as if the rods were in process of division. They take the methylene blue and gentian violet stains readily and frequently show polar, more deeply stained spherules and other structures in the interior. These rods are not bacteria since even sterilization of the agar for fourteen hours or more in the autoclave at pressures varying from eighteen to twenty-two pounds fails to destroy them, and since besides the original agar suspension does not contain them but a few minutes' heating produces them.

A discussion of this discovery with Professor J. W. McBain, of Stanford University, convinces me that I have discovered a colloidal phenomenon which is the result of the assumption of one form of structure among the compounds of the agar which takes expression in the type of aggregates just described. This form is evidently fairly insoluble and fairly stable. An account of the studies carried out respecting the properties of these artificial bacilli will be published later.

As regards the foregoing statements it may be said that we are dealing with facts which can be easily confirmed by any one. It is fascinating, however, and irresistible to speculate as to whether or not these artificial bacilli may, under the proper environmental conditions, take on the properties of living cells. While of course this seems like a wild notion, I am investigating this possibility.

To Mrs. Dorothy Doyle Thomas, who is assisting me with the laboratory investigations, I wish here to express my thanks.

CHAS. B. LIPMAN
UNIVERSITY OF CALIFORNIA

ACTION OF BACTERIA AND ENZYMES ON CARBOHYDRATES AND THEIR BEARING ON PLANT SYNTHESIS

THE question of the nature of plant synthesis is an important one not only for the plant physiologist but also for the scientist concerned with the structure and industrial application of products of plant metabolism. This is particularly true with regard to the utilization of derivatives such as sugars, starch, inulin, cellulose, etc.

One interesting mode of attack appears to lie in an investigation of the action of bacteria and their corresponding enzymes on carbohydrates and polysaccharides, a method which has been followed with some success by two of my coworkers, Messrs. H. L. A. Tarr and R. S. Tipson. It has long been known that *Bacillus mesentericus* converts cane sugar into "gum levan," and it is now found that the same change is apparently brought about by the enzyme isolated from the bacteria. "Gum levan" has been definitely identified by methylation, acetylation and hydrolysis experiments as a polymerized form of an anhydro fructose derived from "active" or "gamma" fructose. It is closely related to inulin, which is the fructose-anhydride-polysaccharide found in the dahlia and artichoke.

Complete methylation of "levanose" (gum levan), followed by hydrolysis, yields crystalline trimethyl γ fructose, which, so far as known, is the first crystalline active or gamma sugar to be isolated.

The action of *Bacillus mesentericus* and its enzyme is specific. They do not bring about any changes with carbohydrates and sugars in which the active form of fructose is absent. Raffinose apparently yields the same product as cane sugar. The action on gentianose and melezitose is to be investigated.

Bacillus xylinum (Aceto bacter xylinum) acts upon glucose, mannose, galactose, maltose, sucrose, fructose, "levanose," etc., with "pellicle" formation and change of the carbohydrate into a polysaccharide. It appears to convert glucose directly into cellulose. Of the sugars already examined the only one on which it exerts no action is lactose.

The action of both bacteria and enzymes on a variety of carbohydrates is being actively investigated and the preliminary results are to be published in the immediate future in the *Canadian Journal of Research*.

Of considerable interest is the fact that *Bacillus xylinum* is apparently able to carry the polymerization of "gum levan" to a further, more complex, stage.

HAROLD HIBBERT
PULP AND PAPER RESEARCH INSTITUTE,
MCGILL UNIVERSITY

SPECIAL CORRESPONDENCE

THE MONTANA TICK PARASITE EXPEDITION TO AFRICA

IT is now possible to summarize the 1928 African tick parasite expedition of the Montana State Board of Entomology. The purpose of the venture was to get as much information as possible on parasites that destroy ticks and particularly to discover new parasites which might be brought to America to be used in the possible control of the Rocky Mountain spotted fever tick, *Dermacentor andersoni* Stiles. The procedure was to collect as many ticks as possible from all kinds of domestic and wild animals, hold them under observation alive and determine if parasites were present. Effort was made to extend the collecting over as wide areas as possible and, at the same time,

to give particular attention to those areas where ticks were known to be not very abundant because, where no other cause was evident, parasites might account for the small number of ticks. With laboratory headquarters at the Veterinary Research Laboratory at Onderstepoort, Transvaal, collecting trips were made to various parts of the Union of South Africa and ticks were obtained from all the provinces. Some three weeks' collecting was done also in the Province and Protectorate of Kenya, in the region near Lake Naivasha.

