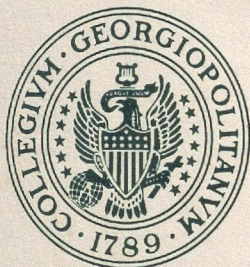


SUMMER CONFERENCE FOR
COLLEGE PROFESSORS OF
PHYSICS AND ASTRONOMY
ON RECENT ADVANCES IN
ASTRO-GEOPHYSICS



GEORGETOWN UNIVERSITY • WASHINGTON 7, D.C.

August 1 to August 24, 1960

Sponsored by the National Science Foundation

- Thirty Stipends and Travel Allowances Available
- Morning Sessions of Lectures by leading Astronomers and Astrophysicists
- Visits to Research Centers in and Around Washington
- Observations with Astronomical Telescopes
- Experience with High Dispersion Spectrographs and Electronic Computers

For applications please address:

REV. M. P. THEKAEKARA, S.J.
Georgetown University
Washington 7, D. C.

Telephone FE 7-3300 Ext. 413 or 577

PLEASE CIRCULATE AMONG THE FACULTY MEMBERS OF
PHYSICS AND ASTRONOMY

Recent Advances In Astro-Geophysics

OBJECTIVES

The Conference is intended to give the college teachers in physics and astronomy an academic stimulus beyond the regular program of instruction at the undergraduate level.

Though astronomy is the oldest of the sciences, at the present time it does not find a place in the curricula of most colleges. This omission has serious disadvantages. Instruments and methods developed by physicists are a major tool for astronomers and astrophysicists. Recent advances in astro-geophysics contribute a great deal towards teaching of classical and modern physics, through stimulating interest, clarifying concepts, illustrating physical laws, and stressing the need for basic research.

Aspects of recent progress have elicited popular interest to an unprecedented degree. The scientific accuracy of some of the widely publicized accounts of the present so-called "space age" is not what physicists and astronomers would like it to be. In class-room discussions of physics and astronomy, questions come up which teachers often feel they cannot handle adequately with their more conventional training.

The Conference on Astro-geophysics, it is hoped, will help correct these deficiencies.

SPONSORSHIP

The Conference is sponsored by the National Science Foundation.

ELIGIBILITY

Thirty college teachers are eligible. The conferees should be sufficiently young, at least in mind, to benefit from a fairly concentrated program covering a great deal of unfamiliar ground.

The Conference is intended primarily for teachers of physics and astronomy. Teachers of mathematics with sufficient background in astronomy may also benefit from the Conference.

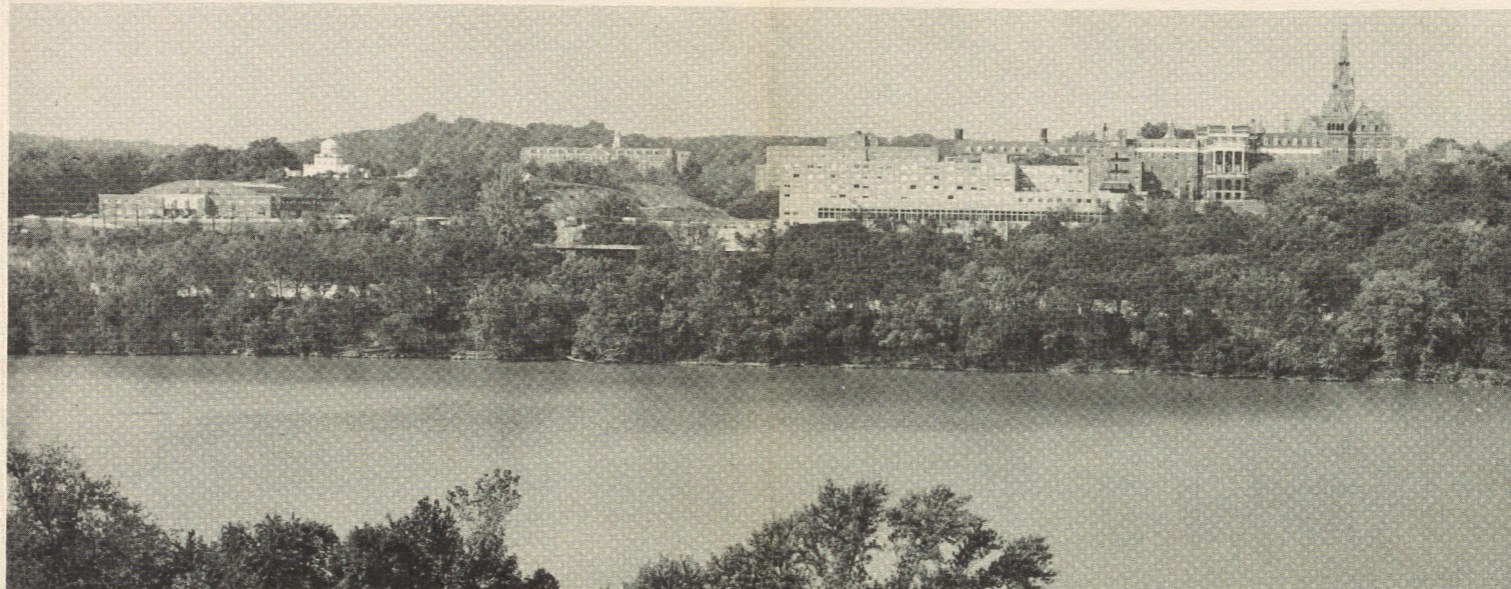
ALLOWANCES

Stipend:

Each participant will receive a stipend of \$350.00 to cover his expenses during the session. The sum will be paid by the Treasurer of the University at the time of registration.

Travel:

Each participant will also receive a travel allowance computed at the rate of 4¢ a mile per one round trip between his home and Washington, D.C.



Georgetown University from across the Potomac

Photo by Bob Young, Jr.

ACCOMMODATION

Lodging:

Dormitory rooms will be reserved for the participants. For men air-conditioned double rooms at the rate of \$43.50, for women single rooms at the rate of \$38.00, for the entire period of the Conference. Families will be guided in finding furnished living quarters in the Georgetown area.

Meals:

The conferees will lunch together on weekdays. A charge of \$24.00 will be made for this service. Other meals may be had on a pay-as-you-go basis, at approximately \$15.00 per week.

Dining hall, cafeteria, Conference hall and lounges are located in the air-conditioned new south building opened in the fall of 1959.

In addition, there are several attractive restaurants in the Georgetown area.

FACILITIES

Equipment:

The observatory building will be used for work with the telescope, computer and spectrographs. The observatory is equipped with the following instruments which will be available for the Summer Conference: a 12" refractor, and a smaller telescope, both on equatorial mounting, one with a prism camera attachment and the other with a large Ross camera, each housed in its own dome, two Wadsworth spectrographs, one in the basement of the main building, and the other in a separate house, with heliostats and other accessories;

a telereadex and a comparator, a telecorder for automatic registering of plate readings, a Burroughs E 101 computer, a Littrow spectrograph.

Libraries:

Besides the libraries of the University and of the observatory, a special library on the topics of the Conference will be located in the Conference hall. There are in addition numerous national and institutional libraries in and about Washington.

Recreation:

The tennis courts and the University Gymnasium will be open to the conferees. A day room will be provided for relaxation and informal meetings. Special sight-seeing excursions will be organized on week-ends for those interested.

THE ACADEMIC PROGRAM

Lectures:

Morning sessions will be devoted to lectures by members of the observatory staff and by invited speakers. The guest speakers include some of the best known names in the current astro-geophysics.

The lectures will be of 2 periods of 50 minutes each, with a coffee break in between and will be followed by a question period.

The first week will be devoted to the basic lectures sufficiently general but not elementary, designed to lay the groundwork for the special topics to be dealt with during the rest of the Conference.

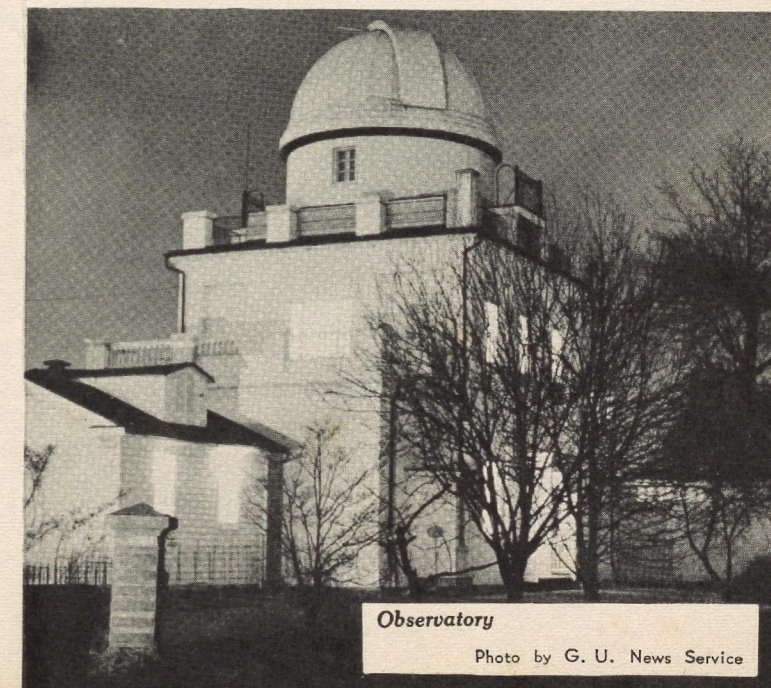
The special topics will be handled by experts, each on his own special field where he has made significant contributions.

Among the lecturers of the Summer Conference are: Prof. A. Cameron, (Victoria Observatory), Rev. Francis J. Heyden, S.J. (Georgetown College Observatory), Dr. Charlotte Moore Sitterly (National Bureau of Standards), Dr. Carl K. Kiess (Georgetown College Observatory), Prof. G. de Vaucouleurs (Harvard College Observatory), Dr. John P. Hagen (Nat. Aeron. and Space Adm.), Dr. R. Tousey (Naval Research Lab.), Prof. John Strong (Johns Hopkins Univ.), Dr. E. O. Hulbert (Naval Research Lab., Retd.).

Mimeographed copies of the lectures will be distributed prior to the Conference.

The Lecture Topics Include:

- Tools of the modern astronomer
- Spectroscopic methods in astronomy
- The solar system
- Terrestrial planets
- Geodetic studies of the earth
- Solar physics
- The milky way and the stars
- Structure and the evolution of the universe
- Radio-astronomical observations
- Satellites and their tracking
- Planetary spectra from balloons
- Ultra-violet studies from rockets
- Upper atmosphere physics
- The Lunar surface
- Interstellar medium
- Production of chemical elements and their distribution
- Cosmic rays
- Galactic studies



Observatory

Photo by G. U. News Service

SPECIAL PROGRAM FEATURES

The afternoons and nights will be devoted to work at the observatory or to field trips. The conferees will be given an opportunity to familiarize themselves with some of the work of the observatory by actually participating in the research.

A few clear nights will be devoted towards mapping the sky with the aid of 12" refractor or a Ross camera.

A small electronic computer, the Burroughs E 101, will be at the disposal of the conferees at selected hours. In a few hours, it should be possible to master the essential stages in programming for the computer and to gain some familiarity with using it for ordinary problems. All the conferees will be able to use the computer for some time.

Some experimental and observational work will also be done with high dispersion spectrographs for the study of laboratory sources as well as of the atmospheres of the planets.

The Field Trips:

The field trips will provide the conferees with the opportunity to visit in a body several important centers of research in and around Washington. Among these are: David Taylor Model Basin, National Bureau of Standards, Melpar Research Corporation, Naval Observatory, Naval Research Laboratories.

Sight-seeing:

Places of interest around Washington are Williamsburg, Battle Fields of the Civil War, Charlottesville, The Skyline Drive, The Chesapeake Bay, etc. Group excursions to these places will be planned to suit the interest of the conferees.



Healy Building

Photo by Bob Young, Jr.

APPLICATIONS

For applications please write to the Director of the Conference. Address: Rev. M. P. Thekaekara, S.J.
Georgetown University
Washington 7, D. C.

Application should be in the mail by May 15th.
Selection of participants will be announced on June 1st.
Deadline for acceptance or rejection of invitations is June 15th.

SUMMER CONFERENCE ON ASTRO-GEOPHYSICS
GEORGETOWN UNIVERSITY
WASHINGTON 7, D. C.

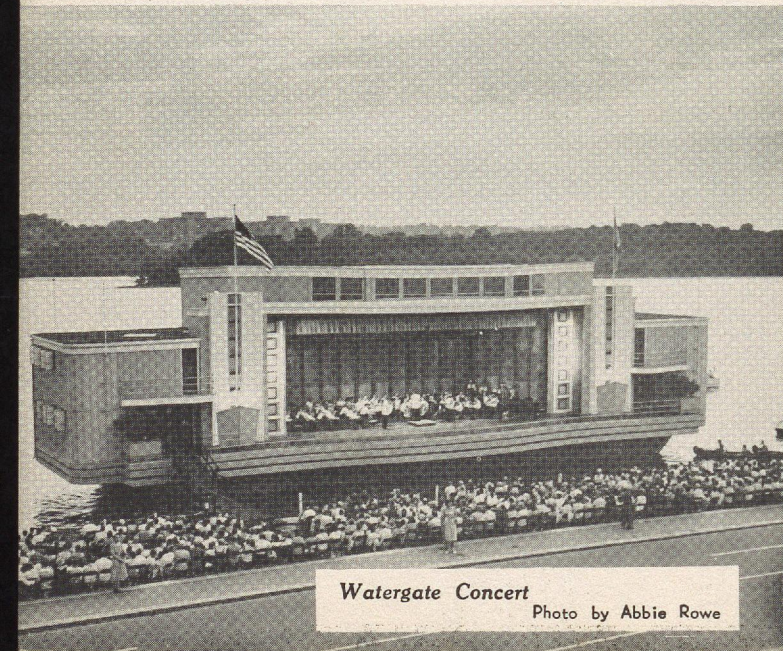
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PAID

WASHINGTON, D. C.

Permit No. 3901



Watergate Concert

Photo by Abbie Rowe

SUMMARY SHEETS FOR A PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION
FOR SUPPORT OF A SUMMER CONFERENCE FOR COLLEGE TEACHERS
OF **SCIENCE OR MATHEMATICS**

I. Subject of proposed conference: RECENT ADVANCES IN ASTRO-GEOPHYSICS

II. Georgetown University, Washington 7, D.C.
(Name and address of host institution)

III. Prof. Dr. Mr. (or: Rev.) Matthew P. Thekaekara, S.J.
(Underline or add term) (Name of conference director)

Asst. Prof., Physics & Astronomy Georgetown University, Washington 7, D.C.
(Director's academic title) (Director's business mail address)

FE. 7-3300, Ext. 577 FE. 7-3300
(Director's office phone) (Director's home phone)

IV. Length of conference: 24 days; August 1 through August 24, 1960
(Beginning date) (Ending date)

V. Number of stipends desired: 30

VI. Indicate group for whom conference is intended: College Teachers of Physics,
Astronomy and Mathematics.

VII. Total amount requested from the National Science Foundation: \$ 20,989.10
(See Budget on next page.)

VIII. Matthew P. Thekaekara, S.J. Joseph F. Cohalan, S.J., University Treasurer
(Signature of Director) (Title and signature of an official authorized
to sign for the host institution)

December 11, 1959
(Date)

(Signatures are needed on only one copy.)

BUDGET FOR PROPOSED 24 DAY SUMMER CONFERENCE AT Georgetown University, Washington, D.C.
(Institution)

A. Support of Participants

1.	<u>30</u> stipends at \$ <u>360.00</u> each	\$ <u>10,800.00</u>
2.	<u>30</u> travel allowances at \$ <u>80.00</u> each	<u>2,400.00</u>
3.	Total for Support of Participants	\$ <u>13,200.00</u> (A)

B. Operational Costs

Staff (including salaries, honoraria, travel, etc.)		
*4.	Director (total amount for conference)	\$ <u>1,300.00</u>
*5.	Staff (How many? <u>5</u>)	<u>1,000.00</u>
*6.	Lecturers (How many? <u>8</u>)	<u>2,000.00</u>
7.	Secretarial and clerical	<u>1,000.00</u>
*8.	Assistants or other staff	<u>300.00</u>
*9.	Retirement	<u>264.00</u>
10.	Subtotal for Staff	\$ <u>5,864.00</u>

Other Direct Costs

11.	Office supplies, printing, publicity	\$ <u>500.00</u>
12.	Cost of laboratory materials (if any)	<u>300.00</u>
13.	Field trips (if any)	<u>250.00</u>
*14.	If required: Health service or insurance, and similar costs incurred by the institution on behalf of participants	<u>120.00</u>
*15.	Miscellaneous direct costs	
16.	Subtotal for Direct Costs other than Staff	\$ <u>1,170.00</u>

17. Total Direct Operational Costs: Add lines 10 and 16 \$ 7,034.00

18. Allowance for Indirect Costs (up to 15% of line 17) 1,055.10

19. Total Operational Costs: Add lines 17 and 18 8,089.10
(B)

20. Operational Cost per Participant per Day: Divide
line 19 by No. of stipends and by No. of days . \$ 11.24

C. Fees (registration, credit fees, tuition, etc.)

21.	<u>Registration</u> at <u>5.00</u>	\$ <u>150.00</u>
22.	<u>Tuition</u> at <u>70.00</u>	<u>2100.00</u>
23.	Total for Fees	\$ <u>2,250.00</u>

24. Total Operational Costs in excess of Fees:

Subtract line 23 from line 19. Record remainder 5,839.10

25. Total Cost of Conference: Add lines 3, 23, 24. Record sum \$ 21,289.10

D. Contributions from Sources other than NSF

*26.	Contribution from host institution	\$ <u>300.00</u>
*27.	Contribution from	
28.	Total Contribution from Sources other than NSF	\$ <u>300.00</u>

Total amount requested from National Science Foundation:

Subtract line 28 from line 25. Record remainder \$ 20,989.10

*STARRED ITEMS IN PARTICULAR SHOULD BE ITEMIZED,
ELABORATED, OR EXPLAINED, ON THE NEXT SHEET.

BUDGET DETAILS

(On this sheet please make any necessary or desired explanations or elaborations.)

A. Support of Participants

Maximum travel allowance, \$80, has been requested, since ours is likely to be the only one of its kind.

B. Operational Costs

Staff

Please supply the requested information concerning the conference Director.

The time that the Director will devote to the conference during the days it is in session will comprise what percentage of a normal work load? (Do not record more than 100%) 100 %

Will this include teaching (including lecturing) in the conference? Yes

How will the Director's time during the days the conference is in session be divided between teaching in the conference and administration in the conference? Teaching: 10 %
Adminstr.: 90 %

Total conference salary for the Director for teaching (if any) and administration for the days the conference is in session \$ 700.00

Allowance (not to exceed four weeks) to Director for work preceding and following the conference. (See instructions.) \$ 600.00

Allowance for dislocation, necessary travel for conference, etc. \$ _____

If any, explain:

Totals for the three preceding items. \$ 1300.00
(Record this total on line 4 in BUDGET.)

Elaboration concerning the above or any other Staff items:

- B4 Director's salary is calculated from his academic salary, for the time of the Conference and three weeks preceding it.
- B5 Staff salary includes the lectures and the assistance at the afternoon or night sessions. Staff members will give about ten of the lectures.
- B6 Includes copying the lectures from tape records to stencils.
- B8 Two research assistants at \$150 each to assist with telescope, computer, etc.
- B9 Retirement is calculatated at 8% of staff and secretarial salary.

Other Direct Costs

- 11 Includes printing of the lectures.
- 12 Computer time, photographic equipment, etc., to be contributed by the Observatory.

C. Fees

22 Tuition was calculated taking the Conference to be equivalent to a 3-Credit Course.

D. Contributions from sources other than NSF

26 Computer time, plates, major part of the cost of printing the lectures.

Summer Conference
on
Recent Advances in Astro-geophysics

A Summer Conference on recent advances in astrophysics is to be held at Georgetown University from August 1 to August 24, 1960. The National Science Foundation is the sponsor for the Conference.

THE HOST INSTITUTION

The Georgetown University will be the host institution for the Summer Conference, and the staff of the Georgetown College Observatory will direct its academic activities. The Georgetown University, founded in 1789, is the oldest Catholic institutions of higher learning in the United States. Its white-domed observatory, which dates back to 1841 occupies the picturesque hilltop at a remote corner of the large campus and overlooks the many university buildings, the Potomac River, and the nation's capital, which has grown around and beyond historic Georgetown.

one of

The University comprises the College of Arts and Sciences, Graduate School, School of Medicine, Law School, School of Dentistry, School of Foreign Service, School of Nursing, Institute of Languages and Linguistics, School of Business Administration, Summer School, Astronomical Observatory, and Seismograph Station. The total enrollment is approximately eight thousand. Course offerings lead to Bachelor's, Master's, and Doctor's degrees in most areas.

The Summer School of the University (enrollment 1900), besides conducting regular courses at the graduate and undergraduate level, has in recent years also administered institutes and conferences for specialized groups of participants. These programs have been under the sponsorship of the National Science Foundation and other agencies. An Institute for high school teachers of mathematics, a Conference for college teachers on Basic Concepts in Physics and Mathematics, and a Conference on Literary Criticism were conducted by the Summer School of 1959.

MAJOR OBJECTIVES OF THE CONFERENCE

The basic plan for this Conference was drawn up in a series of informal discussions among faculty members of the Georgetown College Observatory. The Conference is intended to give to college teachers of physics and astronomy an academic stimulus beyond the regular programs of instruction at the undergraduate level. Though astronomy is the oldest of the sciences, at the present time, it does not find a place in the curricula of most colleges. This omission has serious disadvantages. Instruments and methods developed by physicists are a major tool for the astronomer and astrophysicist. On the other hand, recent advances in astro-geophysics contribute a great deal towards the teaching of classical and modern physics, through stimulating interest, clarifying concepts, illustrating physical laws, and stressing the need for basic research. A few of the aspects of the recent advances have elicited popular interest to an unprecedented degree. The scientific accuracy of some of the widely publicized accounts of the present so-called "space age" is not what physicists and astronomers would like it to be. In classroom discussions of physics and astronomy, questions come up which teachers often feel they cannot handle adequately with their more conventional training. A conference of the kind we are proposing should contribute towards correcting this deficiency.

