September 10, 1960

Mr. Eugene McDermott
Texas Instruments Inc.
13500 N. Central Expressway
Dallas, Texas

Dear Mr. McDermott:

Enclosed is the latest issue of our Bulletin "Expedition", which Dr. Lundell suggested I send on to you. Also I'll see that you get them as they come out.

Our English Physicist, Richard Linington, has just arrived from Oxford and we are meeting with Mr. Eckert and Mr. Johnson, of the Sun Oil Company, on Wednesday to decide when he should go out to Beaumont. When this is worked out I will advise you, hoping that you can put him in touch with people in your organization who can give him some advice in this business of developing archaeological prospecting equipment.

It was a pleasure to talk to you at lunch last week and I must say that after lunch I got very excited about what Dr. Lundell is doing at his research laboratories. This is the first time I realized the real significance of his work and the tie-in with our Tikal Project, in Guatemala. We all hope you can get down there to see what we are doing.

Sincerely yours,

FR:ah

Froelich Rainey
Director

file - Archeol Techn

September 15, 1960

Mr. Eugene McDermott
Texas Instruments Inc.,
13500 North Central Expressway
Dallas, Texas

Dear Mr. McDermott:

Mr. F. L. Johnston of the Sun Oil Company and our British physicist, Mr. Richard Linington, will be in Dallas Friday, September 23rd and I have asked them to call you in regard to this business of developing archaeological prospecting equipment. We just had a lengthy discussion trying to decide how best to develop the equipment for this work and understand that you people at the Texas Instruments company are far and away the best equipped to advise us on what is possible.

Mr. Linington, a young physicist from Oxford, has been working in France with a British expedition utilizing resistivity equipment with considerable success. However, Mr. Johnston has worked for a long time with other types of geophysical instruments and has ideas about other types which may be more practical. As I explained to you we have a Science Foundation grant to develop a specific instrument for locating archaeological remains and we are very keen about this project because we feel that it could be a tremendous help in the excavations we are carrying on in several different fields. None of the archaeologists in this country have made a serious attempt to develop such equipment and I should certainly appreciate your advice and any help you can give Mr. Johnston and Mr. Linington.

Very sincerely yours,

Froelich Rainey
Director

FR:jd

cc: FL Johnston

TEXAS INSTRUMENTS
INCORPORATED

EXCHANGE BANK BUILDING, DALLAS 35
FLEETWOOD 7-4311, CABLE: TEXINS

GEOSCIENCES AND INSTRUMENTATION DIVISION

October 3, 1960

Mr. R. E. Linington
% University Museum
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Subject: Use of geophysics in archeology

Dear Mr. Linington:

I finally reached Mr. McDermott and told him about our conversation. He agreed that it would probably be a good idea to try high-frequency seismic methods and asked me to send him the memo I had prepared containing our recommendations. He will presumably base his decision on it.

Yours sincerely,

Frederick E. Romberg
Chief Scientist

FER:nc

Arch Techniques

November 2, 1960

Mr. Eugene McDermott
Texas Instruments Inc.
13500 North Central Expressway
Dallas, Texas

Dear Mr. McDermott:

I have just learned from Mr. F. L. Johnson of Sun Oil Company that he was in touch with you last week, and that you have told Mr. Romberg to go ahead with the development of seismic equipment for archaeological exploration. I am, of course, delighted that you are going to do this because there is certainly nobody in the country so experienced and so well equipped to adapt the present knowledge of seismic techniques to our program, and I feel very optimistic about coming up with something really good with your help.

Our young physicist, Mr. Linington, is standing by here waiting to hear from Mr. Romberg and will be available to work on this with your people at any time. As you know, we have a $25,000 grant from the National Science Foundation which I hope is the first step toward establishing a laboratory for archaeological techniques at the University Museum. With this money we are financing Linington and installing a certain amount of equipment here. Obviously that amount of money does not go very far in developing new instruments, and I hope some of this cost will be taken over by Texas Instruments. We can, of course, make available some $10,000 from this grant for the actual cost of the development work, and I hope with Mr. J. Howard Pew's interest in our excavations that we may be able to get him to contribute some also. Could you or one of your men let me know about the financing of the project and how we can best go about carrying it out?

It seems to me that archaeologists in this country are extremely conservative about applying modern technology to their work and, as I said before, that their scale of operations must be expanded by the use of such new techniques. We now have eight archaeological expeditions currently operating in various parts of the world and it certainly is up to us to take the initiative in developing new techniques for exploration. Your help will certainly be invaluable to us and, of course, essential if we are ever going to catch up with what is happening in the commercial field. By the way, I

have just learned from the man in charge of our undersea operation off the coast of Turkey this summer that they were able to use a kind of mine detector for locating metal objects in the buried cargo of a ship sunk nearly 3400 years ago. They were working at a depth of ninety feet and lifted some two tons of cargo. Also, I should say that our present resistivity equipment did not work worth a damn at Hasanlu in northwestern Iran during the past summer. I suppose that was because of the extremely dry soils in which our people were excavating.

My best wishes.

Very sincerely yours,

Froelich Rainey
Director

CC - Mr. F. L. Johnson
Sun Oil Co
Production Research Dept, 16th Fl
1608 Walnut Street
Philadelphia 3

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TEXAS INSTRUMENTS
INCORPORATED

EXCHANGE BANK BUILDING, DALLAS 35
FLEETWOOD 7-4311, CABLE: TEXINS

GEOSCIENCES AND INSTRUMENTATION DIVISION

December 7, 1960

Mr. R. E. Linington
% University Museum
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Mr. Linington:

I am sorry we have been so slow in following up on your archeological-geophysical crew, but nobody seemed to know what who was willing to do. Word has just come through, however, that we are authorized to offer you a two-man high-frequency recording crew adapted to your purposes at a price which represents only the immediate out-of-pocket expenses. Texas Instruments would thereby be contributing all overhead and supervisory costs and would of course make no profit.

