

# The Journey of an Oceanographer in NOAA

—By Scott A. Duncan

*This article describes what it is to be an oceanographer in an operational science organization in the Federal Government. The diversity of paths leading to employment in an Oceanographer position is as diverse as the breadth of projects and programs available once employed by NOAA. These paths, programs, and opportunities are described here using the personal experience of the author. Operational oceanography is generally not something learned through academic curricula; it is mastered through on-the-job experience and training.*



A “hydro” planning team within CO-OPS

## How does the journey begin?

The National Ocean Service Center for Operational Oceanographic Products and Services’ (CO-OPS) mission is centered around physical oceanography, but it requires expertise in many other disciplines. There

is no common journey to becoming an oceanographer in CO-OPS. Each path is unique and many have key random events or experiences that change the journey from an intended to the present one. Some oceanographers have had focused undergraduate

and graduate degrees in physical oceanography, however more often than not, the undergraduate degrees have been quite different. Some have had undergraduate degrees in chemical or biological oceanography, in meteorology, in environmental science, in geology, or even in fields unrelated to earth science.

My initial path was architecture. However once I entered community college, I found that the career path I had chosen may not be as satisfying for me as I had envisioned. I changed my majors a couple more times until I chose my first Geology class. This was the class that launched me on the path of becoming an oceanographer. The professor of that class eventually became a mentor of mine, steering me toward the career that has now become my life. After community college, I enrolled into a Bachelor of Science Degree program in Geology and Geological Oceanography at the University of Rhode Island.

### **How does one join CO-OPS?**

Many oceanographers have come into CO-OPS employment right after college, after sending out an average of 7-10 resumes before getting the job. Other CO-OPS staff have worked in the oceanography field, either with NOAA or another federal agency, or in the private sector. Then there are those who participated in internship or fellowship programs at NOAA or used to be NOAA contractors before becoming government employees. I got hired right after college.

### **What makes the difference?**

For several years in the early 1990s, CO-OPS positions, along with many other NOAA positions, were scarce due to budget cutbacks. However, over the past decade, the implementation of new technologies in measurement and data collection have spawned new web-based products and services and real-time data access. This has required additional oceanographers, engineers, and IT personnel in order to maintain the enhanced observing systems and new product development.

Also, some positions became available as career oceanographers employed in the mid-1970s (the last time oceanographer positions were created in CO-OPS) began retiring. The vacancies were very competitive, and applicants needed to demonstrate experience in operational oceanographic products and services.

The NOAA interns and contractors who gained practical on-the-job experience working with NOAA's tides and currents program were ahead of the game. Some field technicians also became experienced in the application of tides measurements, hydrography, and nautical charting after being trained by different offices within NOS.

Applicants are generally required to have a diversity of experience in GIS, and experience with geodesy

and meteorological data is a plus, given the increasing expectation of being able to work in a dynamic environment. Experience with oceanographic modeling, observation system deployment, and retrieval of oceanographic equipment is, of course, the primary requirement. Recently, experience in the application of oceanography to habitat restoration and other non-traditional applications has become desirable. The ideal candidates are those who can work across the CO-OPS product boundaries (described later).

After college, I was lucky enough to get an interview for my current position after sending out about thirty resumes. My traditional B.S. academic background in physics, chemistry, and math, and my degree in the sciences enabled me to put my foot in the door, so to speak. It was the higher-level courses in these same areas that gave me an edge. Experience in the military, and the fact that I was familiar with and had experience with using CO-OPS oceanographic products and services were just some of the things that led to the job offer that I had accepted.

### **Becoming an Operational Oceanographer**

Most new employees, no matter what their background, require some form of on-the-job training. There is usually a very large difference between an academic environment and an operational one.

From my experience there is much more time in the academic world for planning, research, and getting the desired outcome down to an extremely focused result for a project of usually limited duration. CO-OPS is in charge of and maintains nationwide observational programs that are continuous and of unlimited duration.

