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AGENDA
NRAO STAFF MEETING
GREEN BANK, W. VA.
THURSDAY, JULY 17, 1958

1. PERSONNEL
   - 1.1 TECHNICAL
   - 1.2 SUPPORTING
   - 1.3 VISITORS AND OTHERS
   - 1.4 OTHER ORGANIZATION AND ADMINISTRATIVE MATTERS

2. FISCAL MATTERS
   - 2.1 STATUS OF SUPPLEMENTAL REQUEST
   - 2.2 TEMPORARY STOP ORDER
   - 2.3 FY 1960 BUDGET SUBMITTAL
   - 2.4 W. Va Taxes

3. 85 FOOT TELESCOPE PROGRAM
   - 3.1 BLAW KNOX SCHEDULE
   - 3.2 INDUCTOSYN PRECISION INDICATORS
   - 3.3 RECEIVERS, FEEDS, AND OTHER EQUIPMENT
   - 3.4 NRAO PLAN AND SCHEDULE

4. 140 FOOT TELESCOPE PROGRAM
   - 4.1 BLISS PROGRESS ON STRUCTURAL ENGINEERING DETAILS
   - 4.2 FRANKLIN INSTITUTE - POLAR BEARINGS
   - 4.3 DRIVE AND CONTROL

5. OTHER TECHNICAL PROGRAMS
   - 5.1 THE LITTLE BIG HORN
   - 5.2 THE 12 FOOT REFLECTOR
   - 5.3 CORNER REFLECTOR INTERFEROMETER

6. NEW CONSTRUCTION
   - 6.1 WORKS AREA PROPOSAL
   - 6.2 LABORATORY
   - 6.3 RESIDENCE HALL AND CAFETERIA
   - 6.4 UTILITIES

AGENDA - NRAO STAFF MEETING -
GREEN BANK, W. VA. - THURSDAY, JULY 17, 1958

7. REPLY TO NSF (LUTON LETTER, DATED JUNE 27, 1958)

   7.1 INSURANCE
   7.2 USE OF VEHICLES
   7.3 REPORT ON ACCIDENT

8. SITE MANAGEMENT AND DEVELOPMENT

   8.1 NEED FOR COMPREHENSIVE REPORT AND MASTER PLAN
   8.2 CONTENT OF REPORT
   8.3 PROCEDURE FOR ITS PREPARATION; TIME SCHEDULE

9. MONTHLY REPORTS

   9.1 CONTENTS
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10. JOINT DEFINITIVE ARTICLE

11. PLANS FOR MUSEUM

   11.1 CONTENTS
   11.2 ARCHITECTURAL PLANS
   11.3 PROCEDURE

12. PROPOSED STUDIES FOR VERY LARGE ANTENNA

   12.1 PRELIMINARY PROVISIONAL PERFORMANCE SPECIFICATIONS
   12.2 INDIVIDUAL STUDIES

13. SITE PROTECTION

   13.1 FCC
   13.2 CAA
   13.3 INTERNAL (TEST TRUCK, ETC.)
   13.4 LAND PURCHASES

AGENDA - NRAO STAFF MEETING -
GREEN BANK, W. VA. - THURSDAY, JULY 17, 1958

14. POLICY ON VISITOR PARTICIPATION AND STAFF ACTIVITIES

- 14.1 INDIVIDUAL, NOT INSTITUTION
- 14.2 NRAO STAFF TEACHING
- 14.3 NRAO STAFF CONSULTATION
- 14.4 PAPER REVIEW - PERMANENT STAFF; VISITORS with note on reviews

15. EARLY PARTICIPATION IN SPACE SCIENCE PROGRAM

- 15.1 THE SPACE SCIENCE BOARD
- 15.2 NRAO INTERESTS

16. OCTOBER MEETINGS OF TRUSTEES AND ADVISORY COMMITTEE

- 16.1 GENERAL ARRANGEMENTS - HOUSING, TRANSPORTATION, MEETING PLACES

visitors should be asked to submit papers for review - ~~LVB~~ will be final review on all staff papers

write memo on 85-ft coordination & scheduling

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ASSOCIATED UNIVERSITIES, INC.
10 Columbus Circle
New York 19, New York

August 11, 1958

Minutes of NRAO Staff Meeting
Thursday, July 17, 1958

Those present were:

L. V. Berkner	R. M. Emberson
L. R. Burchill	J. W. Findlay
F. J. Callender	D. S. Heeschen ✓
F. D. Drake ✓	M. M. Small

The agenda prepared for the meeting was covered during the course of the day, but not necessarily in the order listed on the agenda.

