Princeton University

Honors Faculty Members Receiving Emeritus Status

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The biographical sketches were written by
colleagues in the departments of those honored.

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Thomas George Spiro

Born on the island of Aruba in the Netherlands Antilles in 1935, Thomas Spiro spent his early childhood years in Hungary and, after 1939, in Canada, before moving to Los Angeles for high school. Even at this age Tom took joy in his home chemistry set, making colorful metal ion solutions and pungent odors that terrified his little sister. Tom received a B.S. degree from UCLA in 1956 and a Ph.D. in analytical chemistry from MIT in 1960. His thesis work in the laboratory of David Hume involved studies of complex compounds containing mercury. In those days the bases for the behavior, and colors, of many metal complexes was just becoming understood in the form of "ligand field theory." Having won a Fulbright Fellowship, Tom and his wife, Helen, sailed to Copenhagen where Tom took a position in the laboratory of Carl Ballhausen, who had just written the classic textbook in this new field.

Tom joined the faculty at Princeton as an instructor in analytical chemistry in 1963, after a year working with Standard Oil in Southern California and a year in Stockholm in the laboratory of Lars Gunnar Sillen, another leader in the chemistry of metal complexes. In this period Princeton and many top universities began to lose interest in analytical chemistry. Fortunately, the two European experiences and the interest in ligand field theory allowed Tom to develop his research at Princeton into the growing field of inorganic chemistry. Donald Hornig, who was then the chemistry department chair, left Princeton to become Lyndon Johnson's science adviser. Left behind in the Hornig laboratory was a Cary Model 81 Raman spectrometer, truly a Cadillac of an instrument in these days before lasers. Tom's embryonic research group took full advantage of the opportunity to apply this instrument to the study of the

metal complexes from the Stockholm experience. Raman spectroscopy, it turned out, was ideally suited for such studies due to the low frequencies and large polarizabilities of metal-metal stretching vibrations.

Tom's first research grant from the National Institutes of Health was to study biologically important metal complexes by Raman spectroscopy. This opportunity allowed for the construction of an argon/krypton laser spectrometer of a radically new design. The visible light from this laser allowed the study of richly colored metal complexes. With this advance, the resonance Raman effect, which greatly amplifies the spectra by coupling electronic absorptions with molecular vibrations, could be applied for the first time to the study of metal-containing proteins and enzymes. Because of the colors caused by light absorption by the metals and cofactors such as heme, the technique allowed measurements of protein vibrations near the metal centers without complications due to the rest of the protein molecule. Tom's application of the technique to the copper-containing protein azurin led to the conclusion that the intense blue color of this protein was due to a planar, trigonal geometry surrounding the copper with a strongly bound sulfur at an equatorial position. The X-ray crystal structure later determined by Hans Freeman in Sydney showed this assignment to be correct.

A huge and enduring success in Tom's application of resonance Raman spectroscopy to the study of biological molecules came in its application to heme proteins such as hemoglobin, the oxygen-carrying protein in red blood cells. This work showed that there was an abundance of structural information encoded into the complicated spectra. Further, with the advent of fast lasers, the motions within proteins could also be examined. Recent advances in the Spiro laboratory have extended the technique into the deep ultraviolet portion of the spectrum that has allowed the direct monitoring of protein folding and unfolding events.

For his many advances in the metals in biology and bioinorganic chemistry fields he helped to define and nearly 500 publications, Tom has received the American Chemical Society's Award for Distinguished Service in the Advancement of Inorganic Chemistry, a MERIT Award from the National Institutes of Health, the Biophysical Society Founders Award, and the Bomem-Michelson Award.

Tom has been a generous contributor to the life of the University, serving as chemistry department chair from 1979 to 1988. He was deeply involved in the creation of the Princeton Environmental Institute and has written an influential textbook, *The Chemistry of the Environment* with Bill Stigliani. This book has served as the basis for his very successful course "Oil to Ozone, Chemistry of the Environment." Colleagues within the Princeton community and around the world revere Tom for his keen sense of scholarship, his intrinsic humility, and his inspirational sense of empathy. While entering emeritus status at Princeton, Tom will be embarking on a new phase of his remarkable career as he moves his very active laboratory to the University of Washington–Seattle. We wish you well, Tom, and may there always be colorful solutions to analyze and contemplate.