Interview with the Chief of Naval Research

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Oceanography **Editor, Rick Spinrad, interviewed the U.S. Chief of Naval Research, Rear Admiral Paul G. Gaffney, Jr., for this special issue, which was sponsored by the U.S. Office of Naval Research. Admiral Gaffney, himself an oceanographer, has also commanded the U.S. Naval Meteorology and Oceanography Command in Mississippi and the U.S. Naval Research Laboratory in Washington, D.C.**

Oceanography: **The first question deals with the Office of Naval Research's (ONR) support for The Oceanography Society: sponsorship of conferences, special issues of the magazine, and the Munk Award. Why has ONR shown such support for TOS?**

Gaffney: We believe that the Navy and ONR have a leadership responsibility in the US for oceanography. It is a core science, it is, of all sciences, the naval science and we have a responsibility to make sure that the national investment and our investment supports the needs of the Navy and likewise the needs of the nation. So it is important for us to do whatever we can to keep the general ocean scientific area strong and healthy. It would not be unusual that we would focus on oceanography in general. Supporting TOS and its magazine is a way of articulating our leadership, our interest in the ocean, and giving back to the American taxpayer whatever we can. The fact is, it's the American taxpayer's money that we spend, and whenever we can return that to him in some useful way directly, we should do that. And it is often returned in ways he doesn't know, because it gets engineered into systems, or engineered into certain kinds of knowledge that is used by the scientific community, but when it can go back in other ways, in the largest and most prosperous maritime nation of this planet, then we should do that. This magazine is the proper vehicle for doing just that. In fact, most of what we invest in shows up in some kind of a journal. TOS however, tries to reach other parts of society, beyond the "heads down, looking at the bench" scientist. You reach members of Congress, industry, educators, and all of that is part of letting people know what we're doing and giving back to them some of the investment that they've made in us.

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Oceanography: **Is there anything that you could refer to as "feedback" or "product return" for the support of TOS? Anything specific that comes back to ONR or the Navy as a result of TOS sponsorship?**

Gaffney: Some of the conferences in which we are the principal supporter tend to focus talent in areas of special interest to us. While it seems altruistic, we are a bit selfish in that when we put hard cash on the table, we want to make sure that there is a direct return on something very specific that we're after. Like the conference in Paris. Dealing with coastal and marginal seas is of extreme interest to the U.S. Navy which right now, recognizes this as the most difficult environment for them to operate in. Having the conference in Europe and focusing on the area is one thing, but then having the conference in a setting in which there are many nations interested in only coastal and marginal seas, because that is the environment they live in I think is double-bang for the buck. So we were very happy to sponsor the Paris conference and get that kind of interaction going. Our principal investigators were able to talk with others; to get ideas put on the table that they normally wouldn't have had the opportunity to do so.

Another example might be the Munk Award, which focuses on acoustics. Oceanography is a core, naval science. Within oceanography, acoustics is even more so, and ONR has the [U.S.] national responsibility for acoustics. While other agencies certainly do invest in acoustics projects, if we/ONR would pull out altogeth-

er, it would collapse and so we are very interested in that role. When we find mechanisms to advertise that we are still actively interested in acoustics, we're still supporting it for the long term, and how important it is–we highlight that impression by having this award, [honoring] perhaps the most prestigious living oceanographer, Walter Munk. It shows people our interest and dedication to the subject. This year, in fact, we've examined this award very closely and are fine tuning our program a little bit with some additional resources to make sure that the national program regains some lost help.

Oceanography: **You started to address the specific issue of why the coastal and marginal seas meeting was conducted in Europe. This approach, at least in the oceanographic community, was somewhat unusual in terms of U.S. sponsorship. Would you categorize the Paris meeting as a success and as the kind of thing you would like to do in the future, as a focused subject in a venue not necessarily in the U.S.?**

Gaffney: When you're looking at priorities, contemporary issues, focusing on getting something out of it that is useful, rather than just having a clambake so that people can exchange ideas, putting it in the right venue is important. Was the right venue overseas? Sure. Putting it overseas just because it is a nice place to go is never a reason. If there is a good reason to do it overseas, we should do it overseas.

Oceanography is a core naval science.

Oceanography: **The subject matter, coastal and marginal seas, is one which people may have interpreted as "the U.S. Navy is no longer interested in blue water oceanography." How do you address that statement?**

Gaffney: What we've said is that we have to have a balanced program that still has a deep-water component. Approximately 40% of the work we do is deep-water related, 40% is shallow-water related, and 40% is everything. Now I know the arithmetic does not add up, but there are certain techniques like some modeling, some remote sensing, some instrumentation that span all regimes and some don't. But we seek a balance. We are trying to recognize something that has not been recognized in the past, that there is a real challenge in the shallow water, the oceanographic challenge, and we also know that the challenge is congruent with the challenge that the Navy and the Marine Corps face.

