DOCUMENTS OF THE GENERAL FACULTY

REPORT OF THE MEMORIAL RESOLUTION COMMITTEE FOR
JOHN C. MAXWELL

The special committee of the General Faculty to prepare a memorial resolution for John C. Maxwell, professor emeritus, geological sciences, has filed with the secretary of the General Faculty the following report.

Sue Alexander Greninger, Secretary
The General Faculty

IN MEMORIAM
JOHN C. MAXWELL

John C. Maxwell, educator, geologist, and scholar, died in Austin, Texas, on January 23, 2006, at the age of 91. He embraced life with enthusiasm and lightened it with his sense of humor, much appreciated by his students during long summer traverses in Italy and California. He was born in Xenia, Ohio, on December 28, 1914, to Addie Crawford and William Maxwell. He is survived by his wife of 66 years, Marian Maxwell, and their daughter, Marilyn Bradford.

After high school, Maxwell was awarded a four-year scholarship to DePauw University, where he graduated in 1936 with a degree in geology. From there, he attended the University of Minnesota, also on a scholarship, and in 1937 graduated with a master's degree. He then took a job with Sun Oil Company in Beaumont, Texas, where he met and married Marian Buchanan. At Sun Oil, he specialized in gravity modeling and the then new skill of seismic reflection interpretation. The academic world was his real interest, and in 1940, the couple drove to Princeton University, where he began work on his Ph.D. and she hoped to find a job.

World War II started during Maxwell’s second year at Princeton. He enlisted in the U.S. Navy and was assigned to a naval intelligence group as an antisubmarine warfare officer. He was stationed in New York City in the unit headed by Commander Harry H. Hess, his thesis advisor at Princeton. In January 1944, Maxwell was transferred to New Caledonia, the headquarters for all U.S. military forces in the Pacific. He remained there until October 1945 and was discharged upon his return to the states. The reunited family returned to Princeton, where John worked to finish his dissertation, receiving the Ph.D. degree in 1946.

Maxwell’s performance as a graduate student was so outstanding that he was appointed to the Princeton faculty as an assistant professor of structural geology and tectonics. He rapidly rose to the rank of professor. In 1955, he was appointed chairman of Princeton’s new Department of Geological Engineering and served in that capacity until 1966, when he became chairman of the Department of Geological and Geophysical Sciences. In 1970, he accepted the position of the William Stamps Farish Chair in Geology at The University of Texas at Austin. He served in that capacity until retirement in 1984.

Maxwell contributed great service to the geosciences. He was elected president of the American Geological Institute, 1971, and president of the Geological Society of America, 1973. He was chairman, Earth Sciences Division, National Research Council, 1970-72, and again 1981-85; chairman, Advisory Panel, Earth Sciences Division, National Science Foundation 1975-76; consultant to Advisory Committee on Reactor Safeguards of the Nuclear Regulatory Commission, 1976-1984; vice chairman of the board of the International Geological Correlations Program, UNESCO 1979-1984; and member of the scientific panel advisory committee to the Gas Research Institute on the Siljan Deep Hole project in Sweden. His service on these panels and organizations made him a valuable counselor when seeking input on people and issues.

Maxwell received numerous awards. He graduated Phi Beta Kappa at DePauw University and was awarded a Thomas F. Andrews Fellowship at the University of Minnesota. He was a Fulbright Research Scholar in Italy in 1952 and a Guggenheim Scholar in Italy during 1961-62. Living in Italy was a life-expanding cultural experience for his entire family. He was selected as a distinguished lecturer by the Canadian Institute of Mining in 1966, and a Sigma Xi National Lecturer in 1967. His 1969-1970 lecture tour for the American Chemical Society earned him
their Speaker of the Year Award. He was also recognized by his alma maters. In 1972, the University of Minnesota gave him their Outstanding Achievement Award. In 1988, DePauw University presented him an Honorary Doctor of Sciences.