1. Works Area Proposal (Item 6.1). The proposals received July 14 on the Works Area building were reviewed, and it was agreed that we should proceed as soon as possible with the proposal from the Parrot Co. for the amount of $121,310, to include the central and southern sections of the building, stone trim, aluminum windows, and minimum electric lights as provided in the third alternate. IBA had checked that the Parrot firm operates in the state of West Virginia in accordance with the usual union regulations, and no difficulties are anticipated from concurrent activities by Parrot at the Works Area and Darin & Armstrong at the 140-foot foundation. Subsequent to the meeting, Mr. Luton of the NSF advised that the temporary stop-order had been rescinded and we were, therefore, free to proceed with a contract for this work as soon as terms could be arranged with Parrot. After further discussion Dr. Berkner directed that estimates be obtained on the plastic-coat finish for the transite panels and that be negotiated as an extra. He also directed that the same procedure be followed to provide stone trim on the west wall of the building. Inasmuch as the north side would not be built at this time, the chimney would not need to be so high, and this reduction should be negotiated as a credit.

2. Concerning fiscal matters, no information was available concerning the status of the supplemental request. Mr. Luton had written that it was contrary to Bureau of Budget regulations for normal operating expenses to be included in a supplemental request. At this point Dr. Berkner suggested that we put our budget for next year at a $375,000 level, because it appears that only this amount of money can be made available to us. Therefore, it does not appear to be feasible this year to fund the operating expenses of the Observatory one year in advance. Mr. Dunbar had received a letter from the Tax Commissioner of the state of West Virginia that did not clarify whether or not sub-contractors, such as E. W. Bliss, would have to pay taxes on the work they do for the Observatory. The lengthy document makes clear that the Federal Government will not have to pay such taxes, and presumably also, AUI. The following is

quoted from the last page of this letter, and seems to leave open the status of all sub-contractors:

> ".....However, this opinion is restricted only to the imposition of the Consumers Sales and Use Tax upon Associated Universities and leaves open the question concerning whether Associated Universities is liable for the West Virginia Business and Occupation Tax imposed by Chapter 11, Article 13 of the West Virginia Code. Likewise, there is left open the question as to whether any of the subcontractors for the furnishing of materials, labor and supplies for the construction or maintenance of this Observatory are exempt from the Consumers Sales or Use Tax and the Business and Occupation Tax.
>
> "I hope this is a satisfactory explanation of the tax status of Associated Universities, Inc. under the West Virginia Consumers Sales and Use Tax. If you have further inquiries, please feel free to call upon us."
>
> (Signed by Arthur N. Gustke, Attorney, Legal Division, Office of the Tax Commissioner, Charleston 3, W. Va.)

3. Under the discussion of personnel matters. Dr. Heeschen submitted a letter to Dr. Berkner concerning appointments to the Astronomy Department, and these matters were privately discussed after the conclusion of the regular meeting. Progress was reported on the recruitment of mechanical and civil engineers, primarily through the efforts of Mr. Dunbar and the Personnel Office at Brookhaven. Dr. Findlay reported that he had no decision from Mr. Campbell, but would press for one soon, particularly in view of the fact that Campbell's work at Ewen-Knight Corp. on the TWT receiver for the Observatory had been completed. Finally, there was considerable discussion on the need of assistance for Mr. Callender. It was clear that the activities of the Business Office require another full-time position and, in addition, part-time assistance may be necessary if reports and plans desired by November are to be completed. In this regard and with reference to Item 8 on the agenda, Dr. Berkner said that he would like to have a draft report available at the November staff meeting on a plan for the management and development of the site. This is to be a comprehensive report including maps, diagrams and perhaps photographs of the site model and of present and proposed changes and installations including telephones, power, roads, buildings, stations for the temporary installation of scientific equipment, etc. Mr. Callender reported that West Virginia University was prepared to help on the site management problems through their Agricultural Extension Service.

