

NATIONAL SCIENCE FOUNDATION  
Washington 25, D. C.

March 20, 1961

MEMORANDUM OF APPRECIATION

TO : Reviewers of Earth Sciences Proposals During  
1960

FROM: Program Director for Earth Sciences

As many of you can attest from your own small sampling, the number of proposals for the support of research received by the National Science Foundation has increased tremendously during the past few years. When I joined the Foundation staff in 1956, the Earth Sciences Program, which then included the atmospheric sciences, received between 50 and 60 proposals. By the end of this fiscal year we will have received at least 250 in the solid earth sciences alone, plus another 30 in oceanography.

The reviewing of so many proposals imposes a large burden on those whom we call for assistance. Moreover, it is sad but true that the greater the number of proposals, the greater the necessity of a quick reply by the reviewers. We have therefore called on you a great deal (and on some of you even more than the three or four proposals per year that we try to keep as our limit to any one reviewer), and you have, almost to a man, responded beautifully. Your replies have been prompt, yet critical.

Because we do not try to acknowledge your efforts individually -- such letters would not only be very time consuming but would also soon become very stereotyped -- I want to take this opportunity to thank you all for your very able and necessary assistance. It enables us to make what we sincerely hope are the best decisions as to which proposals to support with funds that never are sufficient to meet even half requests.

*William E. Benson*

William E. Benson

March 9, 1962.

Dr. William E. Benson, Director,  
Division of Earth Sciences  
National Science Foundation  
Washington 25, D.C.

Dear Dr. Benson:

On March 19th and 20th, I am planning to attend the Symposium on Detection of Underground Objects at the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir. I am wondering if you are planning to attend any of the sessions, and if I shall have the opportunity of seeing you there. If not, I should be glad to come to your office at 3:00 P.M. or at any time thereafter on Monday afternoon if this is a convenient day for you.

I have enclosed six reprints of my most recent short article in which a few dates obtained as part of the project sponsored by NSF Grant G-14094 are reported.

Sincerely yours,

EKR:LF

Elizabeth K. Ralph

file

Head, Office of Science Information Service  
National Science Foundation  
Washington, D. C., 20550

March 5, 1965

Dear Sir:

We have read with interest the publication sent us by the NSF, entitled Improving the Dissemination of Scientific Information. We should like to know whether the ASCA Information Center is an appropriate project for financial assistance from the NSF.

This center was begun in 1960 as one of the projects of the Applied Science Center for Archaeology (ASCA). After this initial support, it has limped along financially with small amounts of funds from the Museum and fractions of the funds available from subsequent NSF grants.

Enclosed you will find an informal account of our work. We shall be glad to come to Washington to discuss this further, or if you direct us to do so, to send a formal proposal. Dr. Rainey is due to return from Europe shortly and in his absence we are sending this preliminary inquiry.

Thank you for your attention.

Sincerely yours,

Elizabeth K. Ralph,  
Associate Dir., ASCA

Jeannette M. Flamm,  
Research Asst., ASCA

In the Information Center at ASCA we have been compiling cumulative author and subject indices of scientific techniques of value to Archaeology and Anthropology. The abstracts of articles, and references, and information on new developments which are the basic components of our files, are culled from many publications of diverse fields. We have found that techniques and developments in other fields, particularly the physical sciences, are frequently pertinent to archaeological research, but that this applicability is either not known, or often not recognized by archaeologists.

A partial list of the periodicals read regularly by the staff of the Information Center is as follows:

Amer. Anthro.	COWA Biblio.
Amer. Ant.	Current Anthro.
Amer. Anth.	Geoexploration
Amer. J. of Arch.	Geol. Soc. Amer. Bullet.
Amer. Numis. Soc., N.Y.	Geophysics
Antiq.	Hesperia
Ant. J.	I.C.C. Abstr.
Archaeology	ICOM News
Arch. J.	Inst. of Arch. Bullet. (Univ. Lond)
Arch. News L.	Jahrb. des D A I
Archaeometry	J. Geophys. Res.
A S M Rev. Met. Lit., Abstr.	J. Iron Steel Inst.
Bollet. Inst. cent. del Rest.	J. N.E. Stud.
Cah. Arch.	J. Soc. Glass Tech.
Chem. Abstr.	Metall. Abstr.

