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OSWALD HOPE ROBERTSON

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A Biographical Memoir by

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DR. OSWALD HOPE ROBERTSON was born in Woolwich, England, June 2, 1886. When he was one and a half years of age, his parents moved to California and settled in the San Joaquin Valley at a time when it was still in a very primitive condition. He loved the out-of-doors, especially the small animal life of the valley and surrounding mountains.

Robertson began and ended his career as a naturalist in this same environment. In the intervening years his contributions to medical science were highly regarded by his colleagues, not only for their basic importance, but also—and especially—for the convincing array of indisputable evidence to support his contentions. He was ingenious in designing apparatus to meet the needs of his experiments. For example, in the early thirties he designed a heart-lung machine to induce artificial pneumonia *in vitro*. It was a masterpiece and almost completely successful; all that was lacking was the discovery of latter-day electronics that has made modern scientific and therapeutic equipment so spectacular.

He was an able clinician as well as an extremely effective teacher, especially with small groups. Occasionally he assumed important administrative assignments but the restraint of his enthusiasm for those responsibilities was quite obvious.

After attending the local primary schools in Dinuba, Cali-

fornia, Robertson graduated from Polytechnic High School in San Francisco.

Originally he planned a career in basic biology but was diverted from this course while on a vacation in Germany. Here he met an American medical student and was invited to accompany him to some lectures and demonstrations in anatomy and clinical medicine. This brief insight into the realm of human biology and pathology provided a new direction to his future course. He decided to study medicine and was admitted on his return to the premedical course at the University of California in 1906. His research instincts asserted themselves early. Even as a first-year student, he did some creditable research on the complement fixation test of rabies in the laboratory of F. P. Gay. Later in the same laboratory he worked on a diagnostic test for glanders. Although these studies were never published, they were written up and accepted for a Master of Science degree in 1910. At the instigation of friends he transferred to Harvard Medical School as a junior student. The high quality of his performance in medical school won for him the prized Dalton Scholarship Award to study pernicious anemia at the Massachusetts General Hospital, where he was appointed as an intern in 1913-1914. During this busy period, he had his first paper published in *California and Western Medicine* on Ehrlich's test for urobilinogen as an index of liver function. By this time his career as an investigator was established and he accepted a renewal of the fellowship to pursue his interests in the experimental and clinical manifestations of certain blood dyscrasias.

After his house officership he was appointed as an assistant in bacteriology and pathology at the Rockefeller Institute for Medical Research, where he planned to continue his studies on the physiology of blood in the laboratories of Dr. Peyton Rous. He and his new bride, Ruth Allen, a nurse he met at the Boston Children's Hospital, moved to New York in the autumn of

1915; but he had barely started his experiments on reticulocytes when World War I called for his services on the Harvard team of Dr. Harvey Cushing. In France, his early interests in hematology stood him in good stead as he was assigned the task of seeking better ways of reducing the risks of excessive transfusions. At the same time he initiated experiments to learn whether a fluid devised by Rous in the laboratory to preserve human blood cells *in vitro* had a practical use for transfusions at the battle front and in military hospitals. He demonstrated that the preserved cells were indeed an acceptable substitute, and Robertson now is recognized as the creator of the first blood bank. For this work he received decorations from both the American and British governments and was discharged in 1919 from the U.S. Army after attaining the rank of major.

He returned to the Rockefeller Institute and began his important studies in the field of infectious diseases, first with Hideyo Noguchi and then with O. T. Avery. In Avery's laboratory he became interested in the pneumococcus and pneumonia, which engaged his attention for more than twenty years. However, again his studies were interrupted by an attractive offer he accepted to assist in the development of the newly established Peking Union Medical College. He was appointed Associate Professor of Medicine and in 1923 he became Professor of Medicine and head of the department. He loved the eight years spent in China, a period of intense clinical activity and a reactivation of research interests in the infectious disease group—particularly in the pneumococcal group. Robertson, working closely with the young Chinese students, as well as with the staff, was given much credit for the successful growth of the institution. It became a hallmark for medical excellence in the Oriental world. The patterns of modern Western methods were accepted and established so readily that repeated efforts to negate them for political rea-

sons were unsuccessful. Although his professional activities kept him very busy he still found time to roam the countryside, to hunt bustards, or just to observe the native fauna and flora. He acquired a host of Chinese friends who made his home and laboratory a favorite meeting place—a practice they continued when visiting him after the Robertsons returned to the United States in 1927 following his recovery from an attack of typhus fever.

After a lengthy convalescence he accepted a professorship in medicine at the University of Chicago, where university-owned hospitals had just been built on the campus. He was intrigued by the opportunity to become associated with the group objectives, which were unique in American medical education and care in three important respects: (1) it was the first time an entire faculty was on a full-time basis as university faculty members without any private practice and remuneration; (2) all patients were utilized for teaching purposes; and (3) the clinical faculty were combined with the nonclinical group into a single division of biological sciences. As these plans became operative in the late twenties they met considerable resistance, but after four decades they are now accepted as sound and have become models for many other institutions, both existing and new ones. Robertson's role during the early growth pains was not insignificant. For a time he was the able administrative head of medicine, but this responsibility he transferred as soon as other competent hands could be found. In the research laboratories his studies on the pathogenesis and immunology of lobar pneumonia were classic. It was at this time he developed the heart-lung machine with his group, of which it was a privilege to be a member.

The practical application of his basic studies on pneumonia was an effective antipneumococcal serum. It was the first specific therapy against the dreaded lobar pneumococcal pneumonia and enjoyed only a brief period of success, as the new sulfa

drugs, which had much more rapid action and were far less expensive, were soon discovered.