The cost to you of such a crew would be $2760 per month. It seems to me that two week's operation of the crew, properly planned, would answer the questions you and I proposed to be answered and show whether it were worth while to make further experiments with the present gear or whether different instruments ought to be designed.

Again I am sorry for the delay. However, it looks now as though we may be able to get going.

Yours sincerely,

Frederick E. Romberg
Chief Scientist

FER:nc
CC: Eugene McDermott
R. C. Dunlap, Jr.

TEXAS INSTRUMENTS
INCORPORATED

EXCHANGE BANK BUILDING DALLAS 35
FLEETWOOD 7-4311 CABLE TEXINS

GEOSCIENCES AND INSTRUMENTATION DIVISION

December 12, 1960

Mr. R. E. Linington
The University Museum
University of Pennsylvania
Thirty-third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Mr. Linington:

Thank you for your letter of the tenth. Texas Instruments is prepared to put a set of high-frequency seismograph instruments at your disposal on January 9, which will allow it to work under your direction for two (working) weeks. Do we bill the University for the cost?

As you suggested, the critical part of the business will be the selection of targets. My view is that it would be most fruitful of results if large and obvious targets were chosen first so as to learn to recognize the effects. Once patterns had been perceived then smaller and less regular features would be tried. However, the main value of the first series of experiments ought to be to give some quantitative answers, showing variation with frequency and size of target, so that the method could be evaluated by extrapolating toward realistic targets.

The actual work of choosing experimental sites and getting permission to make experiments will in my opinion take more than a week and would go much better with the help of somebody who is acquainted with Dallas, as I am not. Would it be possible for you to

ask, for example, for help from someone in the Sun organization? If they could put an experienced permit man at your disposal you might be able to work much more effectively in laying out your program. If it were possible to get that kind of thing started even before January 1, I should think the experimental work would be much more effective.

I am looking forward to seeing the results of the experiments.

Yours sincerely,

Frederick E. Romberg
Chief Scientist

FER:nc

CC: Eugene McDermott
R. C. Dunlap, Jr.
Neil Mann

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 1079
DALLAS 21, TEXAS

December 16, 1960

Mr. Froelich Rainey
University Museum
University of Pennsylvania
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Mr. Rainey:

The purpose of this note is to apologize for my seeming neglect of your several good letters. These arrived during my absence from the city and, actually, I thought that the matter was being properly handled, at my request, by our people in GSI. From Fred Romberg's letter to Mr. Linington on December 12, I judge that we are getting squared away now.

Many thanks for your patience. I look forward to seeing you sometime soon again. Meanwhile, let me wish you and your family a most happy Christmas and good New York.

Sincerely,

Eugene McDermott

EMcD/nj

January 21, 1961

Mr. Eugene McDermott
Texas Instruments Inc.
13500 N. Central Expressway
Dallas, Texas

Dear Mr. McDermott:

It was very good to have your letter and to know that we are really going to be able to work on this archaeological prospecting instrument.

I just have a note from our Physicist out there, Mr. Linington, who says that things are going well in the testing of our geophysical instruments.

I am leaving on Monday for Guatemala for a visit to Tikal and I should be returning via Texas the first week in February. It is my intention to stop in Dallas to see how things are going and I would very much like to say hello to you when there.

Very best wishes,

FR:ah

Froelich Rainey
Director

Archaeological Tidings

February 8, 1961

Mr. Eugene McDermott
13500 North Central Expressway
P. O. Box 1079
Dallas 21, Texas

Dear Mr. McDermott:

After our meeting in Dallas on Friday, Linington and I flew out to Tucson on Saturday morning to see Professor Haury at the University of Arizona and we were lucky enough to arrange for geophysical testing at a very good archaeological site just seven miles out of Tucson. This is a site dating from about the 13th Century, which has been partially dug by the University of Arizona and which contains remains of adobe structures with hard mud walls in loose earth fill. If the instruments can locate those walls we really have it. If not, we can move out to Point of Pines where there are stone walls.

I was very happy that you decided to have us do some more testing with the present equipment on a real archaeological site and that the crew should try the high frequency impulse as well as percussion in this field test. It seems to me that in this way we make an important step forward for the kind of instrument we want in archaeology. Also, I was very much encouraged by the tenor of comments in that meeting. Certainly, all of us involved will keep you posted on the results.

I enjoyed talking with you again and I do hope we have got something good here.

Very best wishes,

FR:ah

Froelich Rainey
Director

Archaeological Techniques

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 1079
DALLAS 21, TEXAS

January 30, 1961

Dr. Froelich Rainey
The University Museum
University of Pennsylvania
Thirty-third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Rainey:

Many thanks for your letter of January 21. I shall look forward to seeing you in Dallas in February.

With best wishes.

Sincerely,

Eugene McDermott

Eugene McDermott

EMcD/ek

~~Eckert~~
Archaeological
Techniques

March 7, 1961

Mr. Samuel B. Eckert
1600 Walnut Street
Philadelphia 4,
Pennsylvania

Dear Sam:

With reference to our telephone conversation, here is the information on our work with the Texas Instruments Company attempting to develop an Underground Exploring apparatus for archaeology.