Mus. J.

Nature

Proc. Preh. Soc.

Rev. Arch.

Science

Sci. Abstr. (Phys)

Sci. Amer.

S.W. J. Arch.

St. in Conserv.

U.S. Nat'l. Mus. Ann. Repts.

The abstracts we write include reports of analyses, dating methods, field studies and conservation methods, and these, as well as information from unpublished material and letters, and our own research work, and instrument surveys, form the comprehensive reference-file library of techniques appropriate to archaeological research. Also included are correspondence and experimental notes concerning seismic equipment and its recent applications, and entries applicable to C-14 dates which supplement the IBM (Radiocarbon Dates Assoc., Inc.) cards and provide leads to dates that appear in archaeological journals. The following is a listing of subject headings in the files:

Analytical Techniques, General

Field Methods of Preservation, in field

Arch. Summaries-Survey Rept.

Field Survey Techniques (Land Sea Air)

Astronomical Info., Solar Radiation

Fluorine Dating

Bone Analyses

Gas-Chemical Methods

Botanical Information

Geolog.-Geophys. Methods (Geochronology)

Ceramic Studies

Geological Information

Chemical Analysis

Geophysical Information

Climatology

Glacial Information

Conservation-Restoration

Glass Analysis-Information

Dendrochronology

Gold, Copper, Bronze Studies

Drills

Gravity Surveys

Ecological Information

History of Technology



The subject index provides major categories captioned according to subjects, and within it the cards are filed alphabetically by author's name. In case of joint authorship, the principal author is the capitalized name found on the authors' cards. Whenever an entry is pertinent to several classifications, a card has been placed in all subsidiary categories, noting the principal category, that in which the summary of the article may be found. The author index includes title and source of article, date of publication, and where it may be found. Instrument surveys accomplished with the proton magnetometer and earth-resistivity equipment and other instruments are also filed,--whether they have been conducted by the ASCA staff or other expedition groups. These are placed according to the type of survey and are cross-referenced to the instruments used as well as to the geographic location of the tests.

It has been our experience that the above described organization of the Information Center, although using a hand file system, has been simpler and more useful to the archaeologists and other interested persons who use the materials, than an elaborate IBM system. The organization is closely related to that used in libraries and a person can find without assistance, the information for which he searches.

A few examples of the utility of the files are as follows:

- 1) An archaeologist using the file for a pollen analysis study can go directly to that particular subject heading or, if the specific site is known principally for the ceramics found and analyzed, there will be a cross-reference in the ceramic file to pollen analyses taken from peat from that site.
- 2) A medical doctor became interested in the study of tissue mummification and found, within a few minutes, much material to assist him in his

research.

3) A professor working on the history of metallurgy has found information contained in several of our abstracts and references which he had not previously seen or found in other bibliographies.

4) See enclosed letter from Professor Movius.

5) On the basis of information received from ASCA's files, dendrochronological results concerning the central Anatolian plateau have been sent to the Institute of Archaeology in Moscow. And, in order to gain permission to core ancient Cedars of Lebanon, the Information Center sent articles to Lebanon about coring techniques and results of dendrochronological correlation and analyses,--whereby permission to core a series of ancient Cedars was granted.

In February 1965, the Information Center at ASCA issued its first newsletter (enclosed). It is hoped that this publication will stimulate individuals and laboratories to forward to ASCA news of their most recent work, so that we may place it in our files and future newsletters, thereby helping to establish contact between laboratories doing similar or related experiments.

Personnel are as follows:

Dr. Froelich Rainey, Principal Investigator, Director, University Museum,  
Director, ASCA

Miss Elizabeth K. Ralph, Associate Director of ASCA

Miss Jeannette M. Flamm, Research Assistant of ASCA

## TENTATIVE BUDGET

## Salaries

Research assistant, full-time	\$ 6,000
Student assistant, part-time	2,400
Total salaries	\$ 8,400

Employee Benefits (9% of salaries) 756

## Equipment and Supplies

Books and periodicals	500
Office equipment and supplies	100
Printing and duplicating costs	400
Total equipment and supplies	1,000

## Travel

Conferences, museums and technical centers 600

Sub-Total 10,756

Univ. of Pennsylvania Overhead (20% of direct costs) 2,151

Total, one year 12,907

Total, two years 25,814

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

*T. Lieban*

May 21, 1968

Dr. Froelich Rainey  
The University Museum  
University of Pennsylvania  
Philadelphia, Pennsylvania 19104

Dear Fro:

Many thanks for the copy of the news release and for the MASCA newsletter. It was good to know of the impressive results of the magnetometer's use in the area where Mike Coe has been working, and I appreciate your keeping me informed.

