MEMORIAL RESOLUTION
JAMES P. BAUMBERGER
1892 - 1973

James Percy Baumberger, Emeritus Professor of Physiology, died on June 21, 1973 at the age of 80, bringing to an end an unbroken career of research begun sixty years ago.

Percy Baumberger was born in San Leandro on September 17, 1892, the son of James and Elise Baumberger who had emigrated here from Switzerland in 1865 and had founded a salt-works in the East Bay at a site, still familiar to railroaders, called Baumberg. He attended the California School of Mechanical Arts in San Francisco and in 1910 matriculated at the University of California from which he received the B.S. in 1914 for work in Biology and Chemistry.

He had an early interest in invertebrates and a particular fascination with insects; indeed, the extensive insect collection which he started as a child is now at Cornell University. At the suggestion of Jacques Loeb who was then at Berkeley, Percy went to Harvard to work first under William Morton Wheeler in entomology and then under George Howard Parker in insect physiology. He received the M.S. under Wheeler in 1916 and the D.Sc. under Parker in 1918 for a thesis on the nutritional requirements of insects with especial reference to the metabolites produced by microorganisms.

During his first term at Harvard Percy came back to the Bay Area for the Christmas holidays to marry Alberta Loraine Jackson on December 22, 1914. He returned to Harvard with his bride and during the balance of his graduate studies he was concurrently an assistant and teaching fellow in Zoology and Botany at Harvard, assistant in Physiology and Entomology at Radcliff, and instructor in Natural Sciences at the Lowthorpe School of Horticulture in Groton.

His interest in human physiology, and particularly in the respiratory function of the blood, developed from his war service in the Meuse-Argonne sector where he was stationed for 10 months in 1918 as a member of the Shock Team commanded by (then) Lieut. Col. Walter B. Cannon. After the Armistice, Cannon offered Percy a post at Harvard but Percy preferred to return to California and, on Cannon's recommendation, he received an appointment as Instructor in Physiology at Stanford, where, as he later told his colleagues, the medical school (then in San Francisco) was soon to be established on the campus, an event that actually coincided with his retirement.

As a general physiologist, Percy was interested in anything that swam, crawled, walked, or just breathed, and this catholicity was well represented in the diversity of his published works which included such titles as "Studies in the longevity of insects", "Fatigue and error in a mental occupation", "Smoking versus chewing", "The relation of bicarbonate content and CO_2 tension to blood clotting", "The blood pigments of *Urechis caupo*", "The relation between the oxidation-reduction potential and the oxygen consumption rate of yeast cells", ",Oxidation-reduction potential, measured with a dropping mercury electrode", "Determination of the oxygen dissociation curve of oxyhemoglobin by a new Method", "Methods for the separation of epidermis and dermis and some physiologic chemical properties of isolated epidermis.'"

He spent many summers working at the Hopkins Marine Station on the moulting of crabs and upon respiratory pigments of marine invertebrates and, whenever the opportunity presented itself, he traveled abroad to undertake investigations in other laboratories. The record of these travels is not only a history of the significant scientific movements in general physiology over the past 40 years but is, at the same time, a reflection of Percy's fundamental commitment to the internationalization of science by the warmth of personal contact. Through a particularly fortunate set of circumstances his first sabbatical leave in Brussels, under a Committee for the Relief of Belgium Fellowship, was extended to 18 months by a grant from the American-Scandinavian Foundation. In Belgium he worked on blood clotting under Bordet at the Pasteur Institute, with Zunz at the Institute of Pharmacology, and with Errera at the laboratory of Colloid Chemistry at the University. At the Physiological Institute in Lund, he carried on work with Thunberg on the oxidation-reduction processes in cells and subsequently worked with Bierrum at the laboratory for Physical Chemistry in Copenhagen. Before returning home in 1926 he also worked in cellular physiology at the Marine Station at Naples, where he held the Rockefeller Table.

His interest in cytophysiology progressed from cells of lower invertebrates to those of mammals and he became interested in the metabolism of malignant cells. He held appointments as Research Associate at Harvard in the C. P. Huntington Cancer Hospital in 1932-33 and later was Visiting professor of Anatomy in St. Louis where he worked at the Barnard Free Skin and Cancer Hospital.

Among his greatest contributions to the general physiology and biochemistry of oxidation-reduction reactions was the application of the dropping mercury electrode to these processes. The application of the polarograph as an analytical tool in electrochemistry was underway in Prague in the late twenties and early thirties in the laboratory of Heyrovsky. Percy was impressed by its potential as an analytical tool in the study of biological oxidations and, after a visit to Heyrovsky's laboratory, made arrangements to obtain one of these instruments. Eventually, his laboratory acquired three of them and for several years it served as a training base for investigators from all over the United States who were interested in the application of this technique to biological problems. Among the many legacies left by Percy to this University one is still unknown: the quantity of mercury that is amalgamated into the plumbing and the air ducts of the Physiology Building as a result of the almost continuous operation of mercury stills over a period of 30 years. Although the applications of the polargraphic technique ranged from studies of the respiration of yeast cells and blood clotting to the combination of azo dyes with plasma proteins, one of the most important contributions made using this method was the analysis of the oxygen dissociation curve of hemoglobin and the study of the kinetics of oxygen uptake and delivery.

