

May 2, 1961

INTERNAL MEMORANDUM

To: OS, JWP, DSH, NH, TKM, CMW, CRL, FJC

FROM: FDD

SUBJECT: Suggestion for a course of action to take with the 140-foot telescope.

As we know, the action to be taken with the 140-foot project is the Observatory's major problem. The following considerations, some of which have been ignored to date, appear to dominate the course to be taken:

1) There is a collection of apparently unanswerable problems connected with the use of a polar axis. These may continue to impede progress because of the inability of anyone to provide a sound, knowledgeable, analysis of the consequences of any approach to these problems.

2) The long delay in the telescope has rendered it obsolete at all wavelengths except those shorter than 10-cm. It can not be justified for longer wavelengths, and any attempt to do so will only bring severe, justified criticism.

3) It is still of great value at short centimeter wavelengths, and its cost is still justified by the promise it gives of important results at those wavelengths.

4) The Green Bank site is an undesirable one for ^{seeing at} these short wavelengths. In this matter, low atmospheric water vapor content and low turbulence are most beneficial. Green Bank suffers from high atmospheric water content, most often due to movement of air masses out of the Gulf of Mexico, and high turbulence due to the location of the first high mountain range of the Appalachians just west of the site, to windward with respect to the prevailing winds. This results in poor seeing at short centimeter wavelengths. In the long run, this could cause much more discredit to surround the 140-foot project than that resulting from the long delay in its construction.

As a solution which is consistent with the above considerations, one might suggest the following steps:

1) Conversion of the design to an alt-azimuth scheme. Almost certainly, the present dish and fork could be used in this, the fork with minor modification. The polar gear could also be used in the azimuth drive. The present pedestal, polar axis, and sphere (hallelujah!) would be scrapped, and replaced with a large vertical bearing and drive that could undoubtedly be built from standard components. It is likely that no delay or additional cost would be incurred from such a change, and perhaps a saving in time and money could be made.

Moving

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2) [^] The site of the telescope, ~~be moved~~, for scientific reasons, to an area of best seeing, implying an area of minimum water vapor and atmospheric turbulence. Inspection of the climatological maps of the United States shows two prime areas of low water vapor content: A small region centered on the Owens Valley, and a larger region near Tucson, Arizona. Of these two, the Tucson region is much to be preferred from seeing considerations, because the Sierra Nevada produces extremely great turbulence effects over the Owens Valley (See recent Science). No such influence exists near Tucson. The apparent superiority of the Tucson region is confirmed by the location of KPNO there. The Tucson area has the additional great practical advantage that there is present a large NSF supported facility, which could provide backup facilities without large capital investment.

It should also be noted that the original reason for locating the 140-foot telescope in the East (easy access to the telescope for eastern astronomers) no longer is valid -- one can reach Tucson by jet from New York as quickly as one can reach Green Bank. This circumstance will not change in the foreseeable future.

Another advantage to a desert site is that large tracts of flat land are available, and this could be very useful in the future construction of large instruments of the von Hoerner type or those based on aperture synthesis. It could be very beneficial to the long term development of the observatory to develop a desert site.

All in all, transfer of the telescope to the Tucson region appears very desirable scientifically, and could be quite advantageous when future instruments are built.

The steps that could be taken in connection with the above course of action are as follows:

To be done immediately:

1) ~~To be done immediately:~~ Stop any further fabrication of the sphere, polar bearings, polar axis, and pedestal.

2) It would be desirable to study seeing conditions to be sure we are on firm ground. This could be done quickly by connecting the existing, unused, 3.75 cm radiometer to a small dish (say the 12-foot, to get as narrow a beam as possible), pointing the antenna at the pole, and making continuous digital records for a month or two. Statistical analysis of the records would give a good value for the short centimeter wavelength seeing conditions at the Green Bank site. Then load the apparatus in a truck and ship it to Tucson to make identical measurements for a similar period. This would also check interference levels.

3) Explore the problems connected with an alt-azimuth conversion.

If these steps produce the expected results, one would then:

- 1) Arrange for a small amount of floor space at the Tucson building of KPNO, to act as an intermediate back-up facility between the main electronic and analysis support facilities at Green Bank and the telescope site. This should be easy because of the mutual NSF sponsorship.
- 2) Obtain control of a good site near Tucson, hopefully much larger and flatter than the Green Bank site.
- 3) Proceed with the telescope conversion.

It is believed that the above course of action would bypass the main difficulties connected with the 140-foot telescope, with a monetary and time advantage, and would at the same time produce an over-all observing ability considerably greater than the presently accepted course of action would give.

The approach should also be politically palatable, since the reasons for the change in plans are not a consequence of bad judgment on anyone's part, but rather a result of the development of jet commercial aircraft, masers, and a new knowledge of atmospheric effects since the first planning of the 140-foot was done.