draining the popliteal lymph node (the only node regional to the site of injection). They reached their highest titer after six days. In all experiments it was found that the antibody titer was higher in the efferent lymph; in some cases the concentration was 100 times that found in the lymph of the afferent vessel. The production of antibody in the popliteal lymph node was preceded and accompanied by a rise in the output of lymphocytes in the efferent lymph which ranged from 15,000 to 20,000 per cu.mm. to 60,000 to 80,000 per cu.mm. or more. At the same time hyperplasia of the lymphatic tissue within the node occurred resulting in some experiments in a weight increase of the node from 0.2 gm to 1.0 gm or more. These observations lent little support to the idea that antibodies are direct products of reticulo-endothelial cells. The latter concept, in fact, is hardly consistent with the complex chain of events in the lymph node during the formation of antibodies as we have described it.

In a recent paper[6] we now have shown that, during antibody formation in the popliteal lymph node of rabbits, the lymphocytes in the efferent lymph vessels contain antibodies in a much higher concentration than the surrounding lymph. The ratio of titers amounted to from 8 to 16 in many instances. This observation seems to offer only two possible interpretations, that the lymphocyte either absorbs or adsorbs, or produces antibodies. Various *in vivo* and *in vitro* experiments[6] failed to show absorption or adsorption of antibody by the lymphocyte; nor was this idea supported by the observations of McMaster and Hudack[18] or our previous experiments.[5] On the other hand, it was noted that the ratio between lymphocyte titer and lymph plasma titer was greatest on the fifth day of the experiment, which was the time of greatest rate of antibody formation in the lymph node. The average ratios of titers fell from 7 on the fifth day to 2.3 on the seventh day, in sheep erythrocyte experiments, and from 5 on the fifth day to 3 on the seventh day, in typhoid vaccine experiments. This observation is consistent with a primary appearance of antibodies within, or on the surface of, the lymphocyte, and inconsistent with what would be expected if absorption or adsorption took place.

It is true that the lymphocyte is a somewhat prosaic cell with no particularly striking morphologic characteristics. If stained with routine stains, the cytoplasm seems to be singularly undifferentiated and unspecialized, especially when compared with that of the other white cells of the blood.[20] However, when studied while living it shows many interesting features, among which the refractile bodies of Gall[21] are the most intriguing. Moreover, lymphocytes contain a wealth of enzyme systems, which have been recently discussed by Barnes.[22]

It is also true that the lymphocyte does not phagocytose and therefore can not absorb corpuscular matter. But who can deny that it has the faculty of absorbing or adsorbing dissolved antigens or split products of particulate antigenic substances? In fact, if our reasoning is correct, the lymphocyte goes into action only after the raw material, *i.e.*, bacteria or other formed antigens, have been properly prepared by the action of micro- or macrophages. It seems that the polymorphonuclear leucocyte and the macrophage as well as the lymphocyte may be instrumental in antibody production. It may be through the cooperation of all these elements that antibodies are produced. If this concept is correct, it becomes clear why blockage of the reticulo-endothelial system may or may not interfere with antibody formation. It is also obvious why the destruction of lymphocytes by x-ray produces a reduction in antibody formation and why the stimulation of lymphocytopoiesis by dry heat induces an increase.

SUMMARY AND CONCLUSIONS

An attempt has been made to show that facts previously regarded as evidence for the reticulo-endothelial theory of antibody formation may be interpreted differently. Moreover, there are recent observations which are difficult to reconcile, if not inconsistent, with this pattern. However, the new observations as well as the old facts seem to fit into another theory of antibody formation in which the lymphocyte and possibly the granulocyte as well as the macrophage play an essential role. This theory is consistent also with the present concepts of the chemical reactions involved in antibody formation.[23, 24]

OBITUARY

CHARLES LE ROY GIBSON

CHARLES LE ROY GIBSON, associate professor of chemistry at the University of New Mexico, died at his home in Albuquerque on December 8, 1944.

Dr. Gibson was born at Clovis, New Mexico, on February 19, 1911, where his father was an official of the A. T. & S. F. Railway. He received his secondary education in the Belen, New Mexico, high school. During his high-school days, following a trip of the Belen high school football team, on which he

[20] C. K. Drinker and J. M. Yoffey, "Lymphatics, Lymph and Lymphoid Tissue." Cambridge: Harvard University Press. 1941.
[21] E. A. Gall, *Amer. Jour. Med. Sci.*, 191: 380, 1936.
[22] J. M. Barnes, *Brit. Jour. Exp. Path.*, 21: 264, 1940.
[23] S. Mudd, *Jour. Immunol.*, 23: 423, 1932.
[24] L. Pauling, D. H. Campbell and D. Pressman, *Physiol. Rev.*, 23: 203, 1943.

played, he was stricken with poliomyelitis from which he recovered, but which left him unable to walk except with the aid of crutches.