THE ACADEMIC PROGRAM

The program of the Conference devotes the morning sessions to lectures and the afternoons or nights to experiment, observations, or field trips. The lectures will last for two periods of 50 minutes each, with a coffee break in between, and will be followed by a question period. They will attempt a survey

of the results which the astronomer obtains when he applies the tools of physics to his subject. Emphasis will be placed on the physics of the bodies of the solar system, in particular the earth, insofar as our knowledge is based upon visual, spectroscopic, rocket, satellite, and radio-astronomical methods. The first week will be devoted to basic lectures, sufficiently general but not elementary, designed to lay the ground-work for the special topics to be dealt with during the following two weeks. Topics for the two following weeks will be handled by experts, each on his own special field where he has made significant contributions. ~~Mimeographed copies of the lectures will be distributed and the collected lectures will be published in the Georgetown Observatory Monograph Series.~~ The large collection of slides at the observatory will be used to illustrate the basic lectures and also some of the special lectures if the speakers so desire. A total of 20 lectures are listed below, for the sake of completeness, though a few of these may have to be dropped because competent speakers are unavailable. The staff members of the Georgetown Observatory have already been consulted about their special topics, but the listing of guest-speakers is tentative. ~~Our experience with the monthly Astronomical Colloquia of the Georgetown Observatory over the last several years makes us fairly confident of eliciting the cooperation of most of the guest-speakers.~~

Lecture Topics

First Week:

- 1 ~~2~~ 1. Tools of the Modern Astronomer (Francis J. Heyden, S.J.) *after noon*
- 2 ~~3~~ 2. Spectroscopic Methods in Astronomy (~~Carl C. Kiess~~) (*M. P. Thekaekara*)
- 3 ~~4~~ 3. Physical Properties of the Solar System (~~Jules De Kort~~) *In Kiess*
- 4 ~~5~~ 4. The Milky Way and the Distribution of Stars (Vera Rubin)
- 5 ~~6~~ 5. External Galaxies (Vera Rubin)
- 6 ~~7~~ 6. Current Astrophysics (~~Matthew P. Thekaekara~~) *DC*
- 7 ~~8~~ 7. Geodetic Studies of the Earth (Pasquale Sconzo)

Second Week:

- 9 ~~10~~ 1. Satellites and their Tracking (Jules De Kort)
- 10 ~~11~~ 2. The Planet Mars (G. de Valcouleurs, Harvard) *① 60 Gardner St.*
- 11 ~~12~~ 3. Planetary Spectra (Carl C. Kiess)
- 12 ~~13~~ 4. Radio-Astronomical Observations of the Planets (John Hagen, *①*
National Aeronautical and Space Agency) *25/*
- 13 ~~14~~ 5. Solar Studies from High Altitude Balloons (M. Schwarzschild, *Phys Astro.*
Princeton)
- 15 ~~16~~ 6. Planetary Spectra from Balloons (John Strong, Johns Hopkins) =
- 16 ~~17~~ 7. The Lunar Surface (Gerard Kuiper, Yerkes; ~~or Alexander Corpacia~~)
Obs - Williams Bay, Wisconsin

Third Week:

- 17 ~~18~~ 1. Upper Atmosphere Physics (Frederick Singer, U. of Maryland) =
- 18 ~~19~~ 2. Ultra-violet Studies from Rockets (Herbert Friedman, *NRL*; or
R. Tousey, *N.R.L.*) *Optics Division. U.S. 25/*
- 19 ~~20~~ 3. Interstellar Medium (Francis J. Heyden, S.J.)
- 20 ~~21~~ 4. Production of Chemical Elements and their Distribution
(A. Cameron, Victoria Observatory) = *B. C. Canada*
- 22 ~~23~~ 5. Cosmic Rays (P. Morrison, Cornell; or F. Singer, U. of Maryland)
- 23 ~~24~~ 6. Galactic Studies (G. de Valcouleurs, Harvard; ~~or Vera Rubin~~) *②*
- 24 ~~25~~ 7. Recent Advances in Astro-Geophysics (Matthew P. Thekaekara)

Instructional Staff

The following are the members of the Georgetown Observatory Staff who will lecture at the Conference:

Francis J. Heyden, S.J., Ph.D Harvard, Director of Georgetown

Observatory - Specialty, Statistical Astronomy, Geodetic Measurements through eclipse observations.

Carl C. Kiess, Ph.D. U. of Cal., Ret'd Physicist, National Bureau of Standards, Asst. Professor, Georgetown University, Spectroscopist, has published over 200 articles.

Matthew P. Thekaekara, Ph.D. Johns Hopkins, Asst. Professor Georgetown U. Depts. of Physics and Astronomy, Spectroscopist, developed the automatic methods with the G. U. E 101 Computer.

Vera C. Rubin, Ph.D., Georgetown U., Asst. Prof., G. U., Dept. of Astronomy, Specialty Galactic Structure.

Jules de Kort, Ph.D., U. of Leyden, Netherlands, Asst. Professor, G. U., previously a member of the Staff of the Vatican Observatory for nine years, Specialty, Celestial Mechanics.

Pasquale Sconzo, Ph.D., U. of Palermo, Italy, Asst. Professor, G. U., Specialty, Dynamical Geodesy.

Alexander Corpaciu, Ph.D., U. of Zurich, Switzerland, Asst. Professor, G. U., Specialty, Geodesy, Reduction of Observations of Rocket flares and Satellites.

The guest speakers we propose to invite are all Ph.D.'s and have contributed a great deal in recent years to progress in the specialized fields with which their names are associated.

Special Program Features

The afternoons or nights will be devoted to work at the Observatory or to field trips. A technicolor film entitled "An Astronomer at Work" on the research activity at the Georgetown Observatory will be shown early in the Conference. The conferees will be given an opportunity to familiarize themselves with some of the work at the Observatory by actually participating in the research. A few clear nights will be devoted to observing and mapping the sky with the aid of the 12-inch refractor or the Ross Camera in the small dome. This we believe would prove of great interest to most physicists.

The small electronic computer, the Burroughs E 101 will also be at the disposal of the Conference for selected hours. In a few hours it should be possible to master the essential stages in programming for the computer and to gain some familiarity with using it for ordinary problems. All the conferees will be able to use the computer for some time.

Some experimental and observational work will also be done with the two high dispersion spectrographs, both Wadsworth mounting, for the study of laboratory sources as well as of the atmospheres of the planets. No exact schedule has been drawn up for this part of the Conference program since nights suitable for telescope work depend on the weather conditions. Several members of the Observatory staff and two research assistants (senior graduate students) will help in carrying out this part of the program.

The field trips will provide the conferees with the opportunity to visit in a body several important centers of research in and around Washington. Our experience with the Summer Conference in 1959 for college teachers of physics and

mail to the Conference Director a typed copy of the
~~it has been suggested~~ a book
except perhaps at the undergraduate level, a "text book"
for the Conference or a "Symposium" will be prepared
beforehand by the ~~speaker~~ lecturers participating in the
Conference. The lecturers will be requested to mail to
the Conference Director a typed text of ~~a page or~~
articles ^{of about 2000 words} covering the main points ~~that~~ ^{each one} intends to dis-
cuss at ~~the~~ ^{his} lecture. The "Symposium" will be available
for distribution to a fairly wide audience after the Conference.

Budget

The National Science Foundation has provided
under operational costs (including honoraria and
travel, etc.) ~~also~~ a total of \$ 2000.00 for
invited lecturers. ~~There~~ There will be 8 to 12
invited lecturers.

chemistry shows that the conferees will be cordially welcomed at these centers and that they will benefit greatly from the visits. Among the centers which we plan to visit are the David Taylor Model Basin, the National Bureau of Standards, the Melpar Research Corporation, the Applied Physics Laboratory and the Naval Research Laboratories, and the Naval Observatory.

ACADEMIC CREDIT

Since the course of lectures has been planned after a great deal of consultation among the staff members of the Observatory, there was some hesitation about not offering graduate credits for the course. However, it was decided not to offer credits. We were guided by the remarks of Dr. R. Henderson, Director of the Summer Conference, 1959, who wrote as follows in his Director's Report: "I believe it important that a conference of this kind maintain a relaxed atmosphere, free from pressures of formal courses, examinations and grades.... From the national standpoint the leading object of the Conference program should be to enable teachers in smaller colleges, weighed down throughout the year as they are with general courses and humdrum duties, to enjoy a change of mental scene in company with their peers."

CRITERIA FOR ELIGIBILITY

The participants should be college teachers with at least three years of experience, but still sufficiently young, at least in mind, to benefit from a fairly concentrated program covering so much unfamiliar ground. The Conference is intended primarily for teachers of physics and astronomy. Teachers of mathematics with sufficient background in astronomy may also benefit from the Conference. Since ours is likely to be the only program on this subject in the country, we are setting no geographical limitations in criteria for eligibility.

Since few, ~~if any~~, of the participants of the conference will have had

FACILITIES

A. The morning sessions will be held in air-conditioned classrooms.

B. The Observatory buildings will be used for work with the telescopes, computer and spectrographs. The Observatory is equipped with the following instruments which will be available for the Summer Conference: a twelve inch refractor, and a smaller telescope, both on equatorial mounting, one with a prism camera attachment and the other with a large Ross camera, each housed in its own dome, two Wadsworth spectrographs, one in the basement of the main building, and the other in a separate house, with heliostats and other accessories; a telereadex and a comparator, a telecordex for automatic registering of plate readings, a Burroughs E 101 computer, a Littrow spectrograph.

The University bus will be available for the field trips.

C. The libraries of the university, the gymnasium and the tennis courts will be open to those attending the Conference. Information concerning theaters, concerts, sight-seeing opportunities, beach resorts, etc., may be obtained from the office of the Director. Special trips to nearby places of interest will be arranged on week-ends. Evenings (or afternoons when night observation is scheduled) and week-ends are free. An air-conditioned drawing room in one of the new dormitories will be set apart for the use of the participants.

A formal training in astronomy or astrophysics, ~~the following detailed~~ presentation of the subject to be dealt with at each lecture will be made available to the conferees in mimeographed form before the ~~of~~ lectures. The speakers will therefore be requested to

D. Dormitory rooms will be reserved for the participants: for men, air-conditioned double rooms at the rate of \$43.50; and for women, single rooms at the rate of \$38.00 for the entire period of the Conference. Families will be guided in finding furnished living quarters in the Georgetown area. On weekdays the conferees will have luncheon together. Other meals may be had on a pay-as-you-go basis, at approximately \$15.00 per week. Dining halls and cafeteria are both located in the air-conditioned New South Building opened in the fall of 1959. In addition there are several attractive restaurants in the Georgetown area.

Oct 1960

DIRECTOR'S REPORT

SUMMER CONFERENCE

For College Professors of Physics and Astronomy,

On

RECENT ADVANCES IN ASTRO-GEOPHYSICS

August 1 - August 24, 1960

GEORGETOWN UNIVERSITY, WASHINGTON 7, D. C.

Director - Rev. H.P. Thekkakara, S.J.

I. INSTITUTE OPERATION

The aim of the Conference was to give to college professors of physics and astronomy an academic stimulus beyond the regular program of instruction at the undergraduate level.

That astronomy, though the oldest of the sciences, is taught at present in few colleges at the undergraduate level has major drawbacks. Recent advances in astro-geophysics contribute a great deal for the teaching of physics, through clarifying concepts, stimulating interest, suggesting new lines of research. And conversely the tools of the astronomer are mainly those developed by the physicists for their specific problems.

The over-all plan of the Conference was admirably summarized in the first two paragraphs of the Editorial which the Washington Post published on August 24, the final day of the Conference.

"The summer conference for teachers of physics and astronomy at Georgetown University under the aegis of the National Science Foundation has attracted a good deal of national interest and has apparently been a great success. The purpose of the conference was to acquaint the teachers with the newest developments in two important fields - geophysics and astrophysics - in which the pace of research and discovery has been most rapid.

"Thus, although many of the teachers who have been attending the conference are themselves relatively recent graduates of university scientific schools, they were painfully aware of a gap between their own knowledge and that of the more advanced experimental scientists. It was to close this gap that the teachers were assembled to hear the reports of eminent specialists in the various subdivisions of the two sciences."

The plan submitted to the National Science Foundation in the original proposal was substantially adhered to in the actual operation. We

had lecture sessions in the mornings, field trips to research centers or work at the observatory in the afternoons or nights.

The lecture topics and the lecturers were :

The tools of the Modern Astronomer, Francis J. Heyden, Director Georgetown College Observatory.
Astrophysical Research with High dispersion Instruments, Carl C. Kiess, Georgetown College Observatory.
Spectroscopic methods in Astronomy, Matthew P. Thekaekara.
The Milky Way, Francis J. Heyden, Georgetown College Observatory
Physics of the sun, C. E. Moore, The National Bureau of Standards.
Lunar Mapping Problems, Chester B. Watts, The U.S. Naval Observatory.
Comets, Carl C. Kiess.
Satellite Tracking, John O'Keefe, National Aeronautics and Space Administration,
New developments in Geodesy with Special implications for the Earth's Interior, John O'Keefe.
The Terrestrial Planets, Gerard de Vaucouleurs, Harvard College Observatory.
Ultraviolet Studies from the Rockets, Richard Tousey, U.S. Naval Research Laboratory.
Planetary Spectra from Balloons, John Strong, Johns Hopkins University.
Radioastronomical Observations of the Moon and the Planets, John P. Hagen, National Aeronautics and Space Administration.
Interstellar Medium, Francis J. Heyden.
Production of Chemical Elements and their Distribution, Alastair G. W. Cameron, Mount Wilson and Palomar Observatories.
Cosmic Rays, Vera C. Rubin, Georgetown College Observatory.
Galactic studies, Vera C. Rubin.
Galaxies, Gerard de Vaucouleurs.

Four of the lecturers whom we had originally planned to have, could not be present, but others equally competent were found and no substantial change had to be made in the topics which we had planned to cover. Some minor adjustments in dates had to be made to suit the speakers, but without sacrificing the logical development of the main theme.

Field trips were made to the following research centers in and around Washington, D.C. : Diamond Ordnance Fuze Laboratory, The U. S. Coast and Geodetic Survey, The U. S. Naval Observatory, The David Taylor Model Basin, The Johns Hopkins Applied Physics Laboratory, The U. S. Naval Research Laboratory, The U. S. National Bureau of Standards, The Space Computing Center. The travel by the air-conditioned bus and the cordial reception at each place made all the field-trips equally enjoyable. Vast areas of research were covered, though at times all too briefly, and unhappily not always at the academic level which best suited the participants of the Conference.

The experimental and observational projects at the observatory were on a very flexible plan. The participants had the opportunity to familiarize themselves with the telescopes, the high dispersion spectrographs, the electronic computers, the automatic techniques for data reduction, etc.

Unhappily few nights were favourable for extensive use of the telescope. The Echo Balloon Satellite which started orbiting about the same time we began our Conference gave us some valuable experience in photographing it with accurate timing devices.

The courses were all at the graduate level. We do not plan to

make them standard offerings in our department of astronomy. Several of the College Professors who attended the Conference have since bought extra copies of the Topical Symposium of the Conference which we had prepared, and are now using it for their courses.

II. STAFF

The members of the Georgetown College Observatory Staff who took charge of the lecture sessions were : Francis J. Heyden, Carl C. Kiess, Vera C. Rubin and Matthew F. Thekaekara. Vera C. Rubin's services were invaluable in the initial stages of planning the conference, for choosing the lecture topics and the speakers. The other three faculty members as also three of our senior graduate students, G. Coyne, H. Banks, and K.V. Varkey were helpful in guiding the participants through the intricacies of the observatory equipment.

Our guest speakers were : John P. Hagen, Chester B. Watts, Charlotte E. Moore, John O'Keefe, Richard Tousey, John Strong, A.G.W. Cameron and Gerard de Vaucouleurs. Dr. Vaucouleurs and Dr. Cameron had to make fairly long trips to come to the conference. Dr. Strong came from nearby Baltimore, Maryland. All the other speakers are residents of Washington. We experienced little difficulty in getting competent speakers, since the subject, "Space-science", is one for which Washington, D.C. has perhaps the highest concentration of experts.

The compensation we offered to the speakers was entirely adequate. It would seem that the compensation is a major consideration to the University and not to the guest speakers. The University likes to maintain certain established traditions of hospitality; whereas the lecturers are very happy to speak about their specialty to a highly select audience such as the one which the Conference could bring together.

We had requested the speakers to send us about a month ahead of the Conference a short paper giving the summary of what they would be discussing at the lecture. Though most of the lecturers mailed in their papers on schedule, the few who did not meet the deadline caused a great deal of time and worry. Thanks to the cooperation of our typists and the printing department, the brochure of the Conference was ready before the participants arrived. The brochure was published on the budget of the Georgetown College Observatory.

III. SELECTION PROCEDURE

The application blank was fairly simple. It asked for standard items of educational and biographical information and a full statement of the applicant's interest, background, and purpose in wishing to attend the Conference. In a printed folder concerning the Conference we had stated: "The conferees should be sufficiently young, at least in mind, to benefit from a fairly concentrated program covering a great deal of unfamiliar ground." We received seventy applications, and practically all of them of fairly high academic ability. Three members of the Observatory Staff, Kiess, Rubin and Thekaekara, studied the applications. The selection was based upon the answers we could give about each applicant to the following questions : How adequate is the applicant's academic background for lectures at a fairly advanced level? How keen does the applicant seem to be on being selected for this Conference? How far would his selection further the aims of the N.S.F. in sponsoring the Conference? In other words, we tried to select men who could derive maximum benefit from the Conference, and make maximum

contribution to College teaching.

A modified scheme of quality point index was used to give to each applicant a rank in order of preference. Of the thirty who ranked highest and were invited to the Conference, four had to decline the invitation; and their places were promptly filled by the next four in rank. During the week before the Conference three more requested to be allowed to attend the Conference at their own expense and without stipend. Since their qualifications were more than adequate, invitations were extended to them also.

In the printed folder we had announced May 15 as deadline for applications, June 1 for selection of participants, and June 15 as deadline for rejection or acceptance of invitations. Since most applications reached us before May 15, on May 18 we sent out the first thirty invitations and within another week the other four invitations. The final list was ready before June 1st.

IV. ADMINISTRATION

Housing was entirely satisfactory. Those who came with their families could find lodgings far more easily than we had anticipated. August is the time when many Washington residents are out of town. The five Sisters who lived on campus had a dormitory to themselves along with other Sisters of the Summer School. Arrangements in the Sisters' building were almost as perfect as in their own houses. The most uptodate arrangements could be made for the unmarried men, in the air-conditioned dormitory which housed also the dining halls and the Conference room.

Meals : All participants lunched together on week days. They had breakfast and dinner in the University Cafeteria on a pay-as-you-go basis. Sundays did cause some inconvenience since the Cafeteria in the dormitory was closed and the men had to go to the hospital Cafeteria at the opposite end of the campus.

The attractive tennis courts just in front of the dormitory proved a disappointment to some since they had not been warned that the University has no system for renting out tennis rackets. But when they were not busy on field trips or at the observatory, there was enough to do, reading up on the next day's lecture or sight-seeing in the nations capital. The participants of the Conference and the observatory staff were a homogeneous group which enjoyed a great deal each other's company.

Early in the Conference we had a "Cook-out" on the Observatory Hill. The presence of the wives and children of so many of the conferees, the picturesque surroundings of the hill-top, the out-door grill, and the sumptuous steak dinner with all trimmings, made it a memorable occasion. The President of Georgetown University took this occasion to meet each of the participants.

Later in the Conference an evening reception was arranged by the officers of the Summer School. Another reception on a more elaborate scale for the participants and lectures of the Conference and for their wives was given by Dr. Vera C. Rubin at her residence. Dr. William E. Morrell, Program Director for Summer Institutes, National Science Foundation, was graciously present for this reception. This gave an occasion for the Conferees to express their thanks directly to the N.S.F. for sponsoring the Conference. They did so by reading out in public a letter which they had written, and presenting it to Dr. Morrell.

V. EVALUATION

The impact of the Conference on the participants can best be seen from a letter which they all planned together and to which all of them put their signatures. The letter was read out during the party at Dr. Rubin's residence and was presented to the Director.

"Dear Father Thekaekara :

The undersigned members of the Conference on recent advances in astro-geophysics have felt that it would be most fitting to express to you, and through you to the other members of the astronomy department, our deepest appreciation for a thoroughly stimulating and pleasant three weeks. We have all remarked that you have established the highest of standards for a conference of this type: all of us will leave with regret but certainly better informed and we hope more capable college teachers.

You have succeeded in providing a diversified series of topics with a highly qualified group of lecturers-- certainly no mean task. The syllabus alone must represent long hours of careful preparation. The work on projects, and the freedom of interest allowed, has proved most informative and suggestive of future ideas for our varied schools. And the field trips and social activities have been most pleasant-- the former adding to our understanding of private and government scientific work around Washington and the latter providing refreshing interludes of informal discussion.

The facilities for meals and for rooms have been most delightful. The lounge with its papers and books has provided diversity as has the program of summer movies available to us. The opportunity to use libraries and observatory facilities has been quite fruitful to us all. But above all the careful planning has given us the leisure to discuss new ideas and mutual problems with one another.

May we then thank you sincerely for a conference which has stimulated and satisfied us, informed and improved us as teachers, and opened to us new friendships and new frontiers. You, Father Heyden, Dr. Kiess, and those connected with helping us in our projects so patiently and well deserve our deepest thanks. Will you also express to the University administration our gratitude for their many kindnesses?

We thank you,"

That our Conference "established the highest of standards for a conference of this type" is a rather strong statement. It proves more the kindness of heart than the scientific accuracy which should have been expected from a group in which there were twenty-two men with doctorate degrees.

Our Conference did at any rate attract a lot of public attention. The Public Relations Office of the university informed the city newspapers that something unusual was happening on the Georgetown Campus. Space - Science has a glamour all its own especially in Washington. Seven of the lectures were reported extensively in the Washington Post. On two occasions long accounts with pictures appeared in the Ladies' Section, thanks to the Sisters and to Mrs. Vera Rubin. There was also an Editorial on the last day, as well as a news story in the Sunday Edition on the Conference as a whole and the Director. Since the Director happened to be an Indian, the U. S. Information Agency cabled the news story to New Delhi and it was later carried by many papers in India. Three of the participants of the Conference were invited by the Georgetown T.V. Forum to appear on a panel to discuss the

Georgetown Conference and the aims of the N.S.F. in sponsoring Conferences of this type. The T.V. Panel discussion was later broadcast by some 200 stations across the nation. The N.B.C. interviewed the Director two days after the Conference on a live show. All this is quite unusual for a scientific Conference which aimed at a high academic level, away from the footlights of publicity.

A question might be asked what it was that made the Conference apparently so successful. Perhaps the answer is that the success was apparent, not real. Every Conference of this type leaves the participants highly enthusiastic. We are all accustomed to conventions of three or four days with crowded hotel lobbies where strange faces bump into each other continually. A physicist once remarked that the mean free path of these men is directly proportional to the expected time-distance from the next academic position. It was a quite different experience to have a conference instead of a convention, with larger impact parameters and longer mean free path. In an atmosphere of leisure, without the heavy workloads of lectures and other responsibilities, with no deadlines to meet, no telephones to answer, we could talk with each other and study the new developments in a fascinating field. The lectures were of course important; but they were only a part of what made the Conference. Every Conference of this type has its characteristic energy distribution curve, of Maxwellian or Planckian shape. The lectures contribute the long, high-energy tail of the curve. The main contribution, the peak in the middle is from the conferees themselves. Newton compared himself to a child picking shells by the sea-shore. We men who came together for this conference all had our separate scientific excursions on distant shores, and shells of many different qualities, some of surpassing beauty, were there in the collection for the others to admire. All these statements about our conference only go to show that we just do not know whether the conference was the success it seemed to be, and that if it was, the reason why is hard to analyze. We all, conferees and staff who took part in it liked the Conference. One does not cull the fragrance of a flower by plucking its petals.