Best regards,

Sincerely,

*Richard W. Lieban*

Richard W. Lieban  
Program Director  
for Anthropology

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

May 27, 1969

ASCA

Dr. Froelich Rainey  
The University Museum  
University of Pennsylvania  
33rd & Spruce Streets  
Philadelphia, Pennsylvania 19104

Dear Fro:

I have received your letter of May 22 and the copies  
of your report on GS-1568 and of the article on  
"Progress in Thermoluminescent Dating of Potters."

Thank you for sending them.

With best wishes,

Sincerely,



Richard W. Lieban  
Program Director for  
Anthropology

January 5, 1970

Dr. Richard W. Lieban  
Program Director for Anthropology  
National Science Foundation  
Washington, D.C. 20550

Dear Dr. Lieban:

John Winter, an organic chemist in our MASCA group, prepared a letter and outline for a project in which he would apply organic chemistry to archaeological materials. He sent it to the National Endowment for the Humanities, and we have just received a reply from Dr. Emerson in which he said that the project is not suitable for support by NEH, but he suggested that he send it with a strong recommendation to the archaeological section of the NSF.

We think that this is a good plan, but Fro and I would like you to know that if it would jeopardize our continuing the thermoluminescence dating of pottery, that we prefer the project in thermoluminescence.

Sincerely yours,

Elizabeth K. Ralph

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

January 8, 1971

Miss Elizabeth K. Ralph  
Museum Applied Science Center  
for Archaeology  
University of Pennsylvania  
Philadelphia, Pennsylvania 19104

Dear Miss Ralph:

Dr. Lieban has left the Foundation to become chairman of the Department of Anthropology at the University of Hawaii. His successor here, Dr. John B. Cornell, will take over the duties of Program Director in mid-January. In the meantime, I am replying to your letter of January 5.

We have been in correspondence with Dr. Winter about his research plan, and should he submit a proposal we will keep in mind the information in your letter.

Sincerely,



(Mrs.) Mary W. Greene  
Associate Program Director  
for Anthropology

CORRESPONDENCE

February 27th, 1974

Dr. Robert Manka, Program Director  
Division of Solar Terrestrial Relationships  
Room 312  
National Science Foundation  
Washington, D.C. 20550

Dear Dr. Manka,

While talking to Dr. French on the telephone today, he suggested that you might be interested in reading our MASCA Newsletter, Vol. 9, No. 1 on the subject of corrections for radiocarbon dates. Therefore, I am sending you a copy.

Our responses from this article have been unusually favorable, and we have had requests for 500 copies in addition to our original mailing list of 2500.

Sincerely yours,

Elizabeth K. Ralph  
Radiocarbon Laboratory

Newsletter also to Dr. Bevan French

NSF

July 17, 1974

Dear Murray:

I just now have your letter of May 29th upon my return from Italy where I have actually been digging again. You ask what my own status with MASCA will be now that Otto Haas is officially the Director. I would say it is essentially unchanged since I remain the Special Investigator under the National Science Foundation and MASCA naturally comes under my direction as Director of the Museum. So far as I can see, there is no change so far as the National Science Foundation is concerned and Otto simply fits in the laboratory as a volunteer administrator of the staff under my general direction. Actually he is working in very well and I think he will be a tremendous help to us in scouting out what's happening in laboratories all over the country so we can get new ideas for attempting new techniques for archaeology. One thing he has been running down is a new kind of radar for searching underground which is being developed by Stanford Research Institute. This looks promising but we will certainly need testing in the field for archaeology and certain modification to make it work as well as we think it may.

