Report of the CfA Visiting Committee

14 April 2008

Overview

The Visiting Committee (VC) met at the Harvard--Smithsonian Center for Astrophysics (CfA) on Monday through Wednesday, December 3-5, 2007. The participating VC members were Jay Gallagher, Martha Haynes (Chair), Dick McCray, Sean Solomon, David Spergel (Vice Chair), Chuck Steidel, and Alan Title.

While the VC membership is nearly unchanged since its last meeting in June 2004, there have been significant changes at Harvard, at the Smithsonian Institution, and at the CfA. After 21 years in the position, Dr. Irwin Shapiro stepped down as CfA director effective July 1, 2004. Under his directorship, the CfA grew considerably in size and scope. And, most notably, Charles Alcock has now been Director for 3.3 years.

There have been a number of significant improvements in CfA management, including the development of a strategic plan and the establishment of an SAO council. These changes have facilitated communication between the SAO staff and the CfA management and among the CfA staff. Members of the staff report that there are now more open channels of communication. The addition of the Deputy Director (DD) position and, most importantly, the selection of Stephen Murray as DD, have strengthened the CfA management.

We endorse Charles Alcock's recommendation that this is the last meeting of the CfA Visiting Committee. There are significant overlaps between the CfA and the Harvard Visiting Committees. We support the Director's recommendation that a joint committee could best advise the Director, Harvard University, and the Smithsonian Institution.

Risks and Opportunities

The Harvard/Smithsonian Center for Astrophysics is one of the jewels in the U.S. astronomy research and educational system. The institution plays an important role in training students and postdocs and its researchers play a leading role in astronomical research ranging from radio wavelengths to TeV photons.

Under Charles Alcock's leadership, the CfA has developed a strategic plan for its future. This is an important document for the CfA; we comment on a number of the elements of the plan in the subsequent subsections.

The VC was very impressed with the strategic planning process. It was inclusive and has broad buy-in across the institution. Both the Harvard faculty and the Smithsonian staff seemed pleased with the plan and supportive of its vision.

While the strategic plan is important step forward, we feel that the CfA needs to confront the many risks that it faces in the coming decade. The institution is at a time of transition and will need to face a number of challenges in the next few years:

- The Chandra X-ray Observatory (CXO) will eventually stop operating, and there will likely be a gap between CXO and the next generation X-ray telescope. With a significant fraction of the staff working on CXO, the loss of this telescope will place a significant strain on budgets and staffing.
- The Submillimeter Array (SMA), the Smithsonian's major investment in astrophysics, is now operational and producing exciting science. However, once ALMA turns on and becomes fully operational, the SMA's scientific niche is unclear. The CfA lacks a clearly articulated vision for the SMA's future direction.
- The Harvard and Smithsonian faculty and staff have identified the Giant Magellan Telescope as its top priority for the next decade. While the next-generation telescope will enable frontier science, there is significant risk that there will not be funding available to operate and instrument two very large US telescopes.
- There is no strategic hiring plan to replace the aging Harvard and Smithsonian staff.
- There is no strategic plan to utilize the isolated Discovery Park space and to relieve crowding in the Garden Street center.

We make a number of recommendations for confronting these challenges. The VC strongly feels, however, that the CfA needs to develop its own implementation plan that outlines how the CfA can realize the vision of the strategic plan and overcome the challenges listed above. We encourage the CfA leadership to follow a similarly inclusive process.

Staffing

In our 2004 report, the VC noted that *"Renewal of the scientific staff stands as a major issue for the next decade. The VC was concerned that few research scientists have been appointed to federal positions in the last decade. These are the only SAO positions that offer an equivalent to the stability of university tenure and thus should be a basis for competitive offers to outstanding scientists who wish to build long-term careers at the CfA. This situation is exacerbated by the likely loss, through retirement, of many 'Smithsonian faculty' from the Harvard Department of Astronomy."* Over the past 2 1/2 years, there has been little progress on this issue: there have been only 2 new Smithsonian staff hires and *no* progress on hiring faculty to replace the Harvard/Smithsonian joint appointments. Of the 56 federal appointments, only five are female and only three are under 50. The VC concerns about demographics and gender diversity have only deepened.

