

WITTE MEMORIAL MUSEUM

3801 BROADWAY

BRACKENRIDGE PARK

SAN ANTONIO 9, TEXAS

TELEPHONE: TAylor 6-0647

August 29, 1962

Dr. Froelich Rainey, director
University Museum
University of Pennsylvania
Philadelphia, Pa.

Dear Dr. Rainey:

Mr. Harry Mayne of the Petty Geophysical Laboratories here referred me to you when I asked him today about Petty's competence in evaluating proton magnetometer equipment for archaeological exploration. Mr. Mayne stated that his company had done some work for you, but, of course, was not able to tell me of the findings without your permission.

I am a consulting geologist-geophysicist and anthropologist (MA, U. of Texas) associated with the Witte and I am seeking the same information you may have sought. The data given by Aitken in his book PHYSICS AND ARCHAEOLOGY indicates that certain types of new equipment may have much utility at selected sites where relatively thin homogeneous soils overlie suspected cultural materials. It would be of the greatest interest to us to learn whatever you could tell us of the practical application of the proton magnetometer as well as the four-probe resistivity survey system.

There are certain refinements and modifications which appear desirable in the instrumentation described by Aitken. It would be my pleasure to cooperate without compensation (other than increased knowledge) if I may be of help in evaluating and improving the survey equipment and techniques you are considering. My purpose in calling Mr. Mayne (whom I have known well for some years) was just that for I was seeking to initiate a program whereby we might try several techniques locally and in Mexico. I am also trying to interest the Cultural Affairs Bureau of our State Department in sponsoring some electronic survey work in Latin American sites. The Bureau is interested and it would help a lot if I knew more about what has been done along this line and what may be expected.

Dr. Burns, director of Witte Museum, asks me to send his best regards. He is out making speeches and doesn't get much time to enjoy the technical aspects.

Sincerely yours,

W.R. Gray

W. R. Gray
Research Associate

August 30, 1962

Dear Mr. Gray:

We are writing in reply to your letter of August 24 to the Department of State, with which you enclosed your biographic information form.

Although we regret to say that the Department can not offer the full-time position which you request, we appreciate the offer of your services as an American Specialist Grantee. Should we receive a request where you might be of service, we shall get in touch with you promptly. To explore the possibilities of finding permanent employment in your particular field, you should communicate with either the Smithsonian Institution in Washington, D. C. or the Axel Wenner-Gren Foundation for Anthropology, 14 East 71st Street, New York, New York. We understand that the Foundation is particularly active in sponsoring archaeological research. Dr. Froelich Raney of the University Museum suggests that you communicate with Mr. Paul Fejos of that organization.

We thank you for your letter and wish you success in carrying out your most interesting plans.

Sincerely yours,

A. Louis Sheitelman
Public Affairs Staff
Bureau of Educational and Cultural Affairs

Mr. William Gray,
548 Babcock Road,
San Antonio 1, Texas.

DEPARTMENT OF STATE
BIOGRAPHIC INFORMATION FORM

(FOR EASE OF REPRODUCTION PLEASE TYPE OR USE PENCIL)

United States citizens with specialized knowledge who wish their names to be included on lists of candidates to be considered for grants under the Educational Exchange Program of the Department of State are requested to complete this form. The completed form should be returned to:

American Specialists Branch
Bureau of Educational and Cultural Affairs
Office of Cultural Exchange
Department of State
Washington 25, D. C.

GRAY, WILLIAM R.

1. LAST NAME FIRST NAME MIDDLE INITIAL

GRAY, WILLIAM R.

2. PERMANENT OR HOME ADDRESS TELEPHONE

548 Babcock Road
San Antonio 1, Texas
512 PE 2 3594

3. BUSINESS ADDRESS TELEPHONE

601 West Ave.
San Antonio 1, Texas
512 PE 5 4211

4. DATE AND PLACE OF BIRTH

October 14, 1917 Alexandria, Louisiana

5. CITIZENSHIP IF NATURALIZED, INDICATE PLACE AND DATE OF NATURALIZATION

U. S. A.

6. MARITAL STATUS

Married, however I usually travel alone on my field work.