You will also be interested that one of our men from MASCA has just returned from Thailand where we are making astonishing discoveries regarding the origin of metallurgy. We first supported this with thermoluminescence analysis of pottery from Ban Chang and that is why I started a major dig there with the Thai this past winter. We are now making technical studies of the early bronzes and the slag as well as other metals. We can also date collagen from human bones from cemeteries and the charcoal from the site. We are now practically certain that cast bronze was made there 4500 years B. C. and from the last reports it may turn out to be even older. I have the feeling this is going to be the most important breakthrough in archaeology in many years and it is certainly going to upset the neareastern archaeologists.

Dr. Murray Aborn  
July 17, 1974  
Page 2

I find the staff is well under way on the report which I promised you  
in September so we certainly can make it.

All best wishes,

Froelich Rainey  
Director

Dr. Murray Aborn  
Program Director for  
Special Projects  
NATIONAL SCIENCE FOUNDATION  
Washington, D. C. 20550

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

May 29, 1974

Dr. Froelich Rainey  
Director  
The University Museum  
University of Pennsylvania  
Philadelphia, Pennsylvania 19174

Dear Fro:

Thank you for the materials announcing the appointment of Otto Haas to the directorship of MASCA. We are glad to have this information for the record.

I guess I did not get clear from our telephone conversation just what your own status will be with this change. Perhaps you can fill me in at the next appropriate occasion.

Sincerely,



Murray Aborn  
Program Director for  
Special Projects

GS-36308X

December 23, 1974

Dr. Bevan M. French  
Program Director for Geochemistry  
National Science Foundation  
Washington, D.C. 20550

Dear Dr. French:

The new Hilton, even with a Government discount, cost \$22.00 per day. Therefore, Mrs. Fanok, Administrative Assistant in the Dept. of Geology, has made you a reservation in the Class of 1925 House (no. 11 on the enclosed campus map, on Locust Walk near 40th Street) for January 8th and 9th. We think that it costs \$12.00 per day.

It does not have a restaurant, but there is a coffee shop for breakfast near 40th and Walnut Streets.

Ken Foland and I hope that you will join us for lunch on the 8th, and we are looking forward to your visit.

With best wishes for the New Year,

Sincerely yours,

*Elizabeth K. Ralph*

Elizabeth K. Ralph

EKR:emd  
Enclosure

April 4, 1975

Dear Murray:

I am now back from the Far East and note that I am again the Director of MASCA as we agreed. Certainly I do want to thank you for getting this thing pushed through as we discussed it on the phone the day I left. Beth tells me there is an official report coming through and I'll be writing a covering letter, but I wanted to express my appreciation for the whole business, off the record.

We are now getting radio carbon confirmation for the very old Bronze Age in Northern Thailand and I think these will shortly be published in an article in the New York Times about the trade in Ban Chiang pots since we got our early TL dates for them five or six years ago. They were publishing the story anyway, so I got the writer down here to explain what our problems of dating are all about, and so, I should think it would be a good article on Ban Chiang as well as on the whole process of thermoluminescence dating. As you can imagine, I really put the heat on regarding acknowledgement to the NSF.

Incidentally, our public relations fellow here tells me that NSF has a Public Affairs Officer named Rosenthal who is making mini documentary films of NSF projects. Do you think MASCA would be a good subject for one of those things? We could add bits of films we have here about application in the field, our own excavations and so forth. Anyway, if you think it is a good possibility do let me know and I'll get in touch with Rosenthal.

All the very best,

Froelich Rainey  
Director

Dr. Murray Aborn  
Program Director for Special Projects  
National Science Foundation  
Washington, D.C. 20550

*Memorandum from ...*

KERSHAW BURBANK, JR.

2 April 1975

Dr. Rainey,

Attached is a draft of the letter to Mr. Aborn at NSF about their mini-documentary films. I'm sure you can improve the draft.

Al Rosenthal could give us more information if you think it's needed. His phone number is (202) 632-5724.