Unfortunately, progress on addressing staff renewal has been delayed by a number of issues: (1) the unwillingness of Harvard and Smithsonian to put the needed resources into hiring new staff; (2) the bad feelings left behind by the unsuccessful parity plan; and (3) a misguided focus on the joint positions as institutional glue. The VC views the notion that the joint appointments are the "glue" that hold the CfA together as mistaken. We feel that the glue that binds the institution comes from common scientific projects. As we reviewed some of the very exciting work done at the CfA across a wide range of topics in astronomy (e.g., ITAMP, Theory, Extrasolar Planets, work on black hole spin), we saw significant contributions by Smithsonian scientists and by Harvard faculty and graduate students. This common effort is the glue, not the joint positions, which themselves remain a divisive issue for many of the staff. While joint positions may be a good match for particular candidates, we recommend that these joint hires be made on an ad hoc basis rather than as the centerpiece of the hiring plan.

In our 2004 report, the VC recommended the development of *"A long range strategic hiring plan that should be agreed upon by the parent institutions and the CfA. This plan must be consistent with the long range scientific goals of the institution and with the need to improve considerably the gender balance."* Today, the need for the plan is even more urgent than it was then.

The hiring plan should include multiple hires and will require a significant investment by both Harvard and the Smithsonian Institution. Harvard's astronomy program is one of the most distinguished in the country, and its graduate program is one of the largest programs. Yet Harvard supports only 14 FTEs, a smaller number of lines than many of its peer institutions. The Smithsonian Institution staff is extremely distinguished and productive: its ranks include one Nobel Laureate and many members of the National Academy of Sciences. Maintaining this level of excellence will require a significant number of new hires.

X-ray Astronomy

The Center for Astrophysics has a long and distinguished tradition in X-ray astronomy. While the Chandra X-ray satellite continues to produce exciting science results and the Chandra Science Center remains a "jewel" in the CfA crown, the medium-term future (say, beyond 2015) for X-ray astronomy looks bleak. There may be a significant delay in the launch of CON-X. This X-ray "drought" will be harmful to both the X-ray group at the CfA and to the broader X-ray astronomy community.

The VC applauds the decision to build up the CfA X-ray Technology (CXT) center. This investment in new detectors and new materials is important not only to the CfA but to the broader community. This investment not only will likely produce significant new technologies that will enhance the science return from future missions but also maintains a broad base for the technology development that extends beyond the NASA centers and helps to ensure that the CfA will play a major role in such missions. The VC encourages the CfA and NASA to continue to support this activity.

The VC was disappointed to see that solar astronomy did not play a role in the CfA's strategic plan. We feel that high-energy solar astrophysics is an important part of the long-range future.

Giant Magellan Telescope

The strategic plan envisions the Giant Magellan Telescope (GMT) as a central part of the CfA's long-term plan. There is significant support in the CfA optical community for this major investment. The VC endorses the notion that the CfA should be a major contributor to a next-generation optical telescope. There are currently three international collaborations working to put together the resources needed to build these expensive, but scientifically extremely valuable, telescopes. The VC encourages the CfA to be flexible in achieving its goal and, in particular, to continue to seek additional partnerships that will ensure that the next-generation optical telescope(s) will be funded adequately.

The VC recommends that the CfA strengthen its optical/infrared division as part of the effort of investing in the GMT.

Submillimeter Array

The VC is pleased to see that the SMA is producing forefront science results. Until ALMA becomes functional, the SMA offers a unique, high-resolution window into the largely unexplored submillimeter universe, paralleling the development of other new facilities and capabilities in this important wavelength range. As we noted in the previous report, *"the SMA is an ambitions, breakthrough-technology instrument that has cost some $100M and engaged SAO staff for more than a decade. Given this huge investment of time, expertise, and intellectual capital, the VC was somewhat surprised at the (apparent) lack of visibility of the project within the astronomical community at large and even among scientists across the CfA itself.* We still feel the SMA's visibilility is less than we might expect; this may be more a matter of perception than of reality, but the issue should be addressed proactively. It would be useful to compare the scientific productivity of the SMA to other projects of its size.

In our previous report, we recommended that *"the SMA could benefit from the development of a long-range plan that outlines strategy for early science, broad community engagement, and funding and resource needs. This plan should explicitly discuss how the SMA fits into the national and CfA portfolio when ALMA begins operations."* The VC was disappointed that we did not see a more detailed plan for either SMA operations or future directions in the ALMA epoch.

Education Program

The VC was very impressed by the quality of work in the Education program. It not only is producing outstanding astronomical education products but also carries out important research in science education. The VC felt, however, that there is a need to integrate it more deeply into the Smithsonian Institution and to bring its high quality products to DC.

