petroleum. The paper chemistry of butane or ethylene to butadiene to rubber is beautiful to behold. But American tanks and guns and jeeps are in action all over the world because yeasts made alcohol from sugar and chemists made this fermentation alcohol into butadiene and this into synthetic rubber. It is true that in this great crisis in motorization and mechanization it was the zymotechnologist and not the petroleum chemist that made rubber supplies possible and reasonably adequate. May I repeat my point. There are many areas in which needed organic compounds can be produced either by fermentation, *i.e.*, by microbial activity or by chemical synthesis. The calm assumption of some of our chemist friends that huge retorts and distillation devices and catalysts and high pressure, etc., constitute the answer should be regarded in many cases with some scepticism. Economics must determine what process is most efficient. The fact that quinine has been synthesized at Harvard recently doesn't mean that the Cinchona tree may not be the most satisfactory source of the drug any more than the demonstration of an enzyme system that can combine fructose and glucose into sucrose means that we will quit producing sucrose from the sugar cane in Cuba. I am insisting that a practical chemical economy in the future depends quite as much upon our exploration of the fundamentals of microbial metabolism as upon the exploration of petroleum chemistry, conceding the vast importance of the latter. A substantial part of the economics of agriculture, of the future of agriculture, is bound up in the adequate exploration of microbial metabolism.

Fermentation products frequently have an advantage in that they are relatively pure, or may be readily purified. Commonly they are not mixed with isomers. For example, 2-3 butylene glycol is a product which can be produced commercially by fermentation with facility. But there are several isomers of this compound which show interesting difference in behavior. One apparently would make a good anti-freeze for your automobile radiator, the others will not. Chemical synthesis is apt to yield a mixture with great difficulty in separation. But certain bacteria produce the desired isomers practically pure.

The stake of agriculture in the problems of chemical utilization are considerable and material. Right now millions of bushels of grain are being converted into rubber. To what extent may agriculture look to fermentation industries in the future to assist in relieving us of great surpluses of grains, surpluses which are absolutely inevitable without major changes in world economy, changes which at the best can be brought about but slowly? Crop residues likewise must be studied directly as competitors of coal and petroleum in the future development of our agricultural economy. Fermentation products will increasingly constitute the raw materials for chemical synthesis and transformations.

In summary, microbial metabolism, microbial nutrition, real continuance of research in fundamental fields relative to the physiology of micro-organisms, are of quite as much significance to agriculture as to medicine or to biology as a whole. We are on the verge of new advances which may have the most far-reaching consequences to standards of living and to civilization.

OBITUARY

ROBERT BENNETT BEAN
1874–1944

ONE of America's outstanding anthropologists and teachers of anatomy, Dr. R. Bennett Bean, died on August 27, 1944, in Staunton, Virginia. He had resigned from his position as head of the department of anatomy in the University of Virginia School of Medicine two years previously because of ill health brought on by arteriosclerosis. His death was not unexpected but was a source of grief to many friends, associates and former students as well as his family.

Dr. Bean was born at "Pleasant Hill," Gala, Botetourt County, Virginia, on March 24, 1874, the third of a family of eight children born to William Bennett and Arrianna Williamson Carper Bean, whose ancestors had been early colonists of Virginia and Maryland, respectively. His father had carried on a hectic courtship between campaigns with the Army of Northern Virginia in which he served as a lieutenant in the Baltimore Light Artillery. Dr. Bean's boyhood and youth were spent under the most trying circumstances of economic distress in the backwash of the Reconstruction period following the war between the states. His formal schooling was intrusted to an aunt, Miss Regina Bean, whose teaching skill and discipline made a lasting impression. Despite the rigors of the times his home life was unusually happy and members of the large family were loyal and devoted. The Bible was a strong factor in his education and he retained deep religious convictions throughout his life.

