


Robert C. Webb, PhD  
Interim Dean

April 7, 2009

**MEMORANDUM**

**TO:** Kenneth P. Bowman, Department Head of Atmospheric Sciences  
**FROM:** Robert C. Webb   
**SUBJECT:** Department of Atmospheric Sciences Program Review Final Report

Enclosed is the Atmospheric Sciences Academic Program Review final report, received April 7, 2009. As outlined in the *Academic Program Review Guidelines*, please forward your written response to these findings back to me at the Office of Graduate Studies within 30 days of receipt of this memo, or no later than Monday, May 11, 2009.

The Office of Graduate Studies will work with your department to schedule a meeting with you, the Executive Vice President for Academics & Provost, the Vice Provost, the Executive Associate Vice President for Research, the Dean of Graduate Studies, the Dean of Undergraduate Programs, and the Dean of your college within two weeks following receipt of your response to discuss follow-up issues and action items. Feel free to invite other individuals from your department who are integral in this process. I will "host" this post-review meeting, but you, with input from your Dean(s) and any guests you invite, will lead the bulk of the discussion. The discussion should heavily focus on what the department plans to do moving forward. The *Guidelines* on our website at <http://ogs.tamu.edu/faculty/program-review-self-study/APRGdlns-Oct08WEBVersion.pdf> contain a sample post review meeting agenda for your convenience. Please take time to review the sample agenda, and call me so we may discuss how you would like to present your thoughts at this meeting.

Enclosures

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**Review Report of the Department of Atmospheric Sciences  
Texas A&M University  
April 2009**

**Panel Members**

William Brune (Chair)  
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Pennsylvania State University

Dennis L. Hartmann  
Professor, Department of Atmospheric Sciences  
Interim Dean, College of the Environment  
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Kuo-Nan Liou  
Distinguished Professor, Department of Atmospheric and Oceanic Sciences  
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William Randel  
Director, Atmospheric Chemistry Division  
National Center for Atmospheric Research

Date of site visit: 29 March – 1 April 2009

Date of Report: 7 April 2009

## **Executive Summary**

- The Department of Atmospheric Sciences has used the Faculty Reinvestment Funds wisely in hiring excellent new faculty members. The addition of the new faculty members has created a broader atmospheric sciences program, which the Panel feels is now competitive with top-tier atmospheric science and meteorology programs in the United States.
- The department has adequate space and has invested in adequate facilities to accommodate productive research and effective teaching by the faculty. However, the administrative and IT staffs have not grown despite the increased needs of the faculty, their research requirements and their students.
- The collegiality among the faculty, staff, graduate students, and undergraduate students appears to be strong and permeates the whole program. The faculty are well organized and working together. The Panel views this environment as being fertile ground for the future growth of the program and will enhance its attractiveness to future faculty, staff, and students.
- Issues and problems with the academic programs are similar to those of other departments with successful undergraduate and graduate programs. They appear to be working to resolve these issues in an effective manner.
- The department has the faculty, facilities, organization, collective vision, and will to continue to grow into a top-tier department. Despite the low cost of living in College Station, Texas, competitive salaries are needed to attract and retain a world-class faculty.
- Continued improvement in academic excellence also requires an increase in the quality of graduate students. The panel believes that the existing faculty strength and the developing careers of excellent new faculty members will build the department's reputation, which will in turn continue to raise the quality of the graduate students. The continued increase in graduate student quality will in turn help the recruiting of future excellent faculty. But this process takes time.
- The department has made the necessary first steps toward developing assessment plans for its academic programs. The faculty recognizes that time will be diverted from other activities in order to develop and implement these assessment plans, but the faculty is committed to the process because it also understands that the information coming from the assessment will help the academic programs improve.
- The Panel agrees with the Department Head's intention to develop a strategic plan this year. Developing a strategic vision will enable the department to present a compelling case to the new Dean for its program objectives and for the need to replace retiring faculty members with new faculty members who have the expertise that the faculty has identified as critical for the department's continued ascent.

## **Key Findings and Recommendations**

Our key findings and recommendations are based on the 2009 Academic Program Report provided by Department Head Kenneth Bowman and the faculty and staff of the Department of Atmospheric Sciences and on the discussions and interviews with administrators, faculty, staff, and students during our visit to Texas A&M in College Station, Texas on 29 March through 1 April 2009. We thank Professor Bowman and his colleagues for preparing such a thorough report, which gave us a good grasp of the program and its current situation and enabled us to have a more in-depth review during our time on campus. We also thank them for being so generous, open, and accommodating during our visit.

