

Report from the Review Committee for the Department of Atmospheric Sciences

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Committee charge. The review committee was formed on 17 February 2010 and charged with assessing the quality of the Department of Atmospheric Sciences and its degree programs, and providing the faculty with constructive suggestions for strengthening those programs.

Committee operations. The review committee read the previous Atmospheric Sciences 10-year review (from 1999) and the most recent self-study submitted in September 2010. In October and early November, 2010, Profs. Riley and Bradshaw met with self-selected faculty from the Department to get a more comprehensive sense of the major issues to be discussed during the site visit.

The external reviewers, Profs. Liou and North, arrived in Seattle on 14 November 2010, and met that evening with the internal reviewers to discuss strategy for the review. The entire review committee then met on 15-16 November with faculty, staff, graduate students, and undergraduate students in the Department. At the end of the second day of the site visit the committee summarized its preliminary findings in a meeting with Dean Lisa Graumlich (College of the Environment), and in a subsequent meeting with the Dean, Atmospheric Sciences Chair Dale Durran, Associate Vice Provost and Associate Dean for Academic Affairs and Planning (Graduate School) James Antony, Associate Dean for Undergraduate Academic Affairs John Sahr, and Senior Academic Program Specialist (Graduate School) Augustine McCaffery.

Structure of the review report. The review committee is very concerned that cumulative cuts in the state-supported budget, resulting in chronic understaffing and decay of essential infrastructure, have put the Department at imminent risk of decline from its long-held position as one of very best Atmospheric Sciences departments in the world.

Based on the rankings of the two external reviewers and of the recent NRC ranking report, the Department of Atmospheric Sciences at the University of Washington is currently ranked among the top three in the nation. It is clear that this department has been and continues to be one of the top-ranked departments at the University of Washington, with its many distinguished faculty and the tradition of producing numerous outstanding graduates who go on to work at various universities and research institutions. However, the department is now at a crossroads due to extraordinary budget cuts, limitations in its growth potential, and the real possibility of losing prominent junior

faculty, the latter which has never before occurred in the history of the department. The review committee submits this report in consideration of the preceding issues, and with full realization that the visionary leaders at the University of Washington must be concerned with the gravity of the erosion of a top-ranked department on campus.

Accordingly, the main body of our report focuses on identifying the most urgent needs of the Department and making recommendations for meeting these needs. In Appendices A and B we review the status of the Department's excellent graduate and undergraduate programs, and make minor recommendations for their improvement.

The role of Atmospheric Sciences in the College of the Environment. The Department of Atmospheric Sciences was the first academic unit to recognize the tremendous opportunities resulting from joining the new College of the Environment. Atmospheric Sciences is central to the College's mission of discovery. Atmospheric Sciences has an inherently global perspective, studies time horizons from deep in the past to well into the future, and has a tradition of collaborative, interdisciplinary research – a perfect fit in the College. Over the past several decades prominent Atmospheric Sciences faculty have founded, nurtured, and led key interdisciplinary environmental programs, including the Joint Institute for the Study of Atmosphere and Ocean, the Earth Initiative, the Program on the Environment, and the Program on Climate Change. The success of the College of the Environment depends upon the continued research strength, vision, and faculty leadership from Atmospheric Sciences.

Departmental quality. By any metric the Department of Atmospheric Sciences is among the top three such departments in the U.S., and many (perhaps most) atmospheric scientists regard UW's Department as the very best in the country (or the world) over the past several decades.

Department faculty are represented by Fellows elected to the major scientific societies – the National Academy of Sciences (2), American Academy of Arts and Sciences (2), American Association for the Advancement of Science (3), American Geophysical Union (3), and American Meteorological Society (9).

Many of the faculty have received prestigious awards for their scientific accomplishments – the AMS's Meisinger and Rossby Awards (Houze, Wallace, Wood), the AMS's Stommel Award (Rhines), and the AGU's Macelwane and Revelle Medals (Wallace).

