APL Collaboration with the Whiting School of Engineering

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A task force was convened in 2003 by President William R. Brody of The Johns Hopkins University to determine how to intensify the degree of collaboration between APL and the Whiting School of Engineering (WSE). Although recognizing differences in culture and cost accounting between the two institutions, the task force identified a shared interest in human capital and the support of WSE graduate students on APL projects of mutual interest. The task force recommended increasing the number of joint appointments, funding enhancements, and a realignment of graduate fellowship programs. The outcome is the WSE/APL Partnership Program that is designed to increase the probability of external funding for the promotion of continuing collaborative activities.

BACKGROUND

It seems trite to say that the world is changing, but the fall of the Berlin wall, the end of the cold war, and the beginning of the war on terrorism have had profound effects on the country and even greater effects on the defense community. Though perhaps not as significant in a geopolitical sense, there also have been profound changes in academic research, particularly in engineering research. These changes have been driven by funding agencies that have emphasized interdisciplinary and transdisciplinary programs that require multi-investigator collaborations and a focus on Pasteur's quadrant, i.e., use-inspired basic research.

In 2003, The Johns Hopkins University had just embarked on a search for a new Dean of Engineering. It was in this context that JHU President William R. Brody convened a task force which he charged with the responsibility of finding ways to intensify the degree of collaboration between APL and the Whiting School of Engineering (WSE). Members of the task force are listed below with titles and organizations in place during the task force period of service.

- Prof. Steven Knapp, Chair (Provost and Senior VP for Academic Affairs, JHU)
- Dr. Harry Charles (Associate Head, Technical Services Department, APL)
- Prof. Andrew Douglas (Associate Dean for Academic Affairs, JHU)
- Dr. Jerry Krill (Head, Power Projection Systems Department, JHU)
- Prof. Gerard Meyer (Chair, Electrical and Computer Engineering Department, JHU)

- Prof. Murray Sachs (Director, Biomedical Engineering, JHU)
- Dr. John Sommerer (Head, Research and Technology Development Center, APL)
- Prof. Scott Smith (Associate Chair, Computer Science Department, JHU)
- Mr. Dan Tyler (Head, National Security Technology Department, APL)

The task force recognized that any initiative to foster such collaboration needed to consider and respect the differences in culture and mission between the Laboratory and the Whiting School, bear in mind their different cost-accounting standards, and find bases of collaboration that were mutually beneficial to both divisions, philosophically as well as practically.

With respect to the first point, APL is primarily a problem-solving organization dealing with national security and space exploration. These missions emphasize teamwork on a large scale, as well as adherence to deadlines, and tend to downplay individual achievement (sometimes, too much so). APL does relatively little "discovery" work, and that fraction of effort undergoes constant scrutiny for relevance to APL's sponsors. On the other hand, the paradigm of academia is much more focused on development of fundamental knowledge that may or may not have short- or even mid-term practical utility. Consequently, most academic research is supported by grants rather than contracts. Schedules reflect prior expectations of progress to granting agencies but are not binding. Individual achievement and investigator freedom are highly prized and recognized.[1] Finally, at least with respect to the national security mission of APL, federal security laws and regulations place significant constraints on the public release of information and even the personnel involved in the work. This creates innate obstacles to collaboration with an academic division where faculty and students may not be U.S. citizens (or are dual nationals) and where the imperative to publish is great.[2]

The second point, cost-accounting standards, has been a particular pitfall in prior efforts to foster collaboration between APL and other divisions of the University. APL, under Federal Acquisition Regulations, must account for the time spent by its entire staff. Almost all of APL's funding is in the form of research contracts (not grants) that obligate the Laboratory to produce specific results according to statements of work and schedules negotiated with the sponsor. Much of this work concerns the sort of sensitive issues noted above, and therefore a number of topics are not particularly attractive to WSE faculty. Furthermore, Laboratory staff collaborating with WSE on more discovery-oriented work must charge their time to accounts where APL has a greater degree of flexibility. These accounts, such as Independent Research and Development (IR&D; a "tax" on other APL work to allow the Laboratory to establish capability relevant to developing future business), are also controlled by government regulations as to applicable topics, and fees (the most fungible revenues available to APL) are limited and have many competing claims. For example, a substantial fraction of the fee collected on APL IR&D is transferred to the president of JHU annually; the remainder is used as operating capital by the Laboratory or to cover disallowed costs resulting from ongoing government audits. The Whiting School has considerably more flexibility in the application of faculty time, since the cost-accounting standards for research grants are less demanding (though increasing) than for contracts and the academic divisions have alternative revenue streams (e.g., tuition, philanthropy) unavailable to APL. Many would-be collaborators at WSE have been frustrated that their APL partners have relatively little flexibility in allocating their time; changes in research direction that arise naturally in the course of discovery are not easily accommodated. Even the start-up phase is difficult, since APL staff members attempt to minimize the uncertainty over their "coverage" for the future year and often seek commitments to projects that may seem too constrained or applied to WSE faculty.