7. PRESENT POSITION OR ACTIVITY

Geophysicist-geologist-archaeologist consultant
Also business manager of family realty properties
Research Associate, Witte Memorial Museum (Honorary)

SALARY PER YEAR \$12,000

8. ACADEMIC AND PROFESSIONAL POSITIONS HELD (Use supplementary page if necessary)

POSITION	ORGANIZATION OR INSTITUTION	DATES OF EMPLOYMENT
Faculty, Dept of Anthropology	University of Texas	Sept. '40-June '42
Geophysicist	Geophysical Service, Inc.	June '42- Jan. '46
Paleontologist-geophysicist	Sun Oil Company	Jan. '46 - June '52
Geophysicist-geologist	Monterey Oil Co.	June '52 - June '55
Consulting geophysicist-geol.	Southwest Research Inst., etc.	to date

9. WHAT IS YOUR MAJOR FIELD OF SPECIALIZATION, INCLUDING PARTICULAR INTERESTS?

Exploration geophysics, stratigraphic analyses especially relating to archaeological investigations. Derivation, interpretation and explanation of archaeological phenomena including lecturing.

10. LIST YOUR PRINCIPAL SCIENTIFIC OR SCHOLARLY PUBLICATIONS

Masters Thesis "Archaeology of the Craig Rock Shelters, Upper Nueces Valley, Edwards Co., Texas"
 "Stratigraphy of the Uranium Bearing Formations of South Texas"
 Numerous articles and scientific reports published in The Bulletin of the Geological Society of South Texas, Uranium Information Digest, The Texas Caver and various newspapers.

11. WHAT ARE YOUR HOBBIES, EXTRA-PROFESSIONAL ACTIVITIES AND AVOCATION?

Speleology, photography
 Currently vice-chairman, Alamo Grotto, National Speleological Society
 Past President, Geophysical Society of South Texas (1957)

12. ACADEMIC TRAINING (Give only higher educational and professional school record)

INSTITUTION	YEARS ATTENDED	MAJOR SUBJECTS	DEGREE REC'D
University of Texas	1936-1940	Geology & Anthropology	BA
Same	1940-1942	Anthropology & Geology	MA

13. TRAVEL AND PROFESSIONAL EXPERIENCE ABROAD

1932-1945 numerous trips into various parts of Mexico for geological and archaeological investigations including work for Petroleos Mexicanos in 1945 as geophysicist. Less frequent trips into Mexico since that time up to July of 1962 when explorations were made in the Grutas de Bustamante.

14. KNOWLEDGE OF FOREIGN LANGUAGES. LIST LANGUAGES BELOW AND EVALUATE YOURSELF ON THE BASIS OF THE FOLLOWING DEFINITIONS.

SPEAKING ABILITY

READING ABILITY

- S-1 Tourist knowledge of the language sufficient for routine travel requirements.
- S-2 Able to deliver prepared lectures in the language but need interpreter for discussions and questions.
- S-3 Able to lecture, answer questions and hold discussions without difficulty or assistance.

- R-1 Able to read proper names, street signs, office and shop designations, etc.
- R-2 Able to read newspapers, reports, briefing material, etc. with some difficulty.
- R-3 Able to read all types of writing without difficulty.

LANGUAGE	S	R	LANGUAGE	S	R
Spanish	2	2	German	2	2

15. GIVE NAMES, ADDRESSES, AND TITLES OF PERSONS WHO ARE ACQUAINTED WITH YOUR PROFESSIONAL ABILITY, CHARACTER, PERSONALITY, AND TRAINING (Give 3 or more)

NAME	ADDRESS	TITLE
Cecil H. Green	Geophysical Service, Inc. 100 Exchange Park North Dallas 35, Texas	Hon. Chm. of Board
Robert Rettger	Sun Oil Company Dallas, Texas	Chief Geologist
Jerome J. O'Brien	Dept. of the Interior Office of Oil and Gas	Director
Martin Goland	Southwest Research Inst. San Antonio, Texas	Director
Dr. Wm. Burns	Witte Museum 3801 Broadway, San Antonio	Director

16. DATES OF PERIOD FOR WHICH YOU WOULD BE AVAILABLE (Grants are generally for three or four months)

ALTERNATIVE PERIOD

I expect to be available at any and all times, barring unforeseen future commitments.

17. IS YOUR HEALTH SUCH THAT YOU ANTICIPATE NO DIFFICULTY WITH FOREIGN TRAVEL AND RESIDENCE? (It should be remembered that in many countries living conditions are difficult and program activities are quite strenuous.)

I am in very good shape and quite familiar with foreign field conditions

18. EXPLAIN TYPE OF PROGRAM FOR WHICH YOU WOULD BE BEST QUALIFIED. INCLUDE COMMENT ON YOUR COMPARATIVE EFFEC-
TIVENESS WITH FORMAL LECTURES TO GENERAL PUBLIC, DISCUSSIONS WITH SMALL GROUPS OR INDIVIDUALS, ETC.