Junior faculty have distinguished themselves as recipients of NSF CAREER awards (Frierson, Jaeglé, Thornton) and the Royal Meteorological Society's L.F. Richardson award (Wood).

As expected from such an elite group of faculty, their publication record and extramural funding history are outstanding.

In addition to scientific excellence, the hallmark of this faculty is collegiality. Every junior faculty member expressed unbridled enthusiasm about the Department to the review committee. Several described their current positions as “dream jobs,” remarking favorably on the consistently high level of support, guidance, and collaboration offered by senior faculty. The Department has a truly phenomenal, decades-long record of faculty recruiting at the Assistant Professor level. The careers of these new Assistant Professors have been carefully nurtured, leading to extraordinary productivity and loyalty as faculty are promoted through the ranks, eventually taking on key leadership roles in their fields nationally and internationally.

The Department is able not only to recognize talented applicants for open faculty positions, but to identify those applicants who appreciate and contribute to the collegial culture. This strategy has maintained necessary strength in the core of the discipline, although it might be worthwhile to consider hiring in other areas of the atmospheric sciences such as the general area of regional-scale climate and climate change.

The Department is also noteworthy for its eagerness to hire in emerging areas of atmospheric sciences, especially those with a strong interdisciplinary flavor. Recent hires in atmospheric chemistry, and an ongoing search in atmosphere-terrestrial-biosphere interactions, are good examples of the Department’s leadership in expanding the scope of atmospheric sciences.

The Department has made great strides in recruiting female faculty, and by all accounts has done a superb job of mentoring them.

Imminent threats to Departmental excellence and stability. It will come as no surprise that a faculty of such uniformly high quality is the continual target of recruiting by other universities. Every faculty member queried by the review committee had received overtures from other institutions (*e.g.*, Harvard, Caltech, Princeton, UCLA) offering much higher salaries and vastly superior research support and infrastructure. So far, these overtures have been rejected – the universal reasons given for staying at UW are the scientific quality of the members of the Department of Atmospheric Sciences, but especially the uniquely collegial, collaborative environment within the Department.

But the Department’s essentially unblemished record of faculty retention is, we fear, in grave jeopardy. Further, the first retention failure has the potential to snowball, and could lead within a very short time to the irreversible erosion of a Department that has been at the top of its field for many decades. A great department and a great university are built by great faculty who, in turn, attract other great faculty, outstanding graduate students and postdocs, research funding, etc. This positive feedback loop is powerful but fragile. A reputation for excellence takes decades of hard work to build, but only a short period of neglect (even benign neglect) to dismantle.

The sources of faculty dissatisfaction are, we believe, few in number and (for the most part) readily addressed. But there is no time to waste in implementing solutions to the problems confronting the Department.

The major issues requiring immediate attention are:

1. *Staff and TA support for the Department's missions.* There are only 2.5 FTE state-funded staff lines in the Department, completely inadequate to support the research and teaching missions of a department of this size and level of research activity. Several essential staff lines, such as the student services coordinator, have been transferred to the research cost recovery (RCR) budget, despite having only a tenuous connection to the research function. (Other staff lines, such as the grant/contract coordinator, are appropriately assigned to the RCR budget.)

Because of unreasonably low staffing, faculty spend an inordinate amount of time dealing with minor administrative tasks which should be assigned to staff. Perversely, this lack of support has inhibited some faculty from pursuing all available research funding, thereby constraining research productivity, limiting graduate student training opportunities, and putting even more pressure on existing RCR funding.

The Department receives an impressive \$460K/yr in RCR, but \$385K of this is diverted to fund staff positions, leaving far too little flexibility in the Department's budget. Critical Departmental needs based on RCR cannot now be met. For example, there is virtually no seed funding for new research initiatives, no bridging funding for faculty between grants, no recruiting funds for graduate students, no emergency funds for equipment repair, and no source of startup funds for newly hired faculty. The Department is able to support just one outside seminar speaker per *quarter*, seriously impeding junior faculty and graduate students from establishing professional networks crucial to their future.