When we considered the current status of the Department of Atmospheric Sciences in the context of the last two decades, we were struck by the dramatic turn-around since the mid-80's, when the program was clearly heading toward extinction, and the last review in 2001, after the department had built a solid foundation on which to grow. It would not have been possible for the Department of Atmospheric Sciences to develop into a comprehensive program – both in terms of research areas and in terms of strong undergraduate and graduate academic programs - without the increased support and faculty positions that came from the College and University, including the Faculty Reinvestment Fund.

At the same time, it is clear to the Panel that the Department has taken full advantage of the opportunities that the increased support and faculty positions offers and has become competitive with the top-tier meteorology and atmospheric science departments in the United States. As with all academic programs, the Department of Atmospheric Sciences can still improve, but the improvements in just the last eight years have been remarkable.

The findings listed in the Executive Summary was presented first to the Provost, the Associate Provost, the Dean of Graduate Studies, the Dean of Undergraduate Studies, and the Dean of Geosciences at a breakfast meeting, then to the Head of the Department of Atmospheric Sciences, Kenneth Bowman, and finally to the assembled faculty, staff, and students of the Department. In this report, the Panel has grouped its more detailed comments and recommendations into four categories: The Faculty; Staffing and Management; Undergraduate and Graduate Academic Programs; and Relationships with Other Programs.

### **The Faculty**

The size of the Department's tenure track faculty increased from 9.5 to 21.5 from 2001 to 2009, with several of these new hires occurring in the last 4-5 years. The Department appears to have successfully accommodated this rapid increase by using its funds to convert existing space into laboratories and offices and to upgrade the facilities that

support research and teaching. The Panel feels that additional space and facilities do not appear to be needed at this time.

The rising reputations of faculty members will attract the attention of other atmospheric science and meteorology programs, creating potential retention issues. Faculty salaries are substantially below average for comparable atmospheric science departments. The low housing costs in College Station partially compensate for this discrepancy, but administrators for the Department, College, and University should carefully weigh the incremental costs of raising salaries of productive faculty members against the costs of counteroffers or the potential loss of the investment in faculty if those faculty members leave.

Mentoring is an important factor in developing productive faculty members, and is generally perceived as positive by the untenured faculty members. Faculty mentors are assigned to untenured faculty members, sometimes at the request of the untenured faculty member, and in most cases, these assignments appear to the Panel to be successful. The Department's collegial atmosphere contributes to this mentoring and the untenured faculty members feel that they are fully integrated into the faculty. However, some untenured faculty feel that it would be helpful if the guidance given in the annual reviews was better connected to the 3<sup>rd</sup>-year review and Tenure and Promotion (T&P) process, which is a concern that the Panel feels the Head and tenured faculty should consider.

The department has decided to be a broad atmospheric program and has hired new faculty members accordingly. Several research areas have benefited from this hiring, particularly atmospheric chemistry. Three recently hired faculty members are making highly visible laboratory measurements and are developing and deploying state-of-the-art instruments in observational field studies. Other research areas, such as remote sensing, radiative transfer, climate dynamics, synoptic and tropical meteorology, data assimilation and planetary atmospheres, have also benefited. The Panel endorses the Department's objective of being a broad department and agrees with the steps that it has taken.

Maintaining and growing a broad program requires careful consideration of the directions of future faculty hires. The faculty asserts, and the Panel concurs, that the department's faculty is now at an appropriate size for its mission. Thus, the upward evolution of the faculty will require judicious replacement hiring for retiring faculty members. Faculty members mentioned hiring in a few research areas that would augment the gains in program breath - a chemical transport modeler or a planetary boundary layer specialist - but the faculty under the leadership of the Head should consider and develop a strategic plan that puts potential future replacement hires into the context of the department's overall goals. Thus, the Panel suggests that the Department begin a strategic planning process immediately, including preparation of vision and mission statements, so that it will have a compelling case for the next Dean when it wants to make replacement hires. The hiring strategy will need to strike a balance between providing faculty to support the meteorology program while developing

new areas of expertise that will create opportunities for the department and keep it at the forefront in research.

### **Staffing and Management**

The Panel's interviews with the faculty, staff, graduate students, and undergraduates made it abundantly clear that the Department was generally a supportive environment for research and learning productivity. However, an almost universal exception to this feeling was the level of support that was available from the administrative and IT staffs.

