

# BioBiology Department



**Professor Susan Berman, center.** This picture was taken at the Spring 2006 Biology Department Research Symposium a year after her retirement from full-time teaching and research. Susan continued to teach occasional courses through the Fall 2008. Pictured with Susan are Cathy Dumas (Biology), Jane Van Doren (formerly of the Chemistry Department) Darlene Colonna and Linda Walsh (both Biology Department). Photo by George Hoffmann.

## Professor Susan Berman's Career: A Retrospective

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Susan Berman served on the faculty at Holy Cross for 25 years, retiring to Emerita status in 2005. She came to Holy Cross having earned Bachelor's and Master's degrees in Zoology from the University of California at Los Angeles and a Ph.D. from the University of Pittsburgh. Her Ph.D. studies dealt with adaptations of hindlimb muscles in rodents that permit some species to hop using only their hind legs. Through hundreds of detailed but tedious dissections of the muscles of desert rodent specimens from around the world, she was able to propose an evolutionary pathway for the evolution of bipedal locomotion. This pathway proposes that the adaptation evolved more than once, and thus represents an example of convergent evolution. She also brought to Holy Cross a well developed talent for teaching, honed through assignments at University of Pittsburgh and other schools in western Pennsylvania. Her interest in paleontology had also been explored through fieldwork in the southwestern United States.



At Holy Cross her work continued, focusing for the most part on adaptations of leg muscles that allowed particular modes of movement in birds. Parrots were of particular interest, and her pet Moluccan cockatoo, Doofus (pictured at left), was a constant companion. Compared to other kinds of birds, parrot species seem more similar to one another. Does this reflect a unique evolutionary advantage to their constellation of morphological features? Or does it derive from an only distant relationship to other avian orders? These questions were addressed in Dr. Berman's work. From samples of six different parrot species, she described the muscles of the hind limbs, proposed the taxonomic relationship among them, and theorized that evolutionary adaptations involved enhanced ability to manipulate their feet using these muscles. The study involved intricate and patient dissection of the anatomical features under investigation, at every stage observing closely and making detailed drawings of the structures. She pointed out that for purposes of morphological illustration, drawings are far superior to photography, since they allow the scientist/illustrator to draw the viewer's attention to subtle aspects that might well be obscured in a photograph.

She also understood that the necessary practice in her discipline of using rare museum specimens for analysis meant that important variations within a species might well be overlooked. To assess the degree of variability within a single species, she embarked on two extended projects with her undergraduate students: to describe the leg muscles of the common house sparrow (40 specimens, easily obtained from supply houses instead of museums) and the northern flicker (51 specimens). To appreciate the magnitude of this study, one must realize that there are 35 individual muscles in each leg of the northern flicker. She and her students accomplished an heroic task and, in so doing, were able to identify several muscles among the specimens that were not identical from one to the next. Such variability could confound the type descriptions that morphologists use to distinguish among species, and thus confuse the evolutionary relationships assumed to have given rise to them. She was among the first to embark on what is now a mainstream activity of evolutionary biologists.



photo by Darlene Colonna

Besides her evolutionary interests in the relationships among species as exhibited by their morphological properties, she was fascinated by the functional consequences of various structures. Using mousebirds, she described their hindlimb muscles in a classical morphological study. Then she established a colony of mousebirds in her home and closely observed how they obtained water, how they used water to bathe, how they shared food, and behaviors associated with courtship, nesting, living communally, and fighting. Both studies resulted in influential publications. With her students she studied the forelimbs of bat species that launch themselves into flight by pushing off from the ground in comparison with those that drop from a tree branch to pick up the necessary momentum. And recently she undertook a detailed study of the facial muscles of a desert rodent that can eat salt-grown plants by using modified mouth hairs to strip off the edible epidermal tissue.

A more detailed description in her own words, along with a photograph of Prof. Berman with her Moluccan cockatoo, is available at the following web site: <http://www.holycross.edu/departments/biology/website/biofaculty/sberman.html>

Her work was held in high regard by the scientific community. She frequently was asked to review books on ornithological subjects for scientific journals, and to provide a critical peer-review of manuscripts submitted for publication to journals such as the *Journal of Mammalogy* and the *Journal of Morphology*. Other morphologists admire her patient, careful observations and her lucid, direct writing style. Indeed she was a perfectionist in everything she set out to do.