In response to suggestions in the last 10-year review (1999), the Department now offers several large undergraduate non-majors service courses (*i.e.*, ATM S 101, 111, 211, 212), enrolling up to 240 students in each course. Counter-intuitively, this responsiveness by the Department has led not to an increase in TA support, but a decrease. Each TA is now responsible for 120 undergraduate students, an unacceptably high ratio that has produced noticeable decline in the quality of instruction. For example, most of these service courses have been forced to move to multiple-choice exams, making it possible to grade the exams without exceeding union work rules, but denying undergrads the opportunity to develop much-needed writing and analytical skills in the sciences. TA service has now become a chore for graduate students, rather than a valuable teaching experience.

2. *Research infrastructure.* The Department has been in the same building (ATG) for more than 40 years without a major renovation. The facilities are inadequate, and, in some cases, unsafe.

Many faculty in the Department require significant computing power to carry out modeling and simulations. Harry Edmon, Director of IT for the College, is also

the Department staff person responsible for computing facilities. He has worked diligently to reduce power demand by the Departmental servers and clusters by upgrading to newer hardware, but the electrical power and HVAC demands of the Department's computing far exceed the capabilities of the building. This is a severe hindrance to research. The Department has explored the possibility of using the UW's Hyak cluster (in the UW Tower), but this is not (yet) an ideal solution. Department faculty, students, and staff need hands-on access to hardware for some specialized applications, and Hyak administration is not (yet) as interactive as is required for those researchers developing and testing complex numerical models.

As the Department has expanded into atmospheric chemistry, the shortcomings of the ATG building have become even more apparent. Laboratory facilities for experimentalists are insufficient or unavailable. Wet labs have water-permeable plain wooden benches. There is no central distilled/deionized water or vacuum system – the Department has cobbled together water stills and vacuum pumps in an attempt to meet research needs. Cold rooms to simulate conditions in the upper atmosphere do not exist. At least one chemistry lab lacks a safety shower and eyewash station. There is no safe storage for hazardous chemicals used for experiments and instrument calibration. This is unacceptable. The infrastructure problems will become even more acute as faculty are hired in areas where experimentalists are common (*e.g.*, the new atmosphere-biosphere position).

Overall, both lab and office space are somewhat cramped.

3. *Faculty salaries.* Typical of the UW, faculty salaries are considerably lower than those at peer institutions.

Potential solutions. Dean Lisa Graumlich is in the best position to develop and implement a detailed strategy to address the Department's immediate needs. We will offer some general advice.

The Department of Atmospheric Sciences came to the College of the Environment from the College of Arts & Sciences. Nearly all of the budget cuts that decimated the Department's staff and TA positions were made while the Department was in Arts & Sciences. Other units within the new College of the Environment came in not as underfunded departments, but as whole schools or colleges with adequate administrative and instructional staffing. It seems likely that a review of the distribution of state funding across departments/schools within the College, combined with efficiencies of scale (*e.g.*, centralization of some services at the College level), could produce an obvious means of restoring staff and TA to an appropriate level within the Department (and across other units within the College). Such a "re-balancing" across the College would go very far towards convincing the Atmospheric Sciences faculty that their pressing staffing/TA concerns have been taken seriously.

The infrastructure issue is more challenging. Most Department faculty expressed a desire for a new building. Moving the construction of a new building to the top of the UW capital projects list in the near future would likely require a major donor. We urge the Department to partner with the Dean in her development efforts.

As an alternative to construction (and financing) of a new building, the Department and the College should explore a plan for renovation of the ATG building. Initial planning will probably require internal (College, Provost) resources. There may well be a role for development in the renovation itself.

The statewide salary freeze precludes any increases in faculty compensation except for promotion and retention cases. It is inevitable that faculty will continue to receive outside offers from other institutions and, until the salary freeze is lifted, it is vital that faculty notify the Department Chair immediately of any overtures from other institutions, and that the Department Chair and Dean work together to take vigorous action on retention cases.