But we did make an attempt to pluck the petals. We distributed a questionnaire to all the participants towards the end of the Conference. One of the questions was: "How well has this Conference achieved the general aims of the N.S.F. in sponsoring these Conferences?" The answers were admittedly an uninteresting monotony - "Excellently" - "My feeling in this matter is fully expressed in the letter to the N.S.F." - "Colossal, terrific, wonderful" - "Absolutely yes" - "Excellently, I learnt a lot, and also got a few ideas" - "Very well, in stimulating interest, and creating new areas of research" - "The general aims were achieved and surpassed" - "N.S.F. got its money's worth; very good Conference." Some of the answers were longer, but all were in the same line.

The questions were :

- 1) "Was the time correctly apportioned between lectures, field trips and projects?" Almost every one said yes. A few had helpful comments. Perhaps the Projects needed better direction.
- 2) "Mention one or two field trips which you thought most profitable?" Each field trip was singled out by at least two. The best liked were, in order of preference, Naval Observatory, Naval Research Lab., Johns Hopkins Applied Physics Lab., and Diamond Ordnance Fuze Lab.
- 3) "Please comment on the projects" - The comments were many and showed a wide spectrum of preferences. Some liked the open doors policy, the flexibility of arrangement. Others felt they would have profited more if we had more organization, more formal instruction.

4) "Mention one or two lectures which in your opinion were most stimulating.

"Are there any lecture topics which you think should have been included?"

"What lecture topics, if any, you think could have been stressed less?"

Here again there was a wide spectrum of opinion, some preferring certain topics, others preferring other topics. All replies taken together, the conclusion would be that we might continue with the same topics for next year if we hold another Conference. The change, if any, should be for more emphasis on theory, less on presentation of experimental data.

Georgetown University has at present no formal program of pre-service teacher training. But the success of this Conference for college teachers and perhaps in an equal measure the success of the institute for high school mathematics teachers, help to emphasize the obligation of a large university with our facilities and our long tradition to participate in these programs sponsored by the N. S. F. and other agencies. The physics department is considering the feasibility of an In-service Institute for high school teachers.

VI. RECOMMENDATIONS FOR THE FUTURE

There is reason to believe that August 7 would be a better time for starting a three week Conference. August 1st is too close to the end of the first summer session in many colleges. Five of our conferees suggested a week later as the best time.

We should have sent ahead of time specific directions as to how to reach the university, and once on the campus, how to get one's key and find one's room. The street directions in the city can be very confusing to an out-of-town motorist, and we had not anticipated that so many would be coming by their own car. We caused some confusion to the house-keeping staff who are more accustomed to undergraduate students than to college teachers since the usual long formalities of registration were dispensed with. However the director was on hand to receive personally most of the conferees as they arrived.

In the questionnaire we inquired what was each one's source of information about the Conference. Eleven persons learnt of the Conference from the N.S.F. announcement which they received from the Chairman of the department, and ten from the folder about the Georgetown Conference which they received in their personal mail. The folders which we sent to the Deans of Colleges were also of some help, though considerably less so. The notices which appeared in Physics To-day, AAS Bulletin, and Albertus Magnus Guild Bulletin were mentioned by a few. It would seem that a folder received in the personal mail claims the best attention and would be the most effective.

We also inquired in the questionnaire about the travel expenses, whether they exceeded the N.S.F. allowance. For 40 per cent of the conferees the N.S.F. travel allowance fully covered actual expenses; for the others the average excess of actual expense over the allowance was \$30.00 per head. It might well be doubted whether this small excess is not more than covered by the per diem stipend. At any rate no one thought that the N.S.F. grant was too small. When the checks were distributed several graciously asked: "All this and a check too?"

Two of the participants strongly urged the Director that he should send in to the N.S.F. a report on the special steps taken in planning the Conference. From this distance of three months one begins to wonder whether

those steps were so very special. Speakers and topics were chosen very carefully. Doubts were expressed by many as to the feasibility of a "Topical Symposium" of lectures to be published prior to the Conference, all the more so because expenses for printing are not provided in the N.S.F. Budget. The typing of the masters for the symposium took a great deal of time. Special efforts were made to print an attractive folder and to mail it out to a large number of selected individuals. All applications were acknowledged immediately and detailed replies were given to all inquiries. For the men's dormitory and the Conference room the very best on the campus were reserved. Excellent cooperation could be secured from the personnel of the Public Relations Office, Summer School Office, University telephone service, house-keeping staff, Treasurer's Office and catering service. On the final day the Public Relations Office gave to each participant a personalized news release which could be used for one's own local papers. A certificate signed by the Dean and the Director was later mailed to each stating the nature of the Conference and its credit equivalent.

VII. ADDITIONAL COMMENTS

If the Conferees thought fit to thank the Director, the Director feels even more strongly that he should thank the N.S.F. Directing the Conference was a rewarding experience. All the planning and work which went into it was extremely worth while. Thanks are also due to Professor Ralph Henderson who had directed the Georgetown Conference for College Professors in 1959, whose helpful advice was invaluable on many occasions.

VIII. ROSTER OF PARTICIPANTS

Please note that several of the participants do not have or preferred not to give a residence address other than the school address.

<u>Name and address</u>	<u>Institution</u>
Sister Mary Avila, S.N.D., College of Notre Dame of Maryland 4701 N. Charles Street Baltimore 10, Md.	College of Notre Dame of Maryland 4701 N. Charles Street Baltimore 10, Md.
Dr. Ulrich H. Bents, Physics Department, University of Arizona, Tucson, Ariz.	University of Arizona, Tucson, Arizona.
Mr. David Arnold Bieber, Dept. of Mathematics and Physics, Wilmington College, Wilmington, Ohio.	Dept. of Mathematics and Physics, Wilmington College, Wilmington, Ohio.
Dr. Gerhard A. Blass, 16636 Wildemere, Detroit 21, Mich.	Dept. of Physics, U. of Detroit, Detroit, Michigan.
Rev. George C. Coyne, S.J., Graduate Department, Georgetown U. Washington 7, D.C.	Georgetown University, Washington 7, D.C.
Mr. B. H. Crusinberry, 2558 Airport Road, Adrian, Mich.	Adrian College, Adrian, Michigan.
Dr. Meir H. Degani, State U. Maritime College, Fort Schuyler, Bronx 65, N.Y.	State University Maritime College, Fort Schuyler, Bronx 65, N.Y.

<u>Name and address</u>	<u>Institution</u>
Miss Margaret C. Ethier, 2480 - 16th Street, N.W., Apt. 301, Washington 9, D.C.	George Washington University, Washington, D.C.
Dr. George L. Farre, 7104 Delaware Street, Chevy Chase, Md.	Georgetown University, Washington 7, D.C.
Dr. Arthur Joseph Giovannangeli, 9 Blake Street, Keene, New Hampshire.	Keene Teachers College, Keene, New Hampshire.
Sister Margaret Francis Goodwin, College of St. Elizabeth, Convent Station, New Jersey.	College of St. Elizabeth, Convent Station, New Jersey.
Sister M. Bernarda Handrup, O.S.F., Alverno College, 3401 S. 39th Street, Milwaukee 15, Wisconsin.	Alverno College, Milwaukee 15, Wisconsin.
Sister Mary Daniel Healy, Incarnate Word College, 4301 Broadway, San Antonio, Texas.	Incarnate Word College, San Antonio, Texas.
Dr. Charles Hetzler, 158 Ferris Avenue, Rumford 16, R.I.	Wheaton College, Rumford, Rhode Island.
Mr. Hendrik Reynolds Hudson, 225 E. Dougherty Street, Decatur, Ga.	Bradley Observatory, Agnes Scott College, Decatur, Ga.
Dr. Allen J. Janis, Dept. of Physics, University of Pittsburgh Pittsburgh 13, Penn.	U. of Pittsburgh, Penn. Pittsburgh 13,
Dr. Karlis Kaufmanis, 215 Haynes Street, Mankato, Minn.	Gustavus Adolphus College, Mankato, Minn.
Mother Marie Kernaghan, R.S.C.J., Maryville College of the Sacred Heart, St. Louis 11, Mo.	Maryville College of Sacred Heart, St. Louis 18, Mo.
Mr. Thomas Henry Leith, 75 Post Gate Road, S. Hamilton, Mass.	Gordon College, Hamilton, Mass.
Mr. James Patrick Lincoln, San Antonio College, 1300 San Pedro Ave., San Antonio 12, Texas.	San Antonio College, San Antonio 12, Texas.
Dr. Alan Lutz, 24 Linwood Avenue, Trenton 8, N.J.	Trenton State College, Trenton, N.J.
Dr. White Marks, Route 3, Box 25, Edmond, Oklahoma.	Central State College, Oklahoma.
Sister Elizabeth Catherine McManus, C.S.J., College of St. Rose, Albany, N.Y.	College of Saint Rose, Albany, New York.
Mr. Carroll L. Moore, Nebraska Wesleyan U. Lincoln 4, Nebraska.	Nebraska Wesleyan University, Lincoln 4, Nebraska.

<u>Name and address</u>	<u>Institution</u>
Rev. James O'Reilly, 11967 Sunset boulevard, Los Angeles 49, California.	Mount St. Mary's College, Los Angeles, California.
Mr. Leonidas H. Roberts, Benton 307, University of Florida, Gainesville, Florida.	University of Florida, Gainesville, Florida.
Dr. John S. Ross, Dept. of Physics, Rollins College, Winter Park, Florida.	Rollins College, Winter Park, Florida.
Dr. John H. Shaw, 576 Melrose Avenue, Columbus 2, Ohio.	Ohio State University, Columbus, Ohio.
Dr. Alex G. Smith, Physics Department, U. of Florida, Gainesville, Florida.	University of Florida, Gainesville, Florida.
Mr. Arthur M. Soellner, Box 402, West Mount Traller Park, Cape Girardeau, Mo.	Southeast Missouri State College, Missouri.
Dr. Joseph L. Spradley, 314 Naperville Street, Wheaton, Illinois.	Wheaton College, Wheaton, Illinois.
Dr. Benjamin J. Stallwood, Clarkson College of Technology, Potsdam, New York.	Clarkson College of Technology, Potsdam, New York.
Dr. M. L. Vatsia, Inter American University, San German, Puerto Rico.	Inter American University, San German, Puerto Rico.

College or university education:

INSTITUTION	SCHOOL OR DEPT.		YEARS		DEGREE	MAJOR SUBJECT	MINOR SUBJECT(S)
	FROM	TO	FROM	TO			

List of publications:

Date

Please use additional sheet if necessary.

Signature

SPECIAL PROGRAM FEATURES

The afternoons and nights will be devoted to work at the observatory or to field trips. The conferees will be given an opportunity to familiarize themselves with some of the work of the observatory by actually participating in the research.

A few clear nights will be devoted towards mapping the sky with the aid of 12" refractor or a Ross camera.

Two small electronic computers, the Burroughs E 101, will be at the disposal of the conferees at selected hours. In a few hours, it should be possible to master the essential stages in programming for the computer and to gain some familiarity with using it for ordinary problems. All the conferees will be able to use the computer for some time.

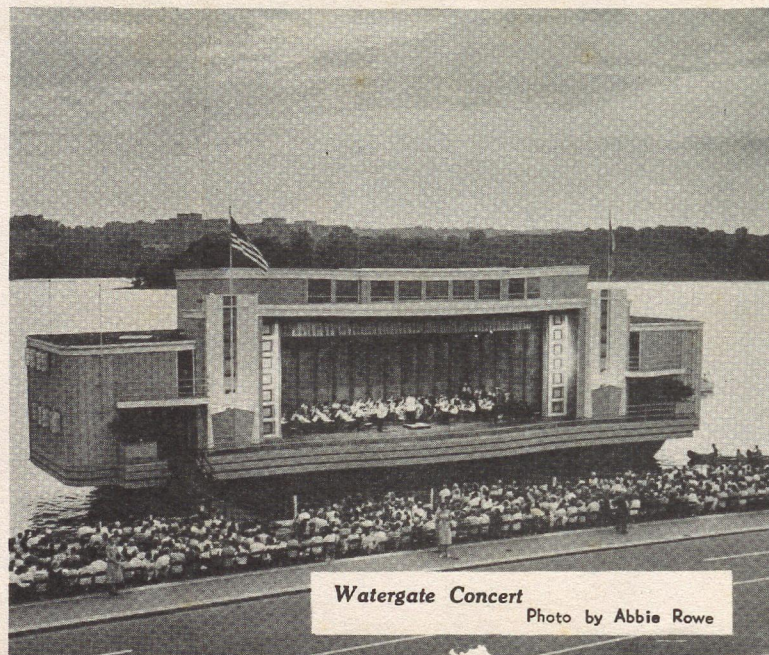
Some experimental and observational work will also be done with high dispersion spectrographs for the study of laboratory sources as well as of the atmospheres of the planets.

The Field Trips:

The field trips will provide the conferees with the opportunity to visit in a body several important centers of research in and around Washington. Among these are: David Taylor Model Basin, National Bureau of Standards, Naval Observatory, Naval Research Laboratories, Diamond Ordnance Fuze Lab., Space Computing Center.

Sight-seeing:

Places of interest around Washington are Williamsburg, Battle Fields of the Civil War, Charlottesville, The Skyline Drive, The Chesapeake Bay, etc. Group excursions to these places will be planned to suit the interest of the conferees.



Watergate Concert
Photo by Abbie Rowe



Healy Building

Photo by Bob Young, Jr.

APPLICATIONS

An **Application Blank** is provided on the end-panels of this folder. Please tear off, and mail it along with a one-page **Statement** about yourself. This statement should contain (1) an account of your educational and professional background, (2) your fields of special interest, (3) your reasons for wishing to participate in this Conference.

Please mail the Application and Statement to the Director of the Conference.

Address: Rev. M. P. Thekaekara, S.J.
Georgetown University
Washington 7, D. C.

Application should be in the mail by **May 15**.
Selection of participants will be announced on **May 21**.
Deadline for acceptance or rejection of invitations is **May 31**.

NON PROFIT ORG.
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Permit No. 3901

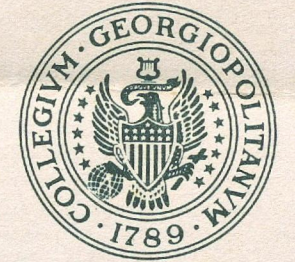
SUMMER CONFERENCE ON ASTRO-GEOPHYSICS
GEORGETOWN UNIVERSITY
WASHINGTON 7, D. C.

To: _____
From: _____
To: _____
From: _____
To: _____
From: _____

Note: Please use this routing slip to forward this copy to faculty members who would be interested in this conference.

Form 3547 Requested

SUMMER CONFERENCE FOR
COLLEGE PROFESSORS OF
PHYSICS AND ASTRONOMY
ON RECENT ADVANCES IN
ASTRO-GEOPHYSICS



GEORGETOWN UNIVERSITY • WASHINGTON 7, D.C.

July 6 to July 28, 1961

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- Research Projects with High Dispersion Spectrographs and Electronic Computers

Please mail applications to:

REV. M. P. THEKAEKARA, S.J.
Georgetown University
Washington 7, D. C.

Telephone FE 7-3300 Ext. 670

PLEASE POST OR CIRCULATE

Name and Address: _____

Date of Birth: _____

Employment Record—List professional experience of the past 5 years in teaching and work related to teaching (list in reverse chronological order giving present or last position first. Add separate sheet if necessary):

DATE	EMPLOYER	NATURE OF ACTIVITY

TEAR ALONG THIS LINE

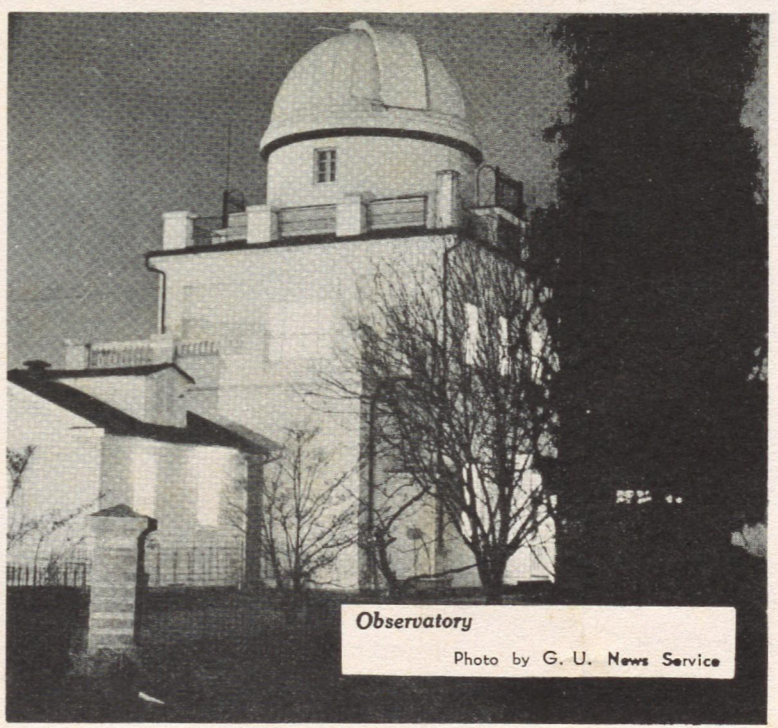
PLEASE SEE REVERSE SIDE

Among the lecturers of the Summer Conference are: Dr. Wallace R. Brode (Georgetown), Dr. Leroy R. Furlong (Georgetown), Dr. John P. Hagen (Nat'l Aer. and Space Adm.), Rev. Francis J. Heyden (Georgetown), Dr. Carl C. Kiess (Georgetown), Dr. John A. O'Keefe (N.A.S.A.), Dr. Charlotte M. Sitterly (Nat'l. Bur. Standards), Dr. Lyman Spitzer, Jr. (Princeton), Dr. David Stern (U. of Maryland), Dr. William J. Thaler (Georgetown), Dr. Richard Tousey (Naval Res. Lab.), Dr. Chester B. Watts (Naval Obs.), Dr. Ralph Zirkind (Advanced Research Projects Agency).

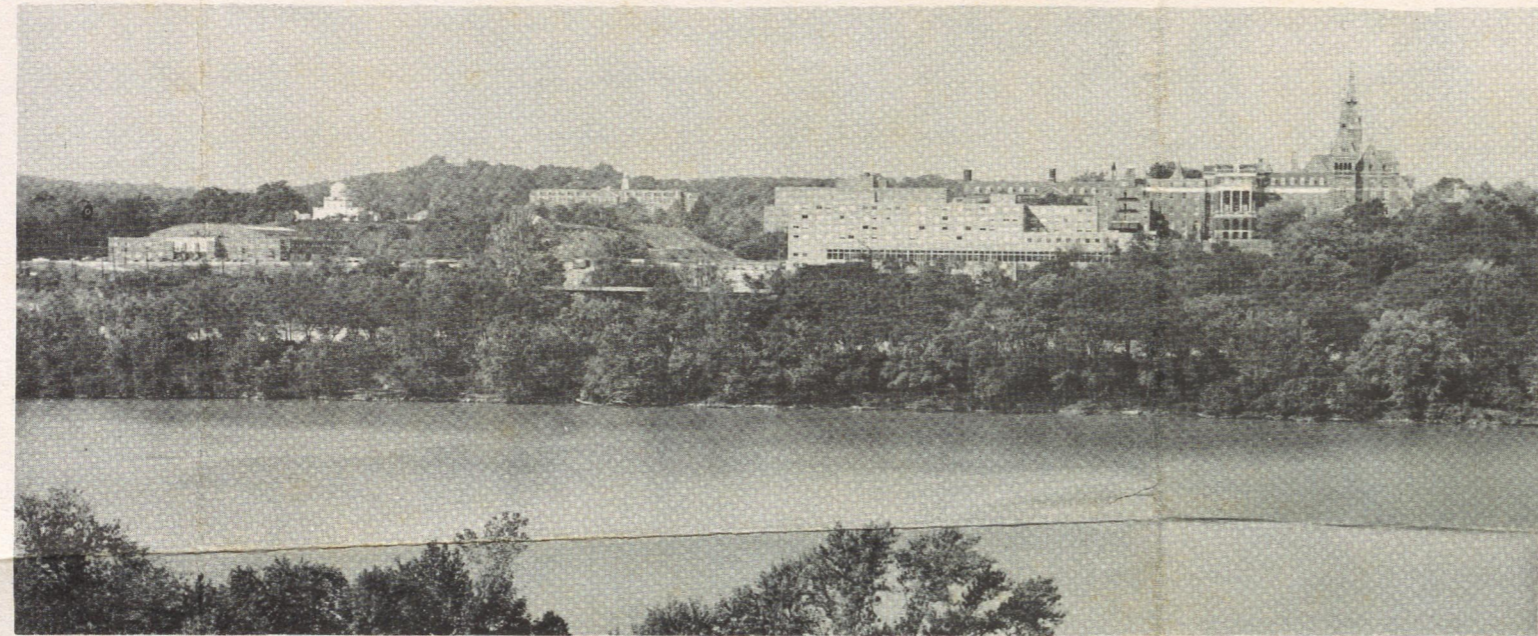
Mimeographed copies of the lectures will be distributed prior to the Conference.

The Lecture Topics Include:

- Tools of the modern astronomer
- Spectroscopic methods in astronomy
- The solar system
- Radiation belts
- Geodetic studies of the earth
- Solar physics
- The milky way and the stars
- Structure and the evolution of the universe
- Radio-astronomical observations
- Satellites and their tracking
- Infrared spectra of the planets
- Ultraviolet studies from rockets
- Upper atmosphere physics
- The Lunar surface
- Interstellar medium
- Production of chemical elements and their distribution
- Cosmic rays
- Galactic studies



Observatory
Photo by G. U. News Service



Georgetown University from across the Potomac

Photo by Bob Young, Jr.

Recent Advances In Astro-Geophysics

OBJECTIVES

The Conference is intended to give to college teachers in physics and astronomy an academic stimulus beyond the regular program of instruction at the undergraduate level.

Though astronomy is the oldest of the sciences, at the present time it does not find a place in the curricula of most colleges. This omission has serious disadvantages. Instruments and methods developed by physicists are a major tool for astronomers and astrophysicists. Recent advances in astro-geophysics contribute a great deal towards teaching of classical and modern physics, through stimulating interest, clarifying concepts, illustrating physical laws, and stressing the need for basic research.