He entered the University of New Mexico in 1929, graduating with highest honors in 1933. After a year of teaching in a New Mexico high school, he became an assistant in chemistry at the University of New Mexico, and in nine years received repeated promotions, until at his death he was an associate professor. Studying during summer quarters and during a leave of absence, he earned the M.S. (1936) and the Ph.D. (1941) at the University of Colorado, his major work being in physical chemistry.

Dr. Gibson was rated by all his students and by his colleagues on the faculty as an exceptionally fine teacher. Not only was he very brilliant himself, but he possessed the faculty of making difficult academic subjects understandable to those less gifted. He commanded the respect and affection of every student who took his work. Shortly after Pearl Harbor, because of his ability in mathematics and physics, he was loaned by the chemistry department to teach physics in the pre-meteorology courses offered to army and navy students, for which work the university was signally commended by the Armed Forces.

In the anxious days following the entry of the United States into the war, Dr. Gibson worked constantly, taking his first vacation in several years, beginning July, 1944. The last of October he became seriously ill with malignant hypertension, from which he died on December 8.

Dr. Gibson is survived by his widow, Anna Vallevik Gibson, whom he married in August of 1944, and his mother, Mrs. Blanche Gibson, of Albuquerque.

Dr. Gibson was a member of the Kappa Sigma fraternity and the honor societies of Phi Kappa Phi, Sigma Xi and Phi Beta Kappa. He was also a member of the American Association for the Advancement of Science and the American Chemical Society.

JOHN D. CLARK

RECENT DEATHS

PROFESSOR WILLIAM TRELEASE, professor emeritus of botany of the University of Illinois, died at the age of eighty-seven years on January 2. He was director of Shaw's Botanical Garden, St. Louis, for twenty-three years before going to the University of Illinois in 1913.

DR. PAUL M. LINCOLN, from 1922 until his retirement in 1937 with the title emeritus director of the School of Electrical Engineering of Cornell University, died on December 20 at the age of seventy-four years.

DR. WILLIAM PINKERTON OTT, since 1924 head of the department of mathematics at the University of Alabama, died suddenly on December 25. He was sixty-eight years old.

DR. WILLIAM FRANKLIN LONG, director of the astronomical observatory of Franklin and Marshall College at Lancaster, Pa., a member of the faculty for twenty-six years, died on January 1 at the age of seventy-three years.

DR. GEORGE T. AVERY, professor of education at the Colorado State College of Agriculture and Mechanic Arts, formerly dean of the summer session and for the past two years director of training at the Joshya Hendy Iron Works, Sunnyvale, Calif., died suddenly on December 26 at the age of sixty-four years.

MISS LAURA M. LUNDIN, professor of physics and mathematics at Russell Sage College, Troy, N. Y., died on December 29 at the age of sixty-six years.

DR. JAMES O. RALLS, assistant professor of biological chemistry of the School of Medicine of the University of Buffalo, of which he had been a member of the staff for the last seventeen years, died on December 28.

SIR JOSEPH A. ARKWRIGHT, bacteriologist at the Lister Institute for Preventive Medicine, London, died on November 22 in his eighty-first year.

SCIENTIFIC EVENTS

GIFT TO THE UNIVERSITY OF CAMBRIDGE OF A COLLECTION OF SCIENTIFIC INSTRUMENTS AND BOOKS

AN exhibition of historic scientific instruments and books, presented by R. S. Whipple to the University of Cambridge, is described in *The Times*, London, as follows:

The collection is notable for its range and variety as well as its representative examples of fine craftsmanship from those centers in all countries where science flourished for nearly four centuries. Among astronomical instruments shown are astrolabes, nocturnals, and a remarkable collection of sundials of various shapes, sizes and materials by English and Continental makers from the sixteenth century onwards. Refracting and reflecting telescopes are well represented, and a feature of the exhibition is a Newtonian reflecting telescope in perfect condition made and used by Sir William Herschel, with 8-inch speculum mirror of 10-foot focal length, together with a finder telescope and a complete set of eye-pieces. The instrument was presented to the present collection for Cambridge by the late Howard Marryat.

The collection of microscopes contains examples of each important type from the times of Robert Hooke and Leeuwenhoek to the end of the last century and is a re-