She was able to stretch beyond her particular specialty to understand other fields. As part of a Holy Cross group that studied together for a year and then visited China for a month in 1988, she was initially surprised that it was difficult to find Chinese scientists interested in evolutionary biology. She astutely recognized that science in China, at least at that time, was overwhelmingly tilted toward practical applications, both medical and agricultural. Taxonomy, systematics, and evolutionary biology were not appreciated as having the needed relevance to allow them to be pursued for their intellectual interest.



photo by Darlene Colonna

Faculty at Holy Cross have as a primary responsibility undergraduate teaching. Professor Berman regularly taught Comparative Chordate Anatomy (later Morphology) with lab and a lecture course in Vertebrate History (Paleontology) to biology majors. In addition she taught the second semester of General Biology to premedical students majoring in disciplines other than biology. As time permitted, she developed two courses for the general education science requirement: the Biology of Birds and Vertebrate History. She took these assignments as seriously as she did her research, constantly tweaking the courses to make them engaging to the students, rigorous in conveying the substance of the biological discipline, and open to student suggestions. Since no single textbook satisfied her demands for breadth and depth, she supplemented them with liberal handouts derived from her own knowledge and various other sources. Noteworthy were the detailed chalkboard drawings that illustrated her lectures. Colleagues were accustomed to find her in the evening putting up a drawing to be used in class the next day. Students not only rose to meet her demands but appreciated the understanding that she helped them to reach. Her student evaluations were consistently stellar in all the various kinds of teaching that she did. Many Chordate students subsequently sought to work on her research projects, and over the years she guided numerous undergraduate research, honors research, and internship projects. She was also called upon to guest lecture for colleagues in the visual arts and for visitors to Family Weekend.

As a citizen of the Holy Cross community, Susan regularly took on more than her share of leadership and service. Particularly noteworthy was her service representing the Biology Department to the college-wide Academic Affairs Council and serving as the Council's Vice Chair. She was appointed regularly to the Special Studies Committee, and chaired it for two years. She served two terms on the Curriculum Committee and on the Judicial Board. Her most significant ongoing committee work related to the Committee on Premedical and Pre dental Advising, which she served almost continuously from 1980 until months before her death. She noted that because most of the students in the program had taken at least one of her classes, she was well positioned to advise them about their future health-care professional options. She did not seem to mind the long meetings and endless letters of recommendation that such service demands.

Within the Biology Department she curated the department museum, arranged to collect and curate frozen bird specimens (which involved obtaining permission from the state), and kept track of biology alumni. Even when on sabbatical leave she supervised student researchers and participated in searches that led to the hiring of new colleagues.

In the wider community she served on the Leicester Conservation Commission Subcommittee on Fish and Wildlife. Such community service was an ongoing part of her character: as a graduate student she served as the first female firefighter in Pennsylvania.

Professor Berman had many interests beyond science. She loved horseback riding and caring for her own horse. In winter she did cross-country skiing; in the summer camping trips were a favorite activity. She and her husband maintained a garden from which they derived a large part of their summer diet (with overflow offered freely to others in the department less dedicated and diligent). In China she was one of only two or three who elected to climb all the way to the top of one of the mountain peaks we visited. And at the end of the month, she was one of four who left Beijing by way of the TransSiberian Express through Mongolia and into Siberia, continuing the rest of the way around the world to get home. She designed and constructed a weathervane based on a peacock image that appealed to her and installed it in the timber frame home that she and her husband built. She shared her many interests with her students and colleagues, regularly inviting students over for dinner, offering observations on local hawks, and housing her pet snake in her office, bringing it out to entertain her students.

Even in retirement she continued to carry out her morphological research, using equipment borrowed from the college and set up in her home. She was just completing a series of observations [about which I know none of the particulars] at the time of her death. She also assisted the department with occasional adjunct teaching and helped the Premedical Committee with its deliberations as recently as last fall.

On the occasion of recognition of her 25 years of service to the College, George Hoffmann, Department of Biology, put it this way: "Susan Berman has been an anchor of the biology program for many years. Her teaching has been excellent and undertaken with uncommon dedication. As a morphologist, she has been invaluable in teaching students the importance of careful laboratory observation, meticulous technique, and biological illustration. These scientific and technical skills, complemented by generosity, have made her an outstanding contributor to the education and guidance of premedical students. Her good judgment, fairness, and flexibility also made her a major contributor to the effectiveness and cordiality of her department." Susan Berman was someone that all members of the biology faculty and staff regarded as a delightful colleague.

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