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Dr. Peter C. Chu
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Dear Peter,

On behalf of James Lynch of the Woods Hole Oceanographic Institution and William Dewar of the Florida State University, please find attached our Academic Program Review (APR) of the Naval Postgraduate School (NPS) Department of Oceanography. We enjoyed the opportunity to meet with your academic faculty, research faculty, technical staff, administrative staff and NPS leadership. We also appreciate the time and effort by many in preparing all the documents we received in advance and the in person presentations and interviews.

The APR Committee received several supporting documents, prior to arrival in Monterey, describing the Mission statement and the Strategic Plan of the Department of Oceanography at the NPS. Amongst the highlighted bullets were maintaining research excellence and supporting the combat effectiveness of the Navy and strategic partners, and providing students with educational opportunities serving critical Navy needs and that were not readily available in other civilian programs. The Committee recognized the wisdom of these goals. We were also asked to comment on a series of issues, ranging from strategy to recommendations. In view of our experience during the visit, we have opted to abandon the requested response format in favor of the one that is attached. The Committee consensus based on our visit was that NPS is in severe danger of losing its existing expertise in Physical Oceanography, an outcome that would leave the Navy dependent upon civilian institutions to educate the officer corps in defense relevant areas.

Please feel free to contact us if you are in need of any additional elaboration or follow up.

Sincerely,



Antonio J. Busalacchi, NAE
President, UCAR

Report of the 2018 Academic Program Review Committee for the NPS Department of Oceanography

**James Lynch
William Dewar
Antonio Busalacchi**

1. Overall Sense of the Academic Program Review Committee

The outcome of the overview work done by the NPS OC Department Visiting Committee on July 10-11, 2018 was not at all what the Committee (A. Busalacchi, W. Dewar, and J. Lynch) expected. Rather than having to make some modest recommendations on how to fine tune a basically healthy program, the Committee found a decidedly precarious OC Department on the verge of a downward trajectory, and at risk of losing key personnel and programs in a 3-5 year timeframe.

Our feeling as a Committee is that the OC Department's situation is well beyond curing by "band-aid" solutions, and that some major decisions about resources, staffing, regulations, and other matters need to be made in timeframe of a few years if the OC Department is to survive and reverse this trajectory.

Some of the decisions that have to be made cannot just be NPS department or Administration level decisions, but need to be made at higher levels in the Navy, as they involve determining the overall mission of NPS Oceanography (specifically as regards the value of research versus teaching), whether or not the Navy is willing to commit the major resources that will be needed for fixing some of these problems (an at-sea oceanography capability is quite expensive) and finally whether the Navy is willing to recognize that rules and regulations which are perhaps required and effective on military bases are inappropriate in an academic environment like that which NPS wishes to maintain, and in which NPS scientists will be able to compete effectively with their civilian university counterparts.

The points to be brought up in the following sections will detail: 1) the problems we identified by category, 2) the strengths that we saw, and 3) our recommendations.

2. Specific Topical Items/Concerns

A. Administration

The NPS administration that we met with were aware of most of the problems we identified, and concerned with how to solve them, but appeared to be highly constrained (shackled might not even be too strong a word) by a very rigid, bureaucratic system. The amount of latitude that they appeared to have as regards hires, rules and regulations, and program directions and details was very small, and only comparatively minor adjustments in any given direction seemed possible. A primary cause of these strictures appears to have been an internal audit (IG) sometime around 2011-2012. The need for this audit may have been legitimate, but many of the downstream effects have been negative.

The Administration also appeared resigned to living within a "BIS" (Butts In Seats) algorithm allocation of internal resources to departments and individuals, i.e. one based strictly on teaching load. This favors departments that have more popular majors (e.g. business versus STEM disciplines) and thus fill more seats. However, the real need for money and resources is often greater in the STEM departments, which require more expensive technical equipment for adequate training and thesis research work. And, as the Committee often contemplated internally, what is the relative value to the Navy during a military operation of an MBA trained in procurement as compared to an expert in underwater acoustics?

The Administration seemed aware that "thinking outside the box" was needed for solving STEM department resource problems, but seemed pessimistic about anything happening along those lines.

As regards external funding, NPS has lost roughly half of what it had before the IG exercise, as the regulations and red tape encountered in dealing with such money have "de-incentivized" the faculty and staff from pursuing such funds. It appears that the Administration is encouraging that more external funding again be pursued, but is powerless to cut much, if any, of the red tape.