Oceanography: **Along those lines, what are the priorities for oceanographic research within the Navy?**

Gaffney: I guess you could characterize it two ways: by discipline or by the actual use of the knowledge that is gained. Let me try the latter, and I would say that right now the number one issue, the one that we cannot blink from, the one that we have ignored, as a corporation have ignored the most in the past 15 years is mine countermeasures. Being able to search and identify and find ways to avoid them is almost exclusively a shallow-water issue. It is the ultimate asymmetric warfare technique.

Oceanography: **What do you mean?**

Gaffney: Asymmetric, meaning a very cheap tool can be used to defeat a very powerful enemy, with expensive systems. Virtually anybody can use these in any place in the world. Typically the mines are in shallower waters, protecting harbors, or certain waterways that are important to them. This is the number one issue in the world today. And that is where we are putting our most emphasis.

There are other areas that are of equal importance: anti-submarine warfare has historically been a top priority for the Navy. It still is a priority, less than mine warfare right now–but many of the techniques we use as oceanographers, to address the mine warfare threat, are equally as useful in the shallow water, anti-submarine warfare. And so whenever we can make that trade, with the application, we do. But it also affects the things like special operations, like amphibious landings which typically come after the mine warfare issue is solved. The interaction of the oceans with the atmosphere in the coastal regime is very complicated, and that affects our ability to conduct air operations, whether they be with manned or unmanned aircraft. The interaction of the oceans and the atmosphere also has a great deal to do with the safe passage of ships and the ability of the people on those ships to function. Knowing when to avoid, or take advantage of bad weather is important. So it is really impossible to draw the line and say this is the only application this research affects, because as you understand the maritime environment it applies to all of them–we are putting a little bit more emphasis on mine warfare now, and in my opinion should have in the last 15 years.

Oceanography: **As a consequence, are program managers more inclined to put their money on safer bets, or do you see a risk level that's allowable in sponsored research? Are we seeing a more conservative sponsorship of research?**

Gaffney: I have great faith in the people at ONR. I find them a rather (now this is a compliment) irreverent group in that they try to stick to the high ground.

I will say that I am generally concerned that 20-30 years of decreasing funds for basic and applied research will tend to design work that does not require a great deal of overhead. "Overhead," to me is going to sea and doing things from ships as opposed to doing everything from a PC or a terminal hooked to a supercomputer

someplace. We could completely consume this community with theoretical modeling, or simulation work, fully employ them all and never go to sea. We could also employ everyone at sea and never do anything else. I worry that nationally and in the Navy in the long term, as money continues to go down, people look for opportunities where overhead is less, to keep people working at the bench. I can't point to incidences, but I am worried about having some difficulty filling up all of our ships right now, even though, as anyone can imagine, there are thousands of years of work to be done at sea. A wise man recently told me that every time you go to sea, you find something you did not expect that you should go back and investigate. That's one of the differences between oceanography and other fields. I am concerned about that, nationally and for the Navy.

Oceanography: **If we, for argument's sake, assume that money will not be the sole driver for how research is done in the future, that is to say that there is some stability in funding, what do you see happening fifty years down the line in the way ocean research is done?**

Gaffney: I foresee our increased ability to handle, store, and to manipulate data–and there should be a lot more data, nationally and internationally–that can be moved around to solve peoples' problems.

I think in the fifty-year time frame, we will still be using ships, however we will be using those ships much better--as in "less risk." When you send them someplace you will know what they actually are going to do. I see a combination of using ships with remote sensing techniques, real-time linkups, and widening the aperture of ships-or eliminating ships using uninhabited, undersea vehicles (UUV). UUV will also be a way to increase the aperture of a ship, if you are going to use a ship, or not use a ship when you don't have to, because ships are expensive with people on board. Using satellites, remote sensing techniques, buoys, over-the-horizon radars, instruments on airplanes, commercial airliners, ships of opportunity and all those kinds of things will, likewise, reduce the need for ship time. I am not one that would define away a ship, however. I still think that you have to go out there occasionally and look over your spot. I can't imagine ODP (Ocean Drilling Program) being replicated through UUV over the next 50 years. If you want to look below the surface, you probably still have to do that from some vessel that floats on the top.