As you know, our physicist, Richard Linington, has been in Dallas for some weeks testing geophysical prospecting equipment of the Texas Instruments Company in collaboration with their engineers and geophysicists. It has proved more successful for these shallow levels than any of us expected. The party from Texas Instruments did their most recent testing on two archaeological sites near Tucson.

When I was in Dallas, about the first of February, I met with Mr. Eugene McDermott, Mr. Dunlap, Mr. Romberg, and other officials of Texas Instruments, as well as a representative of the Sun Oil laboratories in Callas, and at that time Mr. McDermott was so enthusiastic about the results so far that he decided to try some high frequency source rather than percussion for the underground impulse. Mr. Romberg said that his Humble Oil Company had a device for putting a high frequency impulse into the ground and he hoped to get this for experimentation with their geophysical equipment on the archaeological site near Tucson. If this Humble device was not available, they were to develop some other instrument to produce a high frequency source and use that at Tucson.

Linington tells me that the following Monday he learned that they could not get the Humble device and that the engineers at Texas Instruments were not able to develop a substitute device. He felt that even though Mr. McDermott had said to go ahead with this, that there was no actual account number to which the engineers in Texas Instruments could charge the development work and that they had no specific written directions from Mr. McDermott to go ahead with it. Hence, Linington and the Texas Instruments crew went on to Tucson without the high frequency equipment. However, they did obtain a loan of an instrument from some company in Minneapolis, which is a simpler device for putting a shock wave into the ground. This was tried at Tucson and was relatively successful. Nevertheless, our major objective is to get a high frequency source and to design a small, practical apparatus using high frequency for archaeological prospecting.

Our problem now is how to proceed with Texas Instruments. Linington will carry on further experimentation with present instruments at Tikal during March. Mr. McDermott advised further testing with present instruments before they got into new design.

I believe that somehow we must set up a specific working relation with Texas Instruments so that there is a specific account number and instructions to the engineers which will make it possible for us to go ahead and develop our instrument at Texas Instruments. Perhaps, we should ask Mr. McDermott for a grant to the University Museum to develop the instrument at Texas Instruments, thus a specific project with proper instructions. If Mr. McDermott does not wish to do this then we should request money from some other source. In any case, the work should be done at Texas Instruments, because they now have considerable experience with it, know what we want, and seem to be very much interested in continuing the research and development work. Mr. Johnson and your other people in Dallas have been in touch with this all along and are thoroughly familiar with what has been done. I should add that we have paid out of our research funds from the National Science Foundation some $4,000. to Texas Instruments, but they have, of course, invested much more than this in the investigation so far. Could you let me know what you think, by getting this into the proper channels, and how best to complete the job.

Yours,

FR:ah

Froelich Rainey
Director

P. S. If you think it is advisable, I would fly out to talk to Mr. McDermott at any time.

S. B. ECKERT
1600 WALNUT STREET
PHILADELPHIA 3

March 13, 1961

Dear Fro:

Thank you for your letter of March 7, in which you have outlined our work in conjunction with Texas Instruments Company attempting to develop an Underground Exploring apparatus for archaeology.

I had hoped that Jack Pew might carry the ball for us, as far as contacts with Mr. McDermott are concerned, but he is on special field assignment in connection with the Seventy-Fifth Anniversary of the founding of Sun Oil Company and I fear he will not be in Dallas in the near future.

Therefore, I would suggest that you write to Mr. McDermott, explaining our problems and expressing the hope that he would be willing to contribute the sum necessary to finance the work of the Texas Instruments Company in carrying forward this project.

I would also suggest you explain to him that those of the Texas Instruments staff working with us say it is necessary for them to have an account number to which time and equipment are charged, and it is the lack of such a special account that has made it difficult to get the men in the front line trenches to go ahead on this assignment.

Further, I would suggest that you offer to go to Dallas to talk over this matter with Mr. McDermott, since I am sure you could sell him on the idea of making a bequest to the Museum that would cover the cost of Texas Instruments Company's research in this field.

If Mr. McDermott turns down this request, I would suggest that you endeavor to find out from him just how much the work would cost, and we will see if we cannot obtain the funds from some other source.

However, I think a personal talk with Mr. McDermott is highly desirable.

Sincerely,

SBE:r

March 15, 1961

Mr. Eugene McDermott
Texas Instruments Company
13500 North Central Expressway
P. O. Box 1079
Dallas 21, Texas

Dear Mr. McDermott:

We are sending off Richard Linington to Tikal in Guatemala within a few days to carry on his experimentation with the small geophysical instruments we now have. He is waiting to receive a Geophysical Interval Counter, Type GT1, from Electrodynamics Instrument Corporation, Houston, Texas, so that he can carry out your suggestion of additional experimentation on an actual archaeological site before we get to designing the kind of instrument we want for archaeological prospecting. Our schedule is for three or four weeks of experimentation at Tikal before Linington returns to Dallas with his results for discussion with your geophysicists and engineers.

I gather from Linington that after I saw you about the first of February and we decided to try some sort of high frequency source at the site near Tucson, it was not possible to rig up this high frequency source at your plant in Dallas and also not possible to get the instrument from Humble Oil. Since then I have learned that Humble Oil is working on a new instrument to produce a high frequency source for geophysical prospecting, and I have been trying to get some information about this so that we can try it out when Linington returns from Guatemala.