The Smithsonian Institution incorporates a number of facilities with missions in the areas of science education and outreach as well as scientific research. We suggest that further dialogue and exchange between SAO and other SI components could prove of mutual benefit in service to the nation. In particular, the efforts of the Science Education Department (SED) at CfA should be advertised and integrated within the Smithsonian Institution, particularly at its home location in Washington, D.C. Recent constructive discussions are a step in the right direction and should be further encouraged.

One or more of the ideas proposed for integrating CfA and central SI outreach efforts should be pursued on at least an experimental basis. Ideas mentioned for linking CfA's efforts in education and outreach to Smithsonian efforts in Washington include the possibility of a CfA gallery at the National Air and Space Museum or some other permanent space on the Mall, filling resident associate or more senior positions in Washington with CfA staff members appointed as limited-term rotators, and a small CfA office located permanently within SI administrative units in Washington.

Pre-doc/graduate student programs

Since the Harvard visiting committee commented on the graduate program, we did not evaluate the Harvard graduate program, but focused on the Smithsonian pre-doctoral program.

The SAO pre-doc program has tremendous potential to benefit both students and the SAO. The students have the opportunity to work with first-rate scientists, and the program attracts promising students from throughout the world.

The pre-docs seem to be disengaged from SAO and the broader CfA community, however. Many of them interact only with their scientific mentor at SAO. The pre-docs should be better integrated into the graduate student community and need to be mentored as a group by the SAO. The international students seemed to have no source of information about housing, taxes, and integration into the US. An informal website maintained by the students would be very helpful and might avoid some of the legal issues associated with tax advice.

As we noted in our previous report, *"the CfA should encourage more interactions between the CfA pre-docs and the Harvard graduate students. While there is a strong Harvard graduate student community, there does not seem to be a CfA pre-doc*

community." For a number of SAO pre-docs, the VC meeting was their first opportunity to meet their Harvard University peers.

We suggest that a senior SAO staff member be tasked with specific overall responsibility for the pre-doc program, parallel to the Harvard Astronomy Department's Director of Graduate Studies.

Post-doc program

The Center for Astrophysics has a very large postdoctoral community. However, it lacks a well-defined postdoctoral program. The VC recommends that the CfA evaluate the role that it plays in postdoctoral training and develop a program of mentoring its postdocs.

The postdocs could be better integrated into the CfA community. We recommend that the SAO council have a postdoc slot and that representatives from among the postdocs be invited to serve on the TAC and play a role in developing the implementation plan.

We were impressed by the postdoc community's effort to self-organize and pleased to see that the director has been supporting these efforts. We encourage CfA to set up a postdoc mailing list.

While the postdoc community's efforts at self-organization are important, the VC recommends that a member of the Smithsonian staff be given the responsibility for overseeing the postdoc program.

Computing network

Given the central role that computing plays in astrophysics, it is essential that a first-rate research institution have a first-rate computing system. While there is high-level computing available to the theory group, there is a lack of high-level computing across the CfA and a lack of general support. There is no open network, and a number of staff were unhappy about the system.

The VC encourages the CfA to address its computing needs in its implementation plan.

Space

Finally, we turn from outer space to office space. The CfA needs to better utilize space. There is a great deal of high quality space at the Discovery Park site and a pressing shortage of space at 60 Garden Street. We encourage the CfA to move a substantial part of the operations to the Discovery Park. Given the impressive facilities at Discovery Park, we encourage the Director to move the laboratory effort to this site.

Review Process

The VC meeting started with an overview presentation by Charles Alcock, CfA Director; Jim Moran, the chairman of the Harvard Astronomy Department was also present and contributed to an all-around healthy, frank exchange. A valuable dialogue also included Smithsonian and Harvard institutional representatives. The scientific presentations made by staff, postdocs, and doctoral students were all truly excellent, verifying the outstanding quality of the research conducted at the CfA. Overall, the Committee's pre-existing positive impression was entirely reinforced that the CfA is a national scientific treasure. Its unique combination of private and public components give it the capability to carry out projects and research programs that lie beyond the scope of most other astronomical research centers in the United States. The diverse accomplishments of the CfA and its staff were demonstrated to the VC through the range and quality of presentations on science and research facilities. The VC asserts that the preservation of an effective and productive CfA is important to the overall health of U.S. and international astronomy.