

Elizabeth Hay

Betty Hay, as she is usually called, was born and raised in Melbourne, Florida. When World War II began, her father, a practicing physician in Melbourne, enlisted in the US Army Medical Service and was sent to Biloxi, Mississippi, where Betty, her sister and twin brother enrolled in local schools. Six months later, they transferred to Fort Hays, Kansas, for another half year before Lt. Col. Hay was shipped to the Philippines, where he saved many soldier lives with his skillful surgery. After this peripatetic life in High School, Betty was overjoyed to enter Smith College for four settled years and to receive her BA degree in 1948 with honors in Biology.

Growing up, Betty had a deep interest in what makes animals click and, when she took the superb freshman course at Smith in anatomy and physiology, taught by S. Meryl Rose, she was hooked. By sophomore year, she was doing regeneration research with Rose, who became her mentor for the next 6 years and persuaded her to get an MD instead of a PhD degree, because he saw females with PhDs stuck for life teaching in a girls' school like Smith. So Betty did an MD at Johns Hopkins, interned on the Osler Service and then joined Hopkins Anatomy Department faculty, where she continued to work on amphibian regeneration until the era of electron microscopy was born. She soon moved to New York City to interact with the exciting electron microscopists, working with Fawcett at Cornell Medical College and with Porter and Palade at the Rockefeller Institute. She moved next with Don Fawcett to Harvard, where she was promoted to the Pfeiffer Professorship of Embryology in 1964. She became editor-in-chief of *Developmental Biology* in 1971 and succeeded Fawcett as Chairperson of Harvard's Department of Anatomy and Cellular Biology in 1975 and currently is Professor of Cell Biology and Embryology at Harvard.

Betty's research has been in the following areas: limb regeneration, the role of the extracellular matrix

(ECM) in epithelial differentiation, and the process of epithelial-mesenchymal transition (EMT). Studies of the fine structure of amphibian limbs led her to discover in 1959 that regeneration of the limb is accomplished by differentiated cells that dedifferentiate to become stem cells. Investigation of the fine structure of the differentiating cornea, including the finding that the epithelium secretes collagen, led to the demonstration that ECM induces cell differentiation and interacts directly with cells constantly in the embryo and adult. Most recently, Betty's studies of the nature of the signaling pathways involved in EMT during development, have led to the discovery that they can be activated by Smads, instead of β -catenin, in the embryo.

In the interview that follows, Fiona Watt, Editor-in-Chief of JCS, asks Betty about her experiences as a woman in science.

FMW: *What changes for women in science have you observed during the course of your career?*

BH: As has been noted by others in JCS's series of Women in Cell Science, there has recently been a concerted effort to bring up the representation of female students in science. This has now succeeded in creating an average of 50% females matriculating in most classes of medical and graduate students. My class at Hopkins Medical school in 1948 consisted of 70 men and 4 women. This was especially skewed, as the men were coming back from the war in 1945-48, ready to go to school and getting GI BILL benefits to make up for the years of their youth that they missed. There were no hard feelings among the females about this male majority. We were glad to see them back from Europe and the Philippines.

Hopkins welcomed females. It began admitting women when it was created in 1893 with funds from a group of women who specified that women be admitted on equal grounds with men. Harvard, however, was very slow to start admitting women, accepting its first female in 1945. I did not even apply to Harvard Medical School, as there was a rumor among the Smith premeds that



Betty Hay in her new lab upon joining Harvard Medical School in 1960.

Harvard had no bathrooms for female students.

One interesting phenomenon I witnessed at Smith was that, many of the female students were just as prejudiced against women working as were the men of that era. At graduation of the seniors, the junior students in my resident House serenaded all the seniors individually at a farewell party. The song they made up for me went "Poor Hay, going off to medical school; Poor Hay, whatever will become of her?" Thus, a major change for women in science during my career has been the attitude of the women themselves. As this negative attitude subsided, we witnessed a great increase in the female applicant pool and this increase gave medical schools enough good female candidates to begin to approach 50% representation of women in all the classes since the 1960s.

FMW: *How has your research career impacted on your personal life and vice versa?*

BH: My research career has always come first, because I have this intense desire to find answers, using the scientific approach. In order to work with the best people, I have had to move around alone (e.g. from Baltimore to New York to Boston), leaving many good friends behind. Early on, I dated many attractive young men, including medical students. Most were looking for home-makers. Their taste for career females was not high. However, this attitude is changing miraculously today in two-career families, where the homework is shared by both sexes.

FMW: *Do you feel that being a woman is an inherent advantage/disadvantage for a career in science?*

BH: No. The important thing is to be creative and work hard.

FMW: *What are your remaining career ambitions?*

BH: My lab has had a very productive year working on EMT. We feel we have discovered most of its secrets. It will be time for me to retire and I will begin

writing a book on EMT next year. I will do this as a single author, not with multiple authors like 'Cell Biology of Extracellular Matrix' but more like 'Regeneration', my first book.

I am very glad to see in my lifetime the emergence of significantly more career women in science, as this so enriches the intellectual power being applied to the field of cell biology. There is no doubt in my mind that female and male minds are essentially equal in creativity, the sine

qua non of discovery. As a life pursuit, nothing could be more satisfying to the curious mind than unlocking the secrets of nature every day.

*Journal of Cell Science 117, 4617-4618
Published by The Company of Biologists 2004
doi:10.1242/jcs.01391*

*Feedback on our series of **Women in Cell Science** articles is always welcome and should be emailed to wics@biologists.com*