NOTES de la SMC

Fred G. Brauer February 3, 1932-October 17, 2021

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Photo taken from
https://personal.math.ubc.ca/~cytryn/MathBio/images/

Fred Brauer, who grew up with mathematics in his family, received his Ph.D. from MIT in 1956 under Norman Levinson. After teaching at the University of Chicago and the University of British Columbia, he joined the University of Wisconsin in 1960. During his tenure in Madison he became a cornerstone of the department, serving several years as chair, and instituting the departmental seminar in « spherical trigonometry » to show that mathematicians can also play basketball. (He continued to do so well into retirement.) In two terms as associate chair he made important developments to the undergraduate curriculum, including sequences of precalculus courses and mathematics courses for biologists as well as the infusion of differential equations into multivariable calculus, linear algebra and the upper-level curriculum. It was in Madison that he formed a long-term collaboration with John Nohel, also a student of Levinson; in the early 1960's the two wrote what has become a classic textbook on qualitative theory of ODEs, still in print today, more than fifty years later. Hans Schneider, also in the department, joined them on a later book. It was also in Madison that Fred and his wife Esther raised their three children, David, Deborah, and Michael.

In 1997 Fred and Esther retired to Vancouver, British Columbia. There Fred took up an emeritus position at UBC (which thus bookended his career), where he remained quite active in research and mentoring student researchers for another two dozen years. During the same period Fred was also a regular visitor and mentor at the Mathematical and Theoretical Biology Institute, a research institute founded by his former Ph.D. student Carlos Castillo-Chavez and housed first at Cornell University and later at Arizona State University, where hundreds of student researchers, largely from groups historically underrepresented in the sciences, trained and later went on to earn doctorates. MTBI alumni are now tenured faculty at institutions like Oxford, Brown, and the University of Michigan, and Fred—approachable and always generous with his time—played an important role in their mentoring. In this vein he and Carlos published in 2001 a textbook on mathematical population biology which, now in its second edition, also became a classic reference.

Fred's research in mathematical biology was fundamental and groundbreaking. After about fifteen years publishing on the mathematical properties of differential and integral equations (during which time he published five books with John Nohel), he became interested in population biology, and wrote landmark modeling studies in population management and predator-prey systems in the 1970s and 1980s, notably in collaboration with A.C. Soudack and with David Sanchez. In the late 1980s Fred made one last transition, into mathematical epidemiology, in which over the next thirty-plus years he published over 100 articles. Many of his most topical papers, studying then-recent epidemics such as HIV/AIDS, SARS, the 2009 H1N1 influenza pandemic, and COVID-19, were written with two or three co-authors each, leading to an incredibly diverse set of collaborations. Fred's solo papers in recent decades focused on revisiting important topics in epidemiology using simple models and techniques as elementary as possible, in order to be accessible to a wider audience, or on providing perspective on the overall direction of the field. His work continues to have a profound impact on mathematical biology (in 2020 alone it was cited over 1600 times), and his legacy continues in those who benefited from his mentoring.

CK:

When I first met Fred Brauer, he was warning a class of first-semester calculus students about the dangers of applying techniques without thinking. As an example, he wrote on the chalkboard the expression $\sin x / n$. He then proceeded to cancel the n's from numerator and denominator, leaving *six*. At the time, I, a first-semester graduate student, knew nothing of the vast body of work he had produced in rather more advanced mathematics, but his thoughtful approaches to solving problems, coupled with his dry humor, appealed to me. He later encouraged those same calculus students, "Lions in the Serengeti Desert solve optimization problems—and they don't even know calculus." (Fred attributed this observation to Colin Clark.) When, a year later, I went to him in search of a Ph.D. advisor, his kindness and admirable tranquility, and the richness of both the mathematics and the population biology that he showed me, made the decision an easy one. I became Fred's last Ph.D. student at Wisconsin, finishing just weeks before his move to Vancouver.

Over the more than two decades that followed, I continued to enjoy Fred's mentoring but also came to know him in two additional capacities: as colleague and friend. He invited me to co-author with him an introductory book on dynamical systems and mathematical biology. I was determined to make the text approachable to students of biology as well as mathematics, by the infusion of biological research (including photos and data) into every section, and to this day remain grateful for both his patience (the project took, in the end, over a decade) and his support for my pedagogical beliefs. At the same time, I came to know him and Esther more socially, not only at conferences and MTBI but on visits to Vancouver. In 2015 I was able to take them up on a longstanding offer to bring my children (then in junior high) to stay with them and explore at more leisure the incredible natural beauty of the area. Fred and Esther were keen to hear my children's impressions of our adventures each evening, as well as what was going on in their daily lives back in Texas. My children, for their part, listened with rapt attention to Fred's accounts of his family's immigration to the US and Canada in his youth. Although the pandemic prevented us visiting in person the past two years, I am grateful to have been able to keep in touch with Fred and Esther during that time. In one of my last email messages from Fred this year, he wrote, in reply to news of a birth in the family. "Some people are saying that this is a difficult time to bring a child into the world, but others say that children are the hope for a better world."

JW:

Fred's retirement and returning to Canada has been a great fortune to the Canadian mathematical biology and epidemiology, specially before the SARS. Fred's unselfish dedication to the research field and the public health, to his colleagues and his students, was an inspiration for Canadian modellers' collective rapid response to a unique call to establish a national team, and his wisdom and scientific work was the insurance of our collective success. Fred was a highly influential founding member of a Canadian national group, the MITACS disease modeling team, and played a major role in developing a reciprocal linkage between mathematical modelers and public health experts and decision making in Canada, and in establishing international collaborations including the North American Pandemic Modeling Consortium and the Canada-China collaboration.

Fred's work has influenced multiple generations. He was the first organizer and speaker of the Mitacs Infectious Disease Summer School, and his most recent lecture was delivered at the Fields mini-thematic program Mathematics for Public Health May 11, 2021. With his influence, this summer school series provided a common language for a new generation of disease modelers and end-users of disease modelling to communicate and collaborate effectively. Fred co-edited with Pauline van den Driessche and Jianhong Wu the Springer Lecture Notes "Mathematical Epidemiology" based on these summer schools.

Many of us grow up in our careers by reading Fred's work and his books, many of us benefit from his unconditional support. Many of us shaped our careers by following his examples as both a scientist and a human being, the real GENTLEMEN!

Using his most favourite phrase « In theory, Fred passed away; in practice, he is living with us through his mathematics, his friendship ».