

Biophysicist in Profile

DIMITRIOS MORIKIS



Dimitrios Morikis, professor of bioengineering at the Bourns College of Engineering of the University of California, Riverside (UCR), was born in Athens, Greece. His parents, a hotel manager and homemaker, “believed that a good education with a solid emphasis on science and humanities was the foundation for a fulfilling life for their children,” Morikis says. As a child, he was fascinated by mathematics, and his favorite subject was geometry—though his dream was to become a soccer player. “I loved playing soccer and I was good in scoring goals,” he says. “However, at the age of 12, I was injured twice playing soccer, and my parents discouraged me from pursuing my soccer ambitions—actually, banned me from going out in the street to play soccer. So, I stayed home and was spending my time studying, doing my coursework assignments, and continuously reviewing past class material.” After finishing high school, he was admitted to the Aristotle University of Thessaloniki to study physics.

Morikis developed an interest in optics in his undergraduate years, and during a summer internship in Poland he was introduced to nuclear magnetic resonance (NMR) and became interested in magnetic properties of materials. “Upon graduation, I received a Fulbright fellowship to perform graduate studies in the United States,” he says, “and I became a graduate student in physics at Northeastern University in Boston.” After completing his master’s of science degree, he chose to work in biophysics using resonance Raman scattering to study the structure and dynamics of the heme pocket of myoglobin in various states. “A new professor, the biophysicist *Paul Champion*, had arrived and there was a lot of discussion about starting a new direction in biophysics within the department of physics,” Morikis says. “I was fascinated on the prospect of using physical principles and methods to understand basic biological processes.” For his PhD thesis, Morikis performed studies on the electronic structure of the heme moiety of myoglobin, including comparisons in crystal and solution states, and the pH, ionic strength, temperature, and mutagenesis dependence of heme pocket conformational transitions.

He earned his PhD in 1990, and became a postdoctoral fellow in *Peter Wright’s* group at Scripps Research Institute in La Jolla. “At Scripps I worked on structural and hydrogen exchange studies of a legume hemoglobin using NMR, so I retained my interest in heme proteins, but changed the type of spectroscopy and objective to the study of molecular structure,” he explains. “I also developed interest in peptides, and I studied the structure of a stand-alone alpha helix and the hydration of a peptide fragment.”

Later on, Morikis held an NIH National Research Service Award – Senior Postdoctoral Fellowship in *Andy McCammon’s* group at the University of California, San Diego (UCSD). He worked on electrostatic calculations, coupled to computational mutagenesis, to delineate the proton transfer mechanisms during the catalytic function of an enzyme that participates in the biosynthetic pathway of purines.

Morikis held research positions at the Sanford Burnham Institute in La Jolla and UCSD between his postdoctoral fellowships. He then accepted an independent research faculty appointment at UCR. He became a founding faculty member of the Department of Bioengineering in 2006, and is also part of the faculty of the graduate program in biomedical sciences of the School of Medicine and of the Institute for Integrative Genome Biology. Currently, Morikis does research in biophysics and bioengineering using computational and experimental approaches. “Throughout the years, there was a natural evolution from biophysics to bioengineering via structural biology and computational chemistry,” he explains, “which is consistent with the evolution of my research interests and training.” Within the umbrella of biophysics and bioengineering, his lab has three major research directions: immunophysics and immunoengineering, drug and biomarker discovery, and



Morikis with his family when he was named an AAAS Fellow in 2007.

structural and translational bioinformatics. “I coined the term immunophysics about 15 years ago to describe the biophysics of the immune system,” Morikis says. “Immunophysics is the study of the physical basis of immune system function and regulation. We are trying to answer the questions ‘what are the molecular and cellular origins of immune system function, regulation, and inhibition? How does the immune system distinguish self from nonself? How does failure to discriminate self from nonself result in autoimmune and inflammatory diseases? What are the mechanisms that bacteria and viruses have evolved in order to evade immune system action?’ Immunoen지니어ing is the design of immune system regulators with tailored physicochemical properties and desired biological functions. The ultimate goal of immunoen지니어ing is to design proteins, peptides, and small molecules that can modulate immune system function to fight infections and regulate autoimmune and chronic inflammatory diseases.”

Morikis’s decision to focus on immune system function came after a personal struggle with illness. “In 1994, I got sick with a life-threatening disease of the bone marrow. Thanks to modern medicine and after a strenuous process, I recovered and managed to get back to research,” he says. “It was in 1995 when I decided to dedicate the rest of my research life in studying the molecular basis of immune system function and trying to develop means to fight immune-mediated diseases.”

Champion has come to admire Morikis, in part because of his grace in persevering through this challenge. “Dimitri has overcome some tremendous difficulties related to his health and he has done a really amazing job of carving out a distinguished career in biophysics and bioengineering,” Champion says. “[He has taught me] how hard work, resolve, and dedication to one’s chosen intellectual pursuit can help a person to overcome significant obstacles and lead them to success.”

Morikis’s students appreciate his approach to mentoring. *Ron Gorham*, who worked in

Morikis’s lab for six years as a student and postdoc, says, “Nearly all of our one-on-one research meetings were at one of the nearby coffee shops. Sometimes we would spend hours just talking. It usually started off with discussion of data, but always turned into a higher-level intellectual discussion of research ideas, plans, and even career wisdom and advice. These meetings are perhaps my fondest memory of my time working with Dimitri.” *Aliana López de Victoria*, another of his students, adds, “He was my PhD advisor, with an open door policy, willing to listen, help with analyzing results, and plan experiments. He was also a mentor, helping me figure out what I wanted to do next. Now that I’m not his student, Dr. Morikis is a friend, and the person I still call for advice.”



Morikis with his lab students in downtown Riverside, 2015

Morikis’s group also participates in outreach activities at local middle and high schools. His graduate students volunteer with the Inland Empire Regional Science Olympiad, where they supervise a Protein Modeling workshop, and organize demonstrations at science fair expos.

Outside of the lab, Morikis enjoys spending quality time with his wife of 30 years, *Gloria González-Rivera*, professor of economics at UCR, and their son, *Vasilios Aris Morikis*, a third-year graduate student in biomedical engineering at University of California, Davis. He also enjoys cooking Greek cuisine.

Morikis advises young biophysicists, “Enjoy the experience of integrating physics and biology, emphasize blending experiment and computation, and establish strong foundations in quantification and theory. Try to reach out to researchers in the fields of biotechnology and medicine. There will always be challenges ahead of you at the personal or professional level, but try to optimize each situation with a forward-looking attitude.”

Profilee-at-a-Glance

Institution

University of California
Riverside

Area of Research

Immunophysics,
immunoen지니어ing,
drug and biomarker
discovery, bioinformatics