4. For the record, Dr. Heeschen reported that Hein Hvatum was expected on or about October 1, and Dr. Emberson reported that a letter from Grote Reber to Mr. Schauer of Research Corporation indicated that

we might expect Mr. Reber at the site about September 1.

5. Concerning the 85-foot telescope program, the Blaw-Knox schedule of July 2 had been amended by the letter from Mr. Jackson which indicated that shipment would not be made until July 21. During the course of the meeting, Dr. Heeschen received word that Mr. Schaltenbrand of Blaw-Knox and Mr. Ramsey of Radio Construction, the sub-contractor, would be expected at the site Monday, July 21. Meanwhile, Dr. Heeschen had received a letter from Mr. Pottmeyer that clarified the wiring that would be necessary on the telescope, but left open the matter of proper weather protection and the credit that would be allowed to AUI for doing the wiring. Dr. Findlay reported that the inductosyns for the precision indicator were due at Green Bank on October 15. The Jasik feed had arrived, the hydrogen receiver was already at AIL, except for one commercial component that was expected momentarily, and the TWT receiver appeared to be three weeks ahead of schedule at Ewen-Knoght.

6. The 140-foot telescope program was briefly discussed. Dr. Emberson reported that E. W. Bliss was making good progress on the shop drawings and that a meeting at The Franklin Institute the previous week had clarified many misunderstandings concerning the design of the polar bearings. Dr. Findlay reported that there had been several interesting and encouraging conversations with companies interested in making proposals on the drive and control system. There was brief discussion on the matter of change orders and inspection procedures during the construction of the telescope.

7. Dr. Findlay reported that the Little Big Horn (Item 5.1) had been budgeted at $10,000. A road had been bulldozed into the site of the horn, and the foundation for the horn had been completed.

8. A structure was being made east of the Moro Beard house for the installation of the 12-foot paraboloid. Power for this system will be obtained by a temporary connection to the existing transformer on the pole outside the Beard house. Work on the corner reflector interferometer is proceeding. Drs. Drake and Heeschen reported that they plan to use the second floor of the Mary Beard house as a laboratory. If this causes interference when E. W. Bliss occupies the house as field headquarters, the experimental apparatus will be moved into a van. Two vans similar to the one already at the site are being procured through the Government Surplus list. Mr. Callender reported that he was obtaining a rotary snow plow and other similar items through the surplus list for use on the site.

9. The Works Area proposals having been previously reviewed, Dr. Berkner discussed the plans available from IBA on the Laboratory, Residence Hall and Cafeteria, and generally approved of the work so far completed. In view of the fact that IBA will probably become deeply involved in work at Sugar Grove in the near future, the concensus was that we should have IBA proceed without delay to complete the utility plans (water, sewerage, etc.) for NRAO.

10. Dr. Berkner stated that he wishes to prepare annual reports based on fiscal year July to July. In addition, he wished to initiate monthly reports, and as a start in this direction the contents as outlined in a memorandum dated June 23, and the assignments listed therein, were adopted on a trial basis (see memo attached).

11. Dr. Berkner discussed the need for a definitive article that would include both the history of the initiation of NRAO project, the feasibility study, progress to date, and the acquisition and development of the Observatory and plans for the future. He suggested that the various NRAO staff members draft portions of the article of particular interest to them, with the view that the article would be submitted to the Editor of Science this fall. The tentative and specific assignments will be discussed at the next staff meeting.

12. Dr. Berkner brought up the question of scientific and technical articles published by members of the NRAO staff. He believed it was desirable to establish a papers referee system, as is done at other similar institutions. Furthermore, it seemed desirable that NRAO have an opportunity to review papers prior to publication written by visiting scientists and, therefore, based on data obtained at NRAO. Dr. Heeschen was asked to draft several paragraphs on these matters.