International archaeological cooperation for exploration of pre-historic sites amenable to investigation by electronic survey techniques, Carbon-14 dating and detailed stratigraphic analyses of shelter cave deposits. A high percentage of ancient culture localities exists in areas of relatively homogeneous soil conditions, usually alluvial terraces. Soil, sand and gravel deposited by lakes and streams effectively masks most underlying archaeological materials making their delineation an exhaustive matter of relatively blind trenching. In view of the always limited funds and time available for digging at any site, surveys which will pinpoint anomalous areas of interest eliminate the necessity for long exploratory trenches which use up resources without much assurance of success. An American Specialist equipped with two advanced instruments, the proton magnetometer and the transistorized 4-probe resistivity meter, may survey suitable sites readily and at low cost so that buried features may be marked for excavation by local crews supervised by local antiquarians. (These instruments and related equipment are detailed in PHYSICS AND ARCHAEOLOGY, M. J. Aitken, Research Laboratories for Archaeology, Oxford; by Interscience Publishers, Inc., N.Y., 1961) The American Specialist should remain at the site while several survey anomalies are tested so that the validity of his results may be evaluated as variations in soil composition and moisture may make certain findings subject to revision as work progresses. Experience gained in various sites within each given area (the Central Valley of Mexico, for instance; the desert coast of Peru, stream terraces in Costa Rica, etc.) will continually improve the accuracy of survey interpretations. These surveys are new tools of known utility and, as is the case with C-14 age determinations, the more they are used, the greater their general applicability. C-14 Analyses are of primary importance to archaeologists the world over. The techniques required to secure suitable samples are not universally appreciated and much work needs to be done in standardizing procedures in order to secure valid results. The Specialist could be of great help in advising and assisting in the preparation of samples for C-14 determinations and in arranging for the laboratory work which must be done at one of the very few acceptable test centers.

It is conceivable that local archaeologists will acquire their own survey instruments for future exploration. In such case, uniformity of the measuring parameters and data plotting should be encouraged by the Specialist so that, as in other physical sciences, we all speak the same values and can achieve real international cooperation. CAVE DEPOSITS- the concentrated sites found in many ancient shelter caves have long been my particular preoccupation (Thesis, 1942, and many digs to date). Few practising archaeologists are prepared to undertake the specialized, restricted, if lucrative, cave excavations. A great many countries have very important unexplored cave deposits going back to the earliest humans. Lecturing to groups of all sizes is always my pleasure although the exchange of ideas possible with small gatherings is greatly appreciated.

19. HAVE YOU SERVED IN THE ARMED FORCES?

YES NO

20. DO YOU HAVE A PASSPORT?

NUMBER 16973

PLACE Mexico

DATE OF ISSUE June 25, 1945

DATE

SIGNATURE

Aug. 24, 1962

Wm. R. Gray



DEPARTMENT OF STATE
WASHINGTON

Rapp

August 31, 1962

Dear Dr. Rainey:

In accordance with our telephone conversation of August 30, I have forwarded a copy of Mr. Gray's letter to the Wenner-Gren Foundation for Anthropology. I am forwarding a copy of Mr. Gray's curriculum vitae to you in the event that he may be suitable for any projects of the University Museum.

I wish to thank you for your help in this matter. Give my best wishes to Mrs. Rainey.

Sincerely yours,

A. Louis Sheitelman

A. Louis Sheitelman
Public Affairs Staff

Bureau of Educational and Cultural Affairs

Enclosures:

Copy of our reply
to Mr. Gray and copy
of his curriculum vitae.

Dr. Froelich G. Rainey,
University Museum,
34th and Spruce Streets,
Philadelphia, Pennsylvania.

September 4, 1962

Mr. W. R. Gray
Witte Memorial Museum
3801 Broadway
San Antonio 9, Texas

Dear Mr. Gray:

Dr. Rainey has asked me to reply to your letter of August 29th.

In regard to the Oxford proton magnetometer and four-probe resistivity technique, some of the most comprehensive comparative tests have been made recently in Italy in the course of joint expeditions by members of the University Museum and of the Lericci Foundation. Engineer Lericci has published one extensive report by R. E. Linington and another shorter one by E. Ralph is now in process. The published one by Linington is enclosed as well as a copy of Expedition which contains an article by Eng. Lericci. Unfortunately, mine was written in Rome and I don't yet have reproducible copies of the figures here to send to you.

In Linington's report, detailed experiments over the same terrain an elaborate potentiometric resistivity instrument designed by the Lericci Foundation, with the small readily portable Geohm resistivity instrument (manufactured by Gossen Col, Erlangen, W. Germany; sold in U. S. by National Electronics, P. O. box 1237, Sheridan, Wyoming) and with the Oxford Elsec proton magnetometer are described. These tests were conducted at Tarquinia, Cervetri, Veio, and Sibanis in 1961.

