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Nicholas J. Mantis
University of New Hampshire

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commentary

Getting down to the Business of Science: How Undergraduate Research Derailed my Career Plan and put me on a Path to Professional Success

—Nicholas J. Mantis (Editor: Jennifer Lee)

Nicholas Mantis graduated from the University of New Hampshire in 1988 with a Bachelor of Science Honors in microbiology. He was among the first to receive a research award from the (then called) Undergraduate Research Opportunities Program.



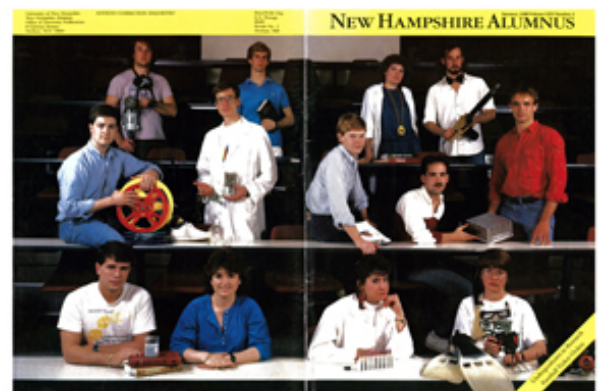
In the fall of 1984, I enrolled at the University of New Hampshire with a specific career plan in mind: I was going to major in microbiology and minor in business administration, with the goal of becoming a big shot executive in the burgeoning biotechnology industry. While I was genuinely interested in biology, my objective in pursuing microbiology was not to get involved in the details of science *per se*. Rather, I wanted to equip myself with the fundamentals of microbiology, biochemistry and molecular biology so as to give me a competitive edge when dealing with technical issues in the biotechnology business world.

My well thought-out career plan started to unravel during the first days of Dr. Richard Blakemore's "Introduction to Microbiology" course in the spring semester of my sophomore year. With his youthful enthusiasm, Dr. Blakemore immersed me (and the rest of the class) in the extraordinary world of microbes. Did you know that bacteria thrive in the hot springs of Yellowstone National Park, growing at temperatures above 80°C? That marine photosynthetic bacteria underlie the entire global carbon cycle? Or that bacteria can be manipulated to produce biofuels and medical products like insulin?

Immersion in Microbes

In a matter of weeks, microbiology was no longer a means to an end; instead, it became an end in itself. I became especially engrossed with understanding how bacteria establish relationships, sometimes beneficial and sometimes deleterious, with plants and animals. That interest was spurred on by Dr. Frank Rodgers' course in medical microbiology, which introduced me to the fundamentals of disease-causing bacteria; and by Dr. Thomas Pistolet's class in immunology, which revealed how much the immune response to a bacterial infection resembles a molecular battle between host and microbe.

To learn more about microbiology beyond the classroom, I volunteered several hours a week in the lab of Betty Seawell in the New Hampshire Veterinary Diagnostic Laboratory (NHVDL) in Kendall Hall. In return for my washing glassware and preparing growth media, Betty let me assist in hands-on diagnostic microbiology, which is effectively detective



The author on the cover of the 1988 UNH Alumna, standing in white coat among the recipients of the first grants from UROP.

work at the microbial level. Samples (blood, stool, saliva) from veterinarians from around New Hampshire would arrive in the laboratory in need of identification. We had to work fast, as the diagnosis of the infectious agent would often dictate the treatment regimen. After a semester at NHVDL I was not only convinced that microbiology was my calling, I also came to the realization that I felt at home in the laboratory. I was finishing my junior year and I wanted more.

It was exactly that year, 1987, that the Undergraduate Research Opportunities Program (UROP) was born. Being a member of the UNH Honors Program, I was among the first to learn that UROP was offering grants to pursue research projects in close collaboration with a faculty mentor or mentors. Dr. Blakemore (or “Dr. B” as he was affectionately known) was kind enough to welcome me into his lab and assign me bench space alongside his graduate students. With the help of Dr. Tom Davis in the Department of Plant Biology, we put together a grant application for research aimed at understanding better how bacteria colonize the roots of leguminous plants and promote nitrogen fixation, especially in high saline environments. Our goal was to identify a species of bacteria that could be used to enhance crop yield in arid and saline environments in the developing world. As it turned out, I was one of the five undergraduates to first receive UROP funding for a research project. Encouraged, I applied for the second round in the fall to continue work on my project and was one of 23 to win an award.

Immersion in Research

My UROP experience in Dr. Blakemore’s lab was effectively an immersion course in the fundamentals of laboratory research: first formulating a hypothesis and writing a well thought-out research proposal; then designing properly controlled experiments, analyzing and interpreting data, communicating findings to colleagues and the scientific community at large; and last, but not least, managing a research budget. The experience (along with a little coaching and guidance from Dr. B) convinced me to apply to graduate school, thereby formally committing me to a career in research and scholarship.

Following graduation from UNH, I completed my doctorate in the Department of Microbiology at Cornell University, where I studied the molecular details of how disease-causing bacteria control expression of their genes involved in infection in response to signals released from their hosts. I then spent two years, partially funded by a Fulbright Scholarship, as a postdoctoral fellow at the Institute Pasteur in Paris investigating how the bacterium *Shigella flexneri* invades cells of the gastrointestinal tract and causes dysentery. After Paris, I spent eight years training in the Gastrointestinal Cell Biology Laboratory at Children’s Hospital Boston and Harvard Medical School, focusing on immunology and vaccine development against intestinal infections.



The author (center) with members of his lab at the Wadsworth Center, 2011.

In 2004, I launched my own laboratory in the Division of Infectious Diseases at the Wadsworth Center, a biomedical research institute within the New York State Department of Health, affiliated with the Biomedical Sciences Program at the University at Albany School of Public Health. Research in my lab is focused on vaccine development against enteric diseases as well as on the development of countermeasures against bioterrorism agents like ricin and anthrax toxins. My laboratory currently consists of five postdoctoral fellows, four graduate students, two technicians and an undergraduate. Work in the lab is primarily supported through extramural grants from the National Institutes of Health.

As a professional research scientist, I now spend my time doing laboratory work, writing grants and manuscripts, reviewing articles and book chapters, teaching at the graduate and undergraduate levels, mentoring, communicating with colleagues, and often traveling to scientific meetings and review panels. As it turns out, my undergraduate research experience had been a foreshadowing of things to come. My undergraduate training in business administration has also paid off. Little did I know that accounting, microeconomics, and organizational behavior courses would be perfect primers on how to balance research budgets and maintain a productive and desirable laboratory work environment. Thus, it is only in retrospect that I can fully appreciate how profoundly my undergraduate research experience has influenced my career.

And you know what? I'm working hard to translate some of my lab's research findings into viable products for the pharmaceutical and biotechnology industries. Hey, maybe I will become one of those big shot biotechnology executives after all!

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Author Bio

*Although **Nicholas Mantis** was born in Minneapolis, Minnesota, his family moved around a lot, he said, when he was growing up. He came to the University of New Hampshire after completing his senior year in high school in Baltimore, Maryland. Currently, he is in charge of his own laboratory in the Division of Infectious Diseases at the Wadsworth Center in Albany, New York.*