13. Concerning the museum, Dr. Berkner suggested that we might decide to located it on the east side of Route 28, rather than on the west side, just south of the main entrance of the Observatory. He thought that the museum should include a section on "what is astronomy", covering historical events of particular interest to radio astronomy, some of the applications derived from astronomy, that there be demonstrations such as a planetarium, the Ewen-Purcell horn, the Reber telescope, models of the big telescopes, a section on research programs, the data and results, and a description of the site, including such topics as radio interference and the local geography and topography. In addition to the museum room, he suggested that there be a lecture hall, with a capacity of about 100, where a lecturer or tour guide could talk to groups before taking them over to the site on a diesel bus or train. He suggested that we should plan to start this activity in January, 1960, although there will, of course, be visitors before that date. In addition to the requirements for tourist visitors, we will probably need to establish a staff position, filled by a senior astronomer or other scientist, with the title of Associate Director, charged with the responsibility of bringing and taking care of distinguished visitors (scientists and others) at the site. He asked Mr. Burchill and Mr. Callender to be prepared to report at the next staff meeting on schemes for financing the museum project, and on a plan to develop the necessary drawings for the building construction. It was estimated that the museum building would be a $200,000 project.

14. Concerning studies for the Very Large Antenna, Dr. Emberson asked if the $25,000 that had been available for such studies was still earmarked for this purpose. Mr. Burchill and Mr. Callender said that the monies had been redistributed among other items in the budget, and it would be necessary for them to re-examine the matter. Meanwhile, it was agreed that any studies should be kept at a preliminary level, and all should incorporate the possibility of tracking motion at a distance east and west of the meridian.

15. Concerning site protection, Dr. Berkner urged that Mr. Callender proceed at once to have the National Science Foundation and the Corps of Engineers initiate the action to acquire land east of Route 28. Dr. Findlay reported that he would be prepared to start work on the test truck as soon as money was available from the new appropriation. He planned to install the equipment in a van obtained from the Government Surplus Property list. There were no new developments concerning detection through the FCC, but Dr. Findlay had made measurements from a proposed CAA installation at the Buckeye #2 site southwest of the Observatory (copy of memo attached).

16. Item #14, on policy concerning visitors and staff acitivities, was resolved as follows: Dr. Berkner had written a letter to Dr. Heeschen questioning the basic philosophy of participation by other institutions. In view of the isolation of Green Bank, Dr. Berkner did not believe it would be feasible for staff members to teach while actively participating at Green Bank and he would, therefore, favor a leave of absence for a semester or year, if NRAO staff members wished to spend some time at a college or university to do some teaching.

17. Concerning the matter of consultation by NRAO staff, Dr. Berkner reported that this had been discussed at the last Trustees' meeting because of questions raised by several staff members at Brookhaven. In brief, staff members are asked to notify the Director before undertaking such consultation, and to limit it to not more than 8 days of leave, no vacation time to be spent on such activities.

18. Concerning NRAO's position in the affairs of the NAS Space Science Board, Dr. Findlay had prepared a draft which Dr. Heeschen was to review, edit, etc., and deliver to Dr. Berkner in time for a meeting of the Space Science Board Saturday, July 19.

19. Dr. Berkner briefly reviewed plans for next October. He thought the Advisory Committee should meet at Green Bank on October 15. On Thursday, October 16, there should be a tour of the site in the morning by Advisory Committee members, Trustees, and any other visitors, followed by a ceremony at noon at the 85-foot telescope. In the afternoon the Trustees would have an Executive Committee meeting at Green Bank, at which time Dr. Menzel would report from the Advisory Committee. On Friday, October 17, the Trustees would

meet either at Three Hills Inn or the Alleghany Lodge (Minnehaha Springs). Mr. Dunbar and Mr. Callender were to explore the various arrangements, keeping in mind the requirements of providing meeting places for the Trustees and the transportation problems of the Trustees and guests.

Attachments.

NATIONAL SCIENCE FOUNDATION
WASHINGTON 25, D. C.

July 11, 1958

Dr. Richard M. Emberson
Assistant to the President
Associated Universities, Inc.
10 Columbus Circle
New York 19, N. Y.

