My Career in Mathematical Biology

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I was born in Accra, the capital city of Ghana. My interests in mathematics and its applications were shaped by my mentors and professors at the University of Ghana- Legon. My first research experience was at North Carolina State University when I started working on my PhD dissertation with John Franke. The dissertation project started with a specific discrete-time pioneer species competition model of John Bishir, a mathematician, and the late Gene Namkoong, a leading authority in forest genetics. The initial task was to develop a global understanding of the dynamics of the model. Thanks to the generous support and encouragement of my PhD dissertation advisor, John Franke, and his colleague and friend, James Selgrade, despite initial rejections of our first set of manuscripts on the model, persistence led to our first publications in the *Journal of Mathematical Biology*, the *Journal of Mathematical Analysis and Application*, and the *Nonlinear Analysis Theory, Methods and Applications* [1-3]. The referees' comments on the quality of the accepted revised manuscripts as well as an encouraging letter from Robert May on the publications cemented my interest in interdisciplinary research.

My first faculty position was at Howard University in the Department of Mathematics, a nurturing and supporting research environment. Early on in my time at Howard, I spent about a year as a long-term visitor at the Institute for Mathematics and its Application (IMA) at the University of Minnesota. During my visit, I participated in several IMA programs on "Mathematics in Biology". In particular, I benefited immensely from an IMA tutorial entitled "Introduction to Epidemiology and Immunology". The two-day tutorial provided an overview to a follow-up IMA workshop on "Mathematical Approaches for Emerging and Reemerging Infectious Disease: Models, Methods and Theory". The IMA programs allowed me to connect with a diverse group of scientists, engineers and mathematicians interested in collaborative interdisciplinary research. I went away from the IMA knowing that I could use mathematics to make positive contributions to the world, especially contributions to the forgotten infectious diseases of Africa. Two years after my IMA visit, I took a two-year leave from my tenured professor position at Howard to visit the Center for Applied Mathematics and the Department of Biological Statistics and Computational Biology (formerly, Biometrics Department) at Cornell University. During this visit, I worked with Carlos Castillo-Chavez and the Mathematical and Theoretical Biology Institute (MTBI) group of Cornell University on various projects in ecology and epidemiology. I also interacted with several leading scientists and mathematicians.

After the Cornell experience, I returned to Howard with a more focused research agenda in mathematical biology. As a result, I have had successful collaborations which resulted in scholarly work on the sustainability of exploited fisheries with scientists at the North East Fisheries Science Center of Woods Hole, Massachusetts. With Avner Friedman of the Mathematical Bioscience Institute (MBI) at the Ohio State University and my graduate students at Howard, I currently work on projects that investigate biodiversity and infectious diseases (such as malaria, cholera, anthrax and bovine babesiosis). My research in mathematical biology has made it possible for me to connect with students and researchers internationally. I have attended and given talks at several research conferences and workshops in Europe and Asia. Over the last five years, the NSF funded DIMACS-MBI Africa initiative, led by Avner

Friedman, Marty Golubitsky and Fred Roberts as well as the NSF funded Masamu project of Overton Jenda, have made it possible for me to give lectures at several institutions in Cameroon, Ghana, Morocco, South Africa, Uganda and Zambia. Last spring, I was on a sabbatical leave at MBI. DIMACS in Piscataway, New Jersey, MBI in Columbus, Ohio, NIMBioS in Knoxville, Tennessee, and similar mathematical biology institutes, and the Society for Mathematical Biology continue to provide excellent introductory and advanced programs that continue to inspire my career. I consider myself fortunate because I am still finding a plethora of interesting and exciting problems at the interface of mathematics and biology.

Selected Publications

1. (with J. Franke) Global attractors in competitive systems, *Nonlinear Anal.: Theory, Methods and Appl.*, Vol. 16, 111-129, 2 (1991).
2. (with J. Franke) Mutual exclusion versus coexistence in discrete competitive systems, *J. Math. Biol.,* Vol. 30, 161-168 (1991).
3. (with J. Franke) Geometry of exclusion principles in discrete competitive systems, *J. Math. Anal. Appl.*, Vol. 168, 385-400, 2 (1992).
4. (with C. Castillo-Chavez) Dispersal, disease and life history evolution, *Math. Biosc*., 173, 35-53 (2001).
5. (with C. Castillo-Chavez and C. Castillo-Garsow), Mathematical models in Isolation and Quarantine, *Journal of American Medical Association,* 290 (21), 2876-2877 (December 3, 2003).
6. (with R. Sienz, J. Stein and L. Jones) Monarch Butterfly Spatially Discrete Advection Model, *Math. Biosc.,* 190, 183-202 (2004).
7. Asynchronous and synchronous dispersals in spatially discrete population models, S*IAM J. Applied Dynamical Systems*, 7 (no.2), 284-310 (2008).
8. (with B. Dembele and A. Friedman), Mathematical Model for Optimal Use of Sulfadoxine Pyrimethane as a Temporary Malaria Vaccine (with Dembele and Friedman), *Bulletin of Mathematical Biology,* 72 (4), 914-930 (2009).
9. (with N. Li, J. Conrad, M.L. Zeeman) Constant and Periodic Harvest Policies: Dynamic Implications of the Pacific Halibut and Cod Fisheries, *Mathematical Biosc.,* 232, 66-77 (2011).

MBI Seeking New Associate Director

The Mathematical Biosciences Institute has an opening for a 2-3 year rotator as Associate Director. The position will be 25% research and 75% administrative.

The Associate Director will be an integral part of the MBI Directorate having primary responsibility for program organization. Other responsibilities could include postdoctoral fellow mentoring, outreach, and educational programs, among other possibilities, depending on the interests of the candidate.

The position will include OSU benefits and the salary will be competitive. Interested candidates should contact the MBI Director Marty Golubitsky (mg@mbi.osu.edu). The start date is negotiable but could be as soon as January 1, 2013.

To build a diverse workforce Ohio State encourages applications from women, minorities, veterans, and individuals with disabilities. Flexible work options available. EEO/AA employer. Ohio State is an NSF Advance Institution.

The mission of MBI is:

- To foster innovation in the application of mathematical, statistical, and computational methods in the resolution of significant problems in the biosciences;
- To foster the development of new areas in the mathematical sciences motivated by important questions in the biosciences;
- To engage mathematical and biological scientists in these pursuits; and
- To expand the community of scholars in mathematical biosciences through education, training, and support of students and researchers.