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Elizabeth D. Hay

Betty Hay has enjoyed a long and illustrious career in the field of cell biology. She has earned numerous awards and is a pioneer not only because she began her career at a time when the field was itself first created, but because of the importance of her scientific work.

Hay was born and raised in Florida until her father, who was a doctor, entered the military as an army physician during World War II and her family moved to Mississippi and Kansas. In 1944, she went to Smith College in Massachusetts, which she says was "the best experience of my life." She feels that Smith was terrific academically and was small enough that each student enjoyed individual attention. Coming from a small town, Hay was comfortable with this kind of educational atmosphere. In her freshman year, Hay took an exciting biology course with Professor S. Meryl Rose, who became her scientific mentor. She continued her work with Rose on amphibian limb regeneration through medical school and in the summers at the Marine Biological Laboratory in Woods Hole, Massachusetts. Notwithstanding her interest in basic research, Rose convinced Hay to go to medical school because at the time he thought a woman would have more opportunities as an MD than a Ph.D.

Hay enrolled in the medical school at Johns Hopkins directly after graduating from Smith. She was one of only four women in the Hopkins Medical School Class of '52. While she thoroughly enjoyed the intellectual rigor of medical school, the atmosphere was a stark contrast to the warm, nurturing one at Smith. There were no dormitories at that time at Hopkins and everyone lived in a "slum" on Broadway Street which was devoid of academic flavor. Hay admits that the transition from Smith to Hopkins was difficult. She watches many of her students experience that same sense of displacement today: "It takes people about a year to wake up and realize medical school isn't college."

Hay was able to continue to interact with her college mentor, Meryl Rose, beyond her undergraduate career because of the unique opportunity afforded her at Woods Hole each summer. "Rose was a real pioneer in the postwar development of experimental biology," says Hay. He received one of the first NIH grants and this enabled him to bring his students to conduct research with him at Woods Hole. There, the students came in contact with a group Hay calls a "who's who of scientists." While working at the MBL all summer became impractical for Hay after she moved to Boston, she still enjoys visits there each summer.

After graduating from Hopkins and interning in medicine, Hay joined the faculty of the Anatomy Department at Hopkins. In the mid-50's, she discovered the emerging field of electron microscopy and began to interact with George Palade and Keith Porter at Rockefeller and with Don Fawcett at nearby Cornell Medical College. She moved to Fawcett's Anatomy Department at Cornell in 1957 and thus was in New York at the time when the *Journal of Cell Biology* and the ASCB were conceived (Fawcett was the ASCB's first President; Porter and Palade served in that role later, as did Hay). In 1960, Hay moved to Harvard Medical School with Fawcett and there continued to participate in the affairs of the burgeoning young cell biology society.

Although she has also been very active in other scientific societies, such as the American Association of Anatomists and the Society for Developmental Biology, Hay says, "ASCB is my number one society because as the discipline of cell biology has developed so too has my research." What she likes best about the field of cell biology is its multidisciplinary approach to the cell, which the ASCB has always promoted. Focusing on electron microscopy at the beginning, ASCB meetings now include molecular biology, immunobiology, cell physiology, and myriad of other approaches. "At the very large annual meeting today, the student is exposed to enormous scientific diversity," Hay observes. She also notes that the large size of the meeting has its advantages and disadvantages. The smaller meetings in the past, she feels, permitted a more social atmosphere and easier interpersonal contact. With the increase in size of the meeting and the membership, the management of the Society has also had to assume some of the qualities of a big business, which Hay feels it has done well.

Parallel with these changes in the ASCB, Hay notes that extraordinary growth has also occurred at Harvard during her tenure there, which she feels has fundamentally changed the faculty, not entirely for the better: "the interaction among the faculty is not as great. They are not as close as they used to be." This scientific expansion, which was made possible by the creation of NIH funding for research, has also spawned an emphasis on grant funding which is deeply felt everywhere; the need for larger facilities and better technology that has dominated funding considerations is now frustrated by funding shortages. "There has been a transition from a completely science-oriented faculty to a more money-oriented faculty. Now funding counts so much. Without the NIH, our work is impossible," Hay explains. With a reduction in funding sources has come greater competition, not all of it healthy, Hay feels. She notes that the ASCB has become increasingly politically conscious over the years as a result. Its members testify before Congress, interact with local politicians, and spend a significant amount of time addressing the issue of research funding. "The Society has kept up with the times along these lines as competently as it has with scientific progress. This is as it should be."