John Maxwell’s geologic research had several long-term themes: laboratory studies of quartz sand compaction; the origin of rock cleavage; and field studies that focused on gravity tectonics, soft-sediment deformation, mélangé formation, and the origin and emplacement of ophiolites.

Maxwell’s field research in the 1940s, both before and after the war, was primarily performed at locations around the Caribbean, mostly in Venezuela. From 1952-1970, he made many trips to Italy to examine the ophiolitic and related rocks of the Apennines near Tuscany and Liguria. He was the first American geologist to accept that the ophiolite suite was a recurring rock association found in many mountain belts. In 1964, he co-led with Italian colleagues an American Geological Institute Summer Field Institute in the northern Apennines of Italy. This trip introduced a whole generation of young American structural geologists to ophiolites and mélanges -- enigmatic masses of chaotically mixed blocks of rock dispersed in a sheared matrix of shale or serpentine. From 1953-1962, he participated in the Princeton field courses held in the Rocky Mountains of Colorado, Wyoming, and Montana. Many Princeton student dissertation projects arose from places visited during the field course. And of course, he maintained a steady interest in the geology of the nearby Appalachians. In the late 1960s, Maxwell began a project to study the ophiolites and mélanges in the California Coast Ranges. This program expanded greatly after he moved to Austin, and most of his Texas graduate students worked on geologic problems in the Franciscan Complex.

The direct scientific contributions of John C. Maxwell are recorded in the forty-one formal papers he published and indirectly by the records of the scores of students he inspired and supervised. Maxwell’s dissertation studies resulted in the 1948 publication of a monumental report on the geology of Tobago in the British West Indies. This paper, which includes a map of the entire island, remains a cornerstone in understanding the geology of this part of the southern Caribbean.

Maxwell paralleled his thesis advisor by making geologic observations while serving in U.S. Navy. Commander Hess discovered guyots while captaining a transport ship. While stationed in New Caledonia, Maxwell visited the nickel laterites and chromite deposits. The nickel deposits were relatively well characterized in the literature of the day, but the deposits of chromite were essentially undescribed. Maxwell found time to visit several of the chromite mines and document his observations. His descriptions, published in 1949, clearly show that the chromite layering is of igneous origin and that the associated ultramafic rock was later serpentinized and intensely deformed. He noted that these rocks were atop a basement that included glaucophane schists. He didn’t know it at the time, but this was his first introduction to the association of blueschists with ophiolites.

Upon becoming a Princeton faculty member, Maxwell established a program of laboratory experimentation on sandstone compaction and new field studies concerning the effects of tectonism on sedimentation. The experimental program led to influential papers with Peter Verrall concerning porosity loss caused by elevated pressures and temperatures in deeply buried carbonate rocks in 1953 and quartz sands in 1954. Years of systematic experiments designed to address the role of compaction and cementation in porosity reduction of quartz sands resulted in a 1960 paper that reported data from 230 experiments lasting for time spans ranging from hours to 100 days. The comparison of experimentally deformed rocks with natural samples led him to the conclusion that flowing solutions must be very important in causing dissolution of quartz grains at point contacts. However, his experimental efforts to duplicate the process, now known as pressure solution, were largely unsuccessful. Maxwell suspected geologic timescales were an essential factor, and thus, he engineered a program to systematically compare samples from deep wells across Louisiana, Texas, and Oklahoma -- in essence an analysis of many natural experiments. This project, published in 1964, led to the conclusion that maintenance of original porosity was favored in sandstones by low thermal gradients, young age, stagnant formation waters, absence of minerals other than quartz, and probably excess pore fluid pressures. These papers were widely read as the petroleum industry drilled ever deeper in the search for oil.