Dear Dr. Emberson:

This will acknowledge your letter of May 23, 1958 transmitting a proposed operating budget for fiscal years 1960 and 1961, and a capital budget for fiscal year 1960. In your letter of May 23 you have asked whether the Foundation will be willing to submit a request for a 1959 supplemental appropriation to cover the operating budget for the fiscal year 1960. This will confirm the information given you at the meeting of the AUI and NSF on Monday, July 7. The Budget Bureau regulations covering supplemental appropriations preclude our submitting a request for a supplemental appropriation for this purpose. Section 3 of Bureau of the Budget Circular A-11 states as follows:

> ...No supplemental estimate of appropriation or upward amendment of the estimates will be considered later unless it is due (1) to circumstances not foreseeable at the time the annual estimates are submitted, or (2) to subsequent action by Congress. (meaning new legislation or extension of expiring legislation)

If you have any questions on this matter please get in touch with me.

Sincerely yours,

J. E. Luton
Assistant Director
for Administration

11 July 1958

Dr David S. Heeschen
National Radio Astronomy Observatory
Post Office Box 2
Green Bank, West Virginia

Dear Dave:

I hope you will pardon my delay in replying to your letter of June 6th, but I have awaited the opportunity to discuss the points that you raise concerning cooperation with the University of Virginia with some of the Trustees. It is the general feeling that we should be delighted to have the University of Virginia develop radio astronomy in its Astronomy Department. Certainly, if they have strong radio astronomers with ideas that require the use of the NRAO radio telescopes, the Observatory will find the opportunity for them to set up comprehensive programs for our facilities. We do believe, however, that in consonance with AUI's basic policy, no institution <u>as such</u> can be given institutional rights in any of our facilities.

I wish to emphasize the term "institutional" as contrasted with "personal" relationships.

I believe that we should continue our basic policy to recognize and schedule, whenever possible, experiments suited to our facilities that are proposed by qualified scientists at any institution. The financial arrangements can be worked out to suit the exigencies of each particular case. Under this policy qualified scientists in the field from any institution would have a reasonable expectation of obtaining access to the facilities for suitable work. But AUI must always retain the right to make its own decisions on the qualifications of the personnel and on the suitability of the experiments that are proposed and, of course, on the suitability and best application of the NRAO equipment for any particular purpose.

With respect to relations of members of our staff to university activities, these should be worked out in a manner satisfactory to both the Director of the NRAO and the individual concerned for each case. I join in doubting whether it would be desirable or even feasible to divide time on a weekly basis between Charlottesville and Green Bank. A staff member should recognize the long-term undesirable aspects of

attaching himself too tightly to any one institution for his extra-curricula teaching activity, though this possibility should not be excluded.

On the other hand, I am sure that the Observatory would encourage leaves from time to time to permit lecturing at a university, intermixed perhaps with guidance responsibility for graduate students who might then even carry out their thesis research under appropriate supervision at the Observatory.

Of course, such cases again must be dealt with individually, but I would hope that all members of the staff would from time to time spend a semester or so actually teaching at the universities to broaden their views and to convey newly-acquired knowledge directly to students.

I will be glad to discuss this with you further at our meeting on July 17th should you so desire.

With best wishes,

Sincerely,

L. V. Berkner
President

cc: Mr Callender

ASSOCIATED UNIVERSITIES, INC.
10 Columbus Circle
New York 19, New York

June 23, 1958

MEMO TO: F.J. Callender J.W. Findlay
F.D. Drake D.S. Heeschen

FROM: Richard M. Emberson

SUBJECT: Monthly Summary of NRAO Activities

1. Dr. Berkner has asked that we start a monthly summary of NRAO activities, similar to the monthly BNL reports. I have asked Charles Dunbar to send a few typical issues of these BNL reports to you for your information. If we prepare good summaries each month, the task of preparing an annual report will be greatly simplified.

2. The following is a preliminary outline for the NRAO summary. I have indicated the person or persons who might logically be assigned responsibility for the various sections. Please review this critically, particularly with respect to omissions, and let me have your comments and suggestions by July 9 (or earlier, if we have a staff meeting).