Finally, the search for mutual benefit was particularly difficult for the task force, given the cultural differences discussed earlier. APL is a technologically based organization, so new technology is certainly beneficial to the Laboratory, but its application orientation frequently means that it cannot immediately benefit from discovery-level advances in academia. Similarly, the problems on which APL is working are sufficiently difficult that they can inspire excellent research, but the results might well be unpublishable.

One area of shared interest noted by the task force was human capital. APL spends a great deal of effort and money to recruit new staff. In our high-tech economy, the Laboratory needs to pay competitive salaries, and those salaries frequently deter discovery-oriented funding agencies (e.g., the National Science Foundation) that could expand APL's discovery-oriented portfolio. On the other hand, one of the Whiting School's chief metrics is its production of graduate students. The ability to support additional graduate students on APL projects would benefit WSE faculty. The task force used this "overlap of interest, at arm's length" as a principal basis of its recommendations.

TASK FORCE RECOMMENDATIONS

The WSE/APL Task Force recommended that WSE seek to enhance the number of appropriately credentialed APL staff with secondary appointments in the WSE academic departments. A goal was established to increase the number of joint appointments by roughly an order of magnitude and to emphasize appointments

that would enable APL staff to serve as thesis advisors for WSE graduate students. To facilitate exploration of interest by staff in both divisions, and to address the restrictive nature of APL's cost-accounting standards, the Laboratory made substantial changes to its preexisting program, providing sabbatical professorship and fellowship opportunities to its staff. The resources previously supporting up to 4 APL staff on a full-time basis were divided to provide a day-per-week "release" opportunity for up to 40 APL staff to collaborate, teach, and engage with academic division colleagues. Most of these interactions have been between APL and WSE, but in addition there are now APL staff with joint appointments in the Krieger School of Arts and Sciences and the School of Medicine. Release-time allocations are reviewed annually, and those not resulting in progress toward a joint appointment after a reasonable period are opened to new applicants. In some cases, the technical areas of interest between APL staff and WSE faculty are not sufficient to sustain collaborative activity. In other cases, APL staff find that they prefer to devote full time to their APL assignments. Still others opt for a full-time academic existence and leave the Laboratory for academic appointments in other divisions or institutions. In any case, current joint appointments seem to be stable at the level of support available to APL.

The Laboratory also adjusted its preexisting graduate fellowship programs to align with the task force recommendations by giving preference to WSE students under the guidance of APL-based faculty. A number of students are now progressing toward WSE degrees working on APL projects.

Finally, the task force recommended that President Brody establish an APL Partnership Program focused on WSE/APL interactions. Earlier, Brody had established a program to seed collaborations between APL and academic divisions using part of the APL fee provided to the President's Office under the JHU Interdivisional Stabilization Fund. Under the terms of that program (now in its fifth year), teams of collaborators could work on problems of interest to APL's sponsors under support from the President's allocation plus matching funds from the academic division. That program, administered by Vice Provost for Research Ted Poehler, involves a selection committee drawn from many of JHU's divisions, and APL has served on that body since its inception.

When President Brody appointed Nicholas Jones as Dean of the Whiting School, he acted on the last task force recommendation by allocating to him $500,000/year to foster collaboration. Dean Jones, in turn, asked APL to manage those moneys on his behalf. He gave the Laboratory wide latitude with regard to the use of the funds, but noted that he wanted all uses to emphasize the seeding of new joint activities, as opposed to serving as the sustaining force in such activities.

THE WSE/APL PARTNERSHIP PROGRAM

Based in part on experience with the earlier interdivisional program, the WSE/APL Partnership Program was designed to maximize the probability that collaborative activity would continue after funding of the collaborative team under this program ceased. Consistent with task force recommendations, the Partnership Program is oriented toward generating funding to support additional WSE graduate students on projects of mutual interest to both institutions. The program is just concluding its first year as this is written, and although results are promising, we will not necessarily be constrained by the boundaries of the current experiment in the future. For now, however, the outlines of the program are as follows.

Because the single most frequent factor contributing to the dissipation of a collaborative effort between APL and an academic division of JHU is the discontinuity of financial support, we have as a central guiding principle that a required deliverable for a team supported under this program is a joint proposal for funding by an external agency. We hope that teams will focus not on "who gets how much of whose pie" but on "finding more pie." This adheres to Dean Jones' philosophy of treating President Brody's funding as seed corn and makes explicit both the need to seek outside funding as a sustaining force and the need to support each partner of the collaboration team in any continuation. (Previous collaborative initiatives have indeed led to external funding, but have not always included both partners of the team supported initially by institutional funds.)