You will remember that you were a little puzzled as to why archaeologists were in such a rush to develop these prospecting instruments. I can explain that to a certain extent by saying that we are extremely anxious to get this new geophysical instrument for archaeology to try it out this coming summer in our search for Alaric's tomb. If all goes well with Mr. Lerici and the Italian government, we should be on site in Southern Italy late in June. It may be only a chance in a hundred of finding that half-mythical tomb but if we do it we will revolutionize archaeological techniques.

There are some administrative problems about our work with Texas Instruments, or rather with G.S.I., which I hope we can get straightened out.

I understand that the $4,000 more or less which we have contributed to the work at G.S.I., is only a fraction of what you have put into the experimental work. Also I understand that there is some difficulty in carrying this forward because G.S.I. has no account number to which it can charge time and equipment for this kind of development work. All of this work so far looks very promising and I wonder if it is possible for you to make a regular grant to this work rather than to carry, as you have, a large part of the costs through the regular expenditures in the Company. In other words, if you made a grant to the Texas Research Foundation or to The University Museum specifically to develop an archaeological instrument, would this not facilitate the work which the G.S.I. has been doing on this? If this is not possible and you prefer that we dig up money somewhere else I will have a go at it. As you know, we have a grant of $25,000 from the National Science Foundation for this year to cover all of the work we are trying to do on archaeological techniques. That will not go very far toward the design of the new instrument we would like to produce out of this investigation.

It seems to me from the discussions I heard in Dallas last month that the high frequency business is promising and we have a good chance of developing a really practical instrument for archaeology if we can develop that in application to the regular geophysical principles. Somehow I will find out what Humble is now doing with it so that I can advise you before Linington returns to Dallas after about a month of work in Guatemala.

If it would be any help at all I will, of course, fly out to Dallas and talk this over with you at any time. Please let me know what you think about this and whether I should return to Dallas.

Very best wishes,

Froelich Rainey
Director

FR/eh

Archbold Johnson

March 16, 1961

Dear Sam:

Johnson asked me to send copies of these letters to you which I think he wishes to discuss with Jack Pew.

Regards,

Froelich Rainey
Director

Samuel B. Eckert, Esq.
1600 Walnut Street
Philadelphia 3, Pennsylvania

ENC.

Archlgd Tchnqs

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 1079
DALLAS 21, TEXAS

March 22, 1961

Dr. Froelich Rainey
The University Museum
Thirty-Third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Rainey:

Your letter of March 15 was received in Mr. McDermott's office on the eve of his departure from Dallas for a few days. Because of this, he asked me to forward copies of your letter to appropriate GSI personnel, and he would discuss it with them following his return.

Sincerely,

(Miss) Nelle Johnston
Secretary

Archaeological Techniques

May 4, 1961

Mr. Eugene McDermott
13500 North Central Expressway
Post Office Box 1079
Dallas 21, Texas

Dear Mr. McDermott:

I just have a report from Linington in Tikal which tells me that he is having such good luck with his prospecting instruments that he wants to stay there another couple of weeks to complete his work before returning to Dallas. I expected him to be reporting on his results to Mr. Romberg this week, at least, so could you pass the word along to Mr. Romberg that he will not be arriving there until late in May.

That boy is running tests right up the face of the pyramids and locating earlier temples and tombs inside. This has been proved out by digging in one case on the Acropolis and he is now moving out into totally unexplored areas. Unfortunately, the percussion instrument was again damaged in shipment and he has just now got repair parts. The little German resistance equipment has been the most useful, but as soon as the percussion apparatus has been repaired, he will check this against his other apparatus. Now, I feel sure that we will have some very concrete results to guide us in the next steps.

One of our physicists here is going out to Penn State this week, but it now looks as if our own electronics man here in the Physics Department can do the work on the high frequency equipment most efficiently.

I very much enjoyed our lunch in Dallas and also the trip out with Jack Pew with whom I got really acquainted for the first time.

It is very important for us to have your interest and support in this project and I'm sure you 'll be interested in the results of the experiments at Tikal. We will keep you posted.

Very best wishes,

FR:ah

Froelich Rainey
Director

Angel Tchange

July 6, 1961

Mr. Eugene McDermott
13500 N. Central Expressway
P. O. Box 1079
Dallas 21, Texas

Dear Mr. McDermott:

I am leaving shortly for Italy and want to give you some report on development in underground exploration so far. After talking with you on the telephone, I finally made a contract with Mr. McLaughlin, an electronics expert in the Physics Department here at the University of Pennsylvania. He has now left that department and is working on his own with various contracts.

So far he is very optimistic. At the moment he is putting together an instrument which I might describe very unprofessionally as follows:

He uses a rod-shaped crystal which changes its length when a high voltage current is induced into it. This sends a high frequency current into the ground and the vibrations are picked up on a Geophone, then amplified and recorded on a Radar Scope. I don't actually know just what results he has gotten so far, but he is optimistic and is proceeding along these lines with what advice he can get from Linington on geophysics. An interesting point to me is that he says he can find so very little public information about the kind of thing he's trying to do, and thus believes that he is working in a little known field.

Mr. Johnson is very skeptical that he can get very far with the kind of instrument we want without a more adequate knowledge of geophysics, and he feels that we are going to have to have more help from the Sun Oil Company people in Dallas or from some other company working on geophysical instruments. In any case, things are moving along on this project and I am even hopeful that we will have something to try out in Italy this Fall. You may be interested to learn that Mr. Lerici in Rome has interested the Italian Government in a very ambitious scheme to examine sites all over Italy in

order to preserve them from looting by vandals. We are joining Lerici's group and together we will have six parties operating various electronic instruments in Italy this Fall. This is a kind of test case to convince the Italian Government of the usefulness of these techniques and then we hope the Government will get behind the campaign with financing for a period of years.