The faculty count, the number of grants submitted, and the research funding received have all greatly increased, and yet the central office administrative staffing has remained constant. The workload for department office financial staff is perceived to be unreasonable by both staff and faculty, and it appears that the growing workload requires additional staff. In addition, the grade levels of administrative staff positions seem to be set by history, rather than by a careful consideration of job function, experience and the needs of the department. Staffing decisions appear to be made without regard to the actual needs or effectiveness of the units, but rather upon past practices.

The IT staffing has remained constant while the department has grown. The IT staff assigned to the Department of Atmospheric Sciences also appears to be overloaded and response to requests is very slow, more than six months in several cases. While the faculty, staff, and students appear to be productive, this overload situation for the administrative and IT staff is detrimental to the sustained productivity of the department.

The Panel recommends the following actions. First, financial staff positions need to be upgraded so that competent staff can be retained longer, and an additional staff position seems warranted by the workload. Second, centralization of IT staffing in the College does not appear to be working as currently configured. The ticketing system is not being used to balance the load across all IT staff in the College. IT staff continue to work in the units where they always have because they are familiar with the people and equipment there. Third, the department should have more authority to increase staffing levels to best meet the needs of the department, particularly if they choose to do so with returned indirect cost. The Dean must manage the overall funding levels given to units based on their needs and productivity, but should allow the leaders of those units to determine the best use of those funds to advance the efficient functioning of the department to achieve its teaching and research mission.

### **Undergraduate and Graduate Academic Programs**

The issues, deliberations, and decisions that the Department has made and are now making concerning its undergraduate and graduate academic programs are the same as those being made at other atmospheric science and meteorology programs. The

ongoing discussions regarding the balance of service, undergraduate and graduate courses, especially electives, are the same as at comparable programs, but the discussions and decisions of the Department's faculty must, of course, be put into the context of the strategic plan of its university, the Texas A&M University. None-the-less, the Panel has considered some specific issues of both the Department's graduate academic program and undergraduate academic program.

### ***Graduate program***

The Panel concurs with the faculty's opinion that the continued improvement in academic excellence requires increasing the quality of graduate students. The Panel agrees with the faculty and the Department Head that the quality of the graduate students that the Department attracts is increasing but that it needs to increase further for the program to achieve its goals. The Panel believes that the recent hiring of excellent new faculty members will build the department's reputation, which will raise the quality of the graduate students, but that this process will take some time. The Panel feels that increasing the stipends may have some effect if all else is equal, but that the graduate student applicant pool and incoming students will improve mostly as a response to the rising reputation of the Department. Current efforts to increase applicant quality include sponsoring visits for promising students and having faculty visit local schools.

The graduate students raised some specific issues that the Panel feels the Department Head and faculty should consider. First, the graduate students were not fully aware of the substantial fees that they would have to pay when they considered their offers from the Department. The Panel recommends that the fees be fully disclosed in the offer letters.

Second, the number of graduate elective courses offered is low – roughly one per semester – and should be increased to meet the needs of the graduate students. The Panel recognizes that increasing the number of elective courses means meeting the university policy on a minimum of five enrolled students and balancing classes taught in the graduate and undergraduate curriculum. However, it recommends that the Department find ways to offer at least three electives a year that have a broad enough interest to attract the requisite number of enrolled graduate students.

Third, there appears to be a lack of consistent emphasis of subjects in the core courses that then shows up on the qualifying exam. Thus, the qualifying exam's content is considered somewhat arbitrary by the graduate students. Anecdotal evidence suggests that some students stop with an M.S. degree solely to avoid taking the qualifying exam. The Panel recommends that the faculty develop standard material in the core classes that all instructors must teach with the same level of detail and that the exams be based only on this material. Correcting these issues will alleviate some of the major concerns of the otherwise contented graduate student population.

### ***Undergraduate program***

The Panel agrees with the faculty that the size of the undergraduate program is about right. Any increase in the program will likely necessitate multiple sections for the required courses, significantly increasing the undergraduate teaching obligations of the faculty at the expense of the graduate courses and service courses. This department has one of the largest undergraduate programs in meteorology and atmospheric science, due largely to its reputation for weather and forecasting.

Overall, the undergraduates perceive themselves as an important part of the Department, with strong interactions with the graduate students and faculty. Several of the undergraduates are involved as laboratory research assistants. The undergraduates have access to attentive counseling advice from the Departmental academic counselor. Each undergraduate is also assigned a faculty advisor, although the success of this seems to be hit-or-miss, depending on the specific faculty member.