Oceanography: **Actually the Ocean Drilling Program is a good way to come back to the question of funding, in the terms of its being an international program. You've established this scenario for fifty years down the line, given that we have a current national and international funding structure. Will that work for the kinds of objectives you've stated for the future, or are we looking at a different way of supporting oceanographic research?**

Gaffney: I guess I don't envision a big budget meeting where 50 nations get together in a room and put together a master plan for the global oceanography program except for some discrete, international programs. But the whole program, I don't see being coordinated well by some international body. I can see coordination between communities, among scientists, on an individual level and for some discrete experiments that can be orchestrated and bureaucratically handled. I'm sort of a decentralization-guy. I would prefer that international collaborations be made up of the scientists themselves, by picking the right partners because they know what is going on, rather than some bureaucratic body, who by its definition becomes detached from the science and doesn't get its feet wet or its hands dirty trying to legislate where dollars go. That worries me.

But there is another way for international cooperation/coordination to occur in discrete areas, and that is by increasing involvement in industry, which is gradually becoming more international. I would hope that industry is a very interested partner in TOS and an increasingly important partner in TOS, because the big parties that can afford to go out to sea are international, and they *can* make things happen as well.

Oceanography: **So you see them as catalysts, not necessarily the leader for international cooperation?**

Gaffney: Not necessarily the leader, maybe in certain areas they could be the leader. Certainly in the resources, geology/geophysics area they could be leaders, sure, and I have no problem riding along with them and making partnerships.

It is sort of a theme that we have at ONR, and I have not really tried it in oceanography, but if I really thought about it, I could. I've been worried about the dwindling money going out to academia over the years. And I'm also worried about money going out to industry. I'd like to see the two get together-the basic research community, which includes some small percentage of government laboratories and industry. In my opinion, industry doesn't put money into basic research, and so their vision is unofficially truncated at the level of product development-they don't look 30-40 years down the line (there are some exceptions). And the universities, while they may look down the line, they often don't have a clue about produce-ability. Why don't those guys get together and let the university be the long-view for industry, and let industry be the produce-ability check for the university? Pooling money/resources–I'll be investing in both, but they should come together to get more out of it.

***Oceanography:* Other than investing in both is there a leadership responsibility that you see federal agencies, specifically ONR having in this regard?**

Gaffney: I think ONR is in a better position to take a leadership role in this than other agencies–than the National Science Foundation (NSF). We can be more top-down and they can operate in the reverse-it's a great balance the way we do business and the NSF does business, and we're right next door to each other. We're currently trying to cooperate in engineering areas, like shipbuilding for instance, and in oceanography as well. Maybe there is a chance that an oil exploration company and a university could work together and we could be the funding catalyst for that. I don't think I've seen a proposal in that area, but I like that idea: the dose of reality in the long term, and both groups working together.

***Oceanography:* As the Chief of Naval Research and as an ocean scientist and one of the few that have served in both capacities, what are your personal, versus administrative, views of the nature of the international oceanographic community?**

Gaffney: My experience as an oceanographer is as a military specialist in oceanography. I've worked around oceanography in the military context since 1971, and many of my experiences have been international in nature: Vietnam, Indonesia, Spain, and trips to 30-40 other countries. There has been a great interest on the part of the Navy in working with our colleagues around the world for a couple of reasons. One is to reduce the cost of research–whenever you can get a partner, that is good news; getting access to one's waters, gathering data together, perhaps training other nations to increase their skills and then the quid pro quo for that is exchanging data with them, which allows us to get a better picture of the globe. In fact, we are the only global Navy. You can read the front page of the *Washington Post* or the *New York Times* and guess where the Navy might be the very next day based on what is going on. We can go anyplace. And we don't have the wherewithal to characterize the whole ocean ourself. We can do that by cooperating with as many allies as possible and we do that. I've traveled all over the world and have signed agreements with any number of countries: Albania, Russia, Japan, Korea, Indonesia . . . This is critically important for us to do our job. The other part of that is if one wants to cooperate with a neighbor, friend or someone you would like to be your friend, and you're in the military, you would like to be able to develop a trusting relationship, not based on weapons or war fighting. Oceanography is a way for the U.S. Navy to enter–and the Navy is typically the first uniformed service to enter a new country–a new relationship. Oceanography is non-threatening. It is just the opposite. It aids commerce, transportation, and pollution issues. It provides a whole number of things that can help a nation do better. We have great skill in oceanography in the U.S. Navy, or are able to reach it through our principal investigators from ONR because of the data we hold and manage. We have the ability to go in and do very good things with partner nations and be a national spokesman. We are the only agency that really has global kinds of information, global reach, global interests and could actually be the first agency in.

