

Scientists in the Service

September 08, 2003

Bringing Science to Military Policy

By Jane M. Arabian

I remember, as a new graduate student, hearing one particular comment made to my first “Pro Sem” class by the chair of the University of Toronto psychology department, Endel Tulving. He told us not to expect a position in a college or university once we earned our PhD. He urged us to take advantage of the opportunities to learn and do research as graduate students, but to keep an open mind about careers. Our only “job” in graduate school was to become good scientists; part-time jobs or internships were discouraged.

His remarks surprised me. Until that point, I expected to earn a doctorate and become a professor who would teach and conduct research in an academic environment. Despite the abrupt revision of these expectations and the department’s seemingly inconsistent position on extra-curricular work, I kept my plans – for the time being.

I majored in psychology and learning theory at Connecticut College with Otello Desiderato, and though I began graduate work in that area I eventually completed my doctorate in psychophysiology, with John Furedy as my supervisor. I then returned to the United States for a post-doctoral fellowship in medical psychology at the Uniformed Services University for the Health Sciences, still preparing myself for an academic position. I had acquired knowledge in a variety of areas, published in reviewed journals, and taught. However, after a couple of interviews in academic departments, I realized that my research interests were clearly interdisciplinary, while academic departments seemed to favor specialists. So I switched gears and looked for opportunities that matched my skills – critical thinking, research design, writing, lecturing, etc. – rather than those requiring specific expertise.

I began my non-academic job search with consulting firms. The job market was particularly tough, so I also explored the civil service system. If this sounds like a random search pattern, well, it was! But I was extraordinarily fortunate. I wandered into a perfect environment—a group of behavioral scientists with backgrounds in human factors, industrial/organizational psychology, training technology, psychometrics, cognitive psychology, and other areas.

That’s how I began my career as a research psychologist with the US Army Research Institute. I worked on and led a number of human factors and personnel research projects. As a member of the Reverse Engineering Task Force, I identified operator ability requirements for new weapon systems. I also developed procedures for determining enlistment standards from job performance tests and helped to estimate accession quality goals.

I have the exciting opportunity to be involved in one of the most comprehensive selection and classification research projects ever undertaken – Project A. I worked with professionals, predominately behavioral scientist, who were contractors, academics, and government employees. Most rewarding for me, though, was the chance to interact with soldiers and know that our work at ARI would have a real, fairly immediate, impact. It was through these experiences that I evolved into a military psychologist.

When the opportunity came to influence military enlistment policy more directly, I left ARI and accepted a position in the Office of the Secretary of Defense. I am now the Assistant Director for Accession Policy (Enlistment Standards) and work in the office of the Under Secretary of Defense for Personnel and Readiness. I plan and formulate policy on enlistment standards, including aptitude and education, moral character, age, and citizenship standards for all military branches. Additionally, I have oversight responsibility for the Department's aptitude testing programs. These programs consist of the Armed Services Vocational Aptitude Battery, its computer adaptive counterpart, CAT-ASVAB, and the student testing program known as the DoD Career Exploration Program, which provides career exploration, planning materials, and ASVAB scores to secondary and post-secondary students. I am fortunate to be an active part of the outstanding group of Defense Department psychometricians, programmers, and other behavioral and social scientists who develop and maintain our world class testing program.

The majority of my time is spent juggling the distinct goals and priorities of political appointees, general officers, department or contract researchers, congressional staffers, and, of course, the public. It might not be the academic life I thought I would lead, but this constant shuffling keeps my job challenging, rewarding, and always new.

A Scientist in Uniform

Part Psychology, Part Submarine

By Walter Carr

Navy research psychology is a specialty within the Medical Service Corps of the Navy. The Navy research psychology community consists of about 20 members with diverse graduate training, including cognitive psychology, physiological psychology, and education psychology. We are uniformed naval officers working in various roles in the Navy and other federal installations around the country. Although it is uncommon for more than one or two Navy research psychologists to be assigned to the same duty station, we are able to collaborate remotely and in periodic meetings. More typically, we collaborate through on-site research with the operational military and psychologists, and other scientists from the civil service, universities, private companies, and other military departments.

As a graduate student, it didn't cross my mind that my research on spatial cognition would prepare me for military service. Now, after five years as a Navy research psychologist, I can see how the two paths merged.