The mechanisms by which deformation causes minerals to become oriented in rocks is of interest to all structural geologists. One of the earliest attempts to experimentally generate a fabric in sandstone was published in 1956 by Maxwell and a Princeton student, Iris Borg. Maxwell’s 1960 paper on the origin of slaty and fracture cleavage in the Delaware Gap area of New Jersey received much attention. This report on the Martinsburg slate contained a detailed map, cross sections, and a set of carefully drawn diagrams illustrating the evidence he saw for the
formation of slaty cleavage while the rock was still water-rich and weakly consolidated. This paper, required reading of all students interested in the origin of slaty cleavage, carefully documents relationships observable in outcrops. To this day, field trips routinely stop to see and debate Maxwell’s evidence that the rapid application of tectonic stress induced pore fluid pressures approaching lithostatic values, which in turn caused the injection of sandstone dikelets parallel with the cleavage.

During the summers, a program of field research was designed to elucidate the record of gravity tectonics and soft-sediment deformation. Maxwell was attracted to the Apennines of northern Italy where remarkable turbidite and gravity-slide deposits show all gradations into the chaotic deposits known as olistostromes. These deposits are associated with ophiolites. Two influential reports on these exceptional field relationships were published in 1959 followed by a major 1963 paper complete with several maps and many stereonets.

Maxwell was chairman of the department at Princeton University while several of his colleagues and students were instrumental in the development of plate tectonic theory. He contributed to the revolution with an early 1968 paper entitled “Continental drift on a dynamic Earth” that was aimed at young scientists because it was published by Sigma Xi in American Scientist.

Maxwell discussed ophiolites in his papers concerning Italy. Ophiolite suites are associations of rock whose structural order was long debated because faulting shuffles the relationships. Maxwell, with much experience in Italy and some in New Caledonia, was one of the first American geologists to recognize that the sequence ranged from ultramafic rock (peridotite) at the base, to gabbro and diorite in the middle, to diabase dikes capped with basaltic volcanic rocks, commonly pillow flows depositionally overlain by radiolarian chert and flysch-type sediments. His pioneering insights, presented at meetings and lectured upon in classes, led to a brief 1969 discussion paper that led indirectly to the widespread acceptance of this association by American geologists. He emphasized the European perspective that this rock assemblage formed in deep water, becoming uplifted and juxtaposed with flysch deposits during orogenesis. Within a year, many workers described ophiolite complexes as slabs of ocean crust uplifted by plate tectonic processes at subduction zones. However, in the matter of ophiolite formation, Maxwell differed from many of his colleagues. He agreed they formed by diapiric upwelling and partial melting of mantle material, but he believed that many ophiolites formed within the interior of rising orogenic belts. These concepts were developed in a 1970 book chapter and in the proceedings of a 1973 symposium held in Moscow.

In the petroleum industry, many doubted the validity of the new theory of plate tectonics. For the American Association of Petroleum Geologists, Maxwell contributed a 1974 paper to a volume assessing the validity of plate tectonics. Maxwell argued that the theory accounts for many aspects of ocean floor geology, but he emphasized that the causes of deformation of the interior of continents is especially problematic. In this paper, Maxwell listed seventeen features of the ocean basins and eighteen aspects of the continental deformation that plate tectonic theory seemingly did not readily explain. The topics on his lists spurred many research endeavors.

Maxwell joined the Department of Geological Sciences at The University of Texas at Austin in 1970 and immediately expanded his field program in western California -- an area containing all of his favorite geologic features: mélanges, flysch, blueschists, and ophiolites. This work led to the subject of his address as president of the Geological Society of America and to what is probably his best known and most widely read contribution. The 1974 paper “Anatomy of an Orogen” concerns the origin of the northern Coast Ranges of California and the rock record of subduction. This paper, a benchmark for California and subduction zone geology, was rooted in his own fieldwork and the mapping of 15-minute quadrangles by six graduate students. This paper showed that the Franciscan accretionary prism can be subdivided into eighteen mapable units, five of which were mélanges distinguished by the numbers and types of included blocks. New insights were presented regarding the structural evolution of the Franciscan accretionary prism and its relationship to the overlying Coast Range Ophiolite and Great Valley forearc basin deposits. A companion paper, also published in 1974, “Early western margin of the United States” placed the Franciscan complex and associated terranes into their regional plate tectonic context. Most of the K-Ar geochronology obtained for the student studies in the great California mapping transect were compiled in a major 1984 paper with Fred McDowell as lead author.