To go back to Albania, before they had their recent troubles just after they became a democracy, the first people into Albania were ocean surveyors. They did a rather unsophisticated kind of oceanography; they went in and mapped their coastline for navigation safety. They collected other data, too. We gave that information to the Albanians and they produced charts. Then all of a sudden commerce started coming in. When we did that, I signed an agreement with the Minister of Defense of Albania, who happened to be a mathematician, and understood immediately what we did, how we did it. He understood global positioning systems and navigation and bathymetry and swath sonars and those types of things and he was incredibly interested in the topic. Now here is a one star admiral working with a Minister of Defense of a very important nation trying to grow into democracy. We signed our agreement, he and I and their Chief of Naval Operations and the whole general staff on national television for just the exchange of a couple of charts–it was just amazing. He said to me that he signed a lot of agreements with new Western Allies, and that this was the first agreement that really delivered something useful for his country.

Oceanography is a way for the U.S. Navy to enter . . . a new relationship.

***Oceanography:* Your comments imply an underlying theme of the role of ocean sciences in diplomacy. The State Department has requested the National Academy of Sciences to undertake an assessment of our national investment, if you will, in science and technology as a diplomatic tool. Are we, as a nation, doing everything we can to fully use ocean science and technology as a diplomatic tool?**

Gaffney: I cannot speak for the whole government, because I just don't know what the other agencies are doing proactively in science or oceanography as a tool for better relations between countries. I know that it is important to the U.S. Navy and I know it is very important to ONR. As a mission of ONR, it is one of the reasons we have two foreign field offices: one in Tokyo and one in London, taking care of Asia and Europe. It is a way for us to reach out and peacefully engage our neighbors or people we'd like to have a closer relationship with. It is not threatening and we do it proactively. In both places we have two oceanographers, and they have great connections; that is good news for the U.S.

Navy. I tell senior people in the Navy about this tool that they have. I can apply that to plasma physics and marine corrosion and ship engineering and a whole bunch of other things. I think science is an important way to make connections with people we would like to have a closer relationship with, because it is not provocative and it helps the partner get better as well as us, and it does not cost a lot of money. I guess my opinion is that the nation should use science as a tool to get closer together.

You can look at some of the things Congressman Weldon (R-PA) has done with Russia and the Duma. Whether you agree with it or not, science was a way for him to make good connections. He made excellent connections and opened dialogue that we never even hoped to have. As a matter of fact, it was oceans and environmental sciences that did it. So I think that science should be used in diplomacy as much as possible. It is used actively in the Navy and I would hope that every agency that can use science would.

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If we do something that is new–a new relationship with a new country, and science or oceanography happens to be a potential lead-in, those activities are always coordinated with the State Department.

Oceanography: **You alluded to the ONR foreign offices, what kinds of services or products would the non-U.S. scientists get from these offices?**

Gaffney: The offices have money to do cooperative research. It is a place where they can go to try to navigate through, at least, the Navy bureaucracy. Remember, the one thing that ONR employees are most proud of is our technical base–we know what is going on. If a French scientist is looking for someone in America or Europe to hook up with, for staff support or collective/collaborative funding for example, a scientific officer might help him with those types of connections. We also sponsor conferences, and workshops that bring people together to exchange ideas. I just did one in Istanbul on electric drives. These opportunities are great for us, but they are also great for our colleagues overseas as well.

I was the CNR for two weeks, and the Prime Minister of Armenia was coming to make his first trip to the United States, and guess where his first stop was, after he got off the airplane?-the ninth floor of ONR. He came in, sat at this table for two hours and talked about a $40,000 investment in research we made in three or four scientists in Armenia that were working on materials for lasers. He said you cannot believe what that investment by the ONR in our country, has done for our prestige and morale. He came here to tell me that personally for two hours.

I will continue to be an advocate of releasing data as long as we do it deliberately . . .

Three of our four Munk Award winners are from outside the U.S.–we fund the best person for the job.

Oceanography: **You cited the relationship with the Russians, which involved the release of data. Recently, the Vice President and others have suggested there will be more declassification of U.S. information, not unlike what was done with the altimetry data. Can you comment on what data might be next?**

Gaffney: There is lots of data that has been released other than the Geosat altimetry . . . most of it is hydrographic station (temperature-salinity with depth) measurements. I would say it is millions of discrete observations that have been released as raw databases. I think the role of the operational oceanographer is great. The role of ONR is to be sure that the operational oceanographers play their role deliberately. You want to make the data available, since it is owned by the taxpayer, but you do not want to make a security mistake. It is a very deliberate process, operational oceanographers consider the value of the data, and determine how to release it so that it retains its scientific value. I would continue to push for a release, because my constituents, the principal investigators supported by ONR, can use that data. The more data they get, the less they have to go out and collect all over again. And we have ways to move data so efficiently, off of home pages, bulletin boards, electronically, at low to no cost to the Navy. I will continue to be an advocate of releasing data as long as we do it deliberately, and we don't make a giant security mistake.