The National Science Foundation did come through with another grant for us for the coming year and so we are very much in business here.

One final comment on the Proton Magnatometer which we have now tried in Guatemala and on the Arctic Coast. In both cases it has been a flop, although we know it has been successful in English sites. The best instrument is still the little German Resistance Apparatus, but they have so many orders now that we cannot get delivery of new instruments for six months. The Italians are also working on high frequency equipment and we hope to get our electronics people together this summer. I will keep you posted on how we make out.

Very best wishes and thanks again for your very generous grant to this project.

Most sincerely yours,

Froelich Rainey
Director

FR:mah

November 16, 1961

Mr. Eugene McDermott
13500 North Central Expressway
P. O. Box 5474
Dallas 22, Texas

Dear Mr. McDermott:

I am very sorry for the delay in replying to your telephone call about two weeks ago, but I have been in somewhat of a dilemma. I telegraphed to say that McLaughlin was making tests of his high-frequency device this week and that we would have a full report shortly. Also in that telegram I said that I had discussed the whole matter with Jack Pew, Sam Eckert, and Larry Johnson and we had decided to call off our tentative arrangement with the Petty Company assuming that you people could do a much better job than Petty and without cost to the Museum.

The Petty Company sent us a proposal during the Spring which was to develop a seismic or sonic instrument for archaeological exploration during a period of about ten months with development in five phases, i. e. 1. Preliminary study; 2. Field experiment; 3. Development and construction of an experimental model 4. Field tests and evaluation of experimental models; and 5. Modification and redesign of prototype. This was to cost something over $32, 000. Mr. Pew and Mr. Eckert agreed to put up between them $10, 000 and then the Pew Foundation advanced the balance and I wrote Petty, saying we had the money and they should submit to me a detailed contract. That contract did not arrive until October just about the time I returned from Italy. Shortly after that I wrote to you of the circumstances. After your phone call it took me a few days to get the opinions of Pew Eckert and Johnson and the agreement that we should sign off with the Petty people and continue with you as suggested in the phone conversation. We all felt that we were not obligated to the Petty Company and that we would be much happier having you people do the development work there.

Now I am puzzled because I do not know quite what is to be done or just what we are asking you to do. You will see attached the most recent report from McLaughlin on the development of his sonic device and the results so far; also a preliminary report prepared during the earlier stages of his research. Also included are some suggestions of his as to what should be done now. Perhaps with these reports you will have a better idea as to just what the next step should be. You will note from the photograph of the radar-scope that he is recording anomalies in the ground but that there are certainly very considerable problems to be solved before we have the kind of instrument we want. He is going on to experiment with various transducers but we all think that we should get the instrument out to you in Dallas as soon as possible so that you people can carry out some experiments with it and investigate all the geophysical problems involved. I will sign off with the Petty Company assuming that you people are carrying on the research and development outlined by them, presumably eliminating a lot of the work that they anticipated because you people already did a lot of that last year and because we have McLaughlin's instrument already in being. This assumes of course that McLaughlin's instrument is really going to work and that part of the job is already done. Certainly I would appreciate your opinion on the next steps to carry out the kind of research and development we discussed on the phone.

Most sincerely,

Froelich G. Rainey
Director

FR:ad

FONDAZIONE ING. C. M. LERICI

file
Techniques

december 15, 1961

Mr. Eugene Mc D rmott
c/o TEXAS INSTRUMENTS AB
Dallas/ Texas/USA

Re: archaeological prospecting

Dear Mr. Mc Dermott,

now that this year is close to the end, I wish to take the opportunity to convey to you, also on behalf of my collaborators, our warmest thanks for the interest you have taken, through the University Museum of Pennsylvania, to our activity in archaeological prospecting in Italy. It has been for all of us a great pleasure to cooperate with Mr. Froelich Rainey and his staff, and when you will receive the report of the work done during the last quarter of this year, you will undoubtedly find the best evidence of the advantages derived from this mutual collaboration.

I have heard so much about you from Mr. Rainey and sincerely hope to have the opportunity to meet you next year in Europe or in USA. Our Foundation has since many years excellent relations with your Company and I hope that our research department may in the future have the opportunity to collaborate for the study of new equipments for archaeology.

I have just received the November issue of FORTUNE and read with interest the story of your Company: a real Saga of Modern Age of which you must be very proud.

With the best greetings of the season Iremain

sincerely yours

(ing. Carlo M. Lerici)

P. S. - I have mailed to you the book on the Tomb of the Olympiad: the first painted tomb we have discovered in 1958.

December 19, 1961

Mr. Eugene McDermott
Texas Instruments Company
P. O. Box 5474
Dallas 22, Texas

Dear Mr. McDermott:

We will get out to you very shortly more detailed reports on the functioning of McLaughlin's high-frequency instrument. These reports have been delayed because McLaughlin is trying out different transducers and also because he has had the whole instrument apart again as a part of his experimental work.

It seems to us here that the testing and developing of this apparatus requires the full time of sombody fully trained in geophysics which we do not have. I had hoped from our earlier telephone conversation this could have been done through Texas Instruments but I gather from our last conversation that this is not very practical and so we have decided to go ahead with the Petty Company in San Antonio. We think we can find the money for this all right but we would also like to keep McLaughlin going on his research with his apparatus here and therefore if you could make a contribution to the Museum for this research with our high-frequency instrument, it would be enormously helpful to us. Believe me, I appreciate your offers of help in the development of this kind of equipment and we think it is really paying off because it looks as if McLaughlin has proved that the principle of high-frequency seismic exploration is possible for archaeology. We are now in a stage where a great deal of field testing and improved design is necessary but I think we have gone far enough to show that we are on the right track and that we have something very good here.