Starting in the mid-1970s, Maxwell was an active participant in the U.S. Geodynamics Committee. From 1979-1983, he chaired this committee, which spurred thematic technical sessions at national meetings and nucleated workshops centered on identifying future research directions. He coordinated an auspicious program of
constructing maps and cross sections across the western and southern margin of the North American continent. The program was a great success with twenty geologic transects published as the Geological Society of America Map and Chart Series (MC-28). Maxwell constructed one for the northern Coast Ranges of California, which was published in 1981, and he co-authored with all of his Texas students who had worked in California. A notable aspect of the project was that the transects were prepared at a similar scale and level of detail. Many faculty teaching tectonics courses hung them in the hallways of their geoscience departments.

Maxwell received considerable attention with a 1985 paper provocatively titled “What is the lithosphere?” This report summarized the varying thermomechanical definitions proposed for the lithosphere since the advent of plate tectonics. This paper was expanded for publication in Physics Today and translated into Japanese for publication in their widely read Physical Science Magazine. A contribution published in 1987 gave Maxwell’s perspective on how the U.S. geoscience community changed its overall thinking about Earth behavior from a largely passive view to the exceptionally dynamic perspective of today.

Maxwell’s deep interest in the association of ophiolites and mélanges was the subject of his last papers, which incorporated some of his own field observations. These 1982 and 1984 papers, with Pinar Yilmaz as lead author, concerned the classic ophiolite and mélange occurrences of Turkey. With a 1986 paper dedicated to one of his Italian colleagues, he returned one more time to discuss these rock assemblages in his beloved Apeninnes of Italy.

John Maxwell’s scientific output was large, but it was dwarfed by the production of his graduate students and the countless others he inspired with kind words of encouragement. At Princeton University, he supervised the completion of twenty-seven dissertations and three masters theses. At UT, the totals were eleven dissertations and three masters theses. Many in the Princeton group became leaders in academia while those at UT tended towards industry careers. Most of John’s students are not formally linked to him in the literature because he rarely let his name be placed in the publications arising from their graduate student research.

Maxwell’s effectiveness as a teacher is best described by one of his former graduate students, the distinguished Professor Eldridge Moores: "John Maxwell was revered by his students, who found him to be an enthusiastic lecturer, a supportive advisor, and one who never tried to push his ideas onto his students. His cheerful, infectious humor and his hearty laugh brightened many a classroom and defused many awkward situations." Perhaps John would view his greatest contribution to the geosciences was the fact that he played some role in the education of an extraordinary group of graduate students. His list of Princeton advisees includes: Moores, Verrall, Gabriel Dengo, Raymond Price, Donald Wise, Marvin Kauffman, Ronald Oxburgh, Alan Smith, Creighton Burk, Walter Alvarez, Robert Twiss, William Travers, and Casey Moore. His list of Texas advisees includes Yilmaz, Paul Gucwa, Michael Jordan, Jay Raney, John Kleist, Dan Worrall, and Mark Helper.

In appreciation of the scholarships that he received as a student, in 2001 John and Marian established an undergraduate scholarship in the Department of Geological Sciences at UT Austin. John and Marian Maxwell will forever play a role in helping educate students about the planet they live on.

**Major Publications**


Maxwell, J. C., and Verrall, P., 1953, Expansion and increase in permeability of carbonate rocks on heating: Transactions, American Geophysical Union, v. 34, p. 101-106.


This memorial resolution was prepared by a special committee consisting of Professors Earle F. McBride (chair), Mark Cloos, and William R. Muehlberger.

Distributed to the dean of the College of Geological Sciences, the executive vice president and provost, and the president on June 26, 2006. Copies are available on request from the Office of the General Faculty, WMB 2.102, F9500. This resolution is posted under "Memorials" at: http://www.utexas.edu/faculty/council/.