Aspects of recent progress have elicited popular interest to an unprecedented degree. The scientific accuracy of some of the widely publicized accounts of the present so-called "space age" is not what physicists and astronomers would like it to be. In class-room discussions of physics and astronomy, questions come up which teachers often feel they cannot handle adequately with their more conventional training.

The Conference on Astro-geophysics, it is hoped, will help correct these deficiencies.

SPONSORSHIP

The Conference is sponsored by the National Science Foundation.

ELIGIBILITY

Thirty-two college teachers are eligible. The Conference is intended primarily for teachers of physics, general science and astronomy.

ALLOWANCES

Stipend:

Each participant will receive a stipend of \$345.00 to cover his expenses during the session.

Travel:

Each participant will also receive a travel allowance computed at the rate of 4¢ a mile for one round trip between his home and Washington, D. C.

ACCOMMODATION

Lodging:

Dormitory rooms will be reserved for the participants. For men air-conditioned double rooms at the rate of \$43.50, for women single rooms at the rate of \$38.00, for the entire period of the Conference. Families will be guided in finding furnished living quarters in the Georgetown area.

Meals:

The conferees will lunch together on weekdays. A charge of \$23.00 will be made for this service. Other meals may be had on a pay-as-you-go basis, at approximately \$15.00 per week.

Dining hall, cafeteria, Conference hall and lounges are located in the air-conditioned New South Building.

In addition, there are several attractive restaurants in the Georgetown area.

FACILITIES

Equipment:

The observatory building will be used for work with the telescope, computer and spectrographs. The observatory is equipped with the following instruments which will be available for the Summer Conference: a 12" refractor, and a smaller telescope, both on equatorial mounting, one with a prism camera attachment and the other with a large Ross camera, each housed in its own dome, two Wadsworth spectrographs, one in the basement of the main building, and the other in a separate house, with heliostats and other accessories;

a telereadex and a comparator, a telecorder for automatic registering of plate readings, two Burroughs E 101 computers, a Littrow spectrograph.

Libraries:

Besides the libraries of the University and of the observatory, a special library on the topics of the Conference will be located in the Conference hall. There are in addition numerous national and institutional libraries in and around Washington.

Recreation:

The tennis courts and the University Gymnasium will be open to the conferees. A day room will be provided for relaxation and informal meetings. Special sight-seeing excursions will be organized on week-ends for those interested.

THE ACADEMIC PROGRAM

Lectures:

Morning sessions will be devoted to lectures by members of the observatory staff and by invited speakers. The guest speakers include some of the best known names in the current astro-geophysics.

The first week will be devoted to the basic lectures designed to lay the groundwork for the special topics to be dealt with during the rest of the Conference.

The special topics will be handled by experts, each on his own special field where he has made significant contributions.

OCT 1961

DIRECTOR'S REPORT

SUMMER CONFERENCE

For College Professors of Physics and Astronomy,

On

RECENT ADVANCES IN ASTRO-GEOPHYSICS

July 6 - 28, 1961

GEORGETOWN UNIVERSITY, WASHINGTON 7, D. C.

Director - Rev.M.P.Thekaekara,S.J.

I. OPERATION OF THE CONFERENCE

The aim of the Conference was to give to college professors of physics and physical sciences an academic stimulus beyond what the regular program of instruction at the college level can give.

Few colleges teach astronomy at the undergraduate level. This has a serious drawback both for the teaching of physics and for the college teacher's understanding of the major problems of the current space age. The tools which the astronomer uses in his work are mainly those developed by the physicist for his specific problems. Recent advances in astrophysics and geophysics contribute a great deal to the teaching of physics, through clarifying concepts, stimulating interest and suggesting new lines of research. The current interest in space gives rise to a host of problems which are of an interdisciplinary nature, requiring the specialized knowledge of the physicist and the astronomer. The conventional text books in these two fields do not treat such problems.

In the operation of the Conference three distinct features were insisted upon as most conducive to securing the general objectives:

- i Lecture sessions in the mornings, when all major areas of current astrophysics and geophysics were covered by specialists, each one lecturing on a topic to which he had made significant contributions;
- ii Laboratory sessions in which the participants familiarized themselves with the instruments of the Observatory and made observations and measurements on their own;
- iii Field trips to selected research installations in and around Washington where problems closely related to the Conference are being studied.

The plan submitted to the National Science Foundation in the original proposal was adhered to. The only change we had to introduce was changing the date of the Conference from August 7 - 30 to July 6 - 28. In August the International Astronomical Union was to hold its convention in this country, and most of the lecturers and some of the participants would have been away on the west coast. Hence we had to anticipate the Conference. Because of the July 4th weekend, we could not conveniently start earlier than July 6. Since July 28 is a Friday, the length of the conference had to be reduced from 24 days to 23 days. The operation of the conference was according to the plan originally proposed.

Lecture Sessions

The following was the schedule of lectures:

I. Introductory

- | | | |
|--------|---|--|
| July 6 | Tools of the Modern Astronomer | Francis J. Heyden,
Georgetown College Observatory |
| July 7 | Astrophysical Research with High Dispersion Instruments | Carl C. Kiess,
Georgetown College Observatory |

II. Geophysics

- | | | |
|---------|--|---|
| July 10 | Upper Atmosphere Physics | Edward O. Hulburt,
Naval Research Lab (Ret'd) |
| 11 | Satellite tracking and Geodetic Applications | John A. O'Keefe,
National Aeronautics and Space Administration |
| 12 | Satellite Wakes | William J. Thaler,
Georgetown Univ. Physics Dept. |
| 13 | Backscatter techniques in Geophysics | William J. Thaler,
Georgetown Univ. Physics Dept. |
| 14 | Radiation Belts | Cabell A. Pearse,
Naval Research Laboratory |

III. The Solar System

- | | | |
|----|--|---|
| 17 | Tektites and the Moon | John A. O'Keefe,
National Aeronautics and Space Administration |
| 18 | Lunar Mapping Problems | Chester B. Watts,
U. S. Naval Observatory (Ret'd) |
| 19 | Comets | Carl C. Kiess,
Georgetown College Observatory |
| 20 | Physics of the Sun | Charlotte M. Sitterly,
National Bureau of Standards |
| 21 | Infrared Spectroscopy in Astrophysics | George J. Zissis,
University of Michigan |
| 24 | Radio astronomical observations of the planets | John P. Hagan,
National Aeronautics and Space Administration |

IV. The Stellar Universe

July 25	The Distribution of Stars	Francis J. Heyden, Georgetown College Observatory
26	Cosmic Abundances of the Elements	Wallace R. Brode, President, Optical Society of America
27	Cosmic Rays	David Stern, University of Maryland
28	The Age of Stars	Bengt Strömberg, Princeton University

Six of the lecturers whom we originally expected to have, had to decline our invitation because of conflicting summer schedules. But we experienced little difficulty in finding others equally competent to handle the topics, and no substantial change had to be made in the subject matter proposed for the conference.

We did regret the fact that Dr. Vera C. Rubin, who had given two of the more interesting lectures during the Summer Conference of 1960, and had contributed a great deal towards the success of the earlier conference, had to be away this summer. Her topic, Cosmic Rays, was treated by Dr. David Stern of the University of Maryland, and the lecture was considered one of the best in the series.

Field Trips were made to the following research centers:

July 7	Diamond Ordnance Fuze Lab.
11	National Bureau of Standards
14	Johns Hopkins Applied Physics Lab.
18	David Taylor Model Basin
20	U. S. Naval Observatory
21	U. S. Naval Research Lab.
25	Coast and Geodetic Survey

Air conditioned buses were available for the trips, and the participants were welcomed very cordially at each of the places. Each trip covered a vast area of research, perhaps all too briefly. For the college professors coming from very distant schools, many of them small ones, these trips were very informative. Judging from our experience of the previous year, we could ensure that the academic level of the visit was up to that of a college professor. Our thanks are due to the Directors of the Laboratories for the great care they took to accommodate themselves to a specialized group like ours, so very different from ordinary tourist groups. Since recruitment of personnel is a major problem for all research installations, the visit from our group was one which they welcomed very cordially.

For the experimental and observational projects at the Observatory, the participants were divided into eight groups of four each. There were three projects, in spectroscopy, astrophysics and computer techniques. All participants had an opportunity of spending at least some time with all the major pieces of equipment at the Observatory. Most time was devoted to the computer and practically everyone learned how to write a program for the E 101 computer and to use it for common problems of research.

The lecture course and the lab work were at the graduate level. But since the topics cover too wide a field, we do not plan to make them standard offerings in our department of astronomy. As during the earlier conference, there was heavy demand for extra copies of the Topical Symposium of the Conference. Copies of the Symposium were distributed on the first day of the conference.

II. STAFF

The members of the Staff of the astronomy and physics departments who took charge of the lecture sessions were: Rev. Francis J. Heyden, Director, Georgetown College Observatory; Dr. Carl C. Kiess, and Dr. William J. Thaler. Dr. Kiess and Fr. Heyden were also in charge of the lab sessions. The lab course in computer techniques was conducted by Rev. Francis Haig (Ph.D. Catholic U., 1958) and he was ably assisted by the staff of Burroughs Corporation Computer Division.

In the earlier conference we had used the services of three senior graduate students for the lab sessions. This year we thought it preferable to have faculty members as lab instructors, since questions which college professors raise are not always such as can be answered by graduate students. However, it was a distinct disadvantage that we had to abandon the open door policy of the earlier conference and maintain a rather strict time schedule with fewer sessions.

Our guest speakers were: Dr. Edward O. Hulburt, Dr. John A. O'Keefe, Dr. Cabell A. Pearse, Dr. Chester B. Watts, Dr. Charlotte M. Sitterly, Dr. George J. Zissis, Dr. John P. Hagan, Dr. Wallace R. Brode, Dr. David Stern, and Dr. Bengt Strömngren. Drs. Strömngren and Zissis were the only speakers from out of town.

The compensation we offered the speakers seemed entirely adequate. For none of the speakers did the compensation seem at all important; they were happy to have an occasion to speak about their special field to a highly select audience such as the one which our Conference could bring together.

We had requested the speakers to send us a month ahead of the Conference a short paper of about 2000 words as a lecture outline. Eight of the papers were the same as in the previous year and they caused us no delay. The nine others were all new, and one of the major problems of the director was to get the manuscripts sufficiently early, so that the printed text of the lecture notes could be published before the Conference started. After repeated telephone calls and many letters we did manage to get all the papers, though not as early as we would have liked.

III. SELECTION PROCEDURE

The application blank was fairly simple. It formed the end panel of the publicity folder and hence was mailed out to about 2000 addresses along with the first announcement of the Conference. The application form asked for standard items of educational and biographical information and a detailed letter explaining the applicant's interest, background and purpose in wishing to attend the Conference. We received 81 applications, and practically all of them of fairly high academic ability. Four members of the physics and astronomy departments, Heyden, Thaler, Kiess and Thekaekara, studied the applications. The selection was based on the answers we could give about each applicant to

the following questions: (i) How adequate is the applicant's academic background for lectures at a fairly advanced level? (ii) How keen does the applicant seem to be on being selected for the Conference? (iii) How far would his selection further the aims of the N.S.F. in sponsoring the Conference? In other words, we tried to select men who could derive maximum benefit from the Conference, and make maximum contribution to college teaching.

A modified form of quality point index was used to give to each applicant a rank in order of preference. Of the 32 who ranked highest and were invited to the Conference, three declined, and their places were immediately filled by the next three in rank. Three who were not college professors but were otherwise fully qualified and had Ph.D. degrees sought and obtained permission to attend the Conference without stipend. One of the other applicants whose qualifications were fairly high but was not among those selected decided to attend without stipend. But on the second day of the Conference a stipend could be made available to him, since one of those who had been invited and had accepted the invitation wired inability to come. Thus, in all, 35 persons attended the Conference, 32 with stipend and 3 without. Of these, 22 had Ph.D. degrees.

IV. ADMINISTRATION

Housing: Of the 22 men, 13 stayed in the air-conditioned New South Dormitory and they all found the housing entirely satisfactory. Of the 10 women, all but one were lodged in the Copley Hall, where but for the air-conditioning, the facilities are somewhat better. Only two or three days during the Conference were uncomfortably hot, but air-conditioned lounges were available for those days. Those who preferred to stay off campus had little difficulty in finding suitable lodgings at moderate cost. The newly established Office of Off-Campus Housing had a complete listing of vacant apartments in the area.

Meals: All participants lunched together on weekdays. They had breakfast and dinner in the University Cafeteria on a pay-as-you-go basis. Sundays did cause some inconvenience, since the only campus cafeteria open on Sundays is at the Medical Center, some distance away.

Early in the Conference we had a "cook-out" on the Observatory Hill. The expenses were met by the Summer School Office. The presence of the wives and children of many of the participants, the out-door grill, and the sumptuous steak dinner with all trimmings, made it a memorable occasion. Everyone so thoroughly enjoyed it that the participants decided to have another such dinner at their own expense, this time with entertainment, games, etc. Four of the Conferees gave a good deal of time to the careful preparation for this dinner. This was an occasion for them to express their thanks to the Conference Staff. The Summer School also arranged a cocktail hour when the officers of the Summer School could meet the participants of the Astrogeophysics Conference and the Mathematics Institute.

V. EVALUATION OF THE CONFERENCE

The impact of the Conference on the participants could be seen throughout the Conference. They were more than generous in their appreciation of the arrangements. Frequently during the Conference they mentioned it. Especially, after the final "cook-out" which they themselves organized and financed, they gave expression to that appreciation in a more artistic and tangible way. After the conference broke up, several of the participants wrote personal letters of thanks. The whole group, Conference Staff and participants, had a strong sense of unity, a feeling that they were cooperating in something new and something worth while. They felt that their efforts were richly rewarding.

Apparently the appreciation of the Conference was not confined to the group that gathered in the Faculty Lounge of Georgetown every morning of July. The University Administration and the newspapers knew that something out of the ordinary was happening on the Georgetown Campus. Perhaps it was the academic stature of the men who came to address the Conference, or the glamour of a rapidly widening field, or the large number of college faculty men who had come from every part of the United States. Already last year the Conference had been very widely reported in the Washington Post. This year also several of the lectures were summarized and presented in a popular language by the Post. The Star ran a picture story of our visit to the U. S. Naval Observatory in the magazine section of its Sunday edition. Three of the participants of the Conference were invited by the Georgetown T. V. Forum to appear on a panel to discuss the Conference and the aims of the N.S.F. in sponsoring Conferences of this type. The panel discussion was first broadcast by one of the T.V. stations of Washington, and later was re-broadcast from tape by some 200 radio stations across the nation.

In attempting to evaluate the Conference a question might be asked: What is it that made the Conference so successful; why it attracted so much public attention, and evoked such high appreciation from the participants.

Perhaps every Conference of this type is bound to be a success if the suggestions given by the N.S.F. concerning course structure, selection of participants, etc., are carefully followed. Scientific conventions are usually the only occasion when faculty members from different colleges get together. In crowded hotel lobbies, during an all too brief period, with a heavy program of lectures, they get little opportunity to become acquainted with each other. One meets many new persons, learns their names and forgets them soon after. During a Conference of three weeks, the conditions are entirely different. They live together, take their meals in the same place, work on problems and assignments together, arrange excursions in small groups, and in a hundred different ways get abundant opportunity to become well acquainted. In an atmosphere of leisure, without the heavy work loads of teaching and administration, with no deadlines to meet, no telephones to answer, they can discuss mutual problems, share experiences and at the same time study the recent advances in a very fascinating field. The morning sessions with lectures, coffee-break and question period were, of course, important, but they were only one part of the Conference. A Maxwellian Curve has a low energy peak and a high energy tail; and the total energy is mainly the contribution of the low energy peak. A conference of our type is analogous. Most of the success of the Conference is due to the Conferees themselves. But their discussions were kept at a sufficiently high level, thanks to the topics discussed in the lectures and the informal discussions they had with the lecturers during the coffee break and the lunch hour.

Our Conference had a few special advantages which cannot be ignored. The topic is one that claims a great deal of attention from the public at the present time. Problems of astrophysics and geophysics are no more the idle speculations of the scholar in his ivory tower, but are front page headlines in newspapers. Washington has been called Science City, U.S.A. because of the heavy concentration of research laboratories in this area, and attention is mainly focussed on space age problems. Hence on almost every major topic of our Conference a competent speaker could be found close by; and several of the speakers were men with nation-wide reputation. The facilities in the New South Building are the best on the campus for living accommodation, small size lecture room and cafeteria; and the Conference was at a time when these facilities were not overtaxed. All research laboratories we selected for field trips had something very interesting and very new to show to us. Washington during summertime is a great tourist attraction, and hence weekends and free evenings could be made very enjoyable. The unique character of Georgetown area, the rich associations of a University with its hundred and seventy years of history, the exhibits of the University archives which many conferees visited, all contributed substantially to the success of the Conference.

In order to make our evaluation more specific, we distributed a questionnaire to all the participants towards the end of the Conference.

One of the questions was: "How well has this Conference achieved the general aims of the N.S.F. in sponsoring these Summer Conferences? The following answers are typical:

- 1) "This Conference has been inspiring not only in showing modern advances and techniques, but in suggesting many projects and experiments to be tried and used with students. It was a breath of fresh air for the harried teacher."
- 2) "My understanding is that the general aim is to bring teachers up to date on recent developments. I feel that each lecture accomplished what would have required many days of study on my part. Moreover, I feel that I am much better prepared for further study on my own."
- 3) "The Conference has served its purpose of stimulating the participants in the area of physics and astronomy."
- 4) "The group was well divided as to age, sex, experience and specific interests - astronomy, physics, geology and chemistry. Science teaching and administration were represented, and this made for stimulating round-table discussions and shrewd questioning of value to all disciplines - a well oriented and integrated Conference."
- 5) ". . . . Association with other teachers has been a pleasure, an inspiration. . . ."
- 6) ". . . . In my opinion the leadership and scientific resources of this Conference cannot be matched. . . ." The N.S.F. had the key to take us places to which access would have been practically impossible as individuals."
- 7) "This is one of the best group meetings of its kind I have been privileged to attend, including society meetings. This campus also possesses a certain warmth and kindness which does not pass unnoticed."

All the other answers were much in the same vein, most of them highly enthusiastic.

A question which summer conference directors have often discussed is the most effective form of publicity for the conference. One of the questions we put in our questionnaire was: "What was your source of information about the Conference." The largest number, fourteen, listed folder received in personal mail; for eleven others it was folder received from the Dean's Office. N.S.F. announcement distributed to Chairmen was the source of information for nine of the conferees. Four others listed the announcement in Physics Today and one listed "Other Sources." It would seem that the folder mailed out to a well-selected list of persons is the best way of ensuring a highly competent group of participants.

Some of the other questions were:

- 1) "Was the time correctly apportioned between lectures, field trips and projects?" Almost everyone said "Yes." Some would have preferred more time with the projects.
- 2) "Mention one or two field trips which you thought most profitable." The replies were significantly different from the previous year's. In one or two places where earlier, the guides and the exhibits had not been quite up to our level, we found this year a better appreciation of what we were expecting. Hence every one of the field trips was chosen as the best by at least a few.
- 3) "Please comment on the projects." Since the conferees came with very different backgrounds, we expected and we did find a wide spectrum of preferences. It would seem more time should have been devoted to spectroscopic and astrographic projects.
- 4) "Mention one or two lectures which, in your opinion, were most stimulating."
"Are there any lecture topics which should have been included?"
"What lecture topics, if any, could have been stressed less?"

Here again there was a wide spectrum of opinion. Taking all the suggestions together, we feel that the same topics should be kept if we hold the conference next summer.

Georgetown University has at present no formal program of pre-service teacher training. But the success of our Summer Conference as also of the Summer Institute in Mathematics helped to emphasize that a University like Georgetown with its facilities and long tradition has an obligation to participate in these programs sponsored by the N.S.F. In the present academic year 1961-62 we are conducting an In-Service Institute in physics, and for next year we are considering the feasibility of two institutes, one in physics and the other in mathematics.

VI. RECOMMENDATIONS FOR THE FUTURE

There is reason to believe that August 7 is a better time for starting a three-week conference. The period July 6 - 28 overlaps both sessions of the Summer School and hence is inconvenient to many college teachers.

Receiving the conferees on their arrival is of the utmost importance. The road map of the area which we had sent ahead of time was a great help. But there was some confusion about finding one's room. The registration was extremely time-consuming. The university authorities should be requested not to insist that men who are here for a brief three-week period fill out the complete set of IWM cards of the regular college students.

The travel expenses exceeded the N.S.F. allowance in 70% of the cases. The question of a higher travel allowance for all participants of the conferences and institutes may well be considered by the N.S.F. However, since for the Conference the per diem allowance is fairly high, we would not make any strong recommendation for a change.

Through a mix-up in instructions, the Treasurer's Office mailed the second check directly to the home address of the participants, though they were actually on the campus and expected the checks to be hand-delivered.

The Conference Director has to thank the personnel of many different offices on the campus for their excellent cooperation. In particular, the Summer School office, the Treasurer's office, Public Relations office, the telephone service, the Office of Student Personnel, the Housekeeping Staff, the Food Service, all were extremely helpful in anticipating the needs of the conferees and providing for them.

The Georgetown University Post Office had considerable difficulty in delivering the mail promptly to the participants. A sufficiently complete mailing address should have been sent ahead of time to the participants.

VII. ADDITIONAL COMMENTS

If the conferees thought fit to thank the Director, the Director feels even more strongly that he should thank the National Science Foundation. Directing the Conference was a challenging experience, and also extremely rewarding. All the planning and work which went into the Conference was worth while.

VIII. ROSTER OF PARTICIPANTS

Please note that several of the participants do not have or preferred not to give a residence address other than the school address.