Incidentally I will be off for Rome again early in January to work out a plan with the Italians for exploration on the plain of Sybaris, the work to begin there again in April. This is an ideal site for the testing of all of our instruments and I am extremely anxious to have the high-frequency equipment available for testing at that time.

May I take this opportunity to wish you a very happy Christmas and New Year.

Sincerely yours,

FR:ad

Froelich G. Rainey, Director

Archeological Things
Dr. R

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 5474
DALLAS 22, TEXAS

July 11, 1961

Dr. Froelich Rainey
Director
The University Museum
Thirty-Third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Rainey:

Thanks for your recent letter. I think you are doing the right thing in having the simple vibrator made. There is a chance this might have some value in the field, but the only way you can find out is to take it to the field and actually make some recordings. If it works, that will be just fine. If it doesn't, at least you would have made the trial which I think is advisable. I think it is an entirely experimental procedure, and at the moment I don't see any way theoretical knowledge of geophysics can be helpful, but, again, you won't know until some field experiments have been made.

I hope you have a grand trip to Italy and I hope to see you sometime soon after your return.

With best wishes.

Sincerely,

Eugene McDermott

EMcD/nj

Archaeology
Tellungus

February 28, 1962

Mr. Eugene McDermott
13500 North Central Expressway
P. O. Box 5474
Dallas 22, Texas

Dear Mr. McDermott:

I have just spoken with McLaughlin and he tells me he can produce and test the apparatus you discussed with him in Dallas for another five thousand dollars, but I have been checking over our techniques expenditures here and find that we have not paid McLaughlin's bill for the past two months, January and February, which amounts to about $2000. Your original grant of $5000 has all gone to McLaughlin, and was expended at the end of December. We can cover this $2000 out of our National Science Foundation grants, if you do not wish to add more than $5000, but it will cut down some of the other research scheduled for theApplied Science Center here. In any case, we can manage for another $5000 but would be very happy to have $7000 to take care of all McLaughlin's charges.

Judging by our other expenses, McLaughlin is really producing the goods for a very reasonable figure. I am glad you also find him the right kind of man for our experimental job. None of the other equipment like the proton-magnetometer and the resistance apparatus appears to function very well in locating archaeological features deeper than about ten feet, so we are very anxious, and hopeful, that the seismic type will work out for deeper deposits, such as that at Sybaris in Italy. We will try the gradiometer (improved proton-magnetometer) there this spring, but I am not optimistic about picking up remains which we know lie at a depth of nearly twenty feet.

Believe me, all of us here are grateful for your support and advice and feel sure we are getting results.

Best wishes,

Froelich Rainey
Director

FR:ad

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 5474
DALLAS 22, TEXAS

Asia Texhn
file

July 6, 1962

Dr. Froelich Rainey
Via Simasio 6
Cassano-Sario
Cosenza, Italy

Dear Dr. Rainey:

Thank you for your letters of June 28 and May 10. I am glad to hear that you have had such success with the present project at Sybaris.

I am not surprised that the seismic device you discuss worked according to prediction, that is, not at all. You may remember that McLaughlin, after completion of that equipment, took some records and brought them for us to review. We decided at that time that the equipment - the continuous wave type - was not operable. This only confirmed theoretical principles. Since then he has been working on an instrument to put single pulses into the ground. How far he has gotten on this I don't know as I have not heard from him since he was here.

I am checking our division's relations with Dr. Lerici, and I will let you know what I find out about this. Thank you for writing me about it.

Best of luck for the rest of the project. Also, I am looking forward to seeing you when you come here in October for the Dallas Museum of Fine Arts.

Sincerely,

Gene McDermott

EMcD/nj

MULTI CHANNEL SHALLOW SEISMIC OSCILLOGRAPH
(Interim report)

by MacLaughlin 10/29/62
for Texas Instr.

1. IMPULSE SOURCE

A modified bolt action rifle is used as an impulse source.