*Kerb*

DRAFT Letter to:  
Mr. Murray Aborn  
National Science Foundation

Dear (Murray?) Mr. Aborn:

As you know, we have been looking for some ways to publicize the important assistance that the National Science Foundation has given to the University Museum over the years. I just became aware of NSF's mini-documentary film program, which sounds like an exciting way to help get some dramatic public recognition for NSF's work with the University Museum. As I understand it, your public affairs office produces these films and services them to television stations throughout the country. I would like to suggest that the work which NSF makes possible at the University Museum could make an exciting addition to this series. We have such colorful artifacts both in the Museum and the field that a documentary in this area would certainly further better public understanding of science.

Some film subjects that immediately come to mind might be:

- 1) A tour of our Museum Applied Science Center ~~for~~ Archaeology (MASCA) labs with a discussion of work in progress on the use of satellite photography in archaeology, C<sup>14</sup> dating correction through dendrochronology, and our work in thermoluminescence; or
- 2) if filming in the field is feasible, our June expedition (with Stanford Research Institute) to find the remains of 7000-year-old bristle cone pines in California's alluvial fields using soil penetrating radar or the use of a cesium magnetometer to find buried ruins and artifacts elsewhere.

These are just quick ideas. We would, of course, cooperate with your people to develop a film on these (or any other) subjects.

I am told that such a film costs \$10,000 to \$15,000. If funding for such a film is not available within your Public Affairs budget, perhaps we could pay for it from one of NSF's grants to the University Museum. (Unfortunately, our present financial situation will not allow the University Museum, itself, to fund any publicity films.) I hope we can work something out here because such a film could give important public exposure to NSF's (and The University Museum's) work. Please let me know what you think.

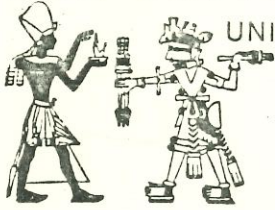
Sincerely,

Froelich Rainey

cc: Mr. Alfred Rosenthal  
Public Affairs Officer  
National Science Foundation  
1800 "G" Street, N.W.  
Washington, DC 20550

(Enclose copy of Archaeology article on "Sciences and Archaeology" to Rosenthal.)

# THE UNIVERSITY MUSEUM



UNIVERSITY OF PENNSYLVANIA

THIRTY-THIRD AND SPRUCE STREETS  
PHILADELPHIA, PA. 19174

CABLE ADDRESS "ANTIQUE"  
TELEPHONE: EVERGREEN 6-7400  
(AREA CODE 215)

April 10, 1975

Dear Mr. Rosenthal:

I have been talking to Murray Aborn about one of your documentaries on the Museum Applied Science Center, which has been financed by the National Science Foundation for many years. Both Murray and I think it would be a good idea to produce such a film at this time and here are some ideas which you might consider in deciding to make the documentary.

We have some experiments going on at the moment which could be very photogenic. In the White Mountains of California during this summer we will be testing a new ground penetrating radar in a search for ancient bristlecone pine logs buried in glacial fans. This is a double header for us since we are, on the one hand, testing a whole new principal for underground archaeological research and, two, searching for bristlecone pine logs which will make it possible to correct radio carbon dating before 7400 years ago. This experiment will have a dramatic setting and action as well as very considerable significance in archaeology. We are also experimenting with aerial photography utilizing some rather dramatic kites and balloons, and, for the first time, an ERTS satellite. Some of these experiments are being carried out in Valley Forge Park since it is convenient to our laboratory here. The aerial shots, looking for archaeological remains in Valley Forge Park, are also coordinating with some tests with other search instruments. In the laboratory, of course, we have the dating equipment for carbon-14 and thermoluminescence and other apparatus for identifying materials which could well fit into such a documentary. Much of our experimentation is done at archaeological sites abroad but I thought these two first examples would give you an idea of what could be done in this country.

I will be here until April 27 and then away in Guatemala and Puerto Rico for about ten days. If you have any questions about this, or any suggestions as to how we could get this thing going, please write me here at the office.

All best wishes,

Froelich Rainey  
Director

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

April 8, 1975

Dr. Froelich Rainey  
The University Museum  
University of Pennsylvania  
Thirty-Third and Spruce Streets  
Philadelphia, Pennsylvania 19174

Dear Fro:

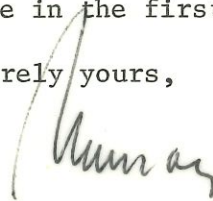
Thank you for your good letter of April 4. I'm glad to hear of your safe return from the Far East, and delighted that the work in Thailand continues to proceed so successfully.

