

The Genetics of Luck

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In general, I've been lucky—very lucky. Since the age of 11, I have always been interested in genetics. My mother had recently learned how to perform cytogenetics and always talked about chromosomes and genetics at the dinner table. Mom had recently received her PhD in medical microbiology and had been hired by the local hospital pathology department; she was promptly offered the opportunity to become the local cytogeneticist. The rationale was that because she already worked with small things (bacteria), learning about chromosomes would be easy. So she spent a week with Janet Rowley in Chicago and another week with Margery Shaw in Ann Arbor. Yes, it took only 2 weeks. Before chromosome banding, all a cytogeneticist had to know was how to set up the cultures and how to count small things. But I digress.

THE KITCHENOME

I do remember trying to catch fruit flies in the kitchen to set up my own experiments, although I was woefully lacking in equipment. I also remember a fifth-grade assignment to write about someone's career that I might want for myself. I wrote about Gregor Mendel and shared the details about the peas and heredity. Most of my fellow students had no clue what I was talking about, although a few asked if I wanted to be a monk. I'm not even sure my teacher knew. Fast-forward to high school and applications to college: I had decided that I didn't know what a geneticist really did for a living, so I considered veterinary school and animal breeding. Although accepted by Cornell University's preveterinary program, I soon decided that being a veterinarian was "depressing." With some animal science classes under my belt, it was easy to switch my major to biology, concentrating on genetics and microbiology. In hindsight, I realize that whenever there was a class project, I would choose something with a genetics slant. For example, in an ichthyology course, my term paper assignment was to describe a fish species and its environmental adaptation. For some reason, I chose goldfish mutations and included descriptions of morphologic mutations such as the bubble eye, lionhead, and pearlscale. Because goldfish mostly lived in bowls, I had little to say about their environment and I received a failing grade.

GENETIC LUCK

In this context, it was now time to apply to graduate school. The Rutgers University catalog outlined its genetic counseling

program. Bingo! Epiphany. I spent the next 9 months earning my master's degree in genetic counseling, although afterward genetic counseling jobs were few and primarily involved being a clinic coordinator or laboratory technician. But, as luck would have it, I'd had fabulous exposures to clinical genetics. One was with Laird Jackson at the outreach clinic in New Jersey; the other was on a field trip to Johns Hopkins to watch Victor McKusick in action (as a bonus, we all received an autographed copy of *Mendelian Inheritance in Man: A Catalog of Human Genes and Genetic Disorders*). These experiences were enough for me to decide that I wanted to be like these men: making diagnoses from direct observation of the patient. For some reason, perhaps luck, I determined that a PhD degree was the way to go. At Michigan State University, my advisor was Janice Lindstrom, a neurologist in the Department of Pediatrics and Human Development. She suggested a thesis on spina bifida.

After a few false starts, I focused on investigating evidence for heterogeneity among the various neural tube defects. In addition to courses and thesis writing, I had the option of attending weekly genetics clinics held at the University Health Center in East Lansing and satellite clinics in Grand Rapids. These were staffed by Lindstrom, James V. Higgins, PhD, and later by Saroj Kapur, MD, in East Lansing, and by Higgins and Donald Waterman, MD, in Grand Rapids. Although Higgins' PhD degree was in population genetics, he was very effective in the clinic. In particular, I did not see any difference between him and Lindstrom in their ability to make diagnoses and deal with patients and their families. This observation provided me with a strong incentive to pursue a career as a medical geneticist. As a side note, my fellow graduate students were truly amazing and included Steve Warren, Tom Glover, Larry Wisniewski, and Terry Hassold.

BEYOND LUCK

Meanwhile, my husband was in medical school at Michigan State University and had been assigned to Grand Rapids for his clinical rotations. At the same time, Higgins and Waterman wanted to expand the Grand Rapids genetics clinic beyond a satellite clinic. I reminded them of my master's degree in genetic counseling and that I was fully qualified to coordinate a clinic. Thus, in the summer of 1978, we moved to Grand Rapids, where I initiated what ultimately became the Genetics and Pediatric Neurology Clinic at Blodgett Hospital. In addition

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to daily administrative assistant duties, I performed prenatal counseling and participated in patient evaluations on clinic days. I discovered that I had a pretty good memory for phenotypes and was suggesting cogent diagnoses more and more often. Even more gratifying—I was sometimes right! I also enjoyed literature searches, which in the late 1970s consisted of reading through volume after volume of *Index Medicus* looking for titles of articles that might be applicable. As a result, I wrote a number of papers keying off patients we'd seen in our clinic. It was now beyond luck: it was these scholarly efforts that helped establish me as a reasonably adept dysmorphologist.

In the meantime, I also arranged for mentoring from individuals highly regarded in dysmorphology and genetics, including Jim Hanson and Jaime Frias. Several years later they invited me to my first David W. Smith Workshop on Malformations and Morphogenesis, which provided a great opportunity to engage mutually with some of the best dysmorphologists in the world. Others with whom I interacted were John Opitz, Robert Gorlin, and Michael Cohen. I am convinced that a major element of my being accepted as a bona fide dysmorphologist was the fact that Bob Gorlin and Mike Cohen were phenomenal at what they did, but neither had an MD degree. The mutuality, in part, consisted of their asking me to write entries for *Syndromes of the Head and Neck* and later to serve as co-editor of *Hereditary Hearing Loss and Its Syndromes*. I still serve as editor of that book, with the most recent edition published in 2013.

LUCK AND DEVOTION

By the mid-1980s, Butterworth Hospital, the rival across town, wanted to start a maternal–fetal medicine service. The recruited perinatologist would only accept if there were genetics services at the hospital, and I decided the time was right for me to move to Butterworth. When I started there in 1987, the genetics service consisted of an administrative assistant and me. It is now a department that includes two administrative assistants, two

clinical geneticists, and seven genetic counselors. In addition, the department was instrumental in developing the cancer genetics program (two more genetic counselors), incorporation of a genetic counselor in the perinatology department, and inclusion of a genetic counselor in the hospital laboratory. A third clinical geneticist is joining the department this summer. I have also participated in various professional society committees and journal editorial boards, as well as serving as a visiting dysmorphologist for several clinics in the Midwest. Although some of this involvement may reflect my not being able to say "no," ultimately, I'm gratified by my contributions.

A few years ago it became clear to me that there was a need for leadership for certain aspects of patient care, such as long-term management and follow-up of children with overgrowth disorders or connective tissue disorders, hence a need to hire MD geneticists. As luck would have it, at that time Michigan State University's College of Human Medicine was establishing a campus in Grand Rapids and was seeking individuals to serve as mentors and part-time directors of some of the programs. I was offered the position of assistant director of the Social Context of Clinical Decision-Making module. Apparently, working in the field of clinical genetics for all of these years had been good preparation for such a position. Within 2 years, I became assistant director of Block I (first year) and, soon thereafter, course director for the Genetics course. At around this same time, Dr. Paul Mark was finishing his residency in medical genetics and he proceeded forthwith to Grand Rapids.

I've been amazingly lucky, having incredible opportunities to do what I love to do most. Although I now have a full-time position as an administrator at Michigan State University, I will always love seeing patients and solving the mysteries of their diagnoses.

DISCLOSURE

The author declares no conflict of interest.