<u>Name and Address</u>	<u>Institution</u>
Prof. Gerald R. Ahlquist 853 - 17th Avenue, So., St. Cloud, Minnesota	State College St. Cloud, Minnesota
Dr. John Stanley Valentine Allen Box 122 Bethany College Bethany, West Virginia	Bethany College, Box 122 Bethany, West Virginia
Dr. V. N. Athavale 3827 Simpson-Stuart Road Dallas 16, Texas	Bishop College 3827 Simpson-Stuart Road Dallas 16, Texas

<u>Name and Address</u>	<u>Institution</u>
Miss Betty Ann Behl 2313 E. Webster Place Milwaukee 11, Wisconsin	Milwaukee Downer College Milwaukee, Wisconsin
Dr. John B. Bulman Central Connecticut State College New Britain, Connecticut	Central Connecticut State College New Britain, Connecticut
Dr. Elizabeth Burger Longwood College Farmville, Va.	Longwood College Farmville, Va.
Mr. Clinton Ray Carpenter 21 Prospect Terrace Cortland, N. Y.	State University of New York Cortland, New York
Dr. E. O. Cook 1906 Dekle Avenue Tampa, Florida	University of Tampa Tampa, Florida
Dr. Frederick Cunliffe Keene State Teachers College Keene, New Hampshire	Keene State Teachers College Keene, New Hampshire
Miss Geneva E. Durham P. O. Box 33 Angwin, California	Pacific Union College Angwin, California
Sister Rose Francis, G.N.S.H. 320 Porter Avenue Buffalo 1, N. Y.	D'Youville College Buffalo, New York
Sister M. Ignatia Frye, I.R.M. Marygrove College Detroit 21, Michigan	Marygrove College Detroit 21, Michigan
Dr. Vittali G. Gabriel P. O. Box 589 Montgomery, W. Va.	W. Va. Institute of Technology Montgomery, W. Va.
Prof. James W. Galli 922 Wright Avenue Sioux City 9, Iowa	Morningside College Sioux City, Iowa
Dr. Edward A. Gaugler, President G-L Electronics Company, Inc. 300 Harvard Avenue Westville, New Jersey	G. L. Electronics Co. Inc. Westville, N. J. (Not on Stipend)
Dr. Lloyd E. Gourley, Jr. Austin College Sherman, Texas	Austin College Sherman, Texas

<u>Name and Address</u>	<u>Institution</u>
Dr. Mary F. Gourley Austin College Sherman, Texas	Austin College Sherman, Texas
Prof. M. Patricia Hagan Emmanuel College The Fenway Boston 15, Mass.	Emmanuel College The Fenway Boston 15, Mass.
Rev. Francis Haig, S.J. Woodstock College Woodstock, Md.	Woodstock College Woodstock, Maryland (Not on stipend)
Prof. Lewis E. Hammitt California State Polytechnic College San Luis Obispo California	Cal. State Polytechnic College San Luis Obispo California
Dr. Fred C. Hess 78 Beckley Street New York 64, N. Y.	Maritime College, State University of New York New York, N. Y.
Mr. William John Hooper, Jr. c/o Clinch Valley College Wise, Virginia	University of Virginia Charlottesville, Virginia
Dr. Phyllis H. Hutchings 825 Newell St. Walla Walla, Washington	Whitman College Walla Walla Washington
Sister M. Constance Loeffler, R.S.M. Mt. Mercy College Pittsburgh 13, Pa.	Mount Mercy College Pittsburgh 13, Pa.
Rev. Richard Miller, S.J. Manila Observatory Manila, Philippine Islands	Manila Observatory Manila, Philippine Islands (Not on stipend)
Dr. Stephen V. Romanoff Virginia Union University Richmond 20, Va.	Virginia Union University Richmond 20, Va.
Brother Thomas P. Schick, S.M. University of Dayton Dayton 9, Ohio	University of Dayton Dayton, Ohio
Prof. Leslie Robert Schweizer 136 Porter Drive Annapolis, Maryland	U. S. Naval Academy Annapolis, Maryland
Dr. John H. Semon 22 N. Hoosac Road Williamstown, Massachusetts	State Teachers' College North Adams, Massachusetts

<u>Name and Address</u>	<u>Institution</u>
Rev. James L. Shilts, C.S.C. University of Notre Dame Notre Dame, Indiana	University of Notre Dame Notre Dame, Indiana
Mr. Cleo B. Smith 3214 Powder Mill Road Adelphi, Md.	Washington Missionary College Takoma Park, Md.
Dr. J. H. Taylor Southwestern At Memphis Memphis 12, Tennessee	Southwestern At Memphis Memphis 12, Tennessee
Miss Eileen Collins Treacy 1416 Montague Street, N. W. Washington 11, D. C.	Trinity College Washington, D. C.
Prof. Edwin M. Vaughan St. Ambrose College Davenport, Iowa	St. Ambrose College Davenport, Iowa
Dr. Otto O. Watts 1442 Lowden Avenue Abilene, Texas	Hardin-Simmons University Abilene Texas

SUMMER CONFERENCE ON ASTRO-GEOPHYSICS

July 6 - 28, 1961, Georgetown University

QUESTIONNAIRE

What was your source of information about the Conference?

- Folder received in personal mail
- Folder received from Dean's Office
- N.S.F. announcement received from the Chairman of the Department
- Announcement in 'Physics Today'
- Other sources

Was the timing of the Conference convenient for you? Yes No

If NO, what better time would you have suggested?

Did your travel expenses exceed the N.S.F. Travel Allowance? Yes No

What was the difference, positive or negative?

Do you feel that time was correctly apportioned between lectures, projects and field trips? Yes No

Please comment:

Mention one or two of the field trips which you thought most profitable?

Please comment briefly on the projects, in particular, on aspects which you liked least or most.

Mention one or two of the lectures which, in your opinion, were most stimulating?

Are there lecture topics which you think should have been included? Please comment.

What lecture topics, if any, do you think could have been stressed less?

Do you have any suggestions to make for improving living accommodation or other arrangements?

How well has this Conference on Astro-geophysics achieved the general aims of the N.S.F. in sponsoring these Summer Conferences? Detailed discussion will be appreciated.

For the benefit of future Conferences, those who had families here, please give the address of your accommodations and rental per week.

If you have any comments to make not covered by the questions, please feel free to make them.

NATIONAL SCIENCE FOUNDATION
Washington 25, D.C.

SUMMER INSTITUTES 196

INSTITUTE
 CONFERENCE
(check one)

DIRECTOR'S REPORT, PART I

SECTION A. Data on Applications, Offers, and Acceptances. Please complete each box, unless it is blacked out.	CLASSIFY BY MAJOR TEACHING ASSIGNMENT								Foreign Teachers (number and level)	Other: not included in previous categories, e.g., students (number and level)	GRAND TOTAL
	COLLEGE LEVEL			SECONDARY LEVEL (GRADES 7-12)			ELEM. LEVEL (GRADES 1-6)				
	Junior College	College	Technical Institute	Junior High	Senior High	Principals, supervisors, counselors, etc.	Teachers	Principals, supervisors, counselors, etc.			
1. No. of applications sent in response to inquiries											
2. No. of completed applications received	6	125									131
3. No. of offers made:											
a. full stipend	2	29									31
b. partial stipend											
c. tuition free; no stipend		1									1
d. Totals	2	30									32
4. No. of participants accepting & attending:											
a. full stipend	2	29									31
b. partial stipend											
c. tuition free; no stipend		1									1
d. Totals	2	30									32
5. No. of Institute participants not covered in #4 (paying own way, summer session students, etc.)											
6. No. of stipend holders living at home dur. Inst											
7. No. of quota stipends allotted by the NSF:	COLLEGE		TECHNICAL INST.		HIGH SCHOOL		ELEMENTARY		TOTAL		
	32								32		
8. Dependency Allowances:	a. ACTUAL NO. AWARDED					b. AVERAGE NO. PER STIPEND HOLDER					
9. Travel Allowances:	a. ACTUAL NO. OF STIPEND HOLDERS PAID A TRAVEL ALLOWANCE					b. AVERAGE AMOUNT PER STIPEND HOLDER					
	31					\$ 70.64					
c. DISTRIBUTION OF ACTUAL ONE-WAY DISTANCES	0-499 MILES	500-999 MILES	1000-1499 MILES	1500-1999 MILES	2000-2499 MILES	2500 MILES OR MORE					
NO. OF STIPEND HOLDERS:	13	7	6	2			3				
FOR SEQUENTIAL INSTITUTES ONLY											
10. No. of summers in YOUR sequence					11. No. of related In-Service semesters, if any						
12. Distribution of participants:											
Year of participation in your sequences:											
	1ST	2ND	3RD	4TH	Other ()	Other ()	TOTAL				
No. of new participants:											
No. of continuing participants:											
DATE OF REPLY					PROPOSAL SERIAL NUMBER						
August 10, 1962					E-2/2/3091						
DIRECTOR					INSTITUTION						
REV. M. P. Thekkarakara S. J.					Georgetown Univ.						

SECTION B. Number of Stipend Holders by State and Level

STATE	COLLEGE LEVEL Including Jr. College and Tech. Institute	SECONDARY LEVEL Grades 7-12	ELEMENTARY LEVEL Grades 1-6	STATE	COLLEGE LEVEL Including Jr. College and Tech. Institute	SECONDARY LEVEL Grades 7-12	ELEMENTARY LEVEL Grades 1-6
Alabama				North Carolina	2		
Alaska				North Dakota			
Arizona				Ohio	2		
Arkansas				Oklahoma			
California	1			Oregon			
Colorado				Pennsylvania	4		
Connecticut				Puerto Rico			
Delaware				Rhode Island	1		
Dist. of Columbia				South Carolina			
Florida				South Dakota			
Georgia				Tennessee	1		
Hawaii				Texas	2		
Idaho				Utah			
Illinois	1			Vermont			
Indiana	1			Virginia			
Iowa	2			Washington	2		
Kansas				West Virginia			
Kentucky				Wisconsin	2		
Louisiana	1			Wyoming			
Maine	1			TOTAL	32		
Maryland	2			U.S. Teachers Overseas (fill in name of country below)			
Massachusetts							
Michigan							
Minnesota	2						
Mississippi							
Missouri							
Montana				Foreign Teachers (fill in name of country below)			
Nebraska	1						
Nevada							
New Hampshire							
New Jersey							
New Mexico							
New York	4			GRAND TOTAL			

DATE OF REPLY *Aug 10, 1962*
 DIRECTOR *Rev. M P Thekkarakal*

PROPOSAL SERIAL NO. *E-7/2/3091*
 INSTITUTION *Georgetown University*

NATIONAL SCIENCE FOUNDATION
Washington 25, D.C.

SUMMER INSTITUTES 196____
DIRECTOR'S REPORT, PART I

SECTION C. Staff

NAME (list actual staff members) (Last, first, middle initial)	% OF FULL TIME DUTIES DEVOTED TO INST.	BACKGROUND INFORMATION					
		HIGHEST DEGREE	FIELD	DATE AWARDED	INSTITUTION AWARDING DEGREE	HOME INSTITUTION	DEPARTMENT
1. DIRECTOR:							
M P Thekackara SJ	100%	Ph D	Physics	1956	Johns Hopkins		Physics
<input checked="" type="checkbox"/> Same as proposed		<input type="checkbox"/> Different from proposed		% of institute time spent in: Teaching _____%; Administration _____%.			
2. ASSOCIATE DIRECTOR:							
<input type="checkbox"/> Same as proposed		<input type="checkbox"/> Different from proposed		% of institute time spent in: Teaching _____%; Administration _____%.			
NAME (Last, first, middle initial)	% OF FULL TIME DUTIES DEVOTED TO INST.	BACKGROUND INFORMATION					
		HIGHEST DEGREE	FIELD	DATE AWARDED	INSTITUTION AWARDING DEGREE	HOME INSTITUTION	DEPARTMENT
3. INSTRUCTORS (same as proposed)							
Francis J Heyden		Ph D	Astron.	1944	Harvard		Astronomy
Karl C. Kieess		Ph D	Astron.	1913	Lick Obs.		Astronomy
John A O'Keefe		Ph D	Physics	1941	U of Chicago		Astronomy Physics
William J Thaler		Ph D	Physics	1952	Cath. U of Am		Physics
Cabell A Pearce		Ph D	Physics	1954	Yale		
John P Hagan		Ph D	Astron.	1949	Georgetown U.		
Vera C Rubin		Ph D	Astron.	1954	Georgetown U.		
4. INSTRUCTORS (different from proposed)							
Talbot A Chubb		Ph D	Physics	1951	U of N. Carolina		
Alfred J Zmuda		Ph D	Physics	1951	Catholic U of Am.		
Nancy Roman		Ph D	Astron.	1949	U of Chicago		
Ralph S Henderson		Ph D	Physics	1955	Harvard		Physics
DATE OF REPLY		DIRECTOR		PROPOSAL SERIAL NO.		INSTITUTION	
Aug 10 1962		M P Thekackara SJ		E - 2 / 2 / 3091		Georgetown U.	

SECTION A. Special Lecturers

NAME (Last, First, Middle Initial)	HOME INSTITUTION	NO. OF DAYS WITH INSTITUTE	AMOUNT OF HONORARIUM	AMT. OF TRAVEL & SUBSISTENCE ALLOWANCE.
1. SAME AS PROPOSED:				
Francis J. Hayden	Georgetown University	3	\$300.00	
Carl C. Klass	" "	3	\$300.00	
H. P. Thekkumara	" "	24	None	
William J. Thaler	" "	3	\$300.00	
John A. O'Keefe	NASA-Goddard	1	None	
John P. Hagen	NASA	1	\$100.00	
Vera C. Rubin	Georgetown University	3	\$300.00	
Cabell A. Pearce	Naval Research Lab	1	\$100.00	
2. DIFFERENT FROM PROPOSED:				
William M. Kulin	NASA-Goddard	1	\$100.00	
Nancy Roman	NASA	1	None	\$3.00
Talbot A. Chubb	Naval Research Lab	1	\$100.00	
Alfred J. Zarda	Applied Physics Lab, JHU	1	\$100.00	
Ralph A. Eirkind	Advanced Res. Projects	1	\$100.00	
Ralph S. Henderson	Georgetown University	2	\$150.00	

DATE OF REPLY October 19, 1962	PROPOSAL SERIAL NO. E-2 / 2 / 3091
DIRECTOR H. P. Thekkumara, S. J.	INSTITUTION Georgetown University

SECTION B. Participants

1. Number of Stipend Holders Who Withdrew From Institute: None		
a. Pre-Institute:	b. During Institute:	c. Total Withdrawn:

2. Number of Participants Awarded Degree Through Institute:	
a. Type of Degree	b. Number of Participants
No degrees were awarded	

3. Participant Roster (use as many additional sheets as necessary):

NAME (Last, First, Middle Initial)	MAILING ADDRESS (No., Street, City, Zone and State)	TEACHING ADDRESS (Pre- and Post-Institute, if different)
		NAME OF SCHOOL, CITY, ZONE, STATE
Allison, Henry C.	Box 892 UP-Martin, Tenn.	University of Tennessee Martin, Tennessee
Ayers, George H.	57 School St. Gorham, Maine	Gorham State Teachers College Gorham, Maine
Balczak, Dr. Louis William	126 Klanta Blvd. Mankato, Minn.	Mankato State College Mankato, Minn.
Beale, Dr. Robert S.	Agricultural & Technical Col., Greensboro, N. C.	AMT College Greensboro, N. C.
Bellcourt, Sr. Kathleen A.	The College of St. Rose Madison & Western Ave. Albany, New York	The College of St. Rose Albany 3, N. Y.
Calaya, Morris A.	3029 Grove St. Davenport, Iowa	St. Ashrose College Davenport, Iowa
Calvert, John Elmer, Jr.	526 Wynoke Avenue Baltimore 12, Maryland	Baltimore Junior College Baltimore, Md.
Cole, Dr. Richard V.	Wash. & Jefferson College Washington, Pa.	Washington & Jefferson College Washington, Pa.
Eldridge, Prof. Henry H.	Fayetteville State Teach. Col. Fayetteville, N. C.	Fay. State Teachers College Fayetteville, N. C.
Ellebo, Prof. Venale W.	Dept. of Physics, I.S.U. Baton Rouge 3, La.	La. State University Baton Rouge 3, La.
Engle, Prof. Paul R.	Pan Amer. Col. Obs. & Astro. Arlington, Texas	Gen. Pan Amer. College, Science Center, Arlington, Texas
Evans, Prof. John Howard	300 Algona Blvd. Oshkosh, Wis.	Wisconsin State College Oshkosh, Wis.
Fressan, Dr. John C., Jr.	3812 Montrose Houston, Texas	Univ. of St. Thomas Houston, Texas
Goodwin, Charles A.	1603-25th Ave. Longview, Wash.	Lower Columbia College Longview, Wash.

DATE OF REPLY October 19, 1962	PROPOSAL SERIAL NO. E- 2 / 2 / 3091
DIRECTOR H. P. Thelacker, S. J.	INSTITUTION Georgetown University

EVALUATION

INSTRUCTIONS. Please read all of Part III before attempting to answer any question. Comment on as many of the following points as possible and include any others that may be pertinent. It is recognized that certain items may not apply. If additional space is needed for any item, continue on a separate sheet of paper (in 4 copies) for each item and place that sheet directly behind the form page containing the item.

A. ADMINISTRATION

1. Discuss any problems concerning the organization of the institute, such as housing, dependents, travel, or overall budget:

All except four of the participants lived on campus. Four who had their families with them could readily find accommodations nearby, thanks to the information material which had been supplied by the conferees of the two previous years. Two of those who came with dependents, one with his teenage son and the other with his wife, could also find lodging on campus.

Total amount budgeted for participants support was sufficient for paying the full 7¢ per mile travel allowance. On the first day of the Conference we learned that all expenses of one of the participants were met by his institution; namely, the U. S. Military Academy, West Point, N. Y.

2. Mention difficulties concerning schedules (deadlines) recommended by NSF:

The schedule recommended by the N.S.F. was satisfactory.

DATE OF REPLY

October 19, 1962

PROPOSAL SERIAL NUMBER

E- 2 / 2 / 301

DIRECTOR

H. P. Robinson, S. J.

INSTITUTION

University
Georgia

B. SELECTION PROCESS

1. List the major criteria applied in selecting participants and evaluate the effectiveness of the process:

The application blank was fairly simple. It formed the end panel of the publicity folder and hence was mailed out to about 2000 addresses along with the first announcement of the Conference. The application form asked for standard items of educational and biographical information and a detailed letter explaining the applicant's interest, background and purpose in wishing to attend the Conference. We received 131 applications, and practically all of them of fairly high academic ability. Four members of the physics and astronomy departments, Hayden, Thaler, Kless, and Throckmora, studied the applications. The selection was based on the answers we could give about each applicant to the following questions: (i) How adequate is the applicant's academic background for lectures at a fairly advanced level? (ii) How keen does the applicant seem to be on being selected for the Conference? (iii) How far would his selection further the aims of the N.S.F. in sponsoring the Conference? In other words, we tried to select men who could derive maximum benefit from the Conference, and make maximum contribution to college teaching.

A modified form of quality point index was used to give to each applicant a rank in order of preference. Of the 32 who ranked highest and were invited to the Conference, five declined, and their places were immediately filled by the next five in rank.

Our selection process was one which we had found highly successful in the two previous years. This year it involved a great deal more time for four of the panelists because of the unusually large number of applicants.

C. INSTITUTE PROGRAM

1. Mention specific problems concerning the content or level of the program, such as overscheduling or adjusting to the participant level:

In the operation of the Conference three distinct features were insisted upon as most conducive to securing the general objectives:

- i. Lecture sessions in the mornings, when all major areas of current astrophysics and geophysics were covered by specialists, each one lecturing on a topic to which he had made significant contributions;
- ii. Laboratory sessions in which the participants familiarized themselves with the instruments of the Observatory and made observations and measurements on their own;
- iii. Field trips to selected research installations in and around Washington where problems closely related to the Conference are being studied.

There was no problem of over-scheduling, but the laboratory sessions did not meet as frequently as we would have liked, partly because of a full schedule of summer research programs at the Observatory.

2. Discuss the effectiveness of scheduled extracurricular activities in encouraging group interaction and in meeting the individual needs of the participants, such as remedial sessions or counseling:

Several afternoons were used very profitably for round-table discussions on teaching of physics and astronomy. In all we had six such discussions on teaching of physics and astronomy. The Secretary at each session took extensive notes which were later mimeographed and distributed. These discussions got under way entirely through the initiative of the participants themselves.

D. PARTICIPANTS

1. Give some examples of positive and negative reactions of the participants to their institute experience:

Under this heading we can do no better than quote verbatim the evaluation reports handed in by the participants at the end of the Conference. Rather than select a few passages from the reports, we thought it preferable to give as a whole some of the reports, without deletions, without editing. Thus one gets a complete picture of the reactions of the Conference. However, to economize on space, we are giving only those reports which are typical and which give both positive and negative reactions.

These reports from the Conference are presented on additional sheets.

NOTES FROM SECOND SEMINAR ON ASTRONOMICAL TEACHING

Lecture and Teaching Aids (Them who can't... teaches.)

Slides and transparencies of astronomical objects and telescopes are available in several sizes from Cal Tech Bookstore, Pasadena.

At least two Life Magazine 35 mm filmstrips are on astronomy and cosmology. Needs special projector.

Check with A-V specialist for film rentals. Telephone Co. will loan "Our Mr. Sun" and others free. Contact local Bell office. NASA has at least one film available: John Glemm's Orbital Flight. (No commercials).

NASA has "Spacemobile" program with built in lecturer touring the country. Puts on big show.

AAS has Visiting Astronomer Program. Big name will visit your campus for two days, give lectures, advise on astronomy program for space-age bargain fee of about \$60.00.

AAS is now pushing exorbitant Jr. and Assoc. memberships. There are several "neighborhood" astronomical get-togethers during year. No fee required.

Reference Books and Periodicals (What every young astronomer should know.)

Popular: (Don't forget Scientific American!)

Sky and Telescope ("Must have...", about \$5/yr.)
Griffith Observer (Griffith Planetarium, L.A., about \$1/yr.)
The Observatory (Brit.)

Semi-Popular: (Contain some non-professional articles.)

The Strolling Astronomer (Lunar & Planetary Studies, Pan. Am. Coll. Obs.,
Edinburg, Tex.)
J. Roy. Ast. Soc. (Canada)
Pub. Ast. Soc. Pac. (plus leaflets on popular subjects)

Professional: (All in foreign languages, including English)

Astron. Jour.; Astrophys. Jour.; Jour. Brit. Ast. Assoc.; Jour. Geophys.
Res.; (Astronomie; Soviet Astronomy; Zeit. Ast.; Astron. Jahrbuch.)*
Monthly Notices, Roy. Ast. Soc.

* Added in proof.

Positional Astronomy & Observing Guides: (Who, where, what... etc.)

- Observers Handbook (R.A.S.C., 252 College St., Toronto 2B, about \$1 plus exchange.
- Am. Ephem. & Naut. Almanac (Obtain for college thru Congressman, or GPO: \$4.)
- Aerial Navigation (Handbook of Hydrographic Office, USGPO)
- New Handbook of the Heavens (Paperback, 50¢)
- The Stars (H. A. Rey, Hought. Mif., 1952 (Unique Constellation Drawings)
- Maryland Acad. Sci. Planet Maps (small 15¢, large \$1)

Space (The stuff between large bodies)

Aviation Week; Jour. Brit. Interplanetary Soc.; Missiles & Rockets; Space Flight; Planetary & Space Science.

Other Publications Mentioned:

- Harvard Book on Astronomy (McGraw Hill)
- The Solar System; The Stellar System; ed. Kuiper.
(2 Series from U. Chi. Press. 4 or 5 pub. already.)
- Present and Future Uses of Telescopes of Moderate Size
(Wood ?, U. Penn. Symposium, 1958)
- Amateur Telescope Making (Ingalls, 3 vol.)*

Telescopes (These are those long tubes you look through...)