B. OC Department Chair

Dr. Peter Chu, the current OC Chair, is now serving an extra term since nobody else stood up to take this watch. Our sense from Peter was that he is acting to insure the survival and basic maintenance of the Department, but is not highly engaged in pushing its future directions, especially given the obstacles that would have to be overcome. He was enthusiastic about the Committee trying to get some motion started as regards future directions.

When the Committee received its information packet, it appeared a marine mammal acoustician was the OC Department's next faculty slot pick, but when we talked in person, it became obvious that a hire or hires in numerical modeling and polar programs were what was needed, and what many of the faculty members were expecting. This pointed to a lack of detailed long-range strategic planning on the part of the OC Department, and a breakdown in internal communication mechanisms within the department. This was a theme repeated frequently in many areas of departmental functioning.

Peter Chu did seem to be very concerned at the inequity in department resource allocation mentioned before, specifically the "one size fits all" BIS allocation algorithm.

A good case can be made that the training of METOC and ASW officers by the OC Department is of comparatively high value, as training in STEM skills needed by the fleet is a critical Navy need.

We do not wish the above paragraphs to be read as a criticism of Prof. Chu. What we wish to convey is the recognition of the difficult position he is in. He has limited, if any, resources and yet shoulders the enormous responsibility of holding together a diverse department which is in great danger of fracturing underneath him.

C. Tenure Track Faculty

The tenure track OC faculty are very good to excellent on an overall national level: competitive, determined, and still quite productive. The high quality of OC's present tenure track staff is not an issue.

That being said, this staff generally has a mid-career to older demographic, has been dispirited by the IG exercise, and is often eying the

exit (whether via retirement or employment elsewhere.) It is also small (in reality six people), not just in absolute size, but in relation to what we would perceive as a good size needed to achieve the needs of the Department and the Navy.

A particularly unnerving, but frequently repeated, attitude of the tenure track faculty was their immediate tendency to look outside the NPS for partnerships to facilitate their research programs. When inspired by an innovative idea or an opportunity, their first response was to look outside NPS, perhaps to Moss Landing or UC Santa Cruz or Scripps, for colleagues there who could actually carry out the needed purchasing, or travel, or host the visitors that would actually make the research program work. NPS cannot possibly hope to maintain their existing tenure track faculty or compete for new tenure track hires with this mode of operation.

Under the current system, the OC tenure track faculty is capped in FTE's, thus restricting critical hires. But just as worrisome is the attractiveness of NPS OC to young faculty. (The same holds for Research Faculty and Technical Staff, as will be discussed.) Even if the FTE cap were lifted, the attractiveness of NPS OC to new, young faculty does not look high. Small, if any, start-up packages, diminishing access to good, in-house technical support staff and equipment, high teaching loads, restricted travel and visitors, and numerous constraints and red tape are making NPS OC a hard-sell to potential newcomers.

We also heard that the tenure track faculty often fund work out of their own pockets, paying hundreds to thousands of dollars for research equipment from personal funds, simply because the bureaucratic mechanisms allowing for needed, on-the-spot purchases, do not exist.

The need for obtaining a security clearance is also an impediment to obtaining new faculty, though an understandable one for NPS.

In terms of the overall education and research mission of OC, the fact that there is no accounting or credit in the pay model for advising students in their thesis research, which is a big chore, puts this aspect of research on a "secondary" footing to teaching, which gives the tenure track faculty 33

hours of support per course. The dearth of Ph.D. students and postdocs also diminishes the "research friendliness" of the NPS atmosphere.

In terms of the present faculty (augmented by Research Faculty), coastal oceanography and acoustics are well represented, and blue water and polar oceanography/acoustics still exist, though in the latter cases faculty leveraging efforts by collaborating with other seagoing laboratories and universities helps.

The two main technical area needs of Navy importance are polar programs and numerical modeling, as stated before. These should be filled via tenured or research faculty hires, whichever is feasible.

D. Research Faculty

The Research Faculty in OC also play a large role in both research and education, but (as is typical) are not subjected to the rigors of a tenure decision. They also do not get startup packages, nor bridge funding, and are also paid less per course taught than the tenured staff (22 vs. 33 hours), the latter of which seems unfair. There was also the perception that the research faculty felt like second-class citizens, in that their voices were not heard when OC decisions were being made, regardless of their relevant expertise.

