

5 February 2004

MEMORANDUM

To: Dan Fabricant
From: Scott Kenyon
Subject: Time Allocation at FLWO and the MMT

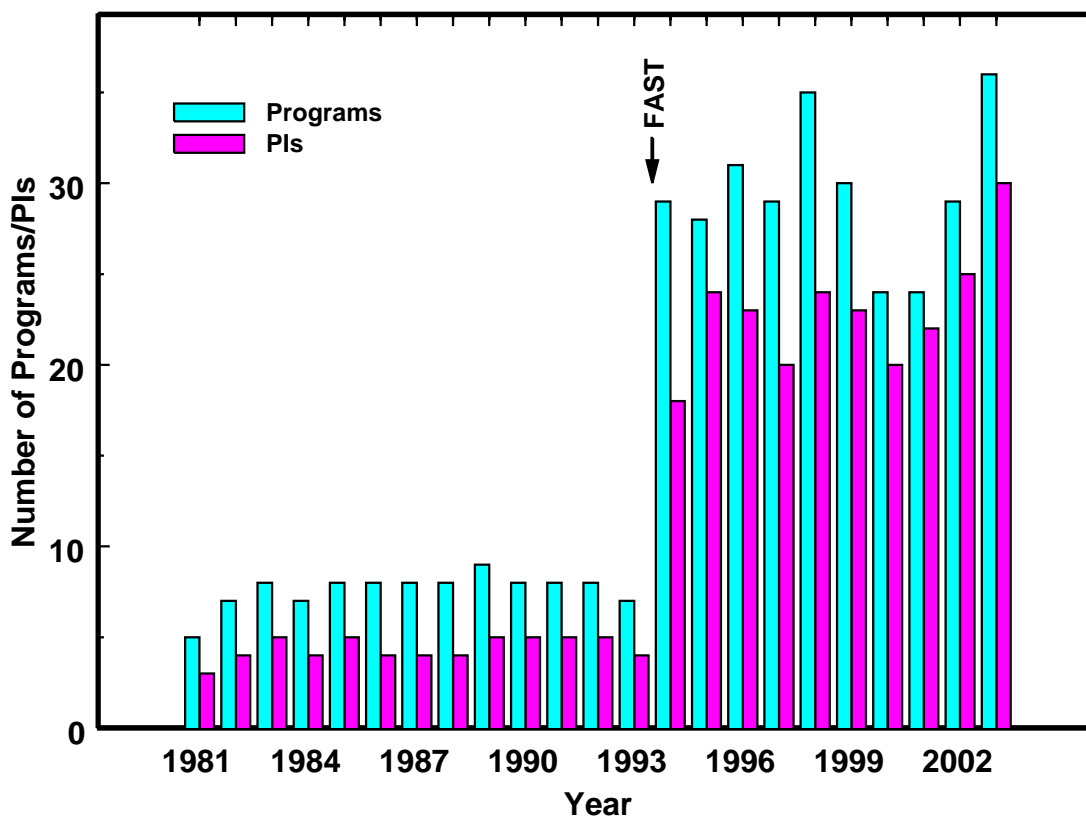
In the 25 years since the dedication of the MMT, CfA optical ground-based telescopes have been among the most productive in the world. CfA scientists have been leaders in all aspects of modern observational astrophysics, from studies of the solar system to understanding the basic fabric of the universe.

Two cornerstones of these achievements are high quality, state-of-the-art instrumentation and a fair, equitable telescope time allocation process. In the 1980's, the Z-machine spectrograph, built for the FLWO 60" telescope by Marc Davis, provided reliable galaxy redshifts for maps of the nearby universe. In the 1990's Dan Fabricant's CCD-based FAST provided a factor of ten improvement in sensitivity. Coupled with efficient queue-observing by highly skilled on-site observers and rapid, uniform data reduction, FAST allowed deeper probes of galaxies and AGN in the nearby universe and enabled new access to many classes of targets previously inaccessible on 60" class telescopes. At the same time, the time allocation committee (TAC) developed a robust queue accounting system to provide PIs and observers with detailed information on the progress of approved programs.

After a decade of FAST operations, the 60" is one of the most productive (and most cited) telescopes in the world. With more than 175 approved programs, FAST PIs have made important contributions to many astrophysical problems. Among the highlights are the first clear association of a gamma ray burst with a supernova and the acquisition of most of the basic data for characterizing the accelerating universe with type Ia supernovae. Many students based their Ph. D. theses on FAST data; several of these students were awarded prestigious Hubble and Chandra fellowships.