Six-inch reflectors have good teaching value, but modest research needs a 12" to 17" instrument. A completely finished scope and mount will cost about \$1000/inch up to this size, but increases drastically thereafter. Seeing must be taken into account. The larger instruments are only worth-while in good climatic conditions. A 16" combination Newtonian-Cassegranian is a good compromise choice if good seeing is available.

Catadioptric systems are becoming more and more popular. A versatile 11" Convertible Gregory-Maksutor-Newtonian with field flattener was described.

It was reported that great savings are possible if the optics, the mounting, and the dome are contracted out separately to specialists, with the purchaser doing the final assembly and coordination.

Tinsley, Three-B Optical Co., and W. L. Richards Inst. Co. were mentioned as typical of smaller contracting opticians and mechanics. Perkin-Elmer and Fecker as larger (usually more expensive) suppliers. Typical accessory equipment was mentioned.

Observatories (For starry-eyed panelists only)

P. Engle passed around photographs of the Pan American College Observatory equipment and some good astro photographs taken by his students.

It was stressed that instruments of 12" aperture or larger should have a pier base independent of the Observatory building, and be as high as practicable off the ground to lessen low-lying air disturbances. A dome is necessary to get the best results from this size of telescope.

Astrodome and other companies will not only build a dome but will furnish engineering and skilled personnel to erect it on your wall. Domes and building often cost as much as the instrument itself.

For small telescopes, the simplest and cheapest solution is to put the roof, or the entire building on tracks and roll it away. Not suited for professional work because of wind problems.

The problem of open houses was discussed thoroughly, and most agreed that they were worth the bother because of the excellent publicity and because of the possibility of motivating high-school age or younger students into scientific careers.

NDEA and NSF have shown a willingness to supply matching funds for telescopes and observatories.

Planetaria (-ums?)

Two planetarium users were present and reported that these were useful in arousing enthusiasm, especially among non-majors and visiting high-school groups, and that they thought they were worth the cost and trouble. Student help must be trained to ease the burden of lecturing. The chamber is useful as an astronomy classroom (among other purposes - one manufacturer promotes it for chamber music recitals!)* in addition to its primary purpose.

Unlike telescope manufacturers, planetarium builders offer much technical and architectural help, plus aid in selling the program to a reluctant administration.

The Terminator

After a long session, even the Far Westerners reached the saturation point and the participants precipitated (i.e., fell out).

Several made the suggestion that some practice in observing techniques (photometry, etc.) be provided to interested conferees by the Observatory staff. The proposal was implemented immediately.**

* Inserted in proof.

** Pentagon translation: Somebody made a phone call but the line was busy.

S. Olanoff, Sgt. at Arms; D. Shirer, Rapporteur
August 21, 1962

College or university education:

INSTITUTION	SCHOOL OR DEPT.	YEARS		DEGREE	MAJOR SUBJECT	MINOR SUBJECT(S)
		FROM	TO			

List of publications:

Please use additional sheet if necessary.

Date _____

Signature _____

SPECIAL PROGRAM FEATURES

The afternoons and nights will be devoted to work at the observatory or to field trips. The conferees will be given an opportunity to familiarize themselves with some of the work of the observatory by actually participating in the research.

A few clear nights will be devoted towards mapping the sky with the aid of 12" refractor or a Ross camera.

Two small electronic computers, the Burroughs E 101, will be at the disposal of the conferees at selected hours. In a few hours, it should be possible to master the essential stages in programming for the computer and to gain some familiarity with using it for ordinary problems. All the conferees will be able to use the computer for some time.

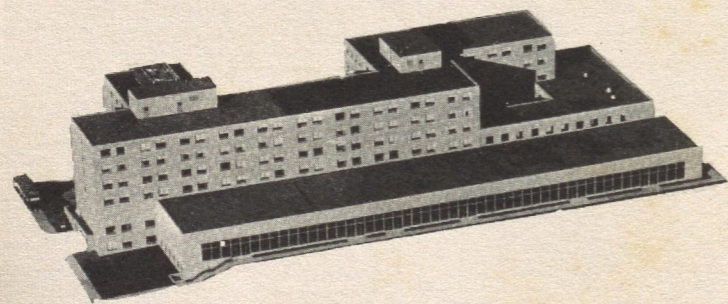
Some experimental and observational work will also be done with high dispersion spectrographs for the study of laboratory sources as well as of the atmospheres of the planets.

The Field Trips:

The field trips will provide the conferees with the opportunity to visit in a body several important centers of research in and around Washington. Among these are: David Taylor Model Basin, National Bureau of Standards, Naval Observatory, Naval Research Laboratories, Diamond Ordnance Fuze Lab., Applied Physics Lab.

Sight-seeing:

Places of interest around Washington are Williamsburg, Battle Fields of the Civil War, Charlottesville, The Skyline Drive, The Chesapeake Bay, etc. Group excursions to these places will be planned to suit the interest of the conferees.



New South Dormitory



Healy Building

Photo by Bob Young, Jr.

APPLICATIONS

An **Application Blank** is provided on the end-panels of this folder. Please tear it off, and mail it along with a one-page **Statement** about yourself. This statement should contain (1) an account of your educational and professional background, (2) your fields of special interest, (3) your reasons for wishing to participate in this Conference.

Please mail the Application and Statement to the Director of the Conference.

**Address: Rev. M. P. Thekaekara, S.J.
Georgetown University
Washington 7, D. C.**

Application and Statement should be in the mail by May 15.

Selection of participants will be announced on May 21. Deadline for acceptance or rejection of invitations is May 31.

NON PROFIT ORG.
U. S. POSTAGE
PAID
WASHINGTON, D. C.
Permit No. 3901

SUMMER CONFERENCE ON ASTRO-GEOPHYSICS
GEORGETOWN UNIVERSITY
WASHINGTON 7, D. C.

Note: Please use this routing slip to forward this copy to faculty members who would be interested in this conference.

To: _____

From: _____

To: _____

From: _____

To: _____

From: _____

Form 3547 Requested

SUMMER CONFERENCE FOR COLLEGE PROFESSORS OF PHYSICS AND ASTRONOMY ON RECENT ADVANCES IN ASTRO-GEOPHYSICS



GEORGETOWN UNIVERSITY • WASHINGTON 7, D. C.

August 6 to August 29, 1962

Sponsored by
The National Science Foundation

- Thirty-two Stipends and Travel Allowances Available
- Morning Sessions of Lectures by leading Astronomers and Astrophysicists
- Visits to Research Centers in and Around Washington
- Observations with Astronomical Telescopes
- Research Projects with High Dispersion Spectrographs and Electronic Computers

Please mail applications to:

**REV. M. P. THEKAEKARA, S.J.
Georgetown University
Washington 7, D. C.**

Telephone FE 7-3300 Ext. 670

PLEASE POST OR CIRCULATE

APPLICATION FORM for Summer Conference on ASTRO-GEOPHYSICS—Aug. 6-Aug. 29

Name and Address: _____

Date of Birth: _____

Employment Record—List professional experience of the past 5 years in teaching and work related to teaching. (Add separate sheet if necessary): _____

DATE	EMPLOYER	NATURE OF ACTIVITY

TEAR ALONG THIS LINE

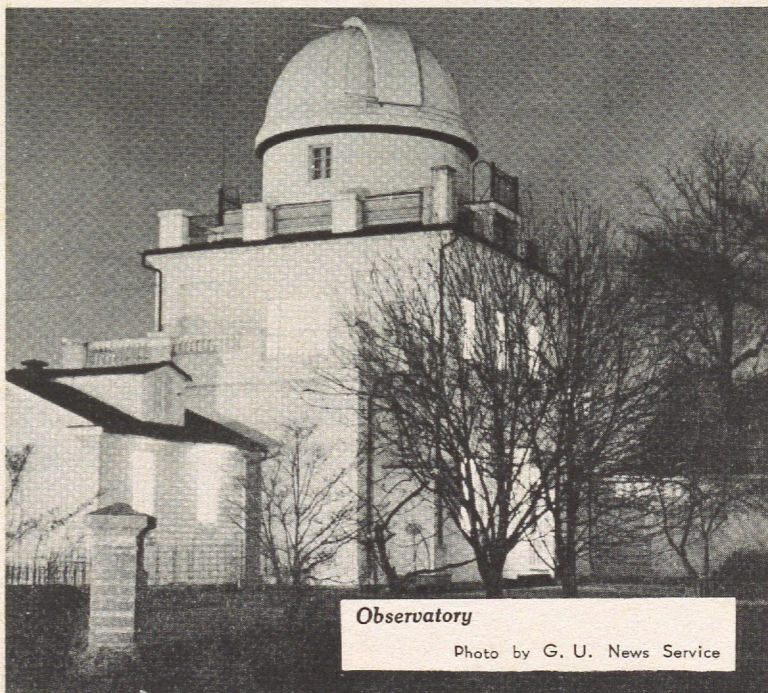
PLEASE SEE REVERSE SIDE

Among the lecturers of the Summer Conference are: Dr. John P. Hagen (Nat'l Aer. and Space Adm.), Rev. Francis J. Heyden (Georgetown), Dr. Carl C. Kiess (Georgetown), Dr. John A. O'Keefe (N.A.S.A.), Cabell A. Pearse (Naval Res. Lab.), Dr. Charlotte M. Sitterly (Nat'l. Bur. Standards), Dr. David Stern (U. of Maryland), Dr. Bengt Stromgren (Princeton), Dr. William J. Thaler (Georgetown), Rev. M. P. Thekaekara (Georgetown), Dr. Chester B. Watts (Naval Obs.), Dr. Ralph Zirkind (Advanced Research Projects Agency).

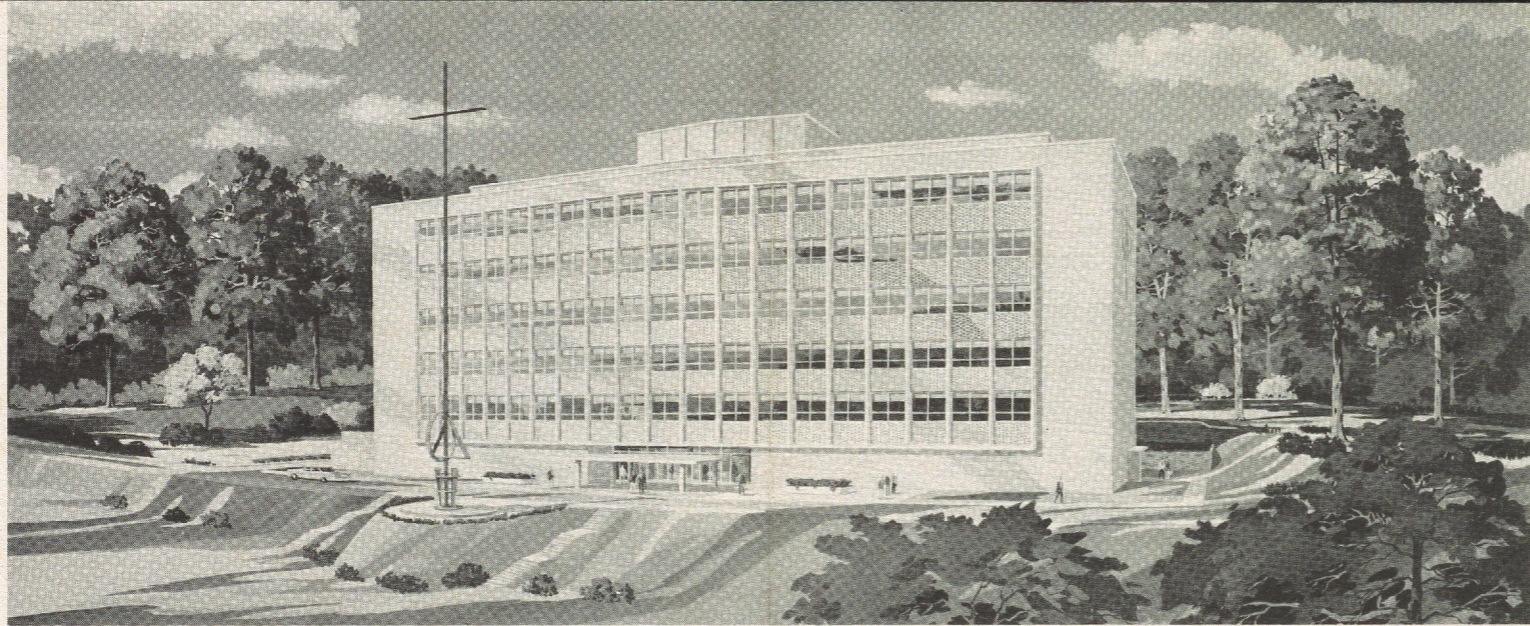
Mimeographed copies of the lectures will be distributed prior to the Conference.

The Lecture Topics Include:

- Tools of the modern astronomer
- Spectroscopic methods in astronomy
- The solar system
- Radiation belts
- Satellite wakes
- Geodetic studies of the earth
- Backscatter techniques in Geophysics
- Solar physics
- The milky way and the stars
- Structure and the evolution of the universe
- Radio-astronomical observations
- Infrared spectra of the planets
- Ultraviolet studies from rockets
- Upper atmosphere physics
- Interstellar medium
- Cosmic rays
- Galactic studies



Observatory
Photo by G. U. News Service



New Science Building

Photo by Photogrammetry, Inc.

ACCOMMODATION

Lodging:

Dormitory rooms will be reserved for the participants. For men air-conditioned double rooms at the rate of \$45.00, for women double rooms at the rate of \$40.00, for the entire period of the Conference. Families will be guided in finding furnished living quarters in the Georgetown area.

Meals:

The conferees will lunch together on weekdays. A charge of \$23.00 will be made for this service. Other meals may be had on a pay-as-you-go basis, at approximately \$15.00 per week.

Dining hall, cafeteria, Conference hall and lounges are located in the air-conditioned New South Building.

In addition, there are several attractive restaurants in the Georgetown area.

FACILITIES

Equipment:

The observatory building will be used for work with the telescope, computer and spectrographs. The observatory is equipped with the following instruments which will be available for the Summer Conference: a 12" refractor, and a smaller telescope, both on equatorial mounting, one with a prism camera attachment and the other with a large Ross camera, each housed in its own dome, two Wadsworth spectrographs, one in the basement of the main building, and the other in a separate house, with heliostats and other accessories;

a telereadex and a comparator, a telecordex for automatic registering of plate readings, two Burroughs E 101 computers, a Littrow spectrograph.

Libraries:

Besides the libraries of the University and of the observatory, a special library on the topics of the Conference will be located in the Conference hall. There are in addition numerous national and institutional libraries in and around Washington.

Recreation:

The tennis courts and the University Gymnasium will be open to the conferees. A day room will be provided for relaxation and informal meetings. Special sight-seeing excursions will be organized on week-ends for those interested.

THE ACADEMIC PROGRAM

Lectures:

Morning sessions will be devoted to lectures by members of the physics and astronomy staff and by invited speakers. The guest speakers include some of the best known names in the current astro-geophysics.

The first week will be devoted to the basic lectures designed to lay the groundwork for the special topics to be dealt with during the rest of the Conference.

The special topics will be handled by experts, each on his own special field where he has made significant contributions.

Recent Advances In Astro-Geophysics

OBJECTIVES

The Conference is intended to give to college teachers in physics and astronomy an academic stimulus beyond the regular program of instruction at the undergraduate level.

Though astronomy is the oldest of the sciences, at the present time it does not find a place in the curricula of most colleges. This omission has serious disadvantages. Instruments and methods developed by physicists are a major tool for astronomers and astrophysicists. Recent advances in astro-geophysics contribute a great deal towards teaching of classical and modern physics, through stimulating interest, clarifying concepts, illustrating physical laws, and stressing the need for basic research.

Aspects of recent progress have elicited popular interest to an unprecedented degree. The scientific accuracy of some of the widely publicized accounts of the present so-called "space age" is not what physicists and astronomers would like it to be. In class-room discussions of physics and astronomy, questions come up which teachers often feel they cannot handle adequately with their more conventional training.

The Conference on Astro-geophysics, it is hoped, will help correct these deficiencies.

SPONSORSHIP

The Conference is sponsored by the National Science Foundation.

ELIGIBILITY

Thirty-two college teachers are eligible. The Conference is intended primarily for teachers of physics, general science and astronomy.

ALLOWANCES

Stipend:

Each participant will receive a stipend of \$360.00 to cover his expenses during the session.

Travel:

Each participant will also receive a travel allowance computed at the rate of 4¢ a mile for one round trip between his home and Washington, D. C.

Dec 15, 1961

SUMMARY SHEETS FOR A PROPOSAL TO THE NATIONAL SCIENCE FOUNDATION
FOR SUPPORT OF A SUMMER CONFERENCE FOR COLLEGE TEACHERS
OF SCIENCE, MATHEMATICS, OR ENGINEERING

(Follow instructions in "Suggestions and Forms for Preparing a Proposal for a Summer Conference for 1962." These Summary Sheets should be reproduced exactly, with the requested information supplied, and used as the first four sheets of each copy of the proposal. Post-mark deadline for 20 copies of the complete proposal is Dec. 15, 1961.)

- I. Subject of proposed conference: RECENT ADVANCES IN ASTRO-GEOPHYSICS
- II. NAME and address of host institution: GEORGETOWN UNIVERSITY, Washington 7, D. C.
- III. Grant should be made to: Georgetown University, Washington 7, D. C.
- IV. Director of conference: Prof. Dr. Mr. (or: Rev.) Matthew P. Thekaekara, S.J.
(Encircle or add term.)
- Director's business mail address: Georgetown University, Washington 7, D. C.
- Director's academic title: Acting Chairman; department: Physics
- Director's office phone No.: FE 7-3300 Ext. 670; home phone No.: FE 7-3300
- V. Length of conference: 24 days; August 6 through August 29, 1962
(Beginning date) (Ending date)
- VI. Number of stipends desired: 32
- VII. Indicate group for whom conference is intended: College Teachers of Physics,
Astronomy and Mathematics
- VIII. Total amount requested from the National Science Foundation: \$ 21,076.00
(Copy from line 28 of Budget. See next sheet.)
- IX. Signature of director: Matthew P. Thekaekara, S.J. Date: Dec. 13, 1961

Name and title (and on one copy,
signature) of an official authorized
to sign for the host institution:

Joseph F. Cohalan, S.J.
University Treasurer

BUDGET FOR PROPOSED 24 -DAY SUMMER CONFERENCE AT GEORGETOWN UNIVERSITY
(Institution)

A. Support of Participants

1.	<u>32</u> stipends at \$ <u>360.00</u> each	\$11,520.00	
2.	<u>32</u> travel allowances at \$ <u>60</u> each	<u>1,920.00</u>	
3.	Total for Support of Participants		<u>\$13,440.00</u> (A)

B. Operational Costs

Staff (including salaries, honoraria, travel, etc.)

*4.	Director (total amount for conference)	\$ 1,500.00
*5.	Staff (How many? <u>5</u>)	<u>1,000.00</u>
*6.	Lecturers (How many? <u>8</u>)	<u>1,600.00</u>
7.	Secretarial and clerical	<u>700.00</u>
*8.	Assistants or other staff	<u>500.00</u>
*9.	Retirement	<u>136.00</u>
10.	Subtotal for Staff	<u>\$5,436.00</u>

*STARRED ITEMS
IN PARTICULAR
SHOULD BE
ITEMIZED,
ELABORATED,
OR EXPLAINED
ON THE NEXT
TWO SHEETS.

Other Direct Costs

11.	Office supplies, communications, publicity \$	<u>600.00</u>
12.	Cost of laboratory materials (if any)	<u>400.00</u>
13.	Field trips (if any)	<u>250.00</u>
*14.	If required: Health service or insurance, and similar costs incurred by the insti- tution on behalf of participants	<u>128.00</u>
*15.	Miscellaneous direct costs	
16.	Subtotal for Direct Costs other than Staff	<u>\$1,378.00</u>

17.	Total Direct Operational Costs: Add lines 10 and 16	\$6,814.00
18.	Allowance for Indirect Costs (up to 15% of line 17)	<u>1,022.10</u>
19.	Total Operational Costs: Add lines 17 and 18	<u>7,836.10</u> (B)

C. Fees (registration, credit fees, tuition, etc.)

20.	Summer School Fee at \$ <u>12.00</u>	\$ 384.00
21.	Tuition at \$ <u>90.00</u>	<u>2,880.00</u>
22.	Total for Fees	<u>\$3,264.00</u>

23. Total Operational Costs in excess of Fees:

Subtract line 22 from line 19. Record remainder	<u>4,572.10</u>
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24. Total Cost of Conference: Add lines 3, 22, 23. Record sum.	<u>21,276.00</u>
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D. Contributions from Sources other than NSF

*25.	Contribution from host institution	<u>\$200.00</u>
*26.	Contribution from _____	
27.	Total Contributions from Sources other than NSF	<u>\$200.00</u>

28. Total amount requested from National Science Foundation:

Subtract line 27 from line 24. Record remainder	<u>\$21,076.00</u>
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29. Operational Cost requested from NSF:

Subtract line 27 from line 19. Record remainder	<u>\$7,636.10</u>
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30. Operational Cost requested from NSF per Participant per Day:

Divide line 29 by No. of stipends and by No. of days	<u>\$ 9.94</u>
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BUDGET DETAILS (On this and the next sheet please make any necessary or desired explanations or elaborations.)

A. Support of Participants

We can conveniently accommodate 32 participants. For travel allowance an average of \$60.00 per person will prove adequate.

B. Operational Costs

Staff

Please supply the requested information concerning the conference Director.

The time that the Director will devote to the conference during the days it is in session will comprise what percentage of a normal work load? (Do not record more than 100%.) 100 %

Will this include teaching (including lecturing) in the conference? Yes

How will the Director's time during the days the conference is in session be divided between teaching in the conference and administration in the conference? Teaching: 15 %
Administr.: 85 %

Total conference salary for the Director for teaching (if any) and administration for the days the conference is in session \$ 800.00

Allowance (not to exceed four weeks) to Director for work preceding and following the conference. (See instructions.) \$ 700.00

Allowance for dislocation, necessary travel for conference, etc. \$ _____
If any, explain:

Total for the three preceding items \$ 1,500.00
(Record this total on line 4 in BUDGET.)

Elaboration concerning the above or any other Staff items:

- B.4 The director will be giving two of the lectures of the Conference. He will also assist the participants in the work at the observatory with spectrographs and computer. The Director's salary has been calculated from his academic salary, for the time of the conference, and for three weeks preceding it.
- B.5 Staff salary includes the lectures and the assistance at the afternoon or night sessions at the observatory. Staff members will give about ten of the lectures.
- B.6 Eight of the lectures will be by guest lecturers.
- B.7 Secretarial salary includes typing the lecture summaries. The monographs published last year can be used for most of the lectures. The new lectures will require additional notes.
- B.8 Three senior research assistants will be needed for helping the participants with the instruments at the observatory.
- B.9 Retirement is calculated at 8% of staff and secretarial salary.

