NATIONAL SCIENCE FOUNDATION
OFFICE OF THE DIRECTOR
WASHINGTON 25, D. C.

APR 20 1961

Mr. Grote Reber
C. S. I. R. O.
Stowell Avenue
Hobart, Tasmania
Australia

Dear Mr. Reber:

Dr. Jerome B. Wiesner has requested that I reply to your letter to him of March 31st.

The Foundation is certainly aware of the difficulties and unexpected costs which have been incurred in connection with the 140-foot telescope. In the light of past experience there are a number of features of the design which would undoubtedly be changed were the task to be repeated, but to my knowledge in no case has it been shown that the design is basically at fault. The criticism of the overall design which is most frequently made is that it would have been less expensive to employ an alt-azimuth mount, as is being done with the 210-foot Australian telescope at Parkes. You will recall that when the alternative types of mounting were under discussion in the latter part of 1955 it was not clear to the experts studying the problem that an alt-azimuth mount would be less expensive. It is largely as the result of development work on telescope control systems during the later years that the control of alt-azimuth systems has become relatively inexpensive and reliable.

The principal difficulty which has been encountered with the fabrication of the telescope is that of assembling the polar axis and the 22-foot spherical bearing. The manufacturer had planned to weld these parts together in the field. However, on the basis of experience it was found that this could not be done without appreciable danger that brittle failure might occur due to stresses that would develop during cooling of the welds. In order to avoid any serious possibility of a failure of this sort, the

problem was recently studied by a panel of outstanding mechanical and metallurgical engineers under the chairmanship of Dr. A. B. Kinzel, Vice-President for Research, Union Carbide Company. The Panel found that the danger of brittle failure can be avoided if the parts of the polar axis - spherical bearing are bolted together in the field rather than welded. Steps are now being taken to change the assembly procedure accordingly. It is also recommended that the entire polar axis and sphere be heated in the future.

Some difficulties were also encountered during the fabrication of individual parts of the spherical bearing. Because of the internal rigidity of these parts, some of the welds failed as a result of stresses developed during the cooling of the welds. These welds were removed and replaced, following which the parts involved were stress relieved and tested by the reflectoscope method. Dr. Kinzel's panel inspected these parts and adjudged them to be structurally sound.

Some question has been raised about the field machining procedures to be used on the bearing itself. The Panel has reviewed these procedures, and recommended changes which it feels would overcome the anticipated difficulties.

It is always difficult to know what a new instrument of unprecedented size and precision "should" cost. To the best of my knowledge no instrument of comparable specifications is under construction or even being designed at the present time. The telescope at Parkes will have a larger aperture but it must be realized that (a) its reported cost of $2.2 million is based on West German prices, and that comparable construction in the United States would be twice as expensive, and (b) that whereas the Parkes instrument will operate efficiently at 21 centimeters wavelength and perhaps at 10 centimeters (according to John Bolton's recent article in "Telescopes"), the 140-foot telescope must operate efficiently at 3-centimeters wavelength and perhaps less. Thus the 140-foot telescope will resolve several times as many objects in a given area of sky as the 210-foot telescope. In view of these simple considerations alone I cannot agree that the 140-foot telescope can be said to cost more than it should.

Your contention that the scientific usefulness of the instrument, when finished, will be close to zero is difficult to discuss since you do not give your reasons. We might guess that perhaps you are making reference to the great resolving power which you expect will be

realized with such instruments as the dish at Parkes, the proposed Mills cross at Sydney and a number of large light dishes being constructed according to designs developed by the Stanford Research Institute. In all these cases, however, the wavelengths to be used are much longer, and in some the question of confusion when studying complicated objects such as the center of the Milky Way cannot be ignored. In any event it seems almost a contradiction of all previous experience in astronomy and microscopy to say that an instrument of double the resolving capabilities of any existing instrument is likely to be scientifically useless.

Sincerely yours,

Alan T. Waterman

Alan T. Waterman
Director

Copy to:
Dr. Jerome B. Wiesner