One of the surprises to the Committee during the visit was the apparent ambiguity it found in the size of the Research Faculty. Our materials and some simple counting suggested seven, but discussions with the Faculty and staff actually suggested a working number of something like three or four. There is also one member stationed in Hawaii and the connections between that colleague and NPS staff were a little unclear. It struck the Committee that having a presence in Hawaii was a potentially great asset. It is not clear that this connection to Hawaii is being efficiently exploited.

Again, this staff seems thin (nominally six people), with attraction and retention being issues.

Due to FTE issues in the present system, needed hires in polar programs and numerical modeling seem more likely to come through this program than through the tenure track.

Again, this is a good, dedicated staff, but suffering the same morale and constraint issues as the tenure track.

E. Technical Staff

Perhaps the most surprising interview that the Committee held was with the Technical Staff, which supports the laboratory and seagoing efforts of the OC Department.

The first indication of this was how grateful the technical staff was that some "higher-ups" would even talk to them as a group, as this was an unusual event. Their sense of being neglected was strong.

Despite that, the technical staff all enjoyed what they were doing, and it seemed that job satisfaction in doing research was the main reason that they stayed at NPS "for the long haul."

What seemed to confirm their stories of the lack of career guidance and supervision was a litany of long overdue and non-existent promotions. Our notes have one person being in the same pay grade for 15 years, while still being viable for a further promotion (which maxes at GS12 for this track at NPS.)

Another disappointing story from the technical staff is that they couldn't even contact HR in any timely fashion about their concerns. HR did not answer the phone, and its doors were cypher locked.

Yet another large concern is that this group is largely near retirement age (within five years), but there is no plan by the department to train replacements or hire new staff in key areas. The loss of this group will be debilitating to research efforts in NPS OC, especially sea-going ones. Ninety plus years of experience will walk out the door in the next few years, and no one is currently in place to benefit from that seniority and training. This loss will be at least as damaging as the reduction in numbers of the technical staff.

Lastly, we also heard from many of the technical staff that they received no guidance with respect to the performance expectations for their job classification. It was left up to each individual to research their own job class and what might be needed to advance to a next level.

F. Students

The bottom line at NPS is its students - their education, training and career paths. Perhaps our happiest interaction overall at NPS was with these students, who are bright, motivated, hardworking, mature and generally upbeat. They also were very frank and candid about their career paths and their perceptions of the educational program, as we will discuss.

The main criticism of the program we heard, and vocally, was "too many courses." There also was some criticism of redundancy in the OC courses, particularly in the "basic dynamics," where one derives and then simplifies the Navier-Stokes equations to examine various dynamic effects. Covering these in a single, unified course (which would cover both oceanography and meteorology) was suggested.

Another "concern" (not so much a criticism) was fitting in math refresher courses at the beginning, and also squeezing in JPME courses as part of their course matrix at NPS. Doing these left less time for core courses, and for research. It did seem to the Committee, however, that the refresher courses were serving a useful and practical purpose in the curriculum.

The students were also well aware of the BIS model that is a major influence in the curriculum design.

A concern of the Committee and the Department is that mathematically sophisticated topics such as numerical modeling may be beyond the reach of MS students, especially those coming in with weaker or more rusty backgrounds.

The Ph.D. students we interviewed were quite knowledgeable, and seemed to be a good resource for the less advanced students.

The presence of postdocs was stressed as being useful, as a more informal and accessible educational resource than the faculty.

G. Curriculum and Overall Education

As mentioned before, there could be some economy in consolidating the dynamics sections of some courses, and perhaps even having the dynamics course taught in one department (or shared, given the competition between departments for students.)

There also could be some consolidation possible in the basic acoustics course between the Physics and Oceanography Departments.

Losing the "Range and 3D Dependent Acoustics" course was a significant loss, as these effects are very exploitable for DCLT purposes, i.e. highly Navy relevant. The Committee heard regret from the students that this course was not available. Again, consolidation economies might allow this to be reinstated in some form. There was also regret expressed about electives not being offered, again because the topics involved could not meet the minimum BIS quota required for a faculty member to get course credit.

Again, consolidation economies might allow this to be reinstated in some form.

Climatology should be a mainstream course in the matrix, to our thinking.

The research experiences that the students related were generally positive, and indeed a welcome change from straight course work.

H. Technical Facilities

The research facilities at NPS are becoming dated, and hard to support with limited internal funds.