In my graduate research, I compared models in spatial cognition literature by examining their ability to account for data gathered in laboratory tasks; I was not, at the time, searching for real world application

of these models. After graduating with a degree in experimental psychology, I interviewed at several small colleges, intending to teach and grow my research program over time. These plans changed after coming across a Navy ad (in the Observer) seeking a research psychologist. I was invited to interview and to give a research presentation.

When I visited the Naval Submarine Medical Research Laboratory I found an extremely diverse interdisciplinary research environment with a dual focus on research excellence and Naval operations support. At NSMRL, a Navy research psychologist works alongside clinical psychologists, physiologists, toxicologists, hospital corpsmen, and other Navy professionals such as submariners and divers. I was excited about the opportunity and pleased that after hearing and reviewing my graduate research – a body of work illustrating how people mentally organize spatial information – Navy officials decided I would fit nicely in the submarine laboratory.

Submariners have the difficult task of continually discerning their blended, undersea surroundings. On-board equipment helps, but submarining is predominantly a mental activity. Initially, I spent most of my time at NSMRL evaluating submariners' spatial thinking ability and their potential to enhance that ability through training.

Since then, the work I've done in the Navy has greatly diversified. Currently, in my second duty station, the Naval Health Research Center, I conduct basic research as well as applied research, and I manage the transition of basic research to operations. Some of my projects at NHRC are neuroimaging individual differences in response to effects of sleep debt, and testing and evaluating portable ultrasound and handheld vital signs monitors for use by medical personnel in the field. Although I've rotated from my assignment at NSMRL, I remain in active collaboration with the Navy psychologists who have assumed these projects.

The shift from graduate student to Navy Research Psychologist was initially challenging. The Navy promotes a different mindset than an academic setting. Now I provide a service to a particular community in addition to contributing to general scientific knowledge. Another aspect of Naval study is the regular duty rotation, which generally changes every three years. This regular rotation challenges research continuity, but is balanced by the benefit of experience in new research areas.

The Navy Medical Research environment is not centrally funded by the Navy. Instead, funding for such research is assigned to bodies, like the Office of Naval Research, which solicit research proposals for competitive evaluation. In this environment, the best research is often realized by partnership between Navy Laboratories and a university. Among other things, this partnership facilitates the dissemination of laboratory research to real world application. As a uniformed scientist, I try not to lose sight of the importance of discussing research efforts with sailors and marines in the operational environment.

Discovering a Behavioral Ecology for the Study of Cognition

By David Bryant

Military people sometimes say, "No plan survives first contact with the enemy." That expression neatly describes how my career as a cognitive psychologist has unfolded, with the enemy in my case being my

own ill-conceived notions of psychology and science.

I began my postgraduate studies with great enthusiasm but little true insight into how human cognition could be studied. On the latter point, there had appeared to be just one answer—research, defined in terms of laboratory-based experiments conducted in university psychology departments. Thus, when I finished my PhD, I immediately sought an academic position without considering that there might be other ways to perform psychological research.

This was a hasty decision, because I see now that both my orientation to science and my temperament were better suited to life outside academia. After a few years toiling as an assistant professor—years in which I never achieved any sort of balance between my research and other duties—I felt I had lost my bearings as a scientist. This feeling came partly from a sense of confinement by academically limited time and resources, but also from an ill-defined realization that I lacked a concrete context in which to study cognition.

I left academia in 1997, first to work briefly in the area of aviation security, then to join a human factors company in my native Canada. There I began to do quite a bit of contract work for Defense R&D Canada, the research arm of Canada's Department of National Defense.

I focused on practical issues of decision making as applied in 'command and control' – processes by which a commander directs his or her forces. A good deal of this work was aimed, ultimately, at supporting decision making through advances in technology, training, and procedure. I was delighted to find, however, that the development of decision support was not considered to be a static process of applying generally accepted cognitive concepts to engineering and doctrine issues. Rather, DND and the Canadian Forces were, and still are, quite progressive-minded about the role science should play in national defense. Their goal is to expand the understanding of cognition in the military domain while simultaneously putting what is learned to use.