In research, strategic planning ensures that grants and contracts are funded from year to year so as to preserve the long-term scientific objectives of the research. In operations, strategic planning focuses on the management and maintenance of projects and activities so as to ensure a sustained "end-to-end" observation system.

In such a system, data measurement, collection, quality control, data management, and product application and delivery are made available to a variety of customers continuously, and recently, in real-time. For example, CO-OPS has developed a product for use by hurricane response teams that are usually on call 24 hours a day during the hurricane season.

Not many people joining CO-OPS come with the experience necessary to develop and deliver such products; hence the importance of on-the-job training. Such training exposes new employees to knowledge and expertise in the areas of their teams, and enables them to participate in other CO-OPS projects or programs. This enhances their base knowledge and introduces them to the applications of CO-OPS products and services.



NOAA honors outstanding performance. Second from left in the back row is Scott Duncan, the author of this article.

Following a period of on-the-job training, employees are assigned their own projects, possibly with other staff to assist or manage. This gives experience in leadership, which is critical for advancement to the higher levels in this organization. Team leaders and supervisors can expect to be involved in the strategy development and decision-making processes.

Eventually, when the “journeyman level” is attained, the employee will have a solid background for the job they were hired to perform. Employees who have “graduated” from the in-house training program work independently (while understanding how their job is integrated into NOAA, and possibly other organizations). They are expected to handle most issues pertaining to their jobs; many are usually considered “experts” in their field.

For example, I am currently in the same group as when I started, the Datums Section in the Products and Services Division (PSD). My on-the-job training began with my doing quality control for some of our many observation systems while simultaneously learning the basics of tidal datums.

In the process, I obtained a thorough understanding of the backbone (19-year or older observation systems) of the entire organization and how the data could be applied to different themes. As my knowledge and experience grew, I became more confident, and I was given the authorization to verify others work.

This, of course, did not happen overnight. Understanding datums, their computation methods, and quality control standards can take years to master.

As I gained rank and experience, I began working on different project teams and with other Line Offices within NOAA. In 2002, I was appointed the project manager of the National Tidal Datum Epoch (NTDE) Update 1983-2001.

The National Tidal Datum is usually updated every 20-25 years to take into account changes in Mean Sea Level around the country occurring during the previous update period.

The 1983-2001 update was the third update to be done in NOAA history, and it remains one of my greatest achievements to date.

The assignment marked a personal watershed—I had truly tran-

sitioned to an Operational Oceanographer. I was able to infuse my knowledge and experience into the project, and, as a result, develop quality control procedures and specific software, and organize and manage this very large project. These experiences elevated me to the journeyman level.

Yet, even with all my experience, I still run across datum issues that require me to really sit down and dig through the problem. This is what makes this job great, as it always tests me and I always learn something new.

While working for NOAA/CO-OPS, I have been able to merge my background in Geological Oceanography with Physical Oceanography and datums. This began my fascination with, and research of, tsunamis and hazard mitigation.

After the 2004 Indonesian tsunami I was assigned to be the CO-OPS Director’s representative on the NOAA Tsunami Program Team. My academic background and professional experience enabled me to assist the Director with the planning and decision making process. This work continues to this day.

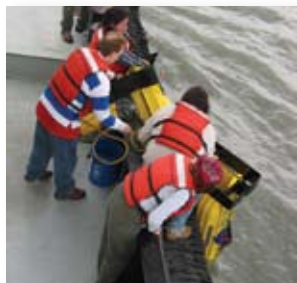
### CO-OPS teams

CO-OPS oceanographers have different areas of expertise and, therefore, are on different teams or programs. Here are some examples.



*Hydro Planning Team (HPT):* Oceanographers on this team develop requirements for hydrographic surveys. They develop co-tidal lines and tide station requirements for planning and operational purposes. They make sure the tide correctors to hydrographic soundings are made

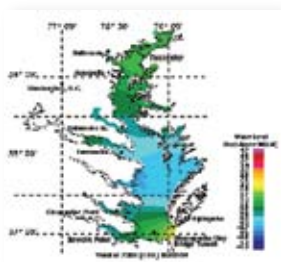
correctly. They coordinate with headquarters and field personnel to make certain the projects are within the desired parameters and on schedule.