From the age of thirteen until he entered the Virginia Polytechnic Institute at the age of twenty-two there was no opportunity for formal schooling. Experiences in farm work, clerking in a county store, managing the dining room at the old summer resort at Daggar's Springs, teaching school, mining, guarding convict labor, selling farm machinery and writing for a county newspaper gave a wide background of use-

ful knowledge. Besides working his way through college with a high scholastic record he engaged in football and track; and retained a lifelong interest in sports. In 1900 he received his B.S. degree from Virginia Polytechnic Institute and was enabled to enter medical school through the generosity of his sister, Miss Mary Cloud Bean. He studied at the Johns Hopkins Medical School under Osler, Mall, Welch, Kelly, Halsted and others. Dr. Bean was deeply imbued with the spirit of research and teaching, and was especially influenced by Mall and Osler. He began his career as an anatomist and anthropologist during his student days. Following graduation in the class of 1904 he remained in Mall's laboratory as assistant in anatomy, pursuing studies of the subclavian artery and racial peculiarities of the Negro brain. In 1905 he became assistant professor of anatomy at the University of Michigan. During the summer of 1906 he studied in the Ecolé d'Anthropologie de Paris under Manouvrier, whose anthropometric techniques and high standards of accuracy he emulated. From 1907 to 1910 Dr. Bean was the director of the Anatomical Laboratory of the University of the Philippines; made extensive observations on physical anthropology of Filipino tribes; and obtained many specimens for the Wistar and Smithsonian collections. Returning to this country he served as associate and professor of anatomy at Tulane. In 1916 he became head of the department of anatomy at Virginia.

Dr. Bean's career was a happy combination of teaching and research. Having decided on anatomy as a life work his investigations in anthropology were a natural development—carrying the study of man outward to the macrocosm of type and race rather than inward to microanatomy and the biophysics of the cell. He had a highly original mind and made several notable contributions in his selected field. Early studies led him to associate particular ear structure and physical type of man. In 1909 he published his first work on morbidity and morphology based on autopsy material, demonstrating an association between body type and predilection to different diseases. Though the belief that type might be related to disease is as old as Hippocrates this was the first objective demonstration of its truth. Several subsequent articles extended and further validated his original thesis, which is now accepted as axiomatic. Another study culminated in a report on "The Pulse of Growth," emphasizing alternate periods of slow and rapid development of tissues and organs from embryonic life to maturity. Other studies included characterizing the physical anthropology of Filipinos; the so-called Mongolian idiot; and old Virginians. He published 72 papers and three books: "Racial Anatomy of the Philippine Islanders," "The Races of Man" and "The Peopling of Virginia."

His excellence as a teacher of anatomy will be remembered by several generations of students. He made a model of the peritoneum which clarified much of its inherent complexity; and taught cerebral nerves in a logical rather than traditional manner. He believed that dissection and demonstration were the prime tools in learning anatomy. Text-books and models were complementary to dissections and lectures. His informal lecture, the quiz-talk, was highly successful though not without some terror for the lazy student. Much of its value lay in the charm and dignity of his personality and the high ideals of scholarship and research he taught and exemplified. His relationship with his students is epitomized in his nickname—"The Baron." Anecdotes were freely used to bring home a point, and the aphorisms and teachings of Sir Thomas Browne, Osler, Pasteur, Darwin, Hunter and others were mingled with his own. A host of students recall the "area of abdominal romance" where the head of the pancreas lies in the arms of the duodenum and has its feet tickled by the spleen when they have forgotten more erudite aspects of anatomy. His essay on teaching anatomy might be read with profit by many to-day.

Though his chief contribution was as teacher and investigator he was active in other ways. When funds became available to erect new buildings for the Medical School at the University of Virginia he was made chairman of the building committee.

In 1907 Dr. Bean married Adelaide Leiper Martin. Their life together was singularly happy. In addition to his widow he is survived by four children, Mrs. James Van Duesen Eppes, Major William Bennett Bean, M.C., AUS, Mrs. Natt Morrill Emery and Chaplain George Martin Bean, U.S.N.R. At one time or another they have all been his collaborators and served an apprenticeship at least in the lesser mysteries of the slide rule. The custom of reading aloud to the family made a strong impression on all its members.

Dr. Bean's rank as a scientist was recognized by his peers and is attested to by membership in numerous scientific societies. He was first president of the Virginia chapter of Sigma Xi, which he was instrumental in establishing. In 1914 he was president of the New Orleans Academy of Science; in 1928 he was president of the Anthropological Section of the American Association for the Advancement of Science. For many years he was an associate editor of the *American Journal of Physical Anthropology*. He was a member of the Association of American Anatomists, the American Association of Physical Anthropologists and the Societa Romana Anthropologica.

