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2000

Elaine Fuchs

Elaine Fuchs was surrounded by science from her earliest days. Her father was a geochemist at Argonne National Laboratories near Chicago. Her father's sister, a "second mother" and the family's next-door neighbor, was a biologist at Argonne. And Fuchs' older sister, Jannon, is a neuroscientist in Denton, Texas. "I'm not sure I could have avoided going into science as a career," Fuchs reflects. Growing up in what was then rural Illinois but today is suburban Chicago, Fuchs recalls an idyllic life: "there was a richness of biology in our backyard. I was fascinated with caterpillars, with metamorphosis. My sister and I would raise tadpoles to frogs. We would catch butterflies in the fields nearby." The Fuchs girls created their version of a laboratory in the family backyard. "My mother had a screened-in porch; in the summertime it became inundated with buckets of tad poles and crayfish and snakes—whatever we could find."

In college at the University of Illinois Champaign-Urbana, Fuchs briefly considered anthropology but settled on chemistry, earning her bachelor's degree in physical chemistry in 1972. Like most of her peers, Fuchs' college years were shadowed by the Vietnam War and the corresponding political activity on campus. The activism "prompted me to really reflect on my life," comments Fuchs, "and made me think 'was I really going to be happy doing physical chemistry?'" In her senior year she took Latin American history and applied to the Peace Corps hoping to go to Chile. But when she was assigned to Uganda instead of Chile, the thought of coping with the violent regime of dictator Idi Amin led her to decline the Peace Corps to pursue graduate school instead.

At Princeton University Fuchs worked with Charles Gilvarg on the biosynthesis and assembly of the cell wall of bacillus megaterium, earning her Ph.D. in 1977.

Until that time, Fuchs had become comfortable with chemical approaches and she then wanted to study under a cell biologist to complete her training. "I struggled with that transition between chemistry and biology. In chemistry you solved the equation, everything balanced out, and you knew that you had an answer. What I never liked about biology then is that you had too many variables and could never solve the equation. But that's what I love most about biology now. Then I was very uncomfortable with it." She took her postdoc with Howard Green at MIT, which "was exactly what I needed," reflects Fuchs.

For his part, Green comments philosophically, "when Elaine Fuchs was a postdoctoral fellow in my laboratory in the late 70's, I already knew that she would be successful in science. She was concentrated, well organized, clear of mind, and undeterred by difficulties. She absorbed, reflected and acted with a rhythm essen- tial for scientific discovery. But I hope she will not mind if I reveal here that she also had a well-developed Dionysian side to her character. For example, she was a very good dancer, especially of those modern forms that seem close to unrestrained expression. She also had a great liking for the motorcycle. The Dionysian element has been thought to be the source of one of the greatest of Greek in- ventions—the theater. Could it be that the Dionysian side of Elaine's character was important for her scientific creativity?"

By the time her work was completed at MIT, Fuchs had a job lined up at the University of Chicago, bringing her home. "I never thought I would return to Chicago, this time to join the University of Chicago, but it is the alma mater of my father and my aunt, who had a major influence on my career. What has kept me there for twenty years is that it is truly and thoroughly an academic and intellectual institution. It caters to those students who want a comprehensive education."

Fuchs' interest from the beginning has been and remains skin biology, specifically the epidermis and hair follicles. She explains that her work falls into three areas: "I've been interested in how the epidermis manifests its protective role, how it produces its barrier, which essentially is the processes of differ- entiation and stratification from a single layer of dividing cells in the innermost layer of the epidermis. Those cells periodically exit from the cell cycle, terminally differentiate, change the transcription of their genes, start switching on the production of the proteins that are necessary to provide the epidermal barrier. We've been interested in the changes that occur and the transcription factors involved in manifesting those changes as epidermal cells differentiate and are routinely sloughed from the skin surface and replenished by inner cells moving outward."

She continues, "these cells have to provide a tough and resilent barrier to the external environment, which they do by building an extensive cytoskeletal architecture, a unique feature of which are keratin filaments. For many years I've been interested in how this unique cytoskeleton is created and how that cytoskeleton helps to protect the epidemeral cells." Most recently Fuchs' lab has been interested in how the cytoskeleton is captured to cell-cell junctions and cell-substrate junctions. The third interest of Fuchs' lab is how pluripotent stem cells in the skin choose between becoming epidermis or hair follicles. "This is an area that my laboratory is currently very excited by. In choosing to become a hair follicle, a cell from the single layer of embryonic ectoderm has to proliferate locally, it has to change its program of

transcription, and it also has to change the way cells interact with one another. That whole process of morphogenesis involves a link to prolifera- tion, a link to transcription, and a link to cell- cell contact and adhesion. We're interested in how all of those changes can occur simultaneously and what orchestrates the process."

Fuchs' colleague Susan Lindquist is a devoted colleague and admirer: "Elaine is a dynamo. She has more energy, grit, and determination than anyone I know. Combined with a brilliant intellect, these qualities have produced two decades of unremittingly dazzling science. Combined with her personal warmth and devotion to the common good, these qualities have had an incalculable effect on the scientific community, from the people who trained in her lab to the broader scientific community she so tirelessly serves. It is with great pride that I count myself her friend."

Despite Fuchs' reputation as a research scientist, her primary concern as President of the ASCB in 2001 will be K– 12 education. "As we as biologists have become more and more specialized in what we do, there is a distancing that occurs quite naturally between what children are being taught in the school systems versus what we are doing in laboratories. I feel the one thing that we as cell biologists must do is to become more active in our communities. As President, I would like to work to develop ways in which we could become involved," she declares.

Fuchs, reflecting on her own childhood, realizes that many youngsters begin with a fascination with bugs, tadpoles, butterflies, flowers and trees, but by the time they are older and ponder a career, their natural interest and craving to discover has faded, representing a lost opportunity. "We need to work on ways to maintain and cultivate that young interest in biology through adolescence," Fuchs explains.

Fuchs' commitment to learning is shared by her husband, David Hansen, a Professor of Education at the University of Illinois. When time permits, Fuchs and Hansen enjoy the many features of Fuchs' native Chicago, including dining out, the opera and the symphony. Fuchs follows a strict daily regimen of 100 laps in the pool, or, weather permit- ting, a swim in Lake Michigan, now more rigorous after a scuba diving accident in the Fiji Islands necessitated back surgery. Travel is also a favorite activity for Fuchs and Hansen. One of their fondest memories is of their honeymoon twelve years ago, which was spent on safari in Botswana and Zimbabwe.