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CAREER PROFILES Options and Insights

DEIRDRE A. BYRNE | Surface Oceanography Unit, National Oceanographic Data Center, National Oceanic and Atmospheric Administration (deirdre.byrne@noaa.gov)

Degree: When, where, what, and what in?

I earned a Bachelor of Science degree in geology and geophysics from Yale University in 1990 and a PhD in Earth and environmental sciences from Columbia University in 2000. My doctoral research involved measuring the heat, salt, and mass transports "leaking" from the Indian Ocean to the South Atlantic via the Agulhas Current.

Did you stay in academia at all, and if so, for how long?

When I was about six months away from finishing my PhD, I took a position at the Island Institute, an environmental nongovernmental organization in Rockland, Maine. The Institute was organizing a multidisciplinary study (funded by the National Oceanic and Atmospheric Administration, NOAA) called the Penobscot Bay Marine Resource Collaborative. In the second year of this study, I was funded as a principal investigator and moved to the University of Maine as an Assistant Research Scientist. I finished my doctorate while working full time as a soft-money researcher there. This was an extremely difficult way to finish a dissertation and launch a career. I stayed at U. Maine for about 13 years. Ultimately, I was not happy with the work-life balance afforded by an academic soft-money position, nor with the professional opportunities available there for my husband, also a physical oceanographer.

How did you go about searching for a job outside of the university setting?

I used the usajobs.gov website extensively, targeting NOAA as an organization that hires a lot of oceanographers and the Washington, DC, area as one in which both my husband and I could probably find positions. I think it is relatively anomalous to join an organization "cold" without a single inside contact. In my case, although I was not personally known to the National Oceanographic Data Center (NODC) staff, we had colleagues in common. I cannot over-emphasize the value of a professional network—even just to conduct the work I do now, I rely heavily on information from colleagues both inside and outside NOAA.

What is your current job? What path did you take to get there?

I've been at NODC for just under four years now, so I'm relatively new to federal service. I came to NODC to lead the Satellite Oceanography Team. Nowadays, I also supervise the Surface Oceanography Unit. At NODC, my unit's role is to provide a full suite of scientific stewardship services for surface observations—including all of NOAA's oceanographic satellite products (whether derived from NOAA or from other satellites). The term "scientific data stewardship" sounds arcane—but it is something that the individual scientist does almost reflexively. Making a measurement requires knowing the data format the instrument uses, its calibration parameters, and where and when

the measurement was made. Without that information, it isn't possible to make good use of the data collected. A good scientist also takes some care to back up the precious data in a variety of locations and on a range of media. Our goal at NODC is to accomplish that task—ensure that the data our nation pays to collect, and the data sent to us by data producers and sister institutes, is going to be useful to scientists around the world for decades to come. It's an enormous and complex task.

What did your oceanographic education (or academic career) give you that is useful in your current job?

In grad school, I learned that attention to detail is critically important for the conduct of rigorous science, but to be a good scientist you simultaneously have to keep an eye on the big picture. As a research scientist, I learned how to define the scope of work for a project, and the concomitant goals and objectives, and from them, develop a comprehensive budget and staffing plan, then execute the plan on time and on budget. I

learned to strategize—to always have a Plan B and maybe a Plan C in my pocket. I also learned to lead a mixed group of scientists, programmers, and techs. As a soft-money scientist, I also learned how to define the ways in which my group could contribute to a larger project and how to define the cost of that involvement and write up a succinct statement of work. As an academic scientist, I also served as the system administrator for my Linux LAN. The other critical thing I learned as an academic scientist was how to collaborate with others on a team and how to reach out to scientists at other institutes who have relevant expertise. I draw on these skills and the professional network I developed as an academic quite heavily in my present position.

Is the job satisfying? What aspects of the job do you like best/least?

I love my job. NODC's mission is one that I wholeheartedly support. The quality of the people at NOAA is superb, and it is a pleasure to work with them.

One thing I've learned at NOAA is that you have to be very patient with the sometimes agonizingly slow or seemingly convoluted processes of government. It's a big ship we are steering, so it takes a long time to change course. You have to give that process a chance to succeed. For example, I've become involved in satellite mission planning, and the time horizons are very long. The payoff is that you have the opportunity to set up something of value to the scientific community and society as a whole that will endure. It's a satisfying feeling.

