Session 5

Global Networks

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GNAT -- A Global Network of Automatic Telescopes

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Abstract

All of us "have-nots" need more telescope time, for ourselves and for our students. There are also many programs where a global linkage is needed to accomplish the objectives. In addition, the world needs more and better science education; astronomy can be a leader if it has adequate facilities to do so. A global network of automatic telescopes can help supply these needs, which are global, spanning all countries. A new non-profit organization (GNAT, Inc.) has been formed to be the catalyst to develop and implement such a concept. We hope that many astronomers and organizations will become "members" of GNAT.

I. Introduction

There is an increasing amount of activity that could be classified as "global networking," including many of the reports at this meeting as well as at some of the earlier meetings devoted to automatic telescopes or photometry. People are already doing it. I won't go into any details here, except about the one I am most involved with, naturally. Let me just mention one or two (discussed in papers at this meeting) as examples: The Whole Earth Telescope program, the French-Morocco connection, the various supernovae search programs, several special variable star consortia (for a one shot deal or for longer activity), and the various APTS programs at Mt. Hopkins, including the link to Mt. Wilson. All of these (as well as just thinking about the issues) show that the topic is of increasing interest and viability. Let me again review the nature of the beast and describe a specific proposal to you (A Global Network of Astronomical Telescopes, GNAT, Inc.). I would like to challenge you to join GNAT.

II. Why a GNAT?

1. Research needs. All of us "have-nots" need more telescope time for our research. Besides the general there are special programs that would benefit greatly by a GNAT:

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long term coverage, monitoring, variable stars with periods near one day, variables needing continuous coverage, etc. There is no way for all the present and future astronomers to have enough observing time unless we find a way to increase significantly the number of telescopes available, and the only way to afford that is to do it with "small" telescopes. Small Science is still frontier science in astronomy.

2. Education needs. The world needs more and better science education, and astronomy can be a leader in helping to provide it, with real data available from and produced with a GNAT. GNAT can also be a source of many other materials, such as tutorials, data bases, and astronomical images.

3. These research and educational needs are global, spanning all countries and all peoples. Anyone, anywhere is a potential user.

4. It can be done at relatively low cost; new generation small telescopes are not astronomically expensive, and they provide a balanced complement to larger telescopes and space facilities. A GNAT can provide such facilities to many at a cost lower than everyone doing it themselves.

II. What and Where?

1. The first essential item is a computer "bulletin board system (BBS)," accessible to all. It will include a list of who is doing what with what, network contacts, many data bases, tutorials, digital images, and other valuable information. Structurally, it will be like many existing BBS's of all kinds, and like many of the resources available through Internet. It can and will be multi-lingual.

2. In addition, GNAT will have a complement of small, automatic telescopes at a number of world-wide sites. Other telescopes can and will be linked to the network, of course. These GNAT telescopes will be truly new-generation instruments, but they will be relatively low cost and will be essentially risk free to obtain and to put into operation. GNAT will not plan in the foreseeable future to offer real-time remote operation, but it will be able to produce high quality data for many people in a cost effective and timely manner.

3. A "Homebase" is required, to coordinate the operation, serve as a location for the BBS system, and as a resource of information to all in the network. There can and will be a number of regional or local nodes as well.

III. Who?

A new tax-exempt non-profit organization has just been incorporated to be the catalyst to develop and implement GNAT. "All of us" who can use and need information and observing time on small but powerful telescopes should be a part of GNAT. GNAT will be a network . We are all "have-nots." GNAT will not be a

dictator, but a catalyst, complementary to all other programs and organizations. We all should become members of GNAT. Think of it as an "electronic scientific institution," with many un-paid, part-time members, world-wide. Currently, membership is free, though donations are most welcome. Just join up.

IV. How?

One needs funding, of course, and a Business Plan and funding proposals are being prepared by GNAT. Any organization or individual interested in supporting cost effective research and/or science education, especially on a global basis, are potential sources of such funding. Funding need not all come from one source or one country, of course. Your input and suggestions are most welcome.

V. When?

As soon as funding is found. There are essentially no problems with obtaining the hardware, software, or personnel necessary to develop and operate GNAT. It is should be truly a no-risk venture. A regular newsletter will begin shortly.

VI. A Few Other Aspects of Note:

1. GNAT should be a great help in insuring homogeneous and accurate data for all. All of us should benefit by uniform standards, systems, hardware, and software. Consider the gain to be made by the mass procurement of quality photometric filters.

2. The "80/20" law. GNAT will not normally be at the cutting edge of hardware or software technology development. It will have as a goal getting 80 percent or more of the performance of the frontier instruments at 20 percent or less of the cost.

3. The "1 +1 > 2" law. By working together, we can achieve much more than we can by doing it all in isolation, including achieving significantly lower over all costs and better quality facilities (such as matched filters and good detectors).