Much of the lab equipment used is actually coming from research grants, rather than supplied by core funds.

PI's are becoming shy of proposing for large research equipment, due to bureaucratic permissions needed, delays in purchasing, etc. We heard one researcher say that he will only do DURIP proposals through an outside lab, which will own the equipment, but allow him to use it as a collaborator. This

is very counterproductive to running a research program with modern, up to date facilities.

The at-sea mooring facility that OC runs is becoming more and more dated, and thinner in equipment than it was in years past. This, together with losing technical support staff, could result in the loss of a critical at-sea capability.

I. NPS Infrastructure (Purchasing, HR, Travel, etc.)

If we had to pick three areas where complaints were uniformly the loudest, they would be: purchasing, HR, and travel. These infrastructure areas were universally pilloried as being slow, bureaucratic, and inefficient.

Purchasing was criticized for all three of the faults above, and in particular it made obtaining equipment for at-sea efforts so slow that one couldn't rely on getting equipment in time for a cruise. Thus, PI's would be happy to have a collaborator purchase (and so eventually own) gear, rather than deal with NPS's system. We also heard that the bureaucratic burden was so heavy that faculty would have to pay for equipment out of their own pocket with no hope of reimbursement just to get the job done, just like a grade school teacher having to use their personal funds to pay for class room supplies. Needless to say this does not reflect well on NPS and certainly does not help in recruiting and retaining quality faculty.

HR was criticized as basically unresponsive. One tale of interest was that the information for retirement would not be provided until one month before the actual date, which is often too late to make certain key arrangements. (One of the Committee, JFL, had his institution working with him on retirement arrangements up to a year before the date. This would be closer to the norm, we would hope.)

Travel was another part of the infrastructure that was cited as counterproductive. For scientists and technical people, travel to and from conferences is an essential part of keeping up to date with one's field. However, travel permissions are so bureaucratic and hard to obtain, that PI's have cut down on such travel, and especially foreign travel, which was described as "nearly impossible."

Travel to NPS by scientific visitors has also been greatly curtailed by travel regulations, and there is a real danger that NPS (not just OC) is becoming scientifically isolated. We heard of instances where money to support visits by external researchers was denied by (what were described as) secretaries because the visits were not viewed as relevant to the research grant objectives and that the faculty member had no way to object to this decision. While the Committee recognizes that the actual decisions were most likely made by higher levels than secretaries, bureaucratic mistrust of the PI's is the real problem. NPS must have some basic trust in its PI's that they will spend their research funds responsibly and competently. In addition, perhaps the bureaucracy charged with monitoring these expenditures should be assured that they would not be held responsible for them. This would alleviate what we heard described as a 'CYA' attitude on the part of the bureaucracy.

3. Strengths

The NPS OC department has some significant strengths that can help it both with recruitment and retention of first rate faculty and staff. Its location in Monterey gives it both an attractive venue, and also provides direct access to the sea. Advisors pay no tuition for students, and the overhead is quite low compared to other universities on the national level.

The reputation of NPS OC and of the individual scientists at NPS OC is, at the moment, very good overall, and the reputation of its faculty has historically been high. However, reputations are fragile things, and if NPS OC wishes to maintain its prestige, solving the problems it faces must get priority.

4. Recommendations

A. Upper Level Navy Management

In the normal course, we would not request the attention of upper level Navy management in such a departmental review. But our perception as a Committee is that NPS OC's situation is beyond usual remedies, and that help and guidance from upper levels is needed.

NPS's Mission Statement emphasizes its role in both research and teaching, but the OC research component especially is in danger of eroding quickly. Teaching is in somewhat less trouble, but could also use help.

Seagoing oceanographic research is quite expensive compared to most other research fields, and right now NPS OC is not receiving enough internal or external funds to sustain a nationally competitive program. We see the following possible ways that upper management might help in solving this problem.

First, deciding what type and size of sea-going oceanography program NPS OC should have going forward is in need of guidance. Maintaining a full blown, national level program will probably need some substantial new investment by the Navy, e.g. for startup funds for new hires, new capital equipment, ship time, etc. This will likely involve an increase in tenure track faculty FTEs by one or two. As to Research Faculty, the current structuring of this group needs some genuine clarification.