I appreciate your pushing hard to get NSF acknowledged in the forthcoming Times article. Boy, could our social science programs use some favorable publicity these days!

Your suggestion for a "mini doc" on MASCA, its work on dating, and applications to excavations in the field is excellent. I have talked with Alfred Rosenthal, Head of the Foundation's Public Affairs Office, and he is sanguine about the possibility. Please contact him to get negotiations started. His telephone number is 63-25724.

Mr. Rosenthal will explain details of the working arrangement when you call. I might mention at this point, however, that the cost of a "mini doc" usually runs about \$11,000, and that the simplest way to make the funds available is through an existing grant -- where one exists. If a working arrangement between the Museum Applied Science Center, Mr. Rosenthal's office, and the Special Projects Program can be agreed upon, I will give approval to a budget reallocation that supplies whatever monies are needed to prepare and distribute a film, and I will supplement your grant in an equivalent amount out of next fiscal year's funds (which would still be in the first year of the grant).

Sincerely yours,



Murray Aborn  
Program Director for  
Special Projects

*ask after about Ind. cont.*

Copy to: Alfred Rosenthal



April 24, 1975

Dr. Murray Aborn  
Program Director, Special Projects  
Social Science Division  
National Science Foundation  
Washington, D. C. 20550

Dear Murray:

Enclosed is the final report for the period ending April 30th. I just wanted to say that I am back in the harness as Director of MASCA, and that Otto Haas and I have our heads together trying to figure out the best approach to industry. The experiments in mud-brick preservation and construction are arranged for this summer in Iran. We are alerting the Rohm-Haas plant in Iran about this experiment, hoping that it will be as useful to them in business as it will be to us in archaeology, and that we can make some deal. Also, as you can see, we will be working with the Stanford Research Institute beginning in May, so there is something under-way, in any case, in that new direction.

I think I told you that the Carbon-14 analyses are bearing out the claims on very ancient bronze in the Far East, as first determined by thermoluminescence. I don't think I can find any one single example of the significance of this new technique in archaeology more impressive than this revolutionary discovery in the Far East. It is a direct result of our thermoluminescent development here.

One thing that continues to plague us is the difficulty of getting

the newspapers and magazines to acknowledge the National Science Foundation's support to MASCA. I even told the editor of Reader's Digest, that unless he put it back into the Digest article, we stood to lose all financing for MASCA, and still the bastard left it out! I explained to Walter Sullivan, of the New York Times, the problem yesterday, and I'm sure he understands it. We expect him to cover the ground radar-bristlecone pine search in California this coming month.

Anyway, thanks again for making the whole operation possible.

As ever,

Froelich Rainey  
Director

FR/al

TO: Committee Management Coordination Staff, MAO

VIA: Acting Assistant Director, BBS  
Division Director, BNS

FROM: Program Director for Anthropology, BNS

RE: SUMMARY MINUTES OF MEETING

Name of Advisory Body: Radiocarbon Dating in Archeology

Date and Time of Meeting: Friday, August 6, 1976, 9:00-5:00

Location of Meeting: Room 628  
1800 G Street, NW  
Washington, D.C.

Members Present: Dr. James B. Griffin, University of Michigan  
Dr. C. Vance Haynes, University of Arizona  
Dr. Robert Stuckenrath, Smithsonian Institution  
Dr. Minze Stuiver, University of Washington  
Mr. James Buckley, Teledyne Isotopes

NSF Members Present: Dr. Nancie L. Gonzalez, Program Director for Anthropology  
Ms. Mary W. Greene, Associate Program Director for Anthropology

NSF Staff Members Present: Dr. Eloise E. Clark  
(Part time) Dr. Richard T. Louttit -  
Ms. Joan M. Jordan  
Ms. Sonya Sperlich

The meeting was open to the public. A summary of the discussion is attached.

The meeting was called by the National Science Foundation in order to review current problems of radiocarbon dating in archeology and to discuss and evaluate ways in which the NSF might intervene so as to improve both service and research. Discussion centered on the following issues.