Well over fifteen hundred animals were examined, including many large and small wild animals, and approximately eight hundred tubes of ticks, including some thirty-four species, were collected. An *Ixodiphagus,* closely related to and possibly identical with *I. caucurtei* Du B. of France, was discovered preying on *Hyalomma aegyptium* L. in the Transvaal. This parasite was recovered several times and for the first time it was possible to make a study of an *Ixodiphagus* in a colony of the insects under natural conditions.

The recovery of *Ixodiphagus* and the studies made on the species were considered to be of enough interest to repay for the venture, but the trip resulted in other discoveries which may prove to be of the greatest importance. Six days after the writer sailed from Durban *en route* to Mombasa, Dr. G. A. H. Bedford, entomologist in the veterinary laboratory staff, discovered a chalcid which attacks adult ticks. These insects are not yet named and almost nothing is known about them. Some weeks later, on the occasion of a visit to South Africa, Dr. Robinson, Cooper's parasitologist, when told of the parasite work now being done in South Africa, stated that some years ago he had received a box of adult *Amblyomma hebraeum* Koch from Cape Province and on arrival in England the box was found to contain adult chalcids which had emerged in transit. He further stated that the insects were evidently of a species different from the one discovered by Dr. Bedford, which Dr. Robinson had an opportunity to examine. This chalcid likewise has not been named or studied. It is therefore reasonably certain that there exist in South Africa two new chalcid parasites of adult ticks which the writer did not have opportunity to study.

Through Mr. C. B. Philip, of the West African Yellow Fever Commission, Rockefeller Foundation, Lagos, Nigeria, Africa, we have learned also of the recent discovery of a colony of an unidentified tick parasite in Nigeria.

The parasite expedition to Africa has indicated that the continent is a promising field for further search. A thorough study of the parasites in Africa will be a necessary preliminary to their importation into America.

R. A. COOLEY

BOZEMAN, MONTANA

QUOTATIONS

DR. WELCH'S "APOTHEOSIS"

WHAT the Grecians called "apotheosis," said Bacon, was "the supreme honor which man could attribute unto man." In that definition of the word, the supreme attribution of honor to Dr. William H. Welch to-day becomes his apotheosis. The nation pauses to give him its highest praise while he still lives. Another great physician, Sir Thomas Browne, in his "Religio Medici," said that he cared for not so much as the bare memory of his name to be found anywhere after his death save in "the universal register of God." But fame pays little attention to the prayers of those whom she delights to honor. It is he among teachers who has overcome that "last infirmity"—the desire to be remembered—that is most likely to be chosen. Dr. Welch has gone his way doing what his kindly genius has suggested without other prompting than the appeal of the thing that needed to be discovered or done for humanity.

He has been called "a first citizen of the scientific world." He has three major achievements to give substance to the distinction that will outlive the personality which has made him both loved and admired. He organized the faculty of the Johns Hopkins Medical School nearly fifty years ago and the Johns Hopkins School of Hygiene and Public Health fifteen years ago. Then, with an undaunted spirit which discredits the general theory of his associate, Dr. Osler, he began when he was almost twice forty years old to develop the history of medicine as a new discipline in the training of physicians, with a library as his laboratory. The fourscore years have not abated his "eternizing passion" in the warfare against the enemies of man's bodily health and social welfare.

The substance of his achievement has been illumined by an old-time spirit of scholarship and graced by an art which is the "happy science of the soul." Like the one who is mentioned by Theocritus in his tribute to Asclepius, the father of medicine, Dr. Welch "put all his art into the work." That is his special distinction. He is both scientist and artist in the highest meanings of both words.

Hippocrates found life short and the art of healing long. Fortunately the life of this great modern physician who took early the Hippocratean oath has