In mine, the two main sections are as follows:

- 1) Tests of an experimental sonic device made by MacLaughlin Electronics, Perkiomenville, Pa. (under contract with the University Museum).

2) Field surveys at Sibaris Made with the Oxford proton magnetometer in April, May, June, 1962.

Our sonic device consists of an oscilloscopic detector, electromechanical transducer, and geophone. It was anticipated that impulses (approximately 20 ms duration) of frequency spectra ranging up to 10 KC would be transmitted into the ground and if reflected, a distortion in the oscilloscope trace would be seen. It didn't work out that way, however, because the pulses didn't have sufficient power to penetrate much more than 1 meter and in addition some of the initially weak impulse may have been lost by inadequate coupling to the ground with simple conical spikes.

Our collaboration with the Petty Geophysical Laboratories is directed also toward the development of a seismic or sonic instrument that will help in the detection of the relatively shallow archaeological features. Our first attempt (the MacLaughlin device) produced a workable and portable detector, but failed otherwise.

In the course of the 3 months during which I used the Oxford proton magnetometer, I gained a great deal of respect for the instrument. It is extremely well designed and after two years of almost constant use, the only repairs required were replacement of plugs, cables, and such simple parts that were subject to the greatest wear. The instrument is sensitive to changes in total magnetic intensity of approximately 1 gamma and rapid to use--readings every 2 1/2 to 3 seconds. It worked ideally on the plain of Sibaris because the river-deposited clay, which occurs in a band from approximately 3 to 6 meters depth is highly magnetic (1.0×10^{-4} emu/cc). Most of the buried walls, building foundations, etc. then produced "anti-magnetic" anomalies (of 10 to 30 P.M.U.) at depths down to 5 meters. (A few massive brick walls exhibited the usual "magnetic responses of similar magnitude.)

Numerous field surveys made with the Oxford proton magnetometer, including one made in Indiana (vol. 4) by R. B. Johnston, Angel Mounds Archaeological Research Station, are reported in Archaeometry, vols 3, and 4 (Bull. of Res. Lab. for Archaeology and the History of Art, 6 Keble Rd., Oxford, England, \$2.00 per copy)

Members of the Oxford laboratory have conducted also several field surveys with the gradiometer or differential

Page 3 Mr. W. R. Gray Sept. 4, 1962

proton magnetometer, and we are in the process of building one of similar design. My feeling about these is that for some surveys they may be more rapid to use, but do not have quite so much sensitivity as the proton magnetometer. Their main advantage is that less data need be recorded.

I seem to have rambled on at great length here, but may not have answered your specific inquiries. If not, please don't hesitate to let me know.

Sincerely yours,

Elizabeth K. Ralph

EKR:dml

WITTE MEMORIAL MUSEUM

3801 BROADWAY

BRACKENRIDGE PARK

SAN ANTONIO 9, TEXAS

TELEPHONE: TAylor 6-0647

Research Associate
Wm. R. Gray
548 Babcock Rd.
San Antonio 1, Texas

September 25, 1962

Elizabeth K. Ralph
Applied Science Center for Archaeology
The University Museum
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Miss Ralph:

Thank you for your most informative reply of Sept. 4 to my questions regarding recent geophysical experiments in archaeology. It is very stimulating to receive such a helpful communication from one who has had extensive field experience in the techniques which I hope to learn and use. I read with great interest the bulletins which you sent containing the articles of C. M. Lerici. I hope that you will favor us with a copy of your paper on the Italian expeditions when it becomes available.

One specific inquiry I have at this time is to ask for your permission to discuss archaeological instrument development with the Petty Geophysical Laboratories. I understand that Petty retains the rights to commercial applications of any instrumentation developed in collaboration with your organization and my only goal is to hasten the availability of suitable equipment for our type of work.

It occurs to me that magnetometer and resistivity contour diagrams on tracing paper would make possible overlay comparisons which might aid in defining anomalies such as shown in fig. 11 and 12 in the Italian report by visually combining the two surveys. Have you tried this yet?

Sincerely yours, W. R. Gray

September 29, 1962

Gray
Mr. Wm. R. Gary
548 Babcock Road
San Antonio 1, Texas

Dear Mr. Gary:

Thank you for your recent letter. In reply to your specific inquiry, it is all right with us for you to discuss archaeological instrument development with the Petty Geophysical Laboratories providing that it is agreeable with them. Dr. Rainey plans to visit their laboratories at the end of October.

In regard to Figures 11 and 12 in the Italian report, I haven't traced them (the originals are in Rome) and put one on top of the other, but my feeling is that neither one pinpoints the tombs precisely.

As soon as new reports are available, I'll forward copies to you.

Sincerely yours,

Elizabeth K. Ralph

EKR:d1f