I love that I am working full time in my field but no longer routinely putting in 60 hours a week; I love being in a place where work-life balance is encouraged. While I still work long hours when needed to meet deadlines, I am not only expected, but required, to take time off after the deadline has been met. To me personally, the least satisfying part of my job is being subject to the severe uncertainties sometimes imposed by the federal budgeting process. The furlough last fall was very demoralizing, and NOAA's oceanographic programs and offices have endured some pretty severe budget cuts, while the scope of our work only increases.

Do you have any recommendations for new grads looking for jobs?

Keep an online version of your professional self up to date and easily accessible. People shouldn't have to hunt around to find a list of your publications and presentations. If you are seeking a non-academic position, do not circulate a CV. Instead, write a resume with sections detailing your executive/leadership, scientific, and technical qualifications. Make sure you reach out to your professional network—not just when you are looking for a job, but on a regular basis. Don't hesitate to suggest meeting someone for lunch for an informal informational exchange. Sometimes you may be the one with a need, and sometimes it will be the other person. Don't always wait until you are the needy one. If you are looking to bring in work for yourself or your group, ask your colleagues what their or their organization's current challenges are. Think hard about whether you can offer them some help and don't be afraid to suggest it (at a reasonable rate of compensation). If you are looking for a new position—be yourself—don't misrepresent your abilities, but at the same time, be open to new experiences and a new line of work. Think about what the organization might need and how you could supply that—not about what your research or scientific priorities are. The job you are offered may not be ideal, but through it, you may make valuable contacts or gain experience that leads to the next, better position.

In government and large organizations, there is a big need for scientists with strong programming, information technology, and data management skills. Consider expanding your skills with, say, a course in Python programming or ISO metadata, or a certification in project management. Alternatively, consider obtaining a certification for teaching Earth system or marine science at the high school level. These positions pay reasonably well and you actually get the summer off! If you are not a US citizen but are in a position to obtain citizenship, consider doing so—there will be more opportunities open to you. If you think you might be interested in operational oceanography, realize that we do not do everything in Matlab. Shell scripting, command-line-based packages such as GMT, languages like Perl or Python, C or Fortran, familiarity with formats like NetCDF, HDF, and relational databases, services like OPeNDAP and revision control systems like CVS, RCS, or git—these are all valuable skills and well within the grasp of someone getting a PhD in a quantitative science. If you can, take some time while still in grad school to learn some of these skills. Community colleges or MOOCs (massive open online courses) can be a good way to brush up on these. As well as technical skills, good organizational and communication skills are essential, and a strong command of written and spoken English is a definite plus. When you present your work to a potential non-academic employer, be careful to mention not only the scientific results, but how you got there—did you have to collaborate widely, strategize a fallback plan when your original experiments fell through, manage a budget, organize a cruise? What technical skills did you use to conduct this work? In other words, try to highlight what associated skills you will bring with you to the job.

PATTY PRATT | Systems Engineer and Calibration and Validation Lead for Ocean Color, Northrop Grumman Aerospace Systems (patty.pratt@ngc.com)

Degree: When, where, what, and what in?

In 1987, I earned a bachelor's degree in fine art–sculpture at University of South Florida, Tampa. In 1991, I was contemplating how to have a career with my art degree and sought a teaching credential. I had always loved science in high school and chose to add on a science teaching credential. This notion changed the course of my life. I took an astronomy class at University California, Santa Cruz, and fell passionately in love with the study of light and spectral analysis. I had to know how and why things absorbed, reflected, and/or emitted light. I knew I would need a physics foundation, so began taking math courses required for admission to the physics department in the University of South Florida. I actually paid out-of-state tuition to take Calculus 1. My family thought I was crazy.

In 1993, I entered the undergraduate physics program. A professor, Kendall Carder, heard about a student in the physics department who loved spectral analysis. He enticed me to come into the graduate marine science program as soon as the prerequisite physics courses were met—adding that research cruises were a must. My arm was forever twisted, and I began a journey into ocean optics that I could have never imagined. In 1997, I earned a Master's degree in marine science/ocean optics at University of South Florida, St. Petersburg.

Did you stay in academia at all, and if so, for how long?

I worked as a research assistant on a NASA Fellowship at the University of Central Florida in Orlando in the graduate physics department for 2.5 years, using laser light, electricity, and magnetism to investigate suspended magnetic fluid for projects on the International Space Station.

How did you go about searching for a job outside of the university setting?