Second, cutting back some of the bureaucratic requirements (e.g. on travel and purchasing) would improve the chances for the NPS OC faculty and staff to collaborate and compete for research and equipment funds externally. At present, we perceive the NPS oceanographers as being handicapped compared to their external scientific colleagues.

These are two major items that need to be resolved at higher levels, and which will give the internal NPS administration, faculty, and staff a clearer roadmap as to what they need to do.

B. NPS Administration

Again, we feel that the NPS administration understands the major concerns facing the OC program, but the solutions that we saw offered do not go nearly far enough to address the long term problems, in that they are mostly in the context of "business as usual." We would suggest that the administration, in collaboration with both upper level and departmental management, implement a three year "up or out" review/strategic plan/improvement program for the department. A review at all levels of OC's status (with this external review being an initial part) would be followed by a detailed strategic plan with definite metrics for success and timelines. A large

fraction of these metrics would have to be met in the three year timescale which, as we have discussed, looks to be the timescale over which action needs to be taken to forestall the faculty and staff erosion expected in a five year timescale. If such metrics cannot be met, we believe that more drastic actions should be considered (and indeed outlined even before the three year review begins.)

The list of problems that we have discussed above gives some of our ideas of solutions within it, but in the long run it is the Navy and NPS that must decide what future they want for the OC department. Such a review/strategic plan/program as we suggest would be one way of determining what that future should be.

C. OC Departmental Level

We feel that the OC department has been too shy about making its case for a greater share of resources, both in personnel and equipment. Though it trains a comparatively smaller number of students than other NPS departments (business being a common example), the students it trains are critical, technical decision path Navy personnel, whose high-tech training makes them scarce and very valuable resources for the fleet and other Navy operations. The resources needed to train such personnel are not common, nor are they cheap. Further, the education these students receive by conducting research is as valuable as that they receive in classrooms. This was a theme the Committee heard several times from the students themselves. If the Navy wishes NPS to continue to train such officers, including an at-sea research component, NPS OC should insist on being given adequate resources. It should also insist that the value of mentoring research be recognized in a manner like classroom teaching currently is.

We also would recommend that the OC department create a strategic plan, and that this should be done ASAP. We additionally advise that this be done in an "all hands" fashion. Both for department morale and for optimal input, everyone needs to be heard at this critical juncture. While upper management will obviously get the final say in things, the benefit of getting everyone's input towards such decisions is substantial.

D. Tenured Faculty

While the present size of the faculty might be "correct" given the number of students taught by the department, it is 1-2 too small given the technical breadth the department is charged with covering. We would strongly recommend upping the FTE level limit on the tenured (and teaching research) faculty.

We would also suggest that upper management and administration work out some "return on overhead" mechanism, where PI's (tenured faculty, research faculty, and senior staff) who bring in external research grants to NPS get a percentage return on such awards for reinvestment much like many leading research universities and laboratories offer. Further incentivizing the procurement of research grants by PI's could help reverse the sharp external funding decline of the past five years.

Next, some way to reduce the number of courses (through streamlining and consolidations) and teaching load would be of benefit to both tenure track and research faculty. If NPS OC wants faculty that are considered nationally competitive in research (which is a requirement for tenured faculty), burdening them with too many courses is counterproductive.

Finally, some change in the pay model to better account for or provide credit for advising students should be implemented. Proper advising is just as time consuming as teaching, and not rewarding it sends a negative message about the value of both NPS's research efforts and the education mission of NPS.

D. Research Faculty

One major complaint heard from the research faculty was the lack of bridge support, or any means of accessing an account linked to or in recognition of the research funds they have brought in to insure against shortfalls. This is probably the biggest worry for the research faculty, and also a negative factor for recruitment, not just retention. Again, if NPS wishes to recruit and retain faculty at a national level, it must put in place support mechanisms consistent with peer organizations.

E. Technical Staff

At least from the Committee interviews, it appears that the technical support staff has largely been ignored as regards supervision, training, career development, demographic status, and input into department affairs. Developing a game plan to counter this trend is sorely needed. Also, a robust recruitment plan, that addresses the realities of demography and critical area needs, has to be implemented. This should be in the next three years, to counter the retirement losses expected in five years, and to allow some training overlap before these retirements.

F. Students

As mentioned, the students most common complaint was heavy course load. Streamlining and consolidating courses (including across departments, which would be Meteorology and Physics in OC's case) is strongly advised. We feel that, by doing this, some small, but useful reduction in course load can be achieved, without sacrificing content.