Figure 1 provides two measures of the importance of FAST to CfA PIs. In the Z-machine era, 5-6 programs by 2-3 PIs accounted for more than 95% of the spectra. In the FAST era, more than 50 PIs acquired data; single PIs typically acquired less than 15% of the spectra per year. The efficiency of FAST enabled rapid completion of many projects, providing timely tests of astrophysical ideas covering a wide range of subjects.

60" Programs 1981-2003



TAC Background

The TAC consists of 5 CfA staff members from HEA, OIR (2), R&G, and SSP. Every four months, TAC members read and grade 125–150 proposals for the FLWO 48" and 60", IOTA, Magellan, the MMT, and ORO. The subscription (ratio of nights requested to nights available) ranges from 125% for the smaller telescopes to 200% or more for the MMT and Magellan.

After proposals are submitted, TAC members independently grade each proposal using a web-based form. Proposals are ranked according to (i) **overall scientific merit**, (ii) **publication record using CfA facilities**, and (iii) **availability of time requested**. A web-script normalizes the grades of each TAC member and generates a ranked list for each telescope. The TAC then meets to discuss the rankings and allocate the time available. Based on merit, publications, and scheduling requirements, we make a preliminary allocation, which is sent to the scheduler for each telescope. The TAC chair works with the scheduler to maximize the overlap between the needs of CfA observers allocated time and the time available for scheduling.

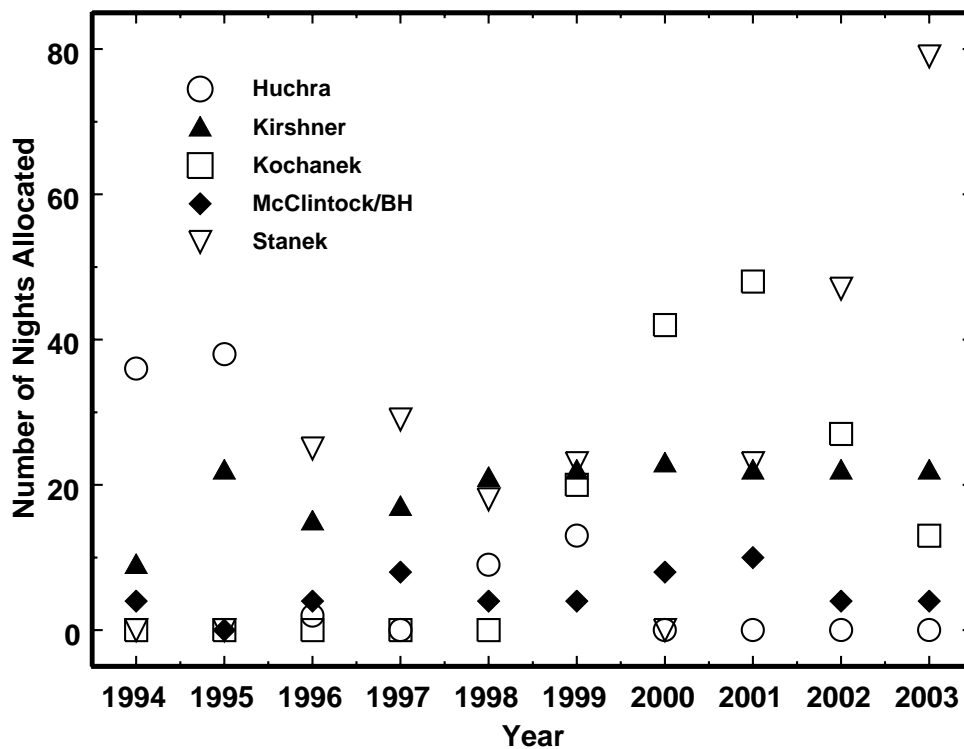
Large Projects

Balancing large and small projects is one of our most challenging tasks. The TAC has not granted guaranteed time to any program. Our policy has been that monitored projects are more productive and finish more quickly. All PIs submit a 1–2 page proposal outlining a new project or describing progress towards completion of a previously approved project. The TAC then judges the merits of starting new projects relative to a continuation of old projects. This system has worked well. We have supported many innovative, short-term projects. Productive long-term projects have also done very well.

The following figures summarize the ability of the TAC to accommodate large, continuing programs with this process.