One of his favorite students, Gabor Markus, now Professor of Biochemistry at S U N Y (Buffalo), has contributed this interesting side light of an era marked by improvisation and imagination in which hypotheses were generated by insight and butt-work and not by a computer. Professor Markus writes: "One is astonished to see the biochemical and physical-chemical sophistication that a man trained as an entomologist could put into a paper in 1939, working with antediluvian equipment, manufactured by himself out of shoestrings and corkstoppers. I am referring to the beautiful paper in Cold Spring Harbor Symposium, 7, 195, 1939, in *which* he related the 0_2 consumption of yeast cells to the state of oxidation of the

cytochromes. The same paper contains the initial experiments for a very important method he worked out for the determination of the oxygen dissociation curve of hemoglobin, i.e., the simultaneous measurement of pO_2 by the dropping mercury electrode, and the spectrophotometric measurement of oxyhemoglobin, all measured continuously and in the presence of respiring yeast to keep the pO_2 changing. Variations of this method are much in use currently, but I doubt whether anybody knows that Percy was the first one to do it. He was way ahead of his time as you can see from this quotation from the introduction of the same paper: ... 'This in no way implies that the cell suspension is in thermodynamic equilibrium. In other words, the numerous systems present are not necessarily in equilibrium with each other, except in a dynamic sense." What he meant would be called today 'steady state'. I doubt that many people saw this as clearly as he did in 1939.

"He had a peculiar and highly individual way of making sense of data. If you brought him a set of observations that didn't make any sense at first, he would sit down, get his immensely long slide rule, a piece of graph paper, and would plot the data, first as they were, then their reciprocals, their squares, and their logarithms, until he got either a straight line, or a line with a break in it. Once that was accomplished he started to think what that meant and he always came up with a hypothesis that was at least interesting, if not always correct. I once asked him (at the beginning of my stay in his lab) how he knew immediately what to plot. He smiled sheepishly and said, 'I really don't know what I am doing; just hoping that something will come out of it.' Many times something really did!

"He was really an excellent instrumentalist. In his lab were two of his favorites: 'the first pH-meter on the Peninsula', and the spectrophotometer. The pH-meter was no longer functional when I came to the lab, but it was still there, occupying a whole table by itself. The spec occupied a whole room and was the cause of my bleeding ulcers but it did work, at least in principle. The principle of it he solved beautifully, but was too impatient to work out a decent way to hold the cuvette (actually a test tube) in a constant position. Therefore there was lots of tube twirling to obtain the maximum transmission which was read from a huge scale on the wall. Passing trucks also contributed to the uncertainty of the spectral data but, miraculously, the instrument yielded some excellent data for a number of people who had used it. He wrote very lucidly and was always available for consultation for students, no matter what he was doing, and was extremely patient when no progress was made, as long as he saw the effort. He grew extremely irascible with lazy students, however, and his wrath was really something to behold. But this did not happen very often. On the other hand, when he liked the results he was extremely encouraging, but never tried to take over. He knew some subjects very thoroughly, but what was more important, he knew a little bit about everything, so that his imagination navigated safely in the rocky harbor of research."

The studies of hemoglobin led naturally to his contributions to aviation medicine during the Second World War and in 1943, as Visiting Professor at the Aeronautical Laboratory at U.S.C., he helped to establish a research program on explosive decompression. He was subsequently special consultant to the U. S. Army Air Force at the Aeronautical Laboratory at Wright Field in Dayton. During the Korean War, under a contract from the Office of Naval Research, he supervised a national project on the compilation of a manual in Field Physiology and began a study of bird navigation based on the paramagnetic susceptibility of hemoglobin.

After retirement in 1958, he continued his work on hemoglobin with the *aid of* his sister-in-law, Mrs. Kathleen Bardwell, who had been his assistant for 35 years. In 1962, as Research Associate at the Palo Alto Medical Research Foundation he continued, with the help of his former student, Mrs. Helen Chin Leong, and Mrs. Bardwell to work under a grant from the Air Force on the effects of various gases on the oxygen delivery rate of hemoglobin, a problem that occupied him until a few months before his death.

His dedication to research is, of course, only one side of this remarkable man. He was concerned not only with the dissemination of the results of scientific work and thought, but also with the social function of science and with social problems, generally. His contributions on behalf of physiology are testified to by his active participation in the various societies of which he was a member: The American Association in the Advancement of Science, The American Physiological Society (of which he was one of the few 50-year members), The American Association for Cancer Research, The Society for General Physiology, and the Society for Experimental Biology and Medicine which elected him Chairman of the Pacific Division for 1956-58. He also served as President of the Stanford Chapter of Sigma Xi (1956-57) and as Chairman of the Editorial Committee of the Annual Review of Physiology for 1955-56. He was also a member of the Commonwealth Club of San Francisco.

Although much of the public activity in behalf of human welfare was carried out by Alberta through her duties as a professional social worker, the Baumbergers also brought a great deal of it home. Their house was frequently the setting for student parties at which they exerted a particular effort at making newcomers (students and faculty, alike) welcome to Stanford and, generally, at helping to sort out problems or to give a helping hand to the lonely, the perplexed, and the bewildered visitors from overseas.

Percy always had a warm spot for students in trouble—financial or academic (usually both)—and it was the measure of the man that he was always ready and able to apply gentle but pervasive pressure in unexpected ways to help these youngsters out of seemingly impossible problems. His greatest source of satisfaction came in following the careers of students who had done research with him. His great strength as a teacher was on the tutorial level, in close contact with a room full of students in his laboratory. He was a warm, compassionate, and thoughtful man, warmly recalled by professional colleagues <u>all</u> over the world and well beloved by about 2,000 students who went through his hands.

Percy is survived by his wife, Alberta, by his sister, Alice Zehnder of Palo Alto, and by eleven nieces and nephews. He is fondly remembered not only by the department which he served for 39 years, but also, in the rubric of a more gracious era, by the entire Stanford family.

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