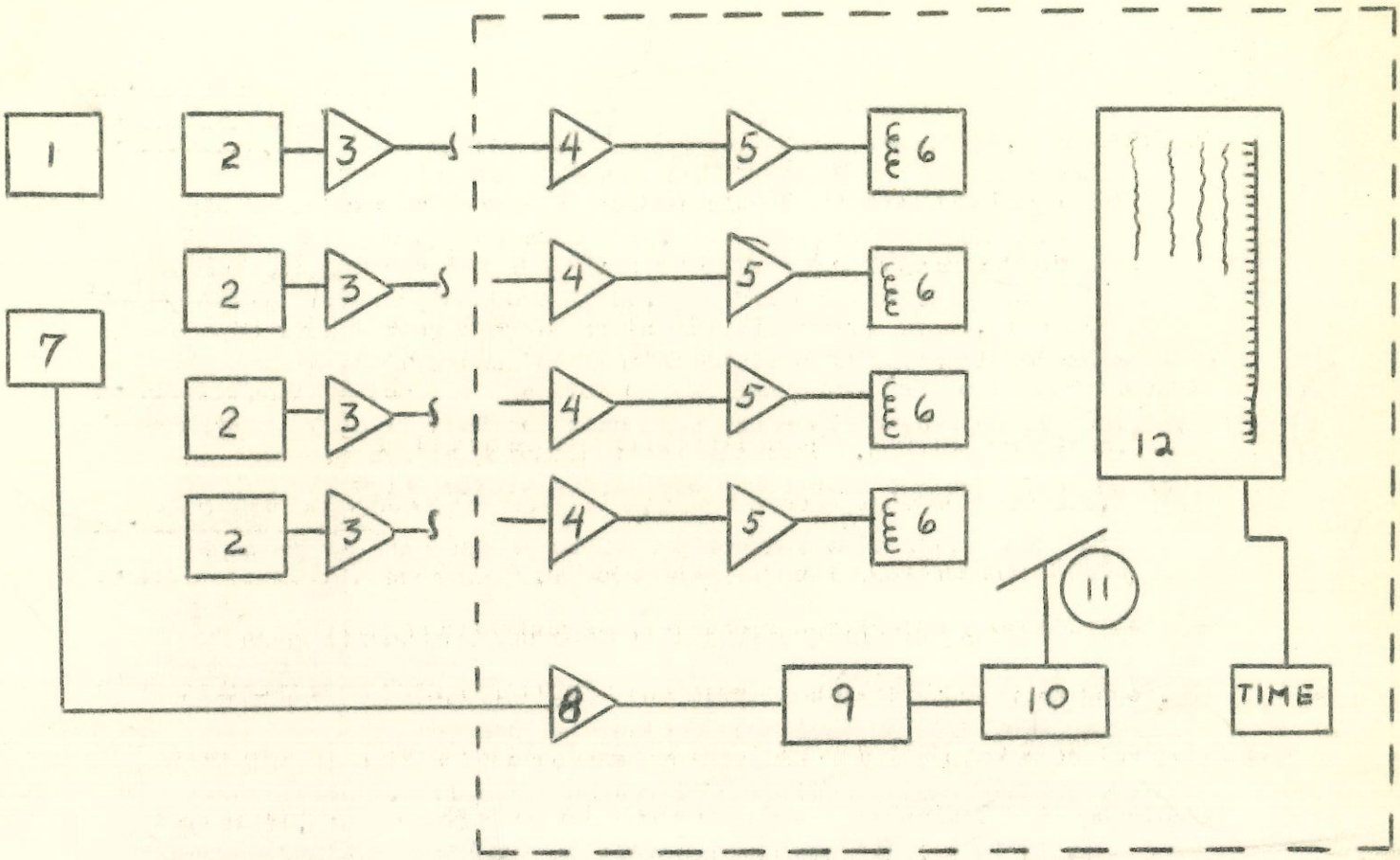
2. GEOPHONE

The four geophones have undergone several revisions. The requirements for a single pulse system are severe, as a wide band amplifier is required and trick signal to noise discrimination such as gated amplifiers cannot be used. The piezo-electric elements are used as an inertial type unit with a seismic mass. The effeciency ofthe pickup at high frequencies is greatly affected by the mass of the portion of the pickup that is ridgedly connected to the earth . This portion of the pickup has been isolated to remove the mass of the transducer case from the moving system. Also, as predicted by Mr.McDermott, the air shock wave was a problem as the sensitivity of the pickup is much greater at high frequencies to air bourne noise.

The isolation of the transducer case helped greatly with this noise reduction, and also reduced wind noise.

3. REMOTE AMPLIFIERS

The remote amplifiers are transistorized and built into the transducer case. They are otherwise conventional and designed to reach the noise level and recover rapidly from a heavy overload.



1. Impulse source - bullet
2. Geophone
3. Remote amplifier
4. Line amplifier
5. Oscillograph drivers
6. Oscillograph elements
7. Shot pick up
8. Trigger amplifier
9. Sweep generator
10. Sweep motor
11. Optical system
12. Camera-Polaroid

4. LINE AMPLIFIER

The line amplifiers were built using printed circuit chassis and are of moderate gain. The frequency response is uniform from 100 to above 10 kc. The response of the system is limited to the response of the galvo elements but an integrating circuit could be used to extend the range of the system if desired. No time variable gain is built into the system but can be added as the sweep voltage can be used as a control varying linearly with time.

5. OSCILLOGRAPH DRIVERS

High current is required to drive the high frequency galvo elements. Balanced push-pull amplifiers were designed to reduce battery drain and eliminate cross coupling. The idling current of the driver amps is approximately 5 ma and maximum output current is over 150 ma.

6. OSCILLOGRAPH ELEMENTS

Oscillograph elements used are 2000 cycle elements which are a good compromise between sensitivity and frequency response. The standard magnet for the galvanometer elements weighs approximately 4.5 lbs. A light weight pole piece assembly was built weighing about 4 ounces. This unit uses new flexible magnetic material.

7. SHOT PICKUP

A piezoelectric element is used to produce a trigger pulse from the bullet impact. This method is used instead of a contact type as improved reliability results.

8. TRIGGER AMPLIFIER

This transistor amplifier is used to amplify the trigger pulse from #7 and trigger the sweep generator circuit.

9. SWEEP GENERATOR

The sweep generator is transistorized and consists of a flip-flop driving a bootstrap sawtooth generator. This circuit produces a linear voltage that is amplified and used to drive the sweepmotor. The shape of the sawtooth can be modified to linearize the sweep due to the flat film plane. But other methods mentioned later minimize this problem.

10. SWEEP MOTOR

The only available units that could be adapted to the mirror drive were about 5 lbs. in weight, so a small motor was developed using an internal core type magnet and moving coil. The entire unit weighs under ½ lb. The coil is matched to the transistor sweep amplifier.

