

July 27, 1962

Honorable Ken Hechler
House of Representatives
Washington 25, D. C.

Dear Mr. Hechler:

During your interview with me and Dr. J. W. Joyce of the National Science Foundation on Monday, July 23, you asked certain questions about the future of the National Radio Astronomy Observatory at Green Bank, West Virginia. You expressed particular interest in plans for a study of advanced radio antenna designs. I will try to summarize the main points of our discussion, in case you should wish to make use of this material.

As you know, a 300-foot radio telescope is rapidly nearing completion at Green Bank. It should be in full operation within a few months when it will join the old reliable 85-foot dish which has been in regular use for about four years. The next major instrument to be completed is a very accurate, rugged 140-foot telescope. Its construction has been delayed by various difficulties which now apparently have been overcome, although completion of this instrument is still about two years away.

Much thought has been given to the problem as to what the next major instrument should be. It is clear that the United States needs a very much larger telescope which can resolve details at least as fine as one minute of arc. This means that it should have the ability to resolve surface details of extended radio sources in the universe, such as the great nebula in Andromeda, and also to distinguish and resolve different sources which are very close together in the sky. In order to accomplish this, one has to have a telescope of great width, ranging upward from several thousand feet to perhaps many miles. It is out of the question to obtain this "width" with a single rigid structure or dish since it would be so heavy as to sag under its own weight: this would distort the surface of the instrument to such an extent that only a confused picture would be obtained.

A different solution, now being studied vigorously by the Green Bank staff, is to obtain the same high resolution and sensitivity by using an array of individual dishes, each small enough to cause no mechanical construction problems. These elements, spread over a level area in some as yet unspecified fashion, have to be joined together electronically in a very sophisticated manner to give a combined output equivalent to what could have been obtained with a single huge dish. At the moment, it appears that the elements themselves will most likely be dishes of the order of 100-300 feet each in diameter, although other configurations are possible.

How long it will take to complete this study, or how much it will cost, are as yet uncertain factors, the more so because the final design has not yet been decided upon. The only thing which can be said with assurance is this: the experts are unanimous that great radio telescopes of the future will be arrays of some kind. For the present fiscal year, our budget includes an amount of about one-quarter million dollars to be spent at Green Bank for studies of a number of different high-resolution antenna systems, including detailed engineering work and construction of models and prototype components to determine the feasibility of the best system.

Until the final design becomes established, it is not possible to state whether the future large radio telescope will be located at the Green Bank site of NRAO or elsewhere. The total dimensions of the array will not be known until the study is completed, which may be one-and one-half to two years, and these dimensions will dictate to a large extent the local geographical requirements.

Finally, you also asked if the Foundation had any plans that might include Sugar Grove, now that this project has been abandoned by the Navy. No firm answer to this can

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be given. However, we feel that completing or modifying construction already started to adapt the Sugar Grove installation to any possible uses we could at present envision would probably be very costly.

If I can be of further assistance, please let us know.

Sincerely yours,

GEORFFREY KELLER
Assistant Director for
Mathematical, Physical, and
Engineering Sciences

cc: Dr. R. Robertson, O/D
Dr. J. W. Joyce, O/D
Dr. Keller's Chron File
Dr. Mulders, MPE

MPE:G.Mulders:bc 7/26/62