Hay is known for her great success at developing the careers of young faculty members. In fact, Hay says that she agreed to succeed Fawcett as the Chair of the Anatomy and Cellular Biology Department in 1975 in part because of her desire to work with young people. "Helping the junior faculty was the most enjoyable part of my job as Chair." As Chair, Hay felt personally responsible for each trainee's success or failure and she continues to follow their careers by keeping in touch with many of them. Tom Pollard, a former ASCB president and recently-appointed President of the Salk Institute, is one student she feels especially proud of. She helped Pollard move from Harvard to become the Chair of the Cell Biology and Anatomy Department at her alma mater, Johns Hopkins, when he was just 35. Pollard calls Hay "a colorful, individualistic woman who has contributed to contemporary biology both as a creative laboratory scientist and a tireless leader." Hay's commitment to young people and to the field of cell biology has been well recognized. She has won over twenty national and international awards including, in 1989, the ASCB's most distinguished honor, the E.B. Wilson Award and, in 1992, the Henry Gray Award from the American Association of Anatomists. "It is very meaningful to have your close colleagues honor you in this way and I am grateful," Hay says. Both awards cite Hay's commitment to the scientific community as well as her research.

Hay's greatest scientific contribution was the role she played in establishing the field of extracellular matrix (ECM) as a domain of cell biology. A very small group of scientists was working in the area of ECM in the mid '60s when Hay entered the field. In the late 70's she was able, with her postdoctoral fellow Steve Meier, to prove by quantitative methods the molecules of the extracellular matrix influenced the differentiation of epithelial cells. In 1981, she edited and produced the book *Cell Biology of Extracellular Matrix* at a time when many people still did not believe ECM was part of a cell. Hay explains, "I was pretty much alone in working in this area then, but now there is always a plenary session and many poster sessions on ECM at every ASCB meeting."

Former ASCB Secretary Robert Trelstad of the Robert Wood Johnson Medical School calls Betty Hay his "second mother" and says, "when she discovered that epithelial cells could make collagen in the early 1960s, it was radical and not accepted. But she had the courage to not only say it, but to publish it." Trelstad explains that Hay "is always able to see the forest for the trees. She is able to develop a picture or story from disparate facts." Hay continues to conduct research and teach, focusing on the role of cell-matrix interactions in cell migration and on epithelial-mesenchymal transformations (EMT) in the embryo. Merton Bernfield, former ASCB Treasurer and a colleague at Harvard, says that Hay's current work on the EMT derives from her understanding of cell behaviors and could lead to important discoveries of medical significance, from metastasis to birth defects. Bernfield says, "she is a true biologist who knows how to ask the right scientific questions and the ways to answer them." The present Chair of Cell Biology at Harvard Medical School, Marc Kirschner, says, "Betty is a wonderful colleague, youthful in her passion for science, her love of teaching, and always willing to work for the common good."

Hay, who is turning 70 this year, lives in the Boston suburb of Weston, Massachusetts, with three Siamese cats and one Maine Coon cat. She puts each cat in a harness and takes them for walks in the woods on weekends. She says she has long been fascinated with cats and has owned up to seven at a time, but this is the first time she has had a Maine Coon. Another of Hay's passions is collecting wild mushrooms. She used to serve them at an annual party for her department, but she had to end this practice one year when following a meal some guests brought her poisonous *Amanita* mushrooms that they had fully intended to eat. But she is still a devoted mycophile: "on a major find you can get 30-40 pounds of six or more types and that is a real feast." Many of her former students at Harvard also became adamant mycophiles.