Final Recommendation

Based upon its thorough review, the Review Committee enthusiastically recommends the continuance of both the undergraduate and graduate degree programs in the Department of Atmospheric Sciences, with a subsequent review in 10 years.

Appendix A

Graduate program. Every indicator suggests that the Department's graduate program is excellent. The applicants are recruited from top undergraduate institutions, the program is competitive with the other high-profile graduate programs across the country, finishing students take positions in universities, agencies (*e.g.*, the National Weather Service), and research centers (*e.g.*, the National Center for Atmospheric Research).

Faculty are happy with the quality of their graduate students, and graduate students are (in general) happy with the faculty, staff, and the graduate program as a whole.

The gender balance and diversity of the graduate program reflect the Department's laudable commitment to "filling the pipeline" in the physical sciences.

Total number of graduate students: 69

Women: 31 (45%)

International: 17 (25%)

Underrepresented minorities: 5 (7%)

Some relatively minor issues were raised in discussions with the faculty and graduate students. These are summarized as bullet points below, and should be considered by the faculty, Dean, and Graduate School.

- Faculty and students would like to have the option of Department-sponsored student support for the first 1-2 years, to allow incoming students to complete their core course requirements and rotate through the labs of potential advisors. Recruiting international students would be more effective if travel funds for interviews were available. (Many departments are using group Skype instead of face-to-face interviews.)
- While students appreciate the reputation that UW Atmospheric Sciences has for producing PhDs with a broad academic background in the field, there is a strong sentiment among many faculty and students that the core curriculum is too long, too heavily weighted towards atmospheric dynamics, insufficiently rigorous in atmospheric chemistry, and not nearly flexible enough to accommodate the increasing scope of the field. With two full years of required courses, students (especially experimentalists) get into their research too late, and faculty grants are supporting students who are taking classes instead of doing research.
- A significant proportion of students are frustrated with the opacity and late timing (third year) of the "COGS process" to determine candidacy for the PhD. We recommend that the Department form a committee composed of faculty, graduate students, and the Director of Student Services to address this issue. The committee should become familiar with the departmental graduate student handbook, and follow (or amend) the processes therein to reflect the current will of the faculty. Established program requirements and milestones should be

followed by all department members, and made available on the departmental website. An explicit appeals process should be put in place.

- The COGS process should be streamlined for students entering with a Master's degree.
- An annual meeting of the student's supervisory committee should be mandatory. Annual review of graduate student progress is required by the Graduate School.

Appendix B

Undergraduate program. The Department's undergraduate program is excellent. Undergraduate majors ($N \sim 70$) with whom we met are pleased with their classroom experiences and quality of training. There was unanimous praise for the advising provided by Samantha Scherer and Cliff Mass. The Department does a remarkable job in finding meaningful internships appropriate to student career plans (*e.g.*, broadcast meteorology, National Weather Service). Overall, roughly a quarter of all majors go on to graduate school, and about a third are involved in undergraduate research.

Some relatively minor issues are bulleted below, for consideration by the faculty and the Dean.

- While about one-third of undergraduates participate in research, this proportion should be larger. Increased advertising to promote student awareness of such opportunities is perhaps the simplest way to increase participation.
- Since Atmospheric Sciences is (and probably always will be) a low-enrollment major, it would be desirable to be able offer scholarships to top undergrad applicants, particularly from outside Washington. Some creative thinking and fundraising in this area could be very productive in the long run.
- Those majors who declare early would appreciate one or more “big picture” courses before immersing themselves in their upper-division coursework. Several suggested that a majors-only section of some of the service courses (*e.g.*, ATM S 101) would be welcome.
- Students complained that some required OCEAN courses (especially OCEAN 200) are pitched at too low a level for climate track ATM S students.
- Students would like a study abroad option.