4. Balance: GNAT's small telescopes (quality ones) and facilities can and will complement large telescopes, space astronomy, radio astronomy (in fact, any multi-wavelength efforts), and university research everywhere. It is a viable extension of university research and education, for all.

5. A key item is "Value Per Cost," which should be maximized, in many ways, by a viable and effective GNAT. Astro-economics is an important and interesting subject. GNAT will be a full-time practitioner.

VII. GNAT Structure:

The GNAT Bylaws provide for a active Scientific Advisory Committee (SAC), meeting regularly mostly by Email, but occasionally in person. SAC will define the

technical needs and advise how to meet them, as well as provide advice on all phases of the operation. SAC can and must be in close touch with active and potential users. The Bylaws provide also for "Members." I hope that all of you will want to become Members.

VIII. The Challenge:

There is no question in my mind of the need for a GNAT and of the fact that it can be done. However, there must be a clear cut demand shown for it. We must create that demand. Without it, there is little hope to get it funded in a timely manner. With it, I am convinced that we can get it funded. How to show the demand: Sign up now as a member. Write, let us know your thoughts about it and your need for it. Tell us how it seems attractive to you, why *you* need it.

IX. Summary:

GNAT is a viable and needed entity and concept. Join up!! Input advice at any time. Help us bring it to a reality, soon.

Note: This concept and proposal is not connected to NOAO or KPNO. It is strictly a creation of those individuals currently involved, a few of whom are staff astronomers at NOAO.

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Discussion

J. Baruch: *Already a couple of working groups have been started at Kilkenny and people are welcome to join. The objective of one of the groups - an interfacing and data structure working group is initially twofold: first, to agree where defined interfaces and datastructures would have more advantages than disadvantages, second, to pursue such agreement to show potential funding agencies that global agreement is possible. Please send your email address, or name and postal address, and offers to participate to John Baruch JEFB@UK.AC.BRADFORD Dept of Electrical Engineering, University of Bradford, UK.*

C. J. Butler: *At the Kilkenny meeting it was proposed that there should be a trial run which would enable observers to test their techniques and their ability to communicate. A forthcoming campaign in the MUSICOS series could fulfill this role and add to the astrophysical importance of the data.*

W. Tobin: *Does the MUSICOS programme have any connection with the UNESCO-sponsored World Astronomy Days being promoted as part of International Space Year?*

C. J. Butler: The MUSICOS programme will take place in early December, but I cannot tell you if this coincides with a World Astronomy Day.

A.R. Upgren: *I want to emphasize the extension of GNAT to existing telescopes for several reasons. As a sometime astrometrist, photometrist and spectroscopist I work on problems of stars that need observations in all of these fields. I see more contact needed between the positional and the photometric researchers. Furthermore membership in a worldwide network could buttress an observatory against the occasional attempt to close it down, and also act as a spur to the use of presently idle research-capable telescopes at developed sites and the securing of funds for this purpose. Telescopes in campuses and in cities have one advantage; they are accessible to large populations. Retention or resurrection of each of these greatly increases the educational element in GNAT's mix of goals.*

Crawford: Yes I think a viable GNAT can and should handle these needs.

J. B. Hearnshaw *The prime motivation for GNAT appears to be to increase the* **quantity** *of observational data. But does not progress in astrophysics at the present time depend far more on data* **quality** *and on its careful* **interpretation***?*

Crawford I think GNAT will offer both quality and quantity. We get it all. One will get excellent data whether we want it or not, because of better filters, standards, software, etc.

C.L. Sterken *I only would like to add that in variable star photometry, the only objective way to estimate the precision of your measurement is to compare results from multisite observations. (see Michel Breger's talk in this meeting). If GNAT would contribute to the quality aspect only it would already pay off. The increase in quantity of data is then a bonus.*

B. Anthony-Twarog *Can you share a larger list of the projected working groups? As a marginal 'have not' where one of the limiting quantities is time, many prospective contributors might be concerned about making a future, open-ended commitment of time and might*

like to carefully plan where they can best plan their contributed effort.

Crawford Examples are, (there are others, and many subsets, of course):
1. Search for Extra Solar System Planets
2. Open Cluster Data Base
3. Variable Stars (many subsets)
4. Telescope
5. Filters
6. Systems
7. Communication
8. Software
9. BBS
10. Education
11. Summer Student Programmes
12. Post-Docs.
13. Optics
14. Sites
15. Meetings
16. Fund raising
17. Administration
18. Membership
19. Newsletter
20. Standard Stars
21. Databases and archiving
22. Fibres
23. Etc

R.M. Genet *The cost of a 2.5-metre system, as suggested earlier, is between US$2.5m and US$3.5m. This includes the telescope, several permanently mounted instruments, and the enclosure and its control.*

Crawford We must always be sure, in computing costs, that we compare 'apples and apples'. That is, include and exclude items and keep things comparable.

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