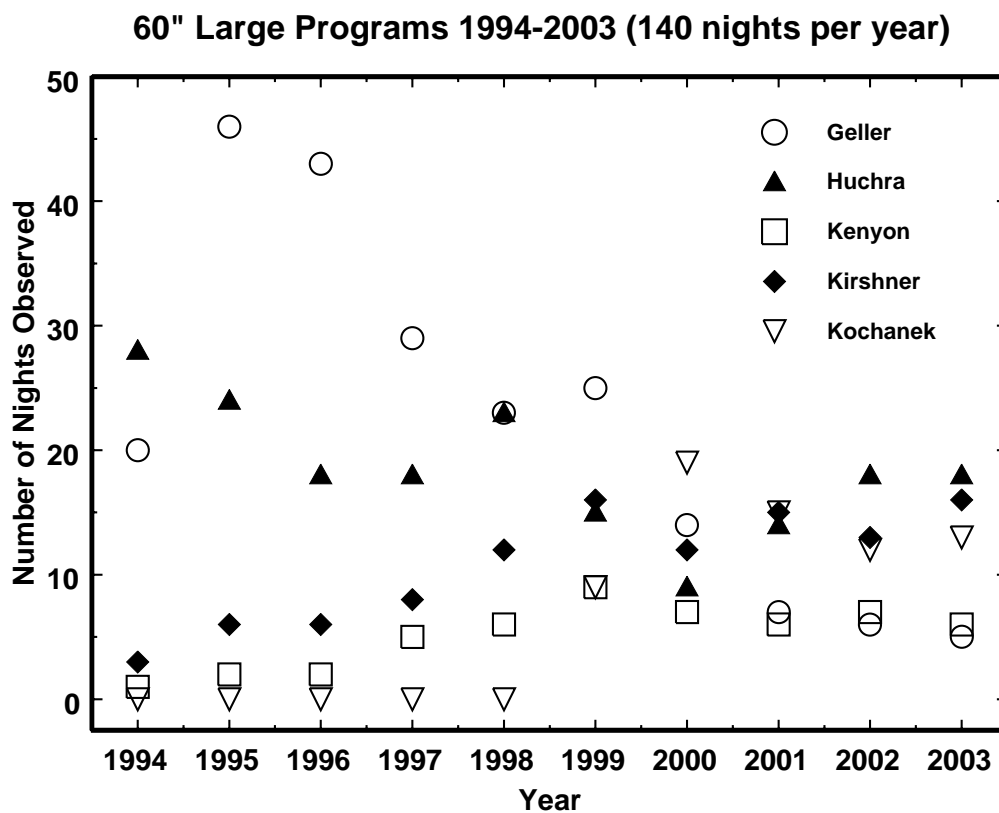
On the 48", we allocate ~ 330 nights per year for optical and near-IR imaging (August is summer shutdown). Programs on supernovae (PI: Kirshner) and black holes (PIs: Garcia, McClintock, and Zhao) are variations on a single scientific theme. To complete a specific project, other programs (examples: DIRECT and planet transits, PI: Stanek; Hectospec targets, PI: Kochanek; ROSAT clusters, PI: Huchra) require large blocks of time for shorter periods. Over the past decade, the TAC has allocated 20%–33% of the available 48" time to large projects.

48" Large Programs 1994-2003 (330 nights per year)



On the 60", we allocate $\sim 60\%$ of the available time to FAST and $\sim 40\%$ of the time to the echelle or the AFOE. Both of the bright time projects – echelle and AFOE – are large, ongoing projects. Before it began to move to Mt. Wilson, the AFOE group (Korzennik, Nisenson, Noyes) received 35–50 nights per year. The echelle group (Latham, Stefanik, Torres) received 80–100 nights per year.

