Paul Olum

August 16, 1918 — January 19, 2001

Professor Emeritus Paul Olum, formerly of the Department of Mathematics at Cornell, died on January 19, 2001 in Natick, Massachusetts, having suffered for some years from a variant of Alzheimer's disease. He served with distinction on the Cornell faculty from 1949-74, at which time he left to become Dean of the College of Natural Sciences at the University of Texas at Austin. Paul was predeceased in 1986 by his wife, Vivian–nee Goldstein–a 1957 Cornell Ph.D. in Psychology; and by his daughter, Judith in 1990. He is survived by a daughter, Joyce Olum-Galaski, a rabbi in Amherst, Massachusetts; and by his son, Ken, of Sharon, Massachusetts, who is a Research Associate in Physics at Tufts University.

In 1976, Paul left Texas for the University of Oregon to serve as Vice President for Academic Affairs and Provost and later as President. He retired from that position in 1988 upon reaching the age of 70. In 1989, he moved to Greece to be with his friend and companion, Margarita Papandreou. His illness forced him to return to the United States in 1996 to live with his son, Ken, and Ken's partner, Valerie White.

Despite Olum's early departure from Cornell, his department colleagues, as well as former Cornell President Dale R. Corson, strongly supported his nomination for emeritus status in light of his many years of service both to the department and to the university.

Paul was born in Binghamton, New York, on August 16, 1918, and received his early education there. He attended Harvard University, earning an A.B. degree summa cum laude in Mathematics in 1940. The world-renowned mathematician Hassler Whitney, who was destined to become Paul's graduate thesis advisor after World War II, wrote that Paul's senior thesis was "almost the equivalent of a Ph.D. thesis." Nevertheless, Paul went to Princeton University to begin graduate work in physics–which at the time he felt was "more 'real' than mathematics." However, his outlook changed.

> *"Two years later, I came to the conclusion that this was pretty illusory and that one can make quite as good a philosophical case for the reality of the formal world of mathematics as for the particular world we happen to live in, and anyhow I liked mathematics better, so I changed back and [in 1942] got an M.A. degree in it."*

Many years later, Paul related an amusing anecdote that may reveal an additional dimension to his career decisions in 1940-1942. Paul stated that he did leave mathematics and go to Princeton as a graduate student in physics. However, his office mate in Princeton was clearly so much more brilliant and able, that Paul became discouraged.

If that's what it took to do graduate work in physics at Princeton, well, then he just wasn't up to it. So he switched back to mathematics. The punch line to the story, which Paul related with obvious relish, was that the office mate was the legendary Richard Feynman. So the mathematics community has Feynman to thank for returning Paul to the fold.

In that period, Paul joined the physicists at Princeton who were working on the Manhattan Project. Feynman, who remained a lifelong friend, was later to write of Olum,

> *"He was of very great practical assistance both there at Princeton and at Los Alamos, which we went to later. Although primarily interested in [the mathematical field of] topology, his interests and knowledge were sufficiently broad to enable him to contribute in important ways to physical and mathematical problems arising in engineering the atomic bomb . . . I believe he joined the project through a feeling of social responsibility and the belief that he could be of greater service on a project such as ours."*

Olum spent the period 1943-46 in Los Alamos, but at the end of that time decided to return to Harvard, where he received his Ph.D. degree in Mathematics in 1947 under Hassler Whitney. After one postdoctoral year at Harvard and another at the Institute for Advanced Study, Olum joined the Cornell faculty as an Assistant Professor in the Department of Mathematics. At that time, he was the only representative of the field of algebraic topology. Historically, that field has deep roots, but it was in the twentieth century, particularly in the latter half, that it would grow into a broad and powerful subject that would touch virtually every branch of mathematics. Olum was clearly aware of the historical trajectory of his field, and while he was anything but parochial in his interests and in his leanings in faculty development, he vigorously and successfully encouraged the growth of topology in the department. Paul was quickly promoted to Associate Professor (1951) and became a full Professor in 1957. He served as department chair from 1963 to 1966.

Some words are now in order about Paul's own work in topology, and this in turn requires a few words by way of background. Algebraic topology is an outgrowth of certain combinatorial and geometric problems involving graphs, networks, surfaces, and solids that go back as far as the sixteenth and seventeenth centuries. The basic problem has been to get some sort of numerical, algebraic or computational handle on the vast variety of geometric objects with which mathematics and physics are confronted. Numbers and algebraic entities are amenable to systematic symbolic manipulation and analysis, whereas geometric entities generally are less so. Thus, connecting the two could provide a powerful method for analyzing the latter. Topology concerns itself with the properties of geometric objects–or, as topologists say, properties of "spaces"–that are invariant under continuous transformation. Numerical or algebraic quantities that are associated with spaces and remain unchanged under

such transformations are known as "topological invariants." Thus, for example, if two spaces have different topological invariants, then they cannot be continuously transformed to one another. Even such limited, negative information has useful applications, for example to the theory of differential equations in applied mathematics and physics. Of course, such invariants should be meaningful and non-vacuous in terms of our geometric intuition, and one has to be able to define them precisely and effectively, as well as to compute them. Such requirements pose formidable problems: indeed, they form the core of the subject of algebraic topology.