Oceanography: **I'm understanding that the message to the research community is that they can look forward to continued declassification. It's the pace and type of data that are not defined, correct?**

Gaffney: Right, and we are looking at all types of information. If you read the MEDEA report, they would classify that operational data held by the Navy are the crown jewels of oceanography on this planet. That is the data that they are looking at: bathymetry, magnetic, hydrographics, ice data, bioluminescence . . . Getting it out ten years ago would have cost an awful lot of money–it meant standing at the copy machine for ten years and licking stamps all night. Now it is really trivial to get it out. The issue is let's review it, see if it's important, can we release it or can we warp it a little bit so that when we do release it, it doesn't do damage. That is what we are proceeding with and, to my knowledge, the Navy is behind that. I am really behind that because it would help my constituents and it would really save me money.

To really understand the data, you've got to clear somebody–and that matter is not trivial.

Oceanography: **Before we close, what about some general comments on Year of the Ocean?**

Gaffney: The year is not over yet. The President, Vice President, Secretary of Commerce, Secretary of the Navy all showed up at the National Oceans Conference, in addition to a whole lot of good looking and important people. I don't recall, since I started hanging around this political-oceanography business in 1975, a better dialogue or critical mass of folks together. I am very happy that the Secretary of the Navy John Dalton, a former submariner, has become so personally interested in oceanography. He has played a personal role in the Navy's investment in the exposition in Lisbon. He was there for the opening. He was a co-sponsor for the Ocean Conference and participated personally and vigorously and went to tens of briefings on exactly how that conference would be set up and run perfectly. He offered the site for the conference at the Naval Postgraduate School, and he has become a vigorous, comfortable co-chairman of the National Ocean Research Leadership Council of the National Oceanographic Partnership Program. I think that is three times a miracle-and we've had many Secretaries of the Navy that have been interested in oceanography. I can name several of them, but Secretary Dalton has been more interested than any one else. That is just really great news for ONR who has a very large segment of its money invested in oceanography, and the Chief of Naval Research by law reports to the Secretary of the Navy. To have your boss intimately interested in the largest chunk of your investment is great. So, to me, the Year of the Ocean was a magnificent success.

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We are a maritime nation and I think it is insane for the United States not to understand why the ocean is a part of why we are a great nation–it acts as both an insulator, and a conductor of this country. It keeps the bad things away, but it also brings us to the rest of the world. To not understand that medium is insane.

The Navy needs to understand maritime weather on the oceans, and that's what makes the Navy and the Marine Corps different from the other services. The Year of the Oceans put a spotlight on that. When the Secretary of the Navy gets involved in the Year of the Oceans, 45 admirals get involved as well, whether they like it or not, and now they all know about it.

Oceanography: **Finally, consider the TOS international audience and a young graduate in ocean scientist coming into the research community right now. What is your advice?**

Gaffney: What is your goal in life? Do you want to make a difference, live in a nice place, have adventure, or make a lot of money? Some of those things apply to research oceanographers, some don't. You're probably not going to be real rich. You'll probably be away from home a lot. On the other hand, you'll definitely have more adventures than your buddy down the street will.

And you've got to want to do something that is very important-I think the world is figuring out that the ocean is very important. We see threats to the environment. There's an awful lot of speculation whether there is global change going on and we have the chance to determine whether or not that is happening, and do something about it. The next generation is going to do something about that–the old guys are not going to do anything about that. The people in school, the post-docs now are going to have to wrestle with that problem and it could be a major issue. Just think of this. About 50%-maybe 75% of the world's population lives within 200km of the ocean, attracted by good recreation, better weather, and transportation options. Before the people you're talking about die, the population of the earth–at the rate we're going now-will double. I predict the same ratio will live along the shores–the stresses that will put on the edge of the ocean are incredible.

So I believe there is an incredible amount of work out there. Will you get rich? No. Will you do important, maybe the most important things for the planet? Yes, I think so. Will it be adventurous? Yes, absolutely. I would encourage you to go into the field, but if you go in thinking you're going to make a lot of money, be a millionaire being an ocean researcher, don't.