## 1. AVAILABILITY OF SERVICES TO ARCHEOLOGISTS

33  
There are at present four commercial labs in the U.S., plus twenty three others associated with university or governmental agencies. Archeological work probably forms a significant part of the workload at only nine of the latter. Six are virtually inaccessible to archeologists, and the remainder do varying amounts of archeological dating. (See accompanying list.)

3  
With few exceptions, lab directors have themselves little or no formal training in archeology. Perhaps for this reason many are less interested in taking on true collaborative relationships with archeologists than with geologists and other scientists. Furthermore, few archeologists have the physical science background and interests necessary for learning to undertake this work themselves. In addition, the costs of setting up and maintaining a lab preclude the possibility of individual investigators doing their own dating. *of their inability*

Some labs are extremely overburdened, with up to nineteen months backlog at the present time. These tend to be those which charge little or nothing for their services (see #2, below). Others offer a shorter wait, but their cost may be beyond the means of the average archeologist. Finally, fast cheap dating may be sought outside the U.S., but with results which probably will not enhance the scientific quality of the project as a whole.

## 2. COSTS

The cost of securing radiocarbon dating is seriously underestimated by most archeologists. The reasons for this are largely due to the disparity in costs among different laboratories. Those which have been subsidized as a research effort have often provided dates free of charge when the lab director was personally interested in the research to be done. On the other hand, even these labs have sometimes charged users whatever the freight will bear. That is, if the archeologist had funding available, a charge might be made. If not, either no charge or a reduced charge would be assessed.

Teledyne, a commercial laboratory, at the present time charges \$160.00, regardless of what the sample includes. This does not cover the actual cost. Other kinds of dating at such laboratories have been partially underwriting the cost of radiocarbon determinations. The charge is likely to rise to \$200.00 per sample in the near future.

The cost at some other laboratories, both foreign and in the United States, is at times almost ridiculously low. It is not always clear why, unless the lab is underwritten in some way. Rather than investigate how such low costs are possible, some archeologists have assumed that all services are equivalent, and have consequently chosen the cheapest. All conferees agreed that some laboratories are exceedingly unreliable and should not be patronized, though no names were mentioned. The conferees agreed that it would be difficult and imprudent for NSF to attempt to establish any kind of rating system for laboratories or to attempt to control quality in any way other than through peer review. *But how will the peers know?*

3. SAMPLE COLLECTION

Conferees agreed that many, *some* if not most, archeologists are poorly informed as to the proper methods for sample collection. They do not know how to pack the materials for shipment to the laboratories, and in many cases they are unaware of how much material is necessary and of the need to include the matrix within which it is found. Neither do they understand the possible causes and sources of contamination. In addition, archeologists are not aware that a series of dates is the only way to achieve a reliable estimate from each horizon or for each cultural feature. Dates inevitably vary and only when several are done can a pattern be shown to exist.

It was suggested that the Anthropology Program might demand that principal investigators demonstrate greater sophistication in their statements on this subject in grant proposals. Some labs already have prepared statements which they send to prospective clients upon request. It was also suggested that the Society for American Archeology might undertake to prepare printed guidelines as an educational service to its members.

4. RESEARCH AND SERVICE FUNCTIONS

Conferees agreed that it is well to have a mixture of research and service in most laboratories. However, different lab directors define "research" differently. Some call it research when they are merely helping an archeologist find dates for materials chosen and collected by the archeologist himself. It was agreed that this constitutes service rather than research.

On the other hand, when the laboratory director himself engages as a true collaborator in the research, many benefits accrue. If the laboratory director can visit the site and advise the archeologist on how many dates are necessary, how the materials should be collected, and sources for possible contamination, the scientific quality of the dating procedure, and thus of the excavation itself, will be immensely improved. This, of course, is expensive and will require additional funding either directly to the lab director or as a consultant on the archeologist's grant.

*How does lab director know what to collect?*

*NSF control*

*NSF interference*

*Why? The archaeologist should collect the samples*

There was some discussion of the need to encourage continuing research on radiocarbon dating techniques themselves. The process is still far from perfect, and many problems need work. Bone, e.g., is extremely difficult to handle, and there are suggestions that charcoal may be easily contaminated and thus yield erratic dates.