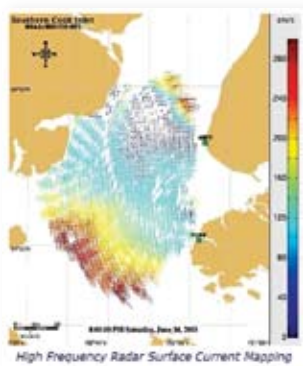
*National Current Observation Program (NCOP):* Oceanographers in this program collect, analyze, and distribute observations and predictions of currents. They also maintain and update the Tidal Current Tables. One of the responsibilities of this group is deploying the sensors that collect the data. This usually entails traveling to different parts of the country from Alaska to Maine.



*Coastal Oceanographic Applications and Services of Tides And Lakes (COASTAL):* Oceanographers in this program can be involved in devising beneficial uses of dredged material, coastal planning projects, marsh restoration projects, long-term sea level assessments, storm-surge monitoring, emergency preparedness, and HAZMAT response. The oceanographers working in this program can become project leads for various activities. The program provides opportunities for working closely with the National Geodetic Survey (NGS) and with NOAA customers.



*National Operational Coastal Modeling Program (NOCMP):* The primary objective of NOCMP is to develop a national network of Operational Nowcast and Forecast Hydrodynamic Model Systems (called OFS) to support NOAA's mission goals and priorities. An OFS consists of the automated integration of observing system data streams, hydrodynamic model predictions, product dissemination and continuous quality control monitoring. State-of-the-art numerical hydrodynamic models driven by real-time data and model forecast guidance form the core of these end-to-end systems. Oceanographers on this team accept models into operational mode and maintain their operational status.



*Ocean Systems Test and Evaluation Program (OSTEP):* CO-OPS manages the OSTEP to facilitate the transition of new sensors and systems to an operational status. OSTEP personnel test instruments to ensure that they meet CO-OPS requirements, assist in the development of operational deployment and implementation processes, and establish quality control criteria. They determine the most appropriate sensor tech-

nology and configuration operation and maintenance schedule to meet CO-OPS mission.

*The Datum Team:* One of the projects managed by the Datum Team (of which I am a member) is the Five Year Epoch datum update for stations in regions with a high rate of sea-level change (Gulf Coast and Alaska). The team also develops datums for in-house activities, such as hydrographic or photogrammetric surveys. Concurrently operational work is carried out daily and may involve calculation of tidal and accepted datums as well as projects of different Line Offices, federal/state agencies, and our normal users through user requests. We also hold weekly meetings focusing on specific projects, general reviews, or training that needs to be attended.

As team leader, I often work directly with the National Geodetic Survey (NGS) on tidal and geodetic datums relationship issues. Through the NGS State Advisor Program, I also assist with issues relevant to local datums. Other days I could be writing articles (such as this one), preparing a presentation, or writing a technical paper for a conference or for publication in an academic journal. Sometimes travel is also involved. One of the benefits of oceanographer positions is that there are always opportunities for travel—whether doing field work, presenting a paper at a conference, or attending a workshop.

### Some history

This year marks the 200<sup>th</sup> anniversary of NOAA. CO-OPS is one of those organizations within NOAA that were created in 1807 by President Thomas Jefferson when he requested from Congress a Survey of the Coast. Since then, CO-OPS has endeavored to provide to users accurate and reliable data.

Data collected by the long-term continuous stations of the National Water level Observation Network

(NWLON) are the indispensable foundation of every water-level product produced by CO-OPS. The San Francisco station, which celebrated its 150<sup>th</sup> anniversary in 2006, holds the record for the longest continuous data series in the western hemisphere. Most NWLON Stations have extremely good metadata. Field engineers, contractors, and oceanographers review the collected data on a monthly basis, more often depending on certain projects. Maintenance work is usually done on an annual basis.