The strong currents of religious conviction and scientific scholarship never caused any perceptible conflict in his life. The Bible on one hand and the rigor-

ous disciplines of research exemplified by Darwin, Pasteur, Mall, Manouvrier and Hrdlička stamped him. He was more interested in the substance of science than the surface trimmings. His writings were straightforward and clear, never polished and never ornate. His guide to English style was Albutt, whose "Notes on the Composition of Scientific Papers" he followed for precept, not example. Taught by a Catholic aunt, a regular attendant at the Presbyterian Church as a youth, Dr. Bean later became a member of the Episcopal Church, of which he was a loyal supporter and vestryman. He had more regard for underlying principles than dogma. An abiding belief in simple Christian virtues characterized his dealings with his fellow man. He was always a friend and often a counselor of his students. His generosity and anonymous benefactions in the community still come to light from time to time. During a period when moral and scientific standards have often given place to laxity and opportunism, he remained true to the highest ideals; and his teachings and example were such that memory of him is a reaffirmation of faith in human dignity and honor.

WILLIAM BENNETT BEAN,
Major, M.C., AUS

RECENT DEATHS

DR. ROBERT K. BREWER, head of the department of physiological chemistry of the College of Medicine of Syracuse University, died on March 22.

DR. HENRY LANE BRUNER, professor emeritus of biology and geology of Butler University, with which he had been connected for forty-six years, died on March 17 at the age of eighty-four years.

DR. GEORGE W. HUTCHISON, since 1933 secretary of the National Geographic Society, died on March 24 at the age of fifty-eight years.

ROBERT HALLOWELL RICHARDS, professor emeritus of mining engineering and metallurgy at the Massachusetts Institute of Technology, died on March 27. He was one hundred years old.

DR. LELAND RUSSELL VAN WERT, consulting metallurgist and chief of the metallurgical division of the Leeds and Northrup Company, Philadelphia, makers of electrical measuring instruments, died on March 27 at the age of fifty-five years.

DR. NEVIL MONROE HOPKINS, consulting and research engineer, died on March 26. He was seventy-one years old.

SCIENTIFIC EVENTS

THE BRITISH THERAPEUTIC TRIALS COMMITTEE[1]

DR. F. H. K. GREEN, of the administrative staff of the Medical Research Council, describes in the *British Medical Bulletin* the work of that council's Therapeutic Trials Committee. In response to representations by the Association of Chemical Manufacturers, the Medical Research Council organized in 1931 a scheme for the clinical testing of new remedies, and the Therapeutic Trials Committee was set up as a disinterested intermediary between the manufacturers and the medical profession, some medical men having been reluctant to carry out tests at the request of commercial firms. It was agreed that foreign as well as British remedies should be tried out and also the products of academic as well as of commercial laboratories. Manufacturers desiring trials by the Medical Research Council must agree to certain conditions. The composition and nature of the substance to be tested must be fully revealed to the council; manufacturers must not, without the council's permission, arrange for other independent trials, and the council is interested only in new substances which have not been therapeutically tested.

When a substance is to be tested, arrangements are made with clinicians of high standing to make tests, usually at more than one hospital, and the council reserves the right to decide whether the results, favorable or not, shall be published or revealed only to the manufacturer. If a clinician's results are published, they are published under the clinician's name as a report to the Therapeutic Trials Committee. Since the scheme was organized in 1931, more than forty new substances have been tested clinically. Outstanding examples are the classical papers embodying the results of clinical trials of "prontosil rubrum," which established the therapeutic possibilities in man of the first sulphonamide drug, which had been discovered in Germany; some of the earliest controlled clinical tests of sulphanilamide; trials of stilbestrol and other synthetic estrogenic agents. During the war clinical tests of penicillin have been organized and are still going on, and British-made equivalents of important foreign pharmaceutical products are being tested. The control of infections of wounds and burns is also being studied. Ultimately, according to Dr. Green, it is at the bedside that the clinical value of any new remedy is decided.

[1] From *Nature*.

MEMORIAL LOAN FUND FOR GRADUATE STUDENTS IN SCIENCE

As a memorial to the late Professor H. H. Whetzel, his former students and associates in the Department