Other Direct Costs

- B.11 Cost of laboratory materials includes rental of time on the computer and the telecordex and cost of photographic plates, paper, etc. Half of this cost is to be met by the Departments of Physics and Astronomy.
- B.14 Health service fee has been computed at the usual rate of \$4.00 per person.

C. Fees

Tuition fee was calculated taking the Conference to be equivalent to a 3-credit course.

D. Contributions from Sources other than NSF

The major part of the cost of computer time, photographic materials, etc. will be contributed from the university.

1. THE HOST INSTITUTION

The Georgetown University will be the host institution for the Summer Conference and the staff of the departments of physics and astronomy will direct its academic activities. The Georgetown University, founded in 1789, is the oldest Catholic institution of higher learning in the United States. Its white-domed observatory, which dates back to 1841, occupies the picturesque hilltop at a remote corner of the large campus and overlooks the many university buildings, the Potomac River and the nation's capital, which has grown around and beyond historic Georgetown. The physics laboratories are at present located in the main building of the campus, the Healy Building, constructed in 1879. During June 1962 the Physics Department will move to the new \$4.2 million Science Building.

The University comprises the College of Arts and Sciences, Graduate School, School of Medicine, Law School, School of Dentistry, School of Foreign Service, School of Nursing, Institute of Languages and Linguistics, School of Business Administration, Summer School, Astronomical Observatory and Seismograph Station. The total enrollment is approximately eight thousand. Course offerings lead to Bachelor's, Master's and Doctor's degrees in most areas.

The Summer School of the University (enrollment 2400), besides conducting regular courses at the graduate level, has in recent years also administered institutes and conferences for specialized groups of participants. These programs have been under the sponsorship of the National Science Foundation and other agencies. Among such programs conducted during the summer of 1961 were: Contemporary Literary Criticism; Christian Social and Political Thought; Foundations of the Physical Sciences; Writers' Conference; all these were sponsored by the University. The I.C.A. sponsored an Orientation Program for Foreign Students. A Teacher Training program for Italian-Colombian teachers of English sponsored by the Department of H.E.W. and a Conference for Native Teachers of French under the N.D.E.A. were also conducted by the Summer School of 1961.

2. MAJOR OBJECTIVES OF THE CONFERENCE

The basic plan for this Conference was drawn up in a series of informal discussions among faculty members of the departments of physics and astronomy. The Conference is intended to give to college teachers of physics and astronomy an academic stimulus beyond the regular programs of instruction at the undergraduate level. Though astronomy is the oldest of the sciences, at the present time, it does not find a place in the curricula of most colleges. This omission has serious disadvantages. Instruments and methods developed by physicists are a major tool for the astronomer and astrophysicist. On the other hand, recent advances in astro-geophysics contribute a great deal towards the teaching of classical and modern physics, through stimulating interest, clarifying concepts, illustrating physical laws and stressing the need for basic research. A few of the aspects of the recent advances have elicited popular interest to an unprecedented degree. The scientific accuracy of some of the widely publicized accounts of the present so-called "space age" is not what physicists and astronomers would like it to be. In classroom discussions of physics and astronomy, questions come up which teachers often feel they cannot handle adequately with their more conventional training. A conference of the kind we are proposing should contribute towards correcting this deficiency.

There is reason to believe that the Summer Conferences on the same topic which we held in 1960 and 1961 succeeded in achieving these objectives. The reaction of the participants was highly enthusiastic, and many of them still keep writing to us. Some of them are using the symposia we published in connection with the conference as text book or extra reading material for their courses, and there have been several bulk orders for the symposia.

In both years several of the lectures were extensively reported in the local newspapers and Washington Post published an editorial each year. Three of the participants presented a panel discussion on the Conference on the Georgetown T.V. Forum. The taped text of the discussion was later broadcast on about two hundred radio stations across the nation. Thus both years we had the opportunity to acquaint a very large public about salient topics in astro-geophysics today, and even more importantly about the objectives of the National Science Foundation in holding Teachers' Conferences of this type.

From the large number of inquiries and requests we have received about another Conference to be held next year, we believe there is sufficient justification in proposing to hold one more such conference.

3. THE ACADEMIC PROGRAM

The program of the Conference devotes the morning sessions to lectures and the afternoons or nights to experiments, observations, or field trips. The lectures will last for two periods of 50 minutes each, with a coffee break in between and will be followed by a question period. They will attempt a survey of the results which the astronomer obtains when he applies the tools of physics to his subject. Emphasis will be placed on the physics of the bodies of the solar system, in particular the earth, insofar as our knowledge is based upon visual, spectroscopic, rocket, satellite and radio-astronomical methods. The first week will be devoted to basic lectures, sufficiently general, but not elementary, designed to lay the ground-work for the special topics to be dealt with during the following two weeks. Topics for the two following weeks will be handled by experts, each on his own special field where he has made significant contributions. Mimeographed copies of the lectures will be distributed. A total of 20 lectures are listed below, for the sake of completeness, though only 18 lectures will actually be given. The staff members of physics and astronomy departments as also some of the guest speakers have already been consulted. The listing of a few of the guest speakers is tentative. From our experience of the two earlier Summer Conferences, we have little doubt but that competent speakers will be available. Most of the guest speakers who spoke at our previous conference expressed great satisfaction at their being able to take part in the conference, and we feel sure of their full cooperation.

Lecture Topics

I. Introductory

Tools of the Modern Astronomer	Francis J. Heyden, Georgetown College Observatory
Spectroscopic Methods in Astronomy	Matthew P. Thekaekara, Dept. of Physics, Georgetown U.
Astrophysical Research with High Dispersion Instruments	Carl C. Kiess, Georgetown College Observatory

II. Geophysics

Upper Atmosphere Physics from Satellites	Robert Jastrow, Naval Research Lab
Satellite tracking and Geodetic Applications	John A. O'Keefe, National Aeronautics and Space Administration
Satellite Wakes	William J. Thaler, Department of Physics Georgetown University
Backscatter techniques in Geophysics	William J. Thaler, Department of Physics Georgetown University
Radiation Belts	Cabell A. Pearse, Naval Research Laboratory

III. The Solar System

Current Astrophysics	Matthew P. Thekaskara, Department of Physics Georgetown University
Tektites and the Moon	John A. O'Keefe, National Aeronautics and Space Administration
Lunar Mapping Problems	Chester B. Wetts, U. S. Naval Observatory (Ret'd)
Comets	Carl C. Kiess, Georgetown College Observatory
Physics of the Sun	Charlotte M. Sitterly, National Bureau of Standards
Infrared Spectroscopy in Astrophysics	George J. Zissis, University of Michigan
Radio astronomical observations of the planets	John P. Hagan, National Aeronautics and Space Administration

IV. The Stellar Universe

Interstellar Medium	Francis J. Heyden, Georgetown College Observatory
The Galaxies	Vera C. Rubin Georgetown College Observatory
Cosmic Abundances of the Elements	Ernest Öpik University of Maryland

Cosmic Rays

David Stern,
University of Maryland

The Age of Stars

Bengt Strömngren,
Princeton University

Instructional Staff

The following are the members of the Georgetown University Staff who will lecture at the Conference:

- Francis J. Heyden, S.J. - Ph.D., Harvard Univ., Director of Georgetown Observatory - Specialty, Statistical Astronomy, Geodetic Measurements through eclipse observations.
- Carl C. Kies - Ph.D., University of California, Ret'd Physicist, National Bureau of Standards, Asst. Professor, Georgetown University, Spectroscopist, has published over 200 articles.
- Vera C. Rubin - Ph.D., Georgetown U., Asst. Prof., G.U., Dept. of Astronomy, Specialty:Galactic Structure, Astrophysics.
- William J. Thaler - Ph.D., Catholic University of America, Professor, Dept. of Physics, Georgetown University, Specialty, Upper Atmosphere Physics.
- Matthew P. Thekaekara, S.J. - Ph.D., Johns Hopkins University, Assoc. Professor, Acting Chairman, Dept. of Physics, Spectroscopist, developed the automatic methods with the G.U. E 101 Computer.

The guest speakers we propose to invite are all Ph.D.'s and have contributed a great deal in recent years to progress in the specialized fields with which their names are associated. Dr. John O'Keefe, Dr. Charlotte Moore, Dr. Chester Watts, Dr. John P. Hagen, Dr. Cabell A. Pearse, Dr. George J. Zissis, Dr. David Stern and Dr. Bengt Strömngren all spoke at our summer conference in 1960.

Special Program Features

The afternoons or nights will be devoted to work at the Observatory or to field trips. The conferees will be given an opportunity to familiarize themselves with some of the work at the Observatory by actually participating in the research. A few clear nights will be devoted to observing and mapping the sky with the aid of the 12-inch refractor or the Ross Camera in the small dome. This, we believe, would prove of great interest to most physicists.

Two small electronic computers, the Burroughs E 101, will also be at the disposal of the Conference for selected hours. In a few hours it should be possible to master the essential stages in programming for the computer and to gain some familiarity with using it for ordinary problems. All the conferees will be able to use the computer for some time.

Some experimental and observational work will also be done with the two high dispersion spectrographs, both Wadsworth mounting, for the study of laboratory sources as well as of the atmospheres of the planets. No exact schedule has been drawn up for this part of the Conference program since nights suitable for telescope work depend on the weather conditions. Several members of the staff and two research assistants (senior graduate students) will help in carrying out this part of the program.

The field trips will provide the conferees with the opportunity to visit in a body several important centers of research in and around Washington. Our past experience shows that the conferees will be cordially welcomed at these centers and that they will benefit greatly from the visits. Among the centers which we plan to visit are the David Taylor Model Basin, the National Bureau of Standards, the Applied Physics Laboratory, the Naval Research Laboratories, the Naval Observatory, Diamond Ordnance Fuze Lab., the Coast and Geodetic Survey, and the Space Computing Center.

4. ACADEMIC CREDIT

Since the course of lectures has been planned after a great deal of consultation among the staff members of the two departments of physics and astronomy, there was some hesitation about not offering graduate credits for the course. However, it was decided not to offer credits. The main reason for so doing is that a relaxed atmosphere, free from the pressures of formal courses and examinations, is essential to the success of the conference. At the end of the conference a formal certificate concerning participation signed by the Directors of the Summer School and of the Summer Conference will be issued to each participant, stating the nature of the conference and its credit equivalent. Some of the teachers from the smaller schools find such a certificate to be of advantage.

5. CRITERIA FOR ELIGIBILITY

The participants should be college teachers with at least three years of experience, but still sufficiently young, at least in mind, to benefit from a fairly concentrated program covering so much unfamiliar ground. The Conference is intended primarily for teachers of physics and astronomy. Teachers of mathematics with sufficient background in astronomy may also benefit from the Conference. Since ours is likely to be the only program on this subject in the country, we are setting no geographical limitations in criteria for eligibility.

6. FACILITIES

a. The morning sessions will be held in the air-conditioned faculty lounge of the New South Dormitory.

b. The Observatory buildings will be used for work with the telescopes, computer and spectrographs. The Observatory is equipped with the following instruments which will be available for the Summer Conference: a twelve inch refractor and a smaller telescope, both on equatorial mounting, one with a prism camera attachment and the other with a large Ross camera, each housed in its own dome; two Wadsworth spectrographs, one in the basement of the main building, and the other in a separate house, with heliostats and other accessories; a telereadex

and a comparator; a telecorder for automatic registering of plate readings; a Burroughs E 101 computer; a Littrow spectrograph.

c. The libraries of the university, the gymnasium and the tennis courts will be open to those attending the Conference. Information concerning theaters, concerts, sight-seeing opportunities, beach resorts, etc., may be obtained from the office of the Director. A special program of movie classics will be running concurrently with the Summer Conference and all participants will be permitted free of charge to see any movie they choose. Special trips to nearby places of interest will be arranged on week-ends. Evenings (or afternoons when night observation is scheduled) and week-ends are free. An air-conditioned drawing room in one of the new dormitories will be set apart for the use of the participants. The drawing room has a television set, and is located on the same floor as the rooms of the participants. A reference library of specially selected books on each of the topics to be treated in the conference will be located in the faculty lounge where the lectures are to be held.

One or two picnic style dinners will be held on the observatory hill for the conference staff and participants and their families. These dinners will prove particularly attractive because of the picturesque surroundings of the hill-top and the large amount of space for the children to play. Other social functions which are usually arranged for similar conferences at Georgetown University include a reception by the Summer School and parties arranged at the homes of the staff members.

d. Dormitory rooms will be reserved for the participants. The rental will be \$50.00 for the entire period of the Conference. Families will be guided in finding furnished living quarters in the Georgetown area. On weekdays the conferees will have luncheon together. Other meals may be had on a pay-as-you-go basis, at approximately \$15.00 per week. Dining halls and cafeteria are both located in the air-conditioned New South Building opened in the fall of 1959. In addition there are several attractive restaurants in the Georgetown area.

Georgetown University, Washington 7, D. C.
Summer Conference
On Recent Advances in Astro-Geophysics
August 1962

Evaluation Reports on the Conference given by the Conferees.

1.

- I. Most liked about the conference
 - A. Choice of lecturers
 - B. The format of the schedule
 - C. The field trips
 - D. Other sessions:
 1. Observatory
 2. Computer Laboratory
 3. Seismograph Laboratory
 4. Spectro-graph
 5. Socials and coffee breaks

- II. Least liked about the conference
 - A. None

2. This was an outstanding meeting. The whole conference from start to finish was excellent. The housing was ideal and the meals very good. The field trips were on the whole excellent. I might suggest that DOFL be dropped and that the Naval Ordnance Laboratory at White Oak, Md. be investigated in view of a field trip.

The conference room was ideal and the speakers, with one exception, were superior in performance. The use of the computer and the fine help of Fr. Haig were additional bonuses. I learned much and was pleased with the conference. Thank you for inviting me.

3. The lectures that I considered most valuable were those by Dr. Kiess, Dr. Thekackara, Dr. O'Keefe, and Dr. Thaler.

The laboratory work with the spectrograph—both observing the instrument and reading the lines will be of great value to me when the time comes to explain these things to astronomy students.

Field trips to the Goddard Space Flight Center, the Naval Observatory, and the Naval Research Laboratory were most helpful in understanding the problems and objectives of current research. I feel that these trips have provided me with experiences which will be drawn on frequently during the coming year.

Incidental valuable experiences for the conference include the exchange of views regarding suitable demonstrations in plupits and satisfactory sources of films and filmstrips for class work.

Finally, Washington is a city which is exceptionally rich in places worthy of repeated visits. I believe weekend trips to the Museum of Natural History, the Smithsonian, National Gallery of Art, the Capitol, and the monuments are of considerable cultural value. I am glad that the schedule permitted these excursions.

4. This conference has been most helpful to me and will have considerable influence on my teaching. Above and beyond the data presented and new results made known, it was brought home in a very forcible way, to me at least, just how gigantic an effort this country is putting into scientific work.

I thought the conference was very well planned and organized in every

respect. I do have two minor suggestions that it would seem to me would improve things. In my opinion, there were too many field trips. I think four would be enough. Secondly, it might be worthwhile, if practical, to break into small groups and do more actual observational work.

Thank you very much for the opportunity to participate in this conference. It has been a most rewarding and thoroughly enjoyable time.

5. On the whole, the conference was very good and well worth the time spent. Most of the speakers were very good; however, some were very poor. Perhaps the speakers should be well-informed of the backgrounds of the participants, if not already done so.

I thought the conference slightly long. Perhaps some of the lectures could be placed on afternoons when no field trip is scheduled. I am sure many participants would not agree with this.

The rooms furnished were very satisfactory. The lunches were good during this week of the first, but declined in quality in succeeding weeks.

The observing facilities, telescopes, should be made available to the conferees. It is a shame that the large telescope was not used by the participants. Perhaps a few more field trips could be added.

I wish to emphasize that I consider the time spent well worthwhile, and I am thankful for having the opportunity to participate.

6. Overall: A Very Valuable and Informative Conference.

Topics Covered: A good survey of recent developments and general background with much thought provoking information and discussions

Field Trips: In as far as the conference staff could control the field trips were good. However, I felt that the trip to the David Taylor Model Basin should either be drastically changed or omitted in future years. Also, the trip to the Bureau of Standards should definitely include some discussion of and a visit to the standards vault.

Informal Meetings: I felt that the informal meetings on the teaching, etc. of Physics and Astronomy were of great benefit. I would recommend that they be planned into the schedule for future years. And in line with this, a note regarding these discussions could be sent to future participants so that they might come to the conference with general lists of requirements and texts, etc. which some of us forget from time to time.

Topical Symposium: The pre-publication of the topical symposium was a great help, especially for pre-study and briefing on the next topic. It, also serves as an excellent review and source of bibliographic information. This should be continued.

Suggested Additions: Besides the inclusion of some material on the solid earth, I would, also suggest:

1. A definite planned field trip or series of trips with only 6 or 8 going at a time, to the seismic station which we took at the last minute.
2. A more definite scheduling of work at the observatory--possibly with a rather definite schedule, rather than the hit or miss that evolved this summer.

This conference has been of great value to me and I am sure that I shall be able to pass much on to my institution and students. I feel very honored and lucky to have been able to attend this conference and should like to think that sometime in the future others as well as myself will be able to attend such a conference again.

7. Field Trips

Most interesting one was to Naval Observatory, next--NASA. In most of the others, the things seen were not directly connected with astronomy. The unscheduled tours of the seismic laboratory was quite informative.

Lectures:

Most of the talks were very interesting and well-presented. The speakers are to be congratulated for challenging us with new material. They were not afraid to give us controversial ideas, and I think the intensity of the discussions showed that the talks were received with enthusiasm.

If you have another conference, be sure to invite Dr.'s Kieggand O'Keefe back.

Practical Work

I think many of the conferees would have liked to use the observatory more. Father Heyden was very gracious in showing us around and explaining the equipment, but on only one occasion did anyone get to actually look through a telescope. Perhaps in the future, a quick course could be given to the conferees on how to use the small telescope and then this could be made available to them on the same basis as the computer.

I appreciated the hard work and interest of the conference director, Fr. Thekackera; Fr. Haig, Dr. Rubin, and other members of the G. U. staff in organizing this conference. I learned a lot and I am sure that this will be immediately reflected in my teaching.

One thing more about practical work. Father Thekackera had to cut his first talk short before he could give many facts. An entire afternoon spent surveying the possible observing techniques and comparing them (i.e. photography-photometry-visual observation, etc.) what you can and can't do with each-resolving powers, recommended emulsions for photography-etc. etc. might be well-received. I am glad that Dr. Eagle was present to give us some sort of information along this line.

Social life was fine! Pace about right.

8. I would like to express my gratitude for the opportunities afforded me by the Institute. I can honestly say that it has been a great as-

assistance to me--both the formal and informal aspects of the conference contributing a great deal.

The only suggestion for improvement I could possibly make and implementation may be impossible. For those of us with limited background in astronomy, it would be advantageous to have a few more evening sessions with the telescope. I would have found this very valuable.

But even without this, I feel the conference has been very valuable. The lectures were, almost without exception, excellent and informative.

In My estimation, I feel that the conference under your direction has certainly met the objectives which were described in the brochure. Most of the lectures and the field trips were very stimulating and well presented. I feel that because of them my subsequent teaching of astronomy will take on a new "dimension".

My suggestion regarding further conferences of this sort is that some of the lectures could be given in the evenings only or on Saturdays and thus making the duration of the conferences exactly three weeks.

It is my hope that subsequent conferences of this sort will be granted and sponsored by the National Science Foundation.

10. Every aspect of this program seems to have been so well planned and so carefully executed that I am at a loss to suggest any improvements. The speakers, with one or two exceptions, were excellent and presented the latest advances in their respective fields. The fact that we had a complete set of lecture notes right from the beginning of the program certainly was an aid in our understanding of the topics presented.

The field trips complemented the lecture topics very nicely. It was obvious that they were not just a fill-in-the-gap measure, but rather that they had been carefully coordinated with the lectures to give us a broader coverage of each topic.

11. In general, this conference has been well-organized and has accomplished the objectives set forth in its descriptive brochure. All the speakers were well-informed; the vast majority of them also communicated well. The field trips were well-chosen and tailored to the needs of the group. The monograph of the course was especially helpful because it was distributed at the beginning of the session. Informal discussions of teaching problems were also beneficial. Living conditions were very satisfactory.

An additional tour of Georgetown's own Observatory would have been useful. Greater access to the books in the Conference Room would also be helpful. If the course is offered again, perhaps the volunteer librarian could be requested to leave the bookcase unlocked a greater percentage of the time.

To encourage conferees to visit the many places of interest in Washington, possibly one sight-seeing tour could be organized for a Saturday or Sunday, or information about such tours could be posted in the Conference Room.

The director and his assistants are to be commended for this fine program.

12. The 1962 Astro-geophysics conference at Georgetown has proved to be one of the most stimulating professional experiences I have had in several years.

With two or three exceptions, the speakers were unusually clear in their presentations and communicated easily with the conference group. The range and sequence of the topics discussed gave evidence of much careful thought.

The laboratories visited on field trips seemed to provide a representative sampling of some of the best local research related to astrophysics and/or geophysics. The timing of these trips within the framework of the conference schedule was particularly good. The personnel at the various installations were courteous and helpful in every case.

Not the least of the attractive features of this conference were its "fringe benefits". Certainly the instruction we received in programming and operating a small computer was of immense help to those of us who were not familiar with machines of this type.

Housing for the conference was adequate, and the Georgetown personnel were cordial hosts.

All in all, it was clear that this conference had been preceded by others of its kind, so that possible deficiencies had been supplied and errors of judgment remedied by 1962.

If I were pressed for suggested improvements for another year, I would recommend one or two replacements in the roster of speakers. I would also wish that there had been greater opportunity for the conferences to make use of at least the small telescope at the Georgetown observatory.

I am glad to have this chance to extend thanks to the National Science Foundation and to the conference director for an exceedingly profitable experience.

13. I have only words of highest praise and commendation for all the phases and facets of the conference. The detailed, painstaking planning and organization were everywhere evident.

Having the speakers' lectures in hand in advance was very helpful. The choice of speakers and places which we visited in our field trips was highly satisfactory.

Opportunity to become acquainted with the electronic computer, the telecordax, and other pieces of equipment at the Georgetown Observatory was most welcome.

I am very grateful for the opportunity to participate in the conference.

14. I am grateful to you for permitting me to participate in the Summer 1962 Conference on Astro-geophysics. I have profited greatly from having the opportunity to exchange ideas with other college professors and to see what is being done now in the field of astro-geophysics.

To my mind the lectures were almost without exception of real interest to me, and of great value. I found particularly good the lectures of Carl Kiew, John O'Keefe, William Thier, and Dr. Thekshara. Even in the single instance where the professor performed rather poorly, we might have benefited much--we were faced with the perfect model of how not to teach. It has been a help to have the lectures in written form beforehand, so that we could obtain some idea of what to expect.

The conference would have been incomplete, I think, without the injection now and then of a field trip. I could not help but notice how well these trips fitted in with the material being covered currently in the lectures. My favorite trip was our visit to the Naval Observatory, as this was my first experience in viewing the world through a good telescope.