Paul's specialty in algebraic topology was the study of certain kinds of invariants known as "obstructions." They arise in the following schematic way. Try to continuously transform (or map) one space to another. This may be very hard, but perhaps you can do so with a small, simple piece of one to a small piece of the other–so far, so good. Now try to enlarge the domain of the transformation by extending it to another small, simple piece, and so on. Perhaps in this way, after a number of such steps, you can get the complete transformation. Or perhaps you get stuck. Now, if you choose your pieces and your method of extension very carefully, you might be able to measure (by using some other simpler invariants already studied for these pieces) how badly stuck you are. With luck, the simple invariants, when equal to zero, may tell you that a small change may get you unstuck, and when not zero will tell you that no small change will help. This kind of invariant–a provisional index of success, as it were–is known as an obstruction. Paul's thesis and subsequent article in 1950 in *Annals of Mathematics*, the flagship journal for pure mathematics–gave a comprehensive, general treatment of obstruction theory that is still a standard reference work today. Indeed, Hassler Whitney wrote with prescience in 1948: "Olum's Ph.D. thesis, on the classification of mappings will, I believe, take its place as one of the basic contributions in algebraic topology." Paul's subsequent work in algebraic topology involved devising computational schemes for calculating obstructions and applying the general theory to specific problems. It should be emphasized that the theory of obstructions gives a method for tackling a vast array of topological questions, so it has played a role in a large proportion of the major topological developments of the latter half of the twentieth century. Thus Paul's work was influential in ways that greatly transcended obstruction theory itself.

The foregoing outline of Paul's academic and research career omits many of the qualities and activities that distinguished him. Among these qualities were his energy and enthusiasm, his personal brilliance, intellectual breadth, and articulateness, his charm and likeability and, perhaps most important, his strong moral sense, which informed all his important decisions. This was already evident in his decision to work on the Manhattan Project and would also be important later in numerous contexts, both academic and non-academic. Paul was highly regarded in the university community, playing a major role for years on numerous university committees. For

example, he served on the Academic Records Committee, the Educational Policy Committee, the Committee on Academic Freedom and Tenure, and the Humanities Council. He was also an accomplished parliamentarian, which he frequently used to great advantage at the monthly University Faculty meetings that formed the basis for faculty governance through the late nineteen sixties. During the troubles at Cornell associated with the takeover of Willard Straight in 1969, Paul was one of three faculty members asked by President Perkins to serve on an Emergency Advisory Board. Later he chaired a special committee of the Constituent Assembly to draft a constitution for the nascent University Senate and to propose changes in the structure of the Board of Trustees. Among other things, the committee recommended the creation of a student-elected trustee position. In 1971, Paul became the first faculty member elected to this position, serving as a Trustee until 1975.

Paul's department activities were similarly energetic and important. He was a strong, uncompromising advocate of high academic standards in the hiring and promotion of faculty members, and he devoted himself tirelessly to the task of faculty development throughout his tenure as department chair. He also initiated, in 1962, the Cornell "Topology Festival," an annual, regional professional gathering at which the major developments in the subject were presented. This became the most prestigious topology conference in the country for many years, and it is still held every year during the last week of Spring classes. It set the standard for the many annual topical conferences in mathematics now held around the country.

Paul became Department Chair in 1963 after a period of serious, internal department dissension. In fact, he was on leave during 1962-63 at the University of Paris and the Hebrew University in Jerusalem. During that year, the department chair had a serious falling out with the tenured faculty, the first such contretemps in department history. At a faculty meeting that was held without the knowledge of the chair, a vote of no confidence passed by a large majority. As a result, the chair left Cornell at the end of that academic year, while the department, which had always been a model of tranquility and collegiality, was rife with factionalism. "Some of the faculty were simply shattered by the turmoil," recalls Anil Nerode, who has been a member of the department faculty since 1959. Paul, both by the fortuitous event of his absence and because of the esteem in which he was held by the entire mathematics faculty, became the obvious choice to head the department. Of Paul's success in restoring tranquility, the then Provost, Dale Corson–a friend of Paul's from their Los Alamos days–was later to write:

> *"He was Chairman of the Department of Mathematics during a period of turmoil and did an excellent job in bringing order out of chaos and restoring the Department to an effective group working together toward common goals."*

Paul's tenure at the University of Texas was brief, and this deserves some further mention. At the time of his departure from Cornell in 1974, Paul was a leading candidate for the position of Dean of the College of Arts and Sciences. He was also being courted by the University of Texas, more specifically, by its President, Steven Spurr, to become Dean of the College of Natural Sciences. Paul had made a conscious decision to leave research mathematics (though perhaps not teaching) and to devote the last decade of his career to academic administration. He felt that this was where he could have the biggest influence on academic programs. He was very favorably impressed by President Spurr, particularly by the latter's commitment to the goal of academic excellence. Of course, Cornell shared this goal. However, Cornell certainly had nothing like the resources available to the University of Texas with which to implement the goal. In addition, one might speculate that the two institutions were so structured that Paul felt he would have greater flexibility and opportunity for achieving his academic aims at Texas. In any case, Paul did choose Texas. However, he did so without a full appreciation of the political problems at that university. That appreciation came quickly, however, and virtually on the eve of his departure from Cornell, he expressed regret at his decision and the realization that it had been a mistake. Indeed, he must have foreseen some of the serious problems ahead, for early that same Fall, President Spurr, on whom Paul had based much of his enthusiasm for the move, was fired by the Chancellor of the University of Texas without even the trappings of due process. Paul realized immediately that he had to leave Texas, and, after considering a number of offers from universities throughout the country, decided in 1976 to go to the University of Oregon.

His tenure as President of the University of Oregon will be more appropriately recorded elsewhere. Mathematical colleagues of Cornell faculty members regularly reported from the University of Oregon the universal esteem in which Paul was held by both faculty and students. From these reports it would seem that Paul did, indeed, achieve the academic goals he set for himself in university administration. In 1996, the University of Oregon honored Vivian Olum with the dedication of the Vivian Olum Child Development Center. And in 1997, the university honored Paul's presidency by dedicating the Paul Olum Atrium in the center of the new science complex, for which he (and Mark Hatfield) had secured the funding.

Dale R. Corson, George R. Livesay, Beverly H. West, Peter J. Kahn