Beginning in 1939 under Robertson's leadership a laboratory group directed their efforts toward elucidating the factors of significance in air-borne infections and especially to the discovery of techniques for aerial disinfection. These studies made necessary an excursion into many new fields, including physical-chemical studies of aerosol behavior; the epidemiology of respiratory infections in experimental animal populations and in human groups; the toxicology of various chemicals designed to kill air-borne bacteria and viruses; the pathogenesis of bacterial and viral infections transmitted via the aerial route; and the design and testing of engineering equipment for application in the field of some of the measures that were devised in the laboratory. In the period which followed, the laboratory group expanded and included the following persons: Edward Bigg, Morton Hamburger, Henry Lemon, Clayton Loosli, Benjamin and Zelma Miller, Theodore Puck, Henry Wise, and William Lester. In 1942 Robertson was named the director of the Commission on Cross Infections in Hospitals of the U.S. Army Surgeon General's Office. The name of this commission was later changed to the Commission on Air-Borne Infections.

Dr. Robertson's laboratory then undertook a double program of field studies in hospitals, army barracks, and industrial installations and laboratory experiments in an effort to develop methods of combating the spread of air-borne infections, which had become an exceedingly important source of attrition of human effectiveness during the war. Studies were carried out on the physical chemistry of aerosols containing viable infectious agents. Effects of various parameters on the viability of these agents were studied and the mechanism of air sterilization by chemical agents was worked out in detail. Such studies showed that the previously held theory that bactericidal action

was exerted through collision of aerosol particles of germicide with aerosol particles of the infectious agent was erroneous, and that the actual mechanism of action required action of the bactericidal agent through the vapor phase. New agents were developed which were enormously more effective than previous materials, and which were shown to be without toxic effects to human populations. The physical chemistry of aerosol vapor interactions was studied, and a number of fundamental papers were published in this field. While the use of chemical air sterilization was developed to the point where it became a practical measure, it never proved possible to obtain clear-cut epidemiological data demonstrating beyond any question that these measures would reduce respiratory disease in ordinary situations of human habitation. Nevertheless, the fundamental advances obtained in the course of these studies have been useful in a variety of ways, in both pure and applied science.

The hectic pace of the scientist with important contributions to make to the military effort during World War II held little appeal to Robertson and after the peace treaties were signed he requested an early retirement from the University of Chicago. He had a nostalgia with which most native Californians are afflicted and in 1950 he moved to the West Coast, where he established a laboratory in the Santa Cruz mountains. Here he began another successful research period. To the amazement and envy of most of his colleagues, salmon and trout occupied his attention. The problem was the cause of death of all Pacific salmon shortly after spawning, an almost unique phenomenon in the vertebrate world. Characteristically he began with the basic ingredients—a study of piscatorial anatomy and physiology during the migratory period. He found marked changes in the fatal journey of the salmon to the spawning grounds. The pituitary glands became hyperactive as their adrenals become overstimulated. This created

a condition similar to Cushing's syndrome in human beings. The destructive alteration of function and structure was directly related to the hyperconcentration of cortisone and hydrocortisone in the blood, plus the starvation which the salmon undergoes on its final voyage.

His last studies, terminated by death in 1966, were attempts to create artificially the most amazing natural phenomenon by injecting hormones in the immature rainbow trout; also, he tried to prevent or postpone degeneration and post-spawning death through the use of adrenal-suppressing compounds.

Robertson became a member of the National Academy of Sciences in 1943.

During his California period Stanford University was of great assistance and made him a member of its faculty. He quite naturally joined the ranks of the zoologists and was accepted as he was in medicine, a top-quality scientist. As one of his closest and most respected friends, Peyton Rous, said, "During recent years, working as a medical scientist still, you have revealed biological truths of such magnitude that their implications for natural phenomena have yet to be realized." He said this as he presented Robertson the Kober Medal, the most illustrious ornament medicine has to offer to one of its scientists.

The scientists working in his laboratory never failed to be deeply and permanently affected by his example of courtesy and gentleness in dealing with people, which reflected deep inner conviction about the worth of every human being. It was a joy to see how he manipulated scientific problems in order to reduce them to relatively simple questions, each of which could be approached by laboratory experiments. He was a masterful experimenter who designed techniques which were deceptively simple. This simplicity, however, resulted from his deep consideration of the essential process underlying the

phenomena studied. This analysis enabled him to eliminate many of the disturbing processes so as to isolate the single element which his subsequent experimentation was designed to elucidate. He taught young men by example, by gentle criticism, and by generous approbation.

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KEY TO ABBREVIATIONS

Am. J. Hyg. = American Journal of Hygiene
Am. J. Med. = American Journal of Medicine
Am. J. Med. Sci. = American Journal of Medical Sciences
Am. J. Public Health = American Journal of Public Health
Am. Phil. Soc. Year Book = American Philosophical Society Year Book
Arch. Internal Med. = Archives of Internal Medicine
Brit. Med. J. = British Medical Journal
Gen. Comp. Endocrinol. = General and Comparative Endocrinology
J. Am. Med. Assoc. = Journal of the American Medical Association
J. Clin. Invest. = Journal of Clinical Investigation
J. Exp. Med. = Journal of Experimental Medicine
J. Immunol. = Journal of Immunology
J. Infect. Diseases = Journal of Infectious Diseases
J. Morphol. = Journal of Morphology
Physiol. Zool. = Physiological Zoology
Proc. Nat. Acad. Sci. = Proceedings of the National Academy of Sciences
Proc. Soc. Exp. Biol. Med. = Proceedings of the Society for Experimental Biology and Medicine
Trans. Assoc. Am. Physicians = Transactions of the Association of American Physicians

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