A second requirement (and here we reserve the right to define "requirement" retrospectively upon seeing proposals) is that both APL and WSE provide matching funds to foster the effort. While the range of acceptable matches is as broad as possible on both sides, we feel that requiring the expenditure of additional resources will focus applicants and their home affiliation on the desirability of obtaining sustaining external funding for the effort. In other words, neither partner of a team is likely to resort to the program opportunistically for supplementary funding, without serious intent to seek outside sponsorship, if it involves the allocation of existing resources. On the APL side, such matching resources can be IR&D or Bid & Proposal funding, release time supporting an existing or sought-for joint appointment, or graduate fellowship or APL program support of a graduate student or postdoctoral fellow. On the WSE side, matching resources can consist of dedicated faculty time and allocated grant support for equipment, graduate students, or postdoctoral fellows.

Support for the program comes in two forms: proposal awards and proof-of-concept awards. In the former case, collaborating teams with a well-developed idea and an identified potential sponsor can apply for funding to

write a detailed proposal to the funding agency. In the latter case, the teams typically have a less well-developed idea (but should still have identified potential sponsors rather specifically); they can apply for funding (for up to 2 years) to perform critical experiments to bolster the case for external funding. Here, however, the emphasis is again on using the Partnership Program funds only to establish the merit of the concept in such a way as to increase the probability of external funding—not to carry out an entire program of research.

CONCLUSION

The WSE/APL Partnership Program has been established with the goal of increasing collaboration between the two divisions. Under the Program, resources are being made available to generate external funding to support new WSE/APL joint activities. To facilitate interactions, an increase in the number of joint appointments between APL and WSE has been effected, with the expectation of a concomitant increase in WSE students working on APL projects and receiving thesis guidance from APL staff. The program is expected to evolve as necessary over time to accomplish its goal.

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REFERENCES AND NOTES

[1]A perhaps hyperbolic characterization of this independence in the post-9/11 environment was provided by NYU President John Sexton, who noted in a 7 December 2001 address to the American Academy of Arts & Sciences (along with Columbia University President Lee C. Bollinger) that "we have encouraged, nurtured, even indulged the notion of the faculty member as an independent contractor, a person who does what he or she wants, when he or she wants, with little formal obligation." (See http://www.amacad.org/news/presidents.aspx.)

[2]The stresses placed on academic freedom by the current implementation of federal security laws and regulations are typified by the white paper entitled "The Impact of Restricting Information Access on Science and Technology" by Alice P. Gast of MIT (available at http://www.aau.edu/research/Gast.pdf). These constraints have prompted a number of universities to refuse federal funding rather than submit to a prior review of results that might lead the government to minimize financial support. Hopkins recently adopted a policy on classified research that forbids such activity on the academic campus and eliminates any such activities from the domain of discourse in deciding tenure and academic promotion or in determining eligibility for a degree.

THE AUTHORS

John C. Sommerer has been APL's Director of Science and Technology since 1 October 2005, its Chief Technology Officer since October 2001, and Chair of the APL Science and Technology Council since April 2000. Prior to his most recent assignment, Dr. Sommerer was Director of the Milton S. Eisenhower Research and Technology Development Center for 9 years. He is an internationally recognized expert in nonlinear dynamics and was named Maryland's Distinguished Young Scientist in 1994 for his experimental and theoretical contributions to that field. Dr. Sommerer has B.S. (summa cum laude) and M.S. (with honors) degrees in systems science and mathematics from Washington University in St. Louis, an M.S. (with honors) in applied physics from The Johns Hopkins University, and a Ph.D. in physics from the University of Maryland. Starting at APL in 1978, Dr. Sommerer worked in the Fleet Systems and Submarine Technology departments, where he contributed to the solution of image processing, search and screening, optimization, stochastic analysis, optics, and threat assessment problems. He currently also serves as Vice Chair of the U.S. Naval Research Advisory Committee, the senior scientific advisory body to the Secretary of the Navy, the Chief of Naval Operations, the Commandant of the Marine Corps, and the Chief of Naval Research. **Marc D. Donohue** has been the Associate Dean for Research at the Whiting School of Engineering since 1999, a professor of chemical and biomolecular engineering since 1987, and a member of the Hopkins faculty since 1979. Dr. Donohue's research interests include the equilibrium properties of mixtures, the kinetics of phase transitions, self-assembly, supercritical extraction, the behavior of polymers dissolved in solvents and gases dissolved in polymers, and the statistical thermodynamics of complex molecules. He was named Maryland's Outstanding Chemist in 1999, recognized for Outstanding Professional Achievement by the National Society of Professional Engineers in 1995, and received a Dow Outstanding Young Faculty Award in 1985. Professor Donohue has a B.S. (with great distinction) in chemical engineering from Clarkson College of Technology (where he also taught from 1977 to 1979) and a Ph.D. in chemical engineering from the University of California, Berkeley. For further information on the program discussed in this article, contact Dr. Sommerer. His e-mail address is john.sommerer@jhuapl.edu.

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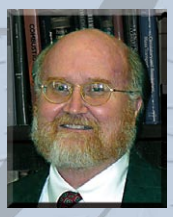

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