I primarily used the Internet, looking at websites of specific companies located in Florida that had anything to do with the ocean, and I networked with peers and colleagues to get more ideas and leads. Ultimately, I did a nationwide search before securing a good entry-level position (Ocean Analyst) at Orbimage, which later became GeoEye (now owned by DigiGlobe). Because of my diverse background, I did not need to emphasize my level of skill in theoretical optics.

Is this the only job (post-academia) that you've had? If not, what else did you do?

I worked at Orbimage/GeoEye, a satellite data vendor for 1.5 years doing ocean color work for the fisheries industry. I actively sought opportunities and activities within the company to expand my skills and to utilize my theoretical optics capabilities. I actually took on tasks of one of the optical engineers after work hours (no pay) simply to learn the skill. I continued to network with people I knew and met along the way, and I learned new tools such as mathematical software codes and Linux and Windows systems on my own time to remain current in the marketplace, while searching for a more formal career that would capitalize on my increasing experience in engineering.

What is your current job? What path did you take to get there?

I invested a lot of time applying for new positions while employed by Orbimage/GeoEye and interviewed even if the job wasn't perfect. I researched the various systems that were being built and learned all the acronyms and program specific news via public venues, especially sound-recorded, archived conference plenary sessions. I listened to the speakers from past conferences over and over again to learn the material and be well versed in their topics. I knew them by voice long before I ever met them face to face. I knew nearly every sensor and system being built so that no matter which program I had the opportunity to interview with, I could already speak the program specific "language." Ultimately, one of the people I interviewed with at Northrop Grumman called back when an appropriate position was posted. I am now a systems engineer and the calibration and validation lead for ocean color at Northrop Grumman Aerospace Systems on the Suomi National Polar-orbiting Partnership (NPP, formerly NPOESS).

My work focuses on our nation's climate and weather satellites, specifically in the area of ocean color. I'll never

forget the first major program meeting at Northrop Grumman with the customers and scientists all in the same room presenting when I would hear a voice and say to my self, "Ahh, that's so and so." And I would remember exactly who they were and what they did. I was able to speak to many people right away about their specialties and ask pertinent questions.

Currently, I create software tools to analyze the active system on one of the instruments aboard Suomi NPP and compare it to the sensor level test data that I analyzed while the instrument was still in the test chambers. I am involved with testing and ultimately integrating a new calibration technique that may nudge the state of the science one step further. In the first few years of working at Northrop Grumman, I followed and analyzed many tests done by the subcontractor, though the ones that are the most pertinent to ocean color, such as polarization, were my accountability as Calibration/Validation Systems Engineer Ocean Color Lead.

What did your oceanographic education (or academic career) give you that is useful in your current job?

Training in a combination of physics and theoretical optics, in conjunction with marine science and ocean optics, provided me with a unique set of skills that correlate to my current position working with both satellite sensor payloads and the ocean color community at large. Having participated on lengthy research cruises at sea with many colleagues, I am able to effectively convey the needs of fellow scientists to the sensor and satellite developer community. I understand the way the light enters the telescope and falls on the detector substrate, and I approach ocean color from the standpoint that if the sensor or detectors are not calibrated and validated, the data from the water leaving radiance (ocean color) never will be. I consider myself to be a liaison between the sensor and the ocean color scientist. Because I have the experience at sea, I can more easily guide the sensor testing and troubleshooting process to deliver a system that optimizes the products delivered to the ocean scientist.

Is the job satisfying? What aspects of the job do you like best/least?

Northrop Grumman Aerospace Systems offers a considerable amount of latitude to creatively solve problems in a wide variety of tasks, from sensor testing to "big data" reduction. It is quite gratifying to be able to invent something useful in the business world. On the other hand, the freedom to take deep dives into the more academic side of ocean science problems isn't in my job jar. However, the creation of new tools to investigate how sensor test data can influence ocean remote sensing is a deep dive that few can experience. It requires understanding both ocean color (light coming from the sea surface) and how it is interpreted by the sensor and algorithm (integrated system) in order to correctly design and calibrate a method that works.

Do you have any recommendations for new grads looking for jobs?

While seeking a job, and even after you find one, continue to focus on what truly lights you up and keeps you engaged in your own development. Be willing to work on your own for free to stay current with market needs, and always seek ways to build relationships with key scientists in the exact, and similar, fields that interest you. Allow your pursuit to evolve around a need rather than constraining it to a specific focus. Grow with the unfolding science.