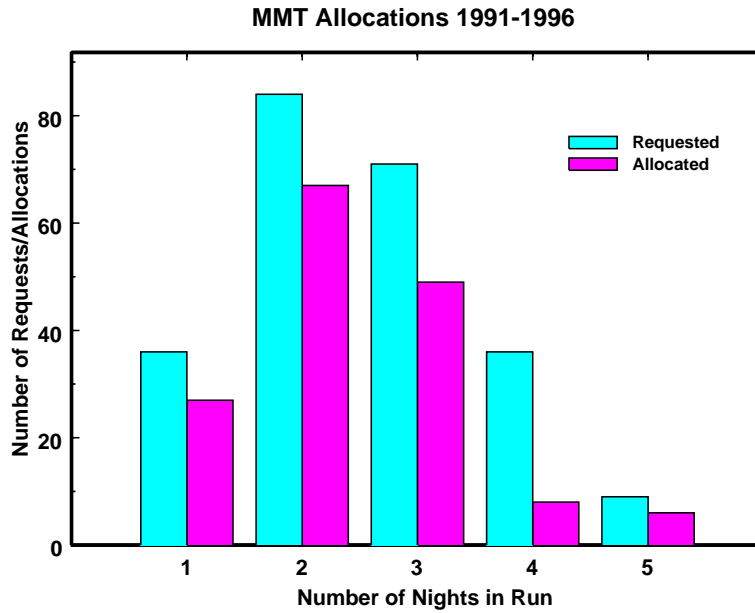
The following figure summarizes allocations for some large projects with FAST. This figure uses actual observing time – derived from the data headers – instead of allocations. The large projects include redshift surveys (PIs: Geller, Huchra), binary stars (PI: Kenyon), supernovae (PI: Kirshner), and the mass function of galaxies (PI: Kochanek). During this period, large projects had 40% to 50% of the usable time.



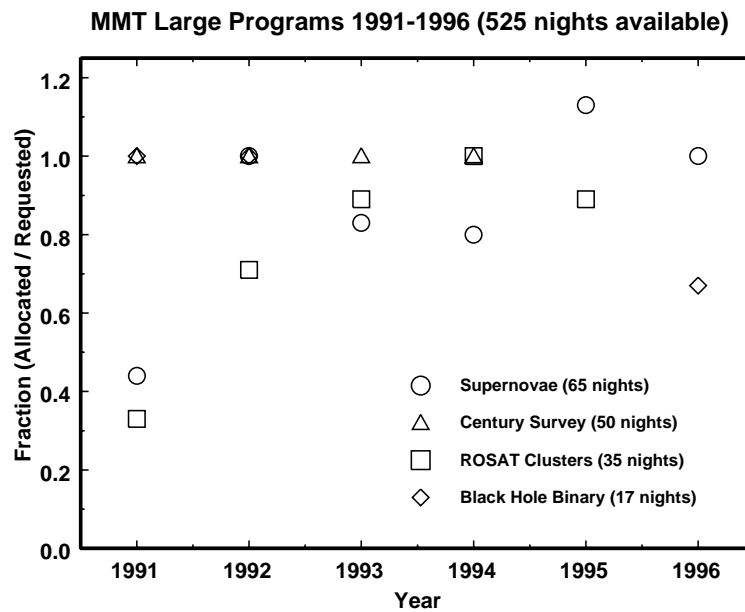
On the MMT, we consider the period 1991-96 when the 4.5-m MMT was fully functional and instrumented. Because we share the MMT with the Univ of Arizona and the visitor program, we typically have 150 nights per year to allocate (50 per trimester).

The following two figures summarize our ability to accommodate large projects on the MMT. The first of these is a histogram of the number of nights in a typical observing run, as requested by the PI (light histogram) and as allocated by the TAC (dark histogram). PIs requesting 5 night runs, all of which were long-term projects, were just as likely to

receive their full allocation as those requesting 2–3 night runs. Much of the shortfall at 4 nights is due to PIs requesting extra time to compensate for weather losses. TAC policy has been to delete extra time to compensate for predicted weather losses.



The final plot summarizes the success rate for four large MMT programs. During the period, these four programs received 31% of the time available. Most received 80% to 100% of their requested allocations.



Future Observing Programs on the MMT

The January–April 2004 trimester was the first to request proposals for f/5 instruments. The TAC received high quality proposals in many exciting fields, including

- extrasolar planets and the structure of the solar system (5 proposals)
- disk evolution and the mass function of young stars (6 proposals)
- distribution of matter in the Milky Way (2 proposals)
- distribution and evolution of galaxies (5 proposals)

The total request for f/5 science programs was 40 nights. Scheduling constraints limited the time available to 31 nights. After allocating 19 nights to engineering proposals, the TAC had only 12 nights available for f/5 science programs. We divided these nights equally between MegaCam, Hectochelle, and Hectospec.

During the next year, the TAC expects MMT allocations to return to normal. Reduced engineering requests will leave much more time for science projects. Based on our experience with new instruments at the 48" and the 60", we anticipate an extraordinary set of large and small research programs. The TAC looks forward to working with CfA scientists and instrument PIs to ensure that the best programs receive time.