Some undergraduates feel that the number, sequencing, and depth of the practical synoptic meteorology and forecasting curriculum did not prepare them sufficiently for careers in meteorology. Hiring an instructor was a good idea for forecasting, since only rarely can tenure-track faculty members, especially those who are un-tenured, successfully be practicing forecasters and active researchers at the forefront of the atmospheric sciences at the same time. However, the Panel notes that some students in air quality feel that two atmospheric chemistry and air quality courses are insufficient. The faculty has also wrestled with requiring all undergraduates to take a senior level synoptic meteorology/forecasting course. Some Panel members are very familiar with these conundrums; the entire Panel urges the faculty and Head to think carefully about their undergraduate curriculum as part of their strategic planning process. The Panel also suggests that the Department gather information from their B.S. graduates to find out if the curriculum is preparing their students for this variety of careers.

Increasing student credit hours (SCH) is commonly used as a metric for allocation of resources among departments, even if the exact criteria being used are a mystery to faculty members themselves. The Panel suggests that the Dean make it clear how important it is for the College's departments to increase their own SCHs, potentially at the expense of its other departments, and how much is really a collaborative effort among departments. The Panel is encouraged that the College administration is supportive of the Department's present distribution of teaching effort.

That being said, the Panel supports the creation of a Tier 2 service course on Climate Change, which could and possibly should be elevated to Tier 1 for the good of Texas and the rest of the United States. This course on a hot topic, taught by a dynamic instructor, will likely attract hundreds of students and will educate a population of Americans who desperately need to be educated on climate change. This type of course has the potential to greatly increase the Department's number of SCHs, probably without seriously impacting the curriculum for undergraduate majors and graduate students.



## **Assessment**

The department has made the necessary first steps toward developing a learning objectives and assessment plan. The faculty acknowledges that a University mandated assessment plan will be required in the future and will take valuable time to define, implement, and execute. It involves defining learning outcomes, gathering data to see if objectives are met, and then taking corrective actions to improve the academic programs. Components include developing exit surveys for graduating students and building a database of graduate's satisfaction and opinions on their preparation for their careers. The faculty has prepared a draft of a questionnaire and will start administering it soon. The faculty and Head recognize that all of this effort will result in information that can be used to improve the programs. The Panel applauds the faculty's cooperative attitude and agrees that the ultimate result will be information that can be used to improve the Department's academic programs.

## **Relationships with other programs**

The department has good working relationships with other departments in the College, with the strongest being with the Department of Oceanography. The connections – teaching courses useful to both programs, serving on each other's Ph.D. committees, holding joint appointments, and some joint research programs – are solid. There are similar connections between Atmospheric Science and Geography and somewhat weaker connections with the Departments of Chemistry, Mathematics, Physics, and Statistics. The department also provides teaching for courses important for the Environmental Programs in Geosciences. The Panel feels that these collaborative efforts are consistent with the department's mission and are comparable to the collaborative activities that are occurring at peer atmospheric science and meteorology programs.

A new center, the Center for Atmospheric Chemistry and the Environment, was established in 2003 and extends across the Colleges of Engineering, Science, and Geosciences, and the Institute of Science, Technology, and Public Policy. This Center, which is comparable to environmental chemistry centers at other universities, takes advantage of the excellent faculty that the Department of Atmospheric Science has built, particularly in the area of atmospheric chemistry and air quality. It has received reasonable initiation funding from the University and the Colleges of Science, Geosciences, and Engineering and is beginning to attract external funding. However, for the Center to grow, the University and three Colleges will need to agree on a consistent and incentivizing system for distributing funds from the Indirect Cost Return that results from Center proposals.

Most of the department's peers at other institutions are co-located with large federal laboratories or large federal programs. There is a feeling among the faculty that having

such a large federal program co-located with Texas A&M would be beneficial to the department's reputation, research, faculty, and students, even though they recognize potential drawbacks. The Panel agrees with the faculty's assessment and suggests that the department consider the pros and cons of having a large co-located federal program and explore possible mechanisms for obtaining one in their next strategic planning exercise.

The faculty members of the Department of Atmospheric Sciences appear to be open to developing collaborations with colleagues across the university and throughout the Earth sciences community. The Panel feels that this attitude is the correct one and will lead to more research opportunities and greater recognition for the department's faculty and students.