

Engineering Research at NRAO

Recommendation of the NRAO's Observatory Technical Council (OTC) to the Director.

2004-05-07

1. Summary

The OTC has considered how to maintain and promote the level of Engineering Research at the NRAO. We do hold a leadership role in many areas of technology that support radio astronomy, and it is desirable not just to maintain, but to enhance that important role. We make several recommendations to that end, in particular the enhanced definition of the existing staff positions of *Research Engineer* and *Senior Research Engineer*.

2. ENGINEERING RESEARCH at NRAO

The OTC is seriously concerned about the diminution of instrumentation research at the NRAO because of the pressures of telescope operations, operating budget shortfalls, and commitments to large projects. In the FY2005-2009 AUI Management and Operation Plan submitted to the NSF there were only 5 receiver development accomplishments listed for the four-year period of 1999-2002 compared to 11 for the four years 1995-1998. Only one signal processing development was listed after 1993. These numbers suffer from the statistical errors of small numbers, but they are consistent with the strong impressions expressed by senior staff associated with instrumentation that cutting-edge R&D does not have sufficient priority at the NRAO.

The problem is not the lack of talent, motivation, or number of staff members who have shown themselves to be fully capable of high quality, self-directed, engineering research. As can be seen in the AUI Management Plan, the staff has suggested a large number of important development projects. Too few of these are currently underway, and too few have much prospect of being started in the near future.

3. Recommendations of the OTC

The OTC recommends that instrumentation research be given the same short and long-term priority status as telescope operations and project engineering deadlines. We believe that this can be accomplished with the following steps:

1. Better define the operational descriptions of the positions of Research Engineer and Senior Research Engineer along the lines of the scientific staff positions. In most cases this will include a similar 25% / 75% or 50% / 50% split between research and project/operations commitments. We recommend that a task group be established to refine the definition of these positions.
2. For those who choose and qualify for the positions of Research Engineer and Senior Research Engineer, clearly budget their time for the research portion, define yearly career goals, and evaluate performance with proper emphasis on productive research.
3. Budget for R & D as an indispensable part of the NRAO's mission.
4. Base the continuance of time for self-directed research on a history of accomplishments and formalize a career path that can lead to tenure, continuing appointment, or other recognized senior status in a manner very analogous to the career possibilities for PhD astronomers and scientists [note: "astronomer" and "scientist" have different definitions under the new scientific staff policy].
5. Encourage collaborations with university colleagues for the vigorous exchange of ideas, for involvement with students, and for greater possibilities of finding sources of research funding.

Clearly, our instrumentation research must support the mission of the NRAO. The same is true of scientific research, and the same level of individual judgment and long term productivity evaluations should apply. Engineering research support must not be required to clear additional hurdles associated with project planning, budgeting, and committee decision-making.

One clear difference between scientific and engineering research is the need for test and prototyping equipment and for technician and machine shop support of engineering projects. To some extent, this need can be mitigated by the use of modern simulation tools, and we recommend that the Observatory include the acquisition and maintenance of appropriate simulation software in future budgets. However, experimental work remains essential in most of our key technical areas. In an environment of very tight budgets this could lead to a stalemate in our efforts to emphasize instrumentation research, but it must not be allowed to do so. To minimize these costs and thus maximize our research potential, we should manage the work by requiring careful definitions of end products of research in the form of proofs-of-concept that are not necessarily tied to telescope-ready hardware. After such cost reduction efforts, it remains critical to provide an adequate level of support in the form of technicians, access to fabrication services (using both internal and external shops), and budgets for procurement of components.

4. Conclusion

The OTC recommends a number of steps to enhance the Engineering Research future at the NRAO, including in particular the redefinition of the existing positions of Research Engineer and Senior Research Engineer.

5. Membership of the OTC

During the generation of this recommendation, the membership of the OTC was:

Barry Clark
Larry D'Addario
Darrel Emerson (chair)
Rick Fisher
Brian Glendenning
Tony Kerr
Peter Napier
John Payne
Dick Sramek
Dick Thompson
John Webber.