I found especially interesting and worthwhile the work we did with the computer and the telecordax.

15. In regard of your request my evaluation of the conference is as follows; the housing was satisfactory, the food in psy cafeteria was very good. Lunch from general cafeteria was very very poor as to the price \$1.25 per meal, the theoretical and practical program of the conference was scientific in nature, although 35% of lecturers were not qualified for this program, in general, the conference was very useful for me. I learned very much theoretically and practically.

D. PARTICIPANTS (continued)

2. Give examples of the participants' plans to continue their development, such as independent study or degree work:

Most of the participants have a Ph.D. degree. All of them are actively engaged in teaching. The Conference gave them a needed stimulus in their academic work.

3. Mention any plans for follow-up studies on the post-institute activities of the participants:

The activities of the participants are very varied, and no follow-up studies are feasible. The Director continues to hear occasionally from the participants of all three previous years or meets them at conventions of the Physical Society.

E. STAFF AND VISITING LECTURERS

1. Comment on problems in obtaining staff and visiting lecturers:

Some of the lecturers whom we originally expected to have, had to decline our invitation because of conflicting summer schedules. But we experienced little difficulty in finding others equally competent to handle the topics, and no substantial change had to be made in the subject matter proposed for the Conference.

For this particular topic, Recent Advances in Astrogeophysics, perhaps no other city in the U.S. has so abundant a supply of competent speakers.

2. Describe the general reaction of the staff to the institute and participants:

The staff members were enthusiastic about the reactions of the conferees. One of them, I am afraid, misjudged the level of the audience, and another, though maintaining a sufficiently high level, was too much a research scientist and administrator to make a good teacher.

3. State your judgment of the value of the visiting lecturer program, particularly foreign lecturers:

We did not have any visiting lecturers or foreign lecturers.

F. HOST INSTITUTION

1. Comment on the relationship between the institute and the host institution:

a. Officials

The officials of the University are very happy about the Conference. The Office of Public Relations and the Director of the Summer School both helped to highlight the Conference as an outstanding event. Our thanks for a successful Conference are also due to the Office of the Academic Vice-President, the Student Personnel Office, the Director of Off-Campus Housing, the University Food Service, the Telephone Service, the House-keeping Staff, and the University Post Office.

b. Regular staff

Some of the members of the regular staff of the University were speakers at the lecture sessions. A few also helped with the laboratory sessions. The presence of several of the Physics faculty at the round-table Conferences on teaching of physics was very helpful.

2. Describe the impact of the institute on regular teacher-training programs at the host institution and on the host institution and locality as a whole:

The Georgetown University has no regular teacher-training program. The Conferences would not fit well into any such program anywhere.

G. OTHER NSF-SPONSORED PROGRAMS

1. Mention the relationship between the institute and other NSF-sponsored programs at the host institution (Summer, Academic Year, Research Participation):

Other U.S.F. sponsored programs on the campus are the Summer Institute on Mathematics for High School teachers, the In-Service Institute in Physics for Junior High School teachers and the Undergraduate Research Participation Program. Our Conference was held at the same time as the Math Institute and we had one joint party. The lessons learned in the Summer Conference are very helpful for developing the course content of the In-Service Institute.

H. RECOMMENDATIONS FOR THE FUTURE

1. Please suggest ways to improve the Summer Institutes Program on the following levels:

a. Local

It would seem that this item and the two following apply rather to an Institute than to a Conference.

b. Regional

H. RECOMMENDATIONS FOR THE FUTURE (continued)

c. National

2. Please suggest potential activities for NSF in its efforts to improve the quality of science teaching:

Under this heading, it seems appropriate to quote in full a letter to the President of Georgetown by the Conference of 1962 and signed by all of them. Copies of the letter, with all 32 signatures, were also sent to Dr. Alan T. Waterman, Director of the National Science Foundation, and to Rev. M. P. Thekkare, the Director of the Conference. The letter is typed on a separate page.

C
O
P
Y

The Astro-Geophysics Conference
Georgetown University
Washington 7, D. C.
August 27, 1962

The Very Reverend Edward B. Bunn, S.J.
President, Georgetown University
Washington 7, D. C.

Dear Father Bunn:

We, the participants in the Astro-Geophysics Conference held at Georgetown University in the Summer of 1962, wish to express our thanks to the National Science Foundation for sponsoring the Conference and our appreciation for the contributions that Father Thekackara and other members of the Georgetown faculty have made to it. Further, we wish to express our conviction that such conferences are of great value in several significant ways.

It almost goes without saying that the Conference has given a great deal to all of us in knowledge, understanding, and inspiration. But, it has also had values beyond this. We found the pace and intellectual atmosphere extremely conducive to intellectual contest -- to the free and vigorous exchange of ideas.

It is our belief that the guest lecturers and the members of the Georgetown faculty who contributed to the Conference, as well as the Conferees, have gained something from the vigorous exchange of ideas; and it seems inevitable that this something will come to further fruition in their subsequent research and teaching activities, as well as in ours.

But even beyond this, it is pertinent that we comment on the value to our country of the kind of activity this Conference typifies. For a relatively small investment, the United States reaps from this kind of activity a maximization of the contribution that its teachers and scientists can make to the solution of the overwhelming problems that mankind faces in the 20th Century -- and (hopefully) beyond. For this reason -- even more than for any other -- we urge as strongly as we can -- the continuance, and possibly the growth, of the kind of program that this Conference has exemplified.

We are taking the liberty of sending a copy of this letter to Mr. Alan T. Waterman, Director of the National Science Foundation.

Very sincerely,

The Conferees of 1962

I. ADDITIONAL COMMENTS

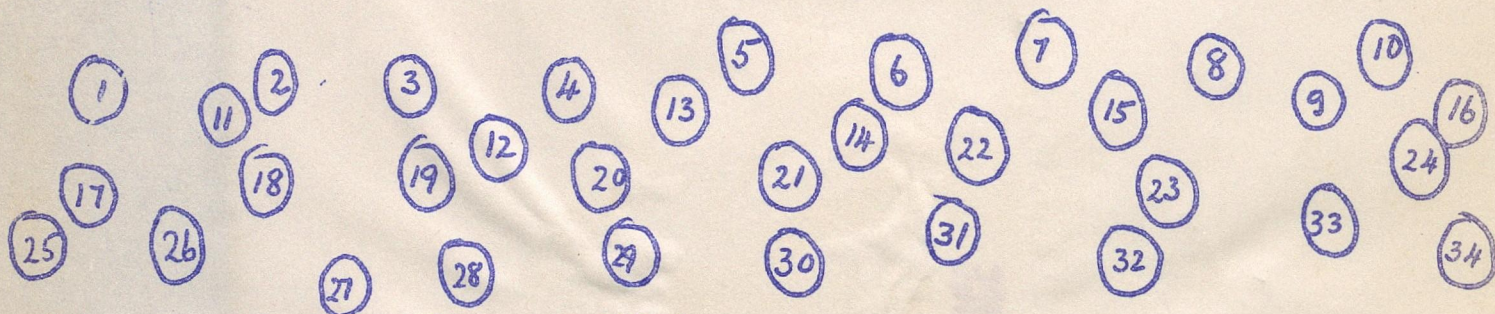
In attempting to evaluate the Conference a question might be asked: What is it that made the Conference so successful; why it attracted so much public attention, and evoked such high appreciation from the participants.

Perhaps every Conference of this type is bound to be a success if the suggestions given by the N.S.F. concerning course structure, selection of participants, etc., are carefully followed. Scientific conventions are usually the only occasion when faculty members from different colleges get together. In crowded hotel lobbies, during an all too brief period, with a heavy program of lectures, they get little opportunity to become acquainted with each other. One meets many new persons, learns their names and forgets them soon after. During a Conference of three weeks, the conditions are entirely different. They live together, take their meals in the same place, work on problems and assignments together, arrange excursions in small groups, and in a hundred different ways get abundant opportunity to become well acquainted. In an atmosphere of leisure, without the heavy work loads of teaching and administration, with no deadlines to meet, no telephones to answer, they can discuss mutual problems, share experiences and, at the same time, study the recent advances in a very fascinating field. The morning sessions with lectures, coffee-break, and question period were, of course, important but they were only one part of the Conference. A Maxwellian Curve has a low energy peak and a high energy tail; and the total energy is mainly the contribution of the low energy peak. A conference of our type is analogous. Most of the success of the Conference is due to the conferees themselves. But their discussions were kept at a sufficiently high level, thanks to the topics discussed in the lectures and the informal discussions they had with the lecturers during the coffee break and the lunch hours.

Our Conference had a few special advantages which cannot be ignored. The topic is one that claims a great deal of attention from the public at the present time. Problems of astrophysics and geophysics are no more the idle speculations of the scholar in his ivory tower, but are front page headlines in newspapers. Washington has been called Science City, U.S.A. because of the heavy concentration of research laboratories in this area, and attention is mainly focussed on space age problems. Hence on almost every major topic of our Conference a competent speaker could be found close by; and several of the speakers were men with nation-wide reputation. The facilities in the New South Building are the best on the campus for living accommodation, small size lecture room and cafeteria; and the Conference was at a time when these facilities were not overtaxed. All research laboratories we selected for field trips had something very interesting and very new to show to us. Washington during summer-time is a great tourist attraction, and hence weekends and free evenings could be made very enjoyable. The unique character of the Georgetown area, the rich associations of a University with its hundred and seventy years of history, the exhibits of the University archives which many conferees visited, all contributed substantially to the success of the Conference.



Georgetown University
Washington 7, D.C.



Group Photograph of
Summer Conference Participants, 1962.

- | | | |
|----------------|-------------------|---|
| 1 Dr. Shirin | 12 Dr. Balczak | 23 Dr. Ine Gervey |
| 2 Prof Goodwin | 13 Dr. Cole | 24 Prof. Eldridge |
| 3 Dr. Osner | 14 Prof Leyn | 25 Fr. Hutakana |
| 4 Prof Ayers | 15 Prof Olanoff | 26 Dr. Beale |
| 5 Prof Allison | 16 Dr. Kelly | 27 Sister M. Cecilia |
| 6 Dr. Hart | 17 Prof Evans | 28 Sister M. Howard ^{last} _{arms} |
| 7 Prof Engle | 18 Fr. Wagener | 29 Sister Kathleen M. ^{Bellecourt} |
| 8 Prof Inayer | 19 Dr. Robertshaw | 30 Sr. Mary Matthew |
| 9 Dr. Kenny | 20 Dr. Prokopow | 31 Sr. Mary Charles |
| 10 Prof Calsyn | 21 Prof. Calvert | 32 Dr. Inatsushima |
| 11 Fr. Haig | 22 Dr. Prather | 33 Dr. Freeman |
| | | 34 Prof Ellerbe. |

RECENT ADVANCES IN ASTRO-GEOPHYSICS

by

Sister M. Ignatia Frye

Marygrove College

Detroit, Michigan

Presented October 28, 1961
UNIVERSITY OF MICHIGAN
Ann Arbor, Michigan

350-51
11-61

REPORT ON THE NSF SUMMER CONFERENCE FOR COLLEGE TEACHERS
ON RECENT ADVANCES IN ASTRO-GEOPHYSICS

Sister M. Ignatia Frye
Marygrove College
Detroit, Michigan

No doubt most of you saw the "Announcement of Summer Conferences for College Teachers - 1961" - sent by the NSF to chairman of college physics departments throughout the country. Among the ten conferences listed under Physical Sciences and Engineering was the one at Georgetown University, July 6 - July 28, entitled Recent Advances in Astro-Geophysics. According to the announcement, this conference was for college teachers of physics and astronomy and would be a "basic survey of the subject followed by talks by specialists on significant recent developments; emphasis on results from spectrographic, rocket, satellite and radio-astronomical methods." It would include work at the observatory with telescopes, spectrographs and electronic computers.

I was one of the 32 fortunate participants at this conference, the only one from Michigan. California and Texas were well represented, but in general there was only one participant from a state. Practically all of the participants had Ph. D.'s and were teaching astronomy or physics or both in a small college. About one-third of the participants were women, one of whom had her Ph. D. in astronomy and had been a professional astronomer before she started teaching. The group as a whole was a very friendly and congenial one. Incidentally there were very few Catholics among them.

The power behind the conference was Father Francis J. Heyden, S. J., Director of the Georgetown College Observatory. He did the major planning and obtained a \$21,300 National Science Foundation grant. Out of this each participant received a stipend of \$345.00 plus traveling expenses. Father Matthew Thekákara, a Jesuit physicist born in India, was director of the conference. He introduced the guest lecturers, arranged the field trips, and looked after all details. Our meetings were held on the Georgetown Campus in the faculty lounge in a new air-conditioned dormitory which also housed the cafeteria and dining rooms.

Each morning we had a guest lecturer, an outstanding geophysicist or astrophysicist who spoke to us on his specialty about one hour before and one hour after the coffee break. A question and answer period followed the second talk and then the group and the guest lecturer lunched together. Among the guest lecturers were Dr. John A. O'Keefe of NASA, Director of the Goddard Space Flight Center; Dr. William J. Thaler, the brains behind Project Tepee and Project Argus; Cabell A. Pearse of NRL; Dr. Charlotte E. Moore, of the National Bureau of Standards; Dr. George J. Zissis of the University of Michigan; Dr. John P. Hagen of NASA who, among other things, built the radio telescope on top one of the buildings of NRL, close to the National Airport in Washington, D. C.; Dr. David P. Stern, of the University of Maryland, and Dr. Bengt Strömberg, of Princeton University.

The basic survey of the subject promised in the original NSF announcement consisted of two lecturers by the faculty of Georgetown College University. Father Heyden talked on the tools of the modern astronomer and Dr. Carl C. Kiess on astrophysical research with high dispersion instruments. After that the guest lecturers told us much about upper atmosphere physics, geodetic applications of satellite tracking, satellite wakes, backscatter techniques in geophysics, radiation belts, tektites and the moon, lunar mapping problems, comets, physics of the sun, infrared techniques in astrophysics, radioastronomical observations of the moon and the planets, distribution of the stars, the origin and abundance of the elements, cosmic radiation, and finally, the ages of stars.

During these morning lectures we heard about the theory of isostasy, plasma physics, the Van Allen zones, the pear-shaped earth, etc. In the afternoon of the first day we were given a basic lecture in computer programming and the use of the Burroughs E101. Two of these electronic computers were available for our use. For one of these, we were divided into teams of three or four participants and our use of it was closely supervised and accompanied by lectures on computer programming. The second E101 was at the observatory and the participants who were considered proficient in its use were encouraged to use it alone. One afternoon when I was at the observatory some astronomers from the University of Michigan arrived. They were particularly

interested in the use of the E101 for astronomical purposes and asked for copies of the programs that had been developed at Georgetown.

At the observatory we were shown how to use the various instruments: the telescopes, cameras, spectrographs, and measuring engines. I was particularly fascinated by one of these which was coupled to a Telecordex. There was also a Telereader coupled to the Telecordex which in turn punched out paper tape that could be used as input for the E101.

Two afternoons a week we had field trips or visits to research centers in and around Washington. Air-conditioned buses provided the transportation. Our first trip was to the Diamond Ordnance Fuze Laboratory. There they put on three lecture demonstrations for us, one on fluid amplification, and an excellent one on micro-miniaturization. They mentioned the fact that they have short films on both these subjects available for loan to colleges and universities, as well as a 22-minute film showing a tour of DOFL called the "The DOFL Story."

At the National Bureau of Standards I was most impressed with their arc thermometry section. They also showed us their betatron and Van de Graaff accelerators and their huge, but by current standards, slow digital computers. At the Johns Hopkins Applied Physics Laboratory we saw an IBM 7070 and at the David Taylor Model Basin we saw the Larc and when I asked what other computers they had, they said, "Oh, a 7070," just as if it was as small as an E101.

At the Johns Hopkins Applied Physics Laboratory we met Transit in all its stages. We heard about Transit I-B, the first navigational satellite, and Transit II-A with Greb, the first piggyback satellite. We saw the instruments with which they collected data during each passage of the satellite and how this data could be fed into a computer to get the orbit. Then we saw future Transits in the mock-up and planning stages and were much impressed by the trend toward micro-miniaturization.

At the David Taylor Model Basin we saw one of the little cars that rides on a cushion of air and at NRL we went up to the roof and examined at close range the fifty foot diameter radio telescope. At NRL we also saw an instrumented rocket designed by Dr. Tousey and his group that had been recovered after flight, and we examined the spectrograms of the sun and of some of the brighter stars that had been obtained by means of such rockets. They told us that the latest rocket spectrum has at least 30 features not yet observed in the laboratory. After that, our visits to the Naval Observatory and the Coast and Geodetic Survey were interesting but unexciting. The Naval Observatory is putting up a new building for astrophysics, but I do not know what they plan to do in it.

The first day of the conference we were given copies of a book to which each of our lecturers had contributed a paper on the topic of his lecture, but these were not the lectures that were given. Many of those in the book had excellent bibliographies attached and I spent every free moment reading journal references in the physics library, the chemistry library, and the library at the observatory.

Facts related to astro-geophysics that most impressed me were the following:

1. The ability of the earth to stay out of a perfectly spherical shape supports Jeffries theory that the mantle has properties which resemble those of ordinary metals as we know them. Under sufficient forces, they can be made to bend and even to flow; but under moderate forces they will retain their shape indefinitely.
2. Satellites such as those in the Transit series are very useful in determining the positions of the continents with respect to each other as well as helping in precise determination of position of ships.

3. In the inner Van Allen belt, radiation density is nearly constant. In the outer belt there is a strong correlation between radiation density, sun-spot activity, solar flares, magnetic storms, etc. The depth of the outer layer was shown by the Argus Project to be remarkably constant.
4. The Berkeley group under Dr. John G. Phillips is now preparing monographs on energy levels of molecules. The one for red CN is finished and C₂ is to be done next.
5. Observations of the radio emission of Venus will probably give the only direct evidence of what lies beneath the clouds.
6. The solution to the puzzle of the high intensity radio emission from Jupiter will surely add fundamental knowledge about the physics of that planet.

On the last afternoon of the conference NASA sent over one of their four spacemobiles to put on a demonstration for us. They showed models of various rockets in operation now and those planned for the future in connection with our attempts to land on the moon and to put satellites in orbit about Venus and about Mars.

Spacemobile number five will give a more advanced demonstration and will be exclusive for senior high and college students. I do not know exactly when it will start touring the country, but once it is ready, you may be able to book it for your institution by writing a letter giving three alternate dates, the type and approximate size of the audience, and sending the letter to

Mr. John Sims
Educational Services
National Aeronautics and Space Administration
1512 H Street, N. W.
Washington, D. C.

When the conference was over, the participants agreed that it was most profitable, and that if they could afford not to teach next summer, they would apply for membership in another NSF summer conference for college teachers.

January 29, 1962

Rev. Charles L. Coolahan, S.J.,
Office of University Development,
Georgetown University
Washington 7, D. C.

Dear Fr. Coolahan:

Thank you very sincerely for your asking the physics department to suggest an instrument that might make an appropriate gift to the University in connection with the formal opening of the Science Building.

The instrument which we suggest is a scanning spectrometer.

This is a major tool for scientists who work in the branch of physics called spectroscopy. In spectroscopy, some one said half-humorously but with a great deal of truth, it is like trying to learn all about the piano by dropping millions of standing pianos down flights of steps and listening to the sound they make when they crash. The spectroscopist is trying to learn all about atoms and molecules. The spectrometer collects the light coming from atoms and molecules when they break down, analyzes the light into the components, and draws a chart showing the relative strength of each component. The spectrum charts tell us a great deal of the inner structure of atoms and molecules.

Spectroscopy is a field where a few Jesuit scientists have figured prominently. Father Francesco Grimaldi was the first to discover the use of gratings for dispersing light, and this was some 50 years before Newton's great discovery about the colors in sunlight. That stars can be classified by their spectra is one of the most important discoveries in the history of astronomy, and that discovery was made by Fr. Angelo Secchi. Incidentally Fr. Secchi was for a brief period, in mid-nineteenth century, the chairman of the physics department of Georgetown University.

At Georgetown today, spectroscopy is our major field of research. Both in Physics and Astronomy Departments more students work in spectroscopy than in all other fields. Hitherto our work has been solely through photography of the spectra. Accurate studies on the strength of the spectral lines can be made only by photo-electric recording. Hence an instrument of the kind we are proposing is of the utmost importance to our work.

The Ebert scanning spectrometer was developed to its present stage of precision and versatility mainly by the spectroscopic group of Johns Hopkins University. I had the good fortune to belong to this group

between the years 1952 and 1957 when different models of this instrument were tried out. The model which we are now proposing to buy combines the best features at a relatively small cost.

The full description of the instrument is given in the enclosed literature. "Analytical Instruments" (Enc. 1) gives on pp 6 and 7 a picture of the spectrometer and its recording system. The JACO Newsletter (Enc. 2) of August 1956 is a more complete description of the instrument. A more recent folder about the same instrument is entitled "Scanning Spectrometers" (Enc. 3). On the three inside panels of this folder one finds a fairly complete description of the whole set up. The price-list dated January 5, 1962 (Enc. 4) gives a large selection of accessories, some of which are essential, others are optional. We have indicated in red the components we would need for the kind of research which we have on hand. The two major items are the spectrometer with the electrical scanning drive and the high sensitivity recording electronics. Among the accessories like gratings, slits, photomultiplier tubes, sources, etc., we have limited our choice to what is most essential. The list of purchasers given in enclosure 5 serves to show how widely popular the instrument is.

The following is a listing of the spectrometer components which we would need to buy:

<u>Model No.</u>	<u>Item</u>	<u>Cost</u>
82-000	Spectrometer with drive mechanism	\$ 2,335.00
35-00-58-34	Grating for range 3000-8000A	290.00
35-00-58-54	Grating for infrared range	180.00
82-015	Slit assembly	200.00
12-410	Slit of 25 micron width (2 numbers)	170.00
83-021	Photo tube housing	95.00
17-700	Photo tube 931 A Response S-4	21.00
17-701	Photo tube 1 P 21 Response S-4	75.00
17-702	Photo tube 1 P 28 Response S-5	40.00
17-703	Photo tube 1 P 22 Response S-8	29.00
82-110	Recording Electronics	3,360.00
82-500	Flame attachment	360.00
82-501	Gas regulator units	340.00
	Total	\$ 7,495.00

The instrument will be located in Room 527, Spectroscopy Research Lab, on the fifth floor of the Science Building. It will be used both for the research of the graduate students and for the new program of undergraduate research participation for which we are expecting N.S.F. sponsorship. For the undergraduate program, the N.S.F. provides stipends for the students, but the University has to provide the instruments. Hence your help in acquiring this instrument will be greatly appreciated.

Sincerely yours,

MPT:ff

(Rev.) Matthew P. Thekaekara, S.J.
Acting Chairman
Department of Physics