Preliminary Outline
and Assignments

General	
Personnel (other than scientific visitors)	FJC
Budgets, fiscal, etc.	FJC
Site Management	FJC
Site Protection	JWF
Meetings (Staff, NSF, etc.)	RME
Construction	
Buildings	FJC & RME
Research Facilities	
85-foot Telescope and related construction	DSH
140-foot Telescope and related construction	RME
Little Big Horn	JWF
(others to be added when appropriate)	
Operation of Facilities	
(This will include only permanent equipment)	

Technical Programs	
Electronic	JWF
Instrumentation (including expendable installations)	JWF
Observational	DSH
Papers for publication	DSH
Meetings, symposia, etc.	DSH
Visitors	
Scientists working at NRAO	DSH
Scientists (consulting or other ad hoc basis)	DSH
Other	FJC,DSH

3. Experience will answer some obvious questions. At the start, since NRAO is a small organization, I suspect that we err by too much, rather than too little, detail. On the other hand, it should not be necessary to list all visitors at Green Bank interested in performing a part of the work. On the other hand, the Bliss visit and contract signing, or if Tom Brown comes in July to review the proposals on the 140-foot drive and control, or a visit by NS Board members or NSF staff, are examples of items that should be listed. The work on the 12-foot paraboloid should be listed, and perhaps treated as a permanent research facility. On the other hand, I think the corner reflector interferometer should be treated as an expendable installation and discussed only under technical programs. Again, please let me have your views on this.

Reception Tests of the Buckeye #2 VOR Site

1. Test Program

The CAA ran tests with a VOR transmitter at the Buckeye #2 site, and kept the NRAO fully informed of the test schedule. One day, June 24th, 1958, was spent in monitoring these tests to evaluate what the interfering signal was likely to be at the NRAO site at Green Bank, W. Va. The transmitter was located at

38° 03' 30" North
80° 30' 00" West

at an elevation of approximately 3750 feet. The test transmitter had a nominal power of 200 watts and a frequency of 110.6 Mc/s.

2. Receiving Equipment

A sensitive communications receiver, a Hallicrafter S-37 was aligned at the frequency of 110.6 Mc/s, and used connected to a 3/4 λ antenna, which could be set either vertical or horizontal. The receiver input impedance and sensitivity were measured, and it was found that the lowest detectable power was about 5×10^{-15} watts at the receiver input. Assuming, roughly, that the receiving antenna has an effective collecting area of one square meter, this means that the order of magnitude of the minimum detectable signal was:

(a) 5×10^{-15} watts for square meter
or (b) 1.5 micro-volts per meter

3. Results

Tests were made at the following sites along US Route 219 and State Route 20:

Approximate Location of Test Point	Approx. Direct Distance to Transmitter	Approximate Elevation of Test Site	Results
Droop Mt. on Route 219 39° 05' 30" N 80° 16' 30" W	11 N.M	3250'	Large signal
Mill Point, Rt. 219 38° 09' 0" N 80° 11' 30" W	17 N.M	3350'	Signal about equal to minimum detectable
Marlinton Rt. 219 38° 13' 0" N 80° 06' 0" W	19 N.M	2500'	No signal
Minnehaha Springs, Rt. 28 38° 09' 30" N 79° 53' 0" W	24 N.M	2500'	No signal
Dunmore Rt. 28 38° 22' 0" N 79° 55' 0" W	32 N.M	2750'	No signal
Green Bank 38° 26' 11" N 79° 49' 44" W	36 N.M	3750'	No signal

5. Conclusions

These tests were somewhat elementary but show that the signal is well attenuated, even at the Mill Point site. It is probably five or ten times lower in

VALUE, SAY ABOUT 0.2 MICROVOLTS PER METER, AT GREEN BANK. ALTHOUGH SUCH A SIGNAL WILL BE DETECTABLE WITH A BIG RADIO-ASTRONOMY ANTENNA, IT CANNOT BE CONSIDERED TO BE OF SUCH A LEVEL AS TO SUGGEST THAT THE BUCKEYE #2 SITE IS INADMISSABLE FROM THE POINT OF VIEW OF NRAO.

JULY 7, 1959

J. K. SINDLAY
HEAD OF ELECTRONICS DEPT.

COPIES TO: AUI New York
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NRL Mr. R. J. Haskins Code 5439
CAA Mr. Brown (3 copies)