When I made the move to DRDC in Toronto, I became immersed in a novel research culture. If one central theme has emerged from my experience in the military-scientific setting, it is that the world of military operations provides a rich "behavioral ecology" in which to study cognition. By this I mean the complex system of people, jobs, goals, demands, constraints, and equipment that allows cognition to be studied in relation to real-world outcomes. My interest in heuristical models of decision-making has come directly from my observations of naval operations officers performing threat assessments under extreme time pressure in complex, uncertain environments. Now, with the benefits of a naval background, I will be able to explore how experts adapt their judgment strategies to the real-world constraints and demands of naval operations. Thus, I find my basic research more closely linked to real-world behavior, and my applications to real-world problems more insightful, for having viewed theory through the lens of practice.

When one's plans do not withstand the unpredictability of events, the sensible strategy is to remain flexible and pragmatic. Working in areas associated more with the practice of human factors than with basic research has allowed me to learn about the behavioral ecology in which military people work, and to learn cognition in its proper context. I believe that it is only by clearly defining the demands and constraints of the environment that one can fully develop an understanding of the mind as it adapts to that environment.

This means the researcher must go beyond the skills acquired in the lab to learn how to describe the physical and functional world. In this respect, the military provides an excellent opportunity. The military world is full of individuals who are not only able to insightfully analyze and describe their world and the intimate interactions of mind, body, and machine within it, but people who are eager to work with psychologists and engineers. A defense scientist's work involves a broad alliance of professionals who help one another toward a more complete and coherent understanding of the mind, and this is perhaps the most gratifying thing I have learned in my new career.

A Lifetime of Experience, Every Day

By Gwendolyn Campbell

Fifteen minutes after arriving at work, one of my research assistants called. Her alarm clock hadn't gone off, she'd overslept, and she had a participant scheduled for an experiment in 15 minutes. Luckily my command, NAVAIR Orlando Training Systems Division, is next door to the University of Central Florida, so I was able to jump in my car, drive to the campus, meet the participant and start the experiment. This particular experiment investigated the effectiveness of several methods of teaching counterintuitive concepts in science.

When my RA arrived to take over, I went back to work and joined a meeting already in progress. Here I learned about ongoing efforts to build simulators for an FA-18 Hornet fighter jet, a command and control center for a Navy destroyer, and an E-2C Hawkeye radar carrying airplane. The plan is to connect these simulators so that pilots and sailors can train together at home, without having to go out to sea in their planes and ships.

The engineers building the systems are focused on the technical challenges of designing and integrating the simulators, so there is a need for psychologists and training specialists to determine how to use these systems to provide effective and efficient training. My particular interest is in identifying what performance data need to be collected by the simulators and how those data should be analyzed to provide feedback. I must also draw conclusions about the prospective need for additional training.

After a quick lunch at my desk, another RA stopped in with some data from the science education experiment. We updated our Excel spreadsheet and took a sneak peek at our means and standard deviations. I spent much of the remaining afternoon writing a paper describing another research project for an upcoming conference on Human-Systems Integration sponsored by the Association of Naval Systems Engineers. This project investigates the capability of computer-simulated teammates to support simulation-based training exercises. We have university and industry teams designing and building the test bed and computer-simulated teammates for this research. During this software development phase, we rely on regular teleconferences and e-mail exchanges to keep things on track, so I'm often communicating online. Once the pieces are assembled, my in-house team will conduct the training effectiveness evaluation experiments.

This description gives the casual observer a taste of my life as a Senior Research Psychologist working for a Navy lab. I came here straight from graduate school six and a half years ago, with a bachelor's degree in mathematics and a master's and PhD in experimental psychology. I have been a team leader

for three and a half years, and have an in-house team with four full-time members and anywhere from two to six part-time members.

We work on projects that range from small, basic research studies to large, applied efforts. We often work within larger, multidisciplinary teams with members from other government agencies, industry and academia. We write research proposals, collect and analyze data, and present the results of our research to our sponsors at conferences and in journals. We go out on ships, meet with sailors, and learn about their jobs and training. The better I understand the soldiers, the more effectively I can help the Navy train them, creating better odds that the people who risk their lives to protect life in America will come home safely.

The basic ingredients of a rewarding career are all here: the study of how people learn and the best ways to teach them; the potential to make an immediate and large impact; and finally, the opportunity to work on a diverse team respected for its intelligence and dedication. In this kind of environment, I venture through a lifetime of experiences almost every day.