It is because of the careful attention to detail and routine product generation by oceanographers that the data continue to be invaluable in the generation of new products and services which are accessible on CO-OPS web site. Among these are products developed for dealing with emergency situations during hurricanes and tsunamis.

The storm tide QUICKLOOK, an emergency management product for hurricanes, is one of such products. In addition, data generated by NWLON stations are used by the Tsunami Warning Centers (TWCs) and Pacific Marine Environmental Laboratory (PMEL) to predict the arrival times of tsunami waves to the shoreline and near CO-OPS observation systems.

### Career growth within CO-OPS

Within the next five years, approximately forty percent of NOAA employees will meet the requirements for retirement. There is thus a unique opportunity for upward mobility for those aspiring to a management position, such as that of a Division Chief and Director of CO-OPS. The positions in between may be non-supervisory, but they are on staff and usually go to a higher grade level, which makes them suitable for advancing without the managerial aspects.

Another career path is the technical product lead. The employees in these positions are usually well versed in the use of various

products and applications. Technical product lead positions can be found throughout CO-OPS. For instance, in the long-term observation systems mentioned earlier, the National Water Level Program (NWLP) of which they are a part, is supervised by one individual.

Another possible career path within CO-OPS is that of project management. CO-OPS projects can run for months or years on end, depending on their complexity and the desired outcome/product.

Finally, there is the technical expert path. Most of these people have a specific expertise developed over years of work. For example, people inside and outside this organization consider me a technical expert on datums and their applications.

Certain individuals have accumulated enough experience and knowledge throughout their careers to be familiar with nearly all aspects of the organization, its products, services, visions, and technical expertise; this essentially makes them experts in the entire organization, and therefore, they are extremely valuable employees.

### Summary

In this article, I gave examples of several different career paths available within CO-OPS—with the relevant educational background and experience. A number of the oceanographic programs mentioned in this article have been described in previous ACSM CO-OPS articles [access the write-ups in “webmazine” <http://www.acsmcongress.org>].

The Census Bureau has published proposed criteria for census tracts, block groups, census designated places (CDPs), and census county divisions (CCDs—defined in 22 states as the statistical equivalents of minor civil divisions) for the 2010 Census—in the Federal Register on April 6, 2007. Federal Register notices are available on the Census Bureau’s Participant Statistical Areas Program website at <http://www.census.gov/geo/www/psap2010/psapcriteria.html> as well as via the Federal Register’s website at <http://www.gpoaccess.gov/fr/index.html>. General information about the 2010 Participant Statistical Areas Program is available on the Census Bureau’s website at [http://www.census.gov/geo/www/psap2010/psap2010\\_main.html](http://www.census.gov/geo/www/psap2010/psap2010_main.html). Requests for additional information about these statistical areas as well as copies of the proposed criteria Federal Register notices should be directed to Michael Ratcliffe, Chief, Geographic Standards and Criteria Branch, Geography Division, U.S. Census Bureau, via e-mail at [geo.psap.list@census.gov](mailto:geo.psap.list@census.gov) or telephone at 301-763-3056.

## What’s Up With This Weather?

March winds brought more than a few April showers this spring, and weather conditions across the United States and around the globe have people wondering, “What’s up with the weather?” Snow in Texas, torrential rains in New York, and flash floods in Thailand, may be indications that the worldwide weather patterns are changing, often creating extreme weather that wrecks havoc and leaves destruction and death in its wake.

*The Complete Idiot’s Guide to Extreme Weather*, written by Dallas-area meteorologist Julie Bologna, offers in-depth information on the science of extreme weather conditions, and examines how and why weather patterns are changing worldwide.

Ms. Bologna, an Emmy-award winning weathercaster who appears on Dallas’ CBS 11 News This Morning, provides easy-to-understand explanations of how storms develop, organize and travel, and details exactly what happens when extreme weather occurs including tornadoes, hurricanes, blizzards, floods, landslides, El Niño and La Niña, and much more.