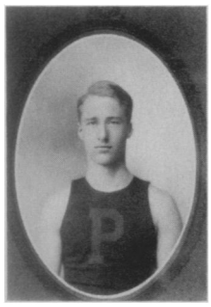
A Tribute to

Joel Henry Hildebrand

Nov. 16, 1881-April 30, 1983

By LINDA GARMON



When the Berkeley Bears prepared each year to meet the Stanford team on the football field, Joel H. Hildebrand would seize the opportunity to produce a chemical version of the confrontation. In his lecture class before each Big Game, much to the delight of his University of California Bear-backing students, the professor would mix different substances to transform a "Stanford red" solution into a "Berkeley blue and gold" one.

Hildebrand, who gained wide recognition for such charismatic teaching as well as for numerous scientific achievements, died last month at the age of 101. From 1913 to 1952, he left his mark on some 40,000 students who took his legendary course in freshman chemistry at Berkeley. In addition, in 1918, he wrote the *Principles of Chemistry* textbook, which remained a classic through its seventh edition, published in 1964. And, between the publication in the early 1900s of his paper on the color of iodine solutions and the appearance in the 1982 REVIEW OF PHYSICAL CHEMISTRY of his latest article on the theory of solutions, Hildebrand earned a reputation among chemists as the expert on how liquids behave.

Off campus, he was known as an avid hiker and nature enthusiast; he even served as Sierra Club president in the late 1930s. And, although he did not learn to ski until he was 40 years old, he became proficient enough by 1936 to manage the U.S. Olympic Ski Team. "His dedication to learning, his wit, his wise counsel and his zest for the active life have made a lasting impression far beyond the Berkeley campus," Berkeley Chancellor Ira Michael Heyman recently noted.

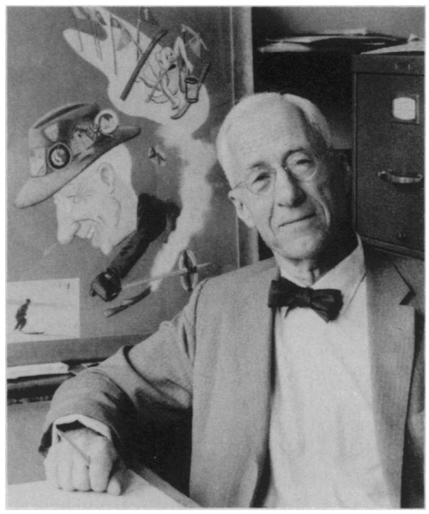
Berkeley's mandatory retirement age of 70 did not quell Hildebrand's zest for an active life. (He objected to being forced to stop teaching undergraduates because of his age and proposed that a professor's time of retirement ought to be determined by how many of that teacher's students were awake after 15 minutes of the lecture.) In the late 1950s, he served on the Citizens Advisory Committee to the Joint Education Committee of the California Legislature and battled for an appropriate balance of fact and theory in the classroom. And he remained active in research on the campus well into his 90s.

When asked about his "ageless" vigor, Hildebrand often would quip, "I chose my ancestors carefully." Born on Nov. 16, 1881, in Camden, N.J., Hildebrand told SCIENCE NEWS in an interview last year that he "was fortunate enough to be born before there was television; I had to make my own decision about what to pay attention to."

From early on, it was chemistry that received much of Hildebrand's attention. When he learned more chemistry than his high school teacher knew, he was given a key to the school's laboratory. There he conducted experiments to show that the correct formula for nitric oxide was not N_2O_2, as stated in his schoolbook, but rather NO.

In later years, Hildebrand's interest in gases and liquids led to a well-known improvement of deep-sea diving capability and safety. After studying the solubility of nearly a dozen gases in various liquids, Hildebrand and colleagues discovered that helium would be less soluble in body fluids than was nitrogen, which then was mixed with oxygen for use as diving gas.

Because of the great pressure exerted by deep columns of water, a diver at great depths experiences an increased dissolution of inhaled gases into the bloodstream and tissues. If pressure is decreased too rapidly, then the gas will release in the form of painful and potentially fatal "bends"-causing bubbles. Substituting the less-soluble helium for nitrogen could ameliorate this problem, Hildebrand wrote in 1924 to the U.S. Bureau of Mines, where the proposal then was tested experimentally. But the real test came on May 23, 1939, when the U.S.S. *Squalus*, the nation's newest submarine, sank in 243 feet of water in the North Atlantic. A total of 628 dives, employing helium, were required to raise the submarine; only two cases of the bends were reported. Use of helium for deep-sea diving is now standard practice.



Above: Hildebrand in his office on the Berkeley campus in October 1959. Left: Hildebrand on the University of Pennsylvania crew in 1902.

That Hildebrand's career went in a number of directions also is illustrated by the special duties he undertook in both World Wars. In World War I, he was asked to analyze the poisonous gases introduced to the battlefields by the Germans. He also helped develop a truck that could steam-treat contaminated clothing. Then, during World War II, Hildebrand was a consultant on the design of the "Weasel," a type of snowmobile that was to be used against the Germans in Norway. He was sent on a top-secret mission to Chile to test the machine's performance on powder snow.

"After an absence of fourteen days," Hildebrand wrote in an autobiography published in the Autumn 1972 PERSPECTIVES IN BIOLOGY AND MEDICINE, "I returned to my freshmen and said, 'My dear children, I must tell you why I have been absent. I trust that you agree with me that there is no offense a teacher can commit that is so reprehensible as to be dull, monotonous, uninteresting, and further, that an effective antidote is for him to fill his life as full as possible with variety and adventure for the sake of his students. Now I just went down to Chile to ski in the Andes, for your sakes; I trust you approve.' They did." □