperature increase in the water was noted. The tips were exposed for a 5-min. period and examined 24 hr. later.

Among these aberrations seen were linear shortening of chromosomes, pseudochiasmata, amitotic division, bridging, irregularities in the chromosomal envelope. The effects noted mimicked those produced by ionizing radiation and c-mitotic substances.

Fig. 1 shows some of the chromosomal aberrations observed. It is believed that this represents a new tool which may induce chromosomal aberrations to a degree contingent upon frequency, pulse, power, exposure time, and the axis of the cell *vis-à-vis* the field. Further experiments on the physical basis of these changes, as well as chromosome and mutation studies on other materials, are at present under investigation.

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### Preliminary Information on the Genetics of Ethiopian Coffees

LITTLE is known about the genetic variability of the species *Coffea arabica* in its native home—south-west Ethiopia. Recently, however, seed samples of wild, cultivated and spontaneous coffees in this region have been gathered by various agriculturists<sup>1,2</sup>. Several small seedling populations from Ethiopia were sent here in 1952 and 1953, and the genetic constitution of some of them is now being worked out.

It was noted that the 'Erythrean moca' coffee (PI 205 413, U.S. Dept. Agric.) is identical with the *semperflorens* mutant, being homozygous for the alleles *sf/sf*<sup>1</sup>.

The results of artificial pollination with the *murta* variety (*ttNana*) revealed that from 33 analysed coffee plants from Ethiopia, 23 carry the alleles *tt*, probably in the homozygous condition. The alleles *tt* characterize the variety *bourbon*, and its presence in Ethiopia indicates that this region and not Reunion Island, as formerly thought, is the place of origin of this important commercial variety. The *typica* variety (*TTNana*) also occurs in Ethiopia.

Plants of the *abyssinica* variety were frequently found in some of the seedling populations. Although the alleles responsible for its main characters are not yet known, it was noted that *abyssinica* plants carry the alleles *TT*. Other populations segregating for *abyssinica* characteristics bear the alleles *tt*. The coffee type *Eunarea* or *Ennaria*<sup>1</sup> does not seem to belong to this variety.

The genetic analysis of the colour of the young leaves revealed that the allele *br* is frequently found in the imported plants. A new recessive allele, *semierecta* (*se*) with a phenotypic effect somewhat

similar to the dominant allele *erecta* (*Er*), was observed<sup>2</sup>. Plants with large fruits and seeds, *macrocarpa*, were noted but no information is available with regard to their genetic constitution.

Coffee seedlings with a small foliaceous and persistent calyx were found in the populations of plants identified as *S.4-Agaro* (PI 205 408) and *S.6-Cioccie* (PI 205 411) coffee. In spite of having developed sepals, these plants do not carry the allele *sd*<sup>4</sup>. An interaction, however, seems to occur between the *sd* and the allele or alleles responsible for persistent sepals from Ethiopia.

Other variations concerning: leaf shape; their position on the lateral branches; fruit shape; colour of the berry; period of fruit ripening and vegetative vigour, were also found.

This rather intensive variability encountered in the seedlings received from Ethiopia may be the result of a non-randomized procedure of seed collection, seeds very often having intentionally been harvested from more or less conspicuous variants, occurring in the Ethiopian coffee forests. Possibly a higher amount of natural cross-pollination, occurring in the native habitat of *C. arabica*, may also be responsible for this marked genetic heterogeneity.

The occurrence of several new genetic factors in such a small sample of Ethiopian coffee indicates that further exploration for coffee mutants in Brazil is highly desirable, to throw more light on the genetics of *Coffea arabica* and also to provide more basic material for its improvement.

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### BIOLOGY

#### Generic Nomenclature of the Intermediate Hosts of *Schistosoma mansoni*

It has been shown by Hubendick<sup>1</sup> that the molluscan intermediate hosts of *Schistosoma mansoni* in Africa and South America are congeneric. The selection of the correct name for this genus of planorbid snails cannot be decided by a simple application of the rule of priority, because there is a conflict of opinion as to which is the oldest available name. The situation is further complicated by the fact that the names competing for precedence under the rule of priority are all quite unknown to the medical field workers and parasitologists who are frequently concerned in studies on these snails. An application has therefore been made to the International Commission on Zoological Nomenclature by Drs. F. S. Barbosa, B. Hubendick, E. A. Malek and myself asking for a decision which will stabilize the nomenclature of this economically most important group. It is probable that the decision of the Commission will not be made known for some time. It is for this reason that I am anxious to direct the