Commercial labs, on the other hand, are still valuable and necessary, even if little or no research is conducted at them. There are many instances in which full collaboration of the sort described above is not necessary. Once a general framework has been established, single dates may be quite acceptable for certain purposes. The archeologist should be aware of when a fuller collaboration is desirable, and a justification of either procedure chosen might constitute part of the project proposed.

#### 5. OTHER DATING METHODS

Conferees agreed that other dating methods should continue to be explored, even though all of them ultimately will depend upon calibration with carbon 14. Those discussed included:

- archeomagnetic dating
- bone racimization
- thermoluminescence
- obsidian hydration
- alpha recoil tracking
- fission tracking

It was recommended that NSF continue to fund research on these other methods, but the conferees themselves came up with no further concrete suggestions on which ones were more promising than others.

#### 6. RECOMMENDATIONS

a) NSF should encourage greater sophistication on the part of applicants in regard to radiocarbon dating.

If no funds are allowed for dating without the presentation of an adequate plan, researchers would trouble themselves to learn. NSF might distribute guidelines if these were prepared by some group such as the SAA. Dr. J. Griffin offered to approach the executive board of the Society for American Archeology on that issue in November.

b) NSF should allow much larger sums than in the past for carefully constructed dating plans. Some sites may need as many as twenty to thirty dates, but this may not be entirely predictable before the excavation occurs. Principal investigators might be encouraged to delay budgeting the dating until after the first phase of the project is completed. Then with the help of a reputable lab director, a proposal for supplementary funding might be submitted. This could run to several thousand dollars.

*Who should judge this?*

*NSF Control*

c) NSF should entertain proposals from existing radiocarbon labs for conducting primary research on the dating technique itself. Since anthropology would be benefitted by such research, the Anthropology Program should be willing to divert some of its funds toward such studies.

d) NSF should consider the possibility of providing ancillary support for certain existing labs if they can offer a coherent organized plan for improving the dating situation for archeologists. Regional labs, perhaps with certain problem-oriented specializations, might be one solution. Some contractual arrangement with NSF might be effected so as to insure the best possible service and collaboration for NSF grantees.

layers rejected  
More NSF control

TR 6 2551

To Beth Ralph - For your information

UNIVERSITY of PENNSYLVANIA

PHILADELPHIA 19174

Bill Schauffler  
[WILLIAM SCHAUFFLER]

Faculty of Arts & Sciences

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Friday  
A born

June 3, 1977

Mrs. Mary Greene  
Division of Behavioral and Neural Sciences  
Anthropology Program  
National Science Foundation  
Washington, DC 20550

Dear Mrs. Greene:

This letter and the enclosed revised budget follow on conversations by telephone on Friday, May 27th with Dr. Gonzales and with you on Thursday, June 2 concerning the research proposal #77-14425 submitted by Dr. Chester Gorman. As a result of discussions with Mr. Schauffler, Dr. Gorman (who is now in Bangkok), Dr. Pritchard, the Director of the University Museum, and myself we have agreed on a revised budget of \$93,516 for two years: \$49,759 for the first year and \$43,757 for the second year.

We have deleted all thermoluminescence costs from the proposal since the thermoluminescence laboratory is funded by the National Science Foundation. At your suggestion we have retained the money budgeted for radiocarbon dating. Ban Chiang is a complex site and a relatively large number of dates will be required to provide the temporal framework for the research objectives outlined in the proposal.

A second problem concerns the money budgeted for the analysis of human skeletal material by Dr. Michael Pietrusewsky of the University of Hawaii. Initially we had budgeted \$1,325 in each of the two fiscal years. We must explain why we have consolidated this amount in the first year rather than delete it. The paleodemographic data that will derive from Dr. Pietrusewsky's analysis of the human skeletal material from Ban Chiang is an essential component of the proposed research strategy. In a letter to Dr. Gorman (dated December 27, 1976) Dr. Pietrusewsky requested the sum of \$2,650 to enable him to complete the analysis of the Ban Chiang skeletal material. In his letter he broke this amount down as follows:

Student help	\$1,750
Computer time	300
Keypunching and supplies	250
Lab supplies	100
Photography	250

This is the only relevant section in the letter