11. OPTICAL SYSTEM

This system has undergone several revisions. The earlier used cylindrical lenses and mechanical shutter to eliminate the retrace. The latest system uses a point light source and pinhole optics with a considerable saving in weight and space. The light is turned on for the duration of the sweep and has so little thermal lag that circuit complications are eliminated.

12. POLAROID CAMERA

A standard polaroid back is used with standard film. The sweep distortion due to the flat film plane is partly corrected by controlling the flux distribution in the sweep motor. A timing signal is incorporated so accurate timing of events is possible.

Archaeology
Techniques

November 7, 1962

Mrs. Eugene McDermott
The DAllas Museum of Fine Arts
Dallas 26, Texas

Dear Mrs. McDermott:

Certainly you and Mr. McDermott made this last visit to Dallas exceedingly pleasant and interesting. All the questions and comments after the lecture made that much more interesting than most of the lectures I do and I was delighted to see that there was so much interest in archaeology and art. It certainly must have been stirred up by Jerry's exhibition. Also the visit to the factory and the laboratories was a complete eye-opener to me. It did not even look like a factory and I always enjoy learning about something in an entirely new and different field. Also the visit to the ranch took me right back to my childhood and now I understand much better why people like Texas.

Just now I have been on the telephone speaking to Annamarie Pope at the Smithsonian Institution in Washington about the Tutankhamun exhibition. She says there is a whole waiting list, but that she will write to you shortly about this. Also I learn from our building superintendent that the spray-on preservative for stone sculpture is called Hilltex, and is made by the Hilliard Chemical Company in St. Joseph, Missouri. Your people at the Museum may know all about this but we find it very satisfactory.

There is some sort of hitch in the arrangements our youngsters in the undersea department are making for a meeting with Mr. Murchison in Dallas so I am not sure that this is going to come off. However if you wish, I feel sure I can get George Bass out there for a lecture at the Art Museum on undersea archaeology. He is just back from Turkey and will be here until spring.

Mrs. Eugene McDermott, continued

November 7, 1962

Could you remind Mr. McDermott that I am very anxious to get the information on the new proton magnetometer being made at Texas Instruments. As I recall the man in the laboratory was to get the information from the apparatus department. Also please thank him for a very exciting visit to the plant and the laboratory. It was very good to see you both and please feel free to call upon me at any time if I can help with traveling exhibitions at the Art Museum.

Most sincerely,

Froelich Rainey
Director

FR:ad

MEMO to Dr. Rainey from E. Ralph Nov. 13, 1962

The following amounts have been spent by Gray MacLaughlin (MacLaughlin Electronics, Perkiomenville, Penna.) for the construction of the Four-Channel Recorder for Texas Instruments, Inc., an instrument requested by Mr. Frederick Romberg. (Univ. Museum Order No. 100399).

April, 1962 (parts and 3 weeks labor @ $6.00/hr.)	$ 807.29
May (parts and 3 weeks labor)	810.33
June (parts and 4 weeks labor)	1094.22
July (parts and 4 weeks labor)	1138.78
August (parts and 4 weeks labor)	972.50
September (parts and 3 weeks labor; actual bill not rec'd)	800.00
October (parts and 1½ weeks labor; actual bill not rec'd)	400.00
November (parts and 4 weeks labor, estimated)	1000.00
Total	$7023.12

The circuits for the recorder, the housing, and the amplifiers have been completed. MacLaughlin estimates that two weeks of work will be required to complete the sweep optical system and the mounting of the amplifiers and piezoelectric elements.

For the field testing and "debugging" of the instrument, MacLaughlin estimates one month of work (December). The cost of this work was not included in his original estimate.

Therefore, the total funds required in excess of the original $5000 donated by Texas Instruments are as follows:

Unestimated expenses for construction	$2000
Field Testing and "Debugging"	1000
Total Needed	$3000

cc. G. MacLaughlin

cc. F. Romberg 1/7/63

Ada Techniques

November 16, 1962

Mr. Eugene McDermott
13500 North Central Expressway
P. O. Box 5474
Dallas 22, Texas

Dear Mr. McDermott:

Attached is an accounting which I have just received from Dr. Ralph of our Techniques Laboratory on McLaughlin's expenditures in research and construction of the four channel recorder. You will see that he has gone some $2,000 over the $5,000 grant you advanced for this purpose and is still in need of some more money to complete it. We have, of course, paid him some additional money for the work he has done on the gradiometer for the laboratory out of National Science Foundation funds. However, I still think Gray McLaughlin is doing a good job for us and this kind of operation is cheaper than it would be in a large plant.

In San Antonio I found that the Petty people are really getting enthusiastic about their research on the sonic device. We should soon have a report of this through to Romberg but as I understand it they are getting a 600 cycle impulse on an intermittent basis through to a depth of twenty-five feet with considerable force and they are now trying to pick up the reflections from cement blocks buried at different depths. Of course they have all sorts of records of speed of travel, etc. We have also learned that Edgerton at M. I. T. is getting interested in this sonic device and Dr. Ralph is working it out so that there should be a constant exchange of information between Edgerton, McLaughlin, Romberg and the Petty people.

I have written Mrs. McDermott to try to express my thanks for a very pleasant visit in Dallas but I do want to say again what an exciting business it was to see the operation of a big electronics plant and laboratory. There can be no question at all that the astonishing technology of our times is affecting our lives more than anyone can imagine and it makes me more pleased than ever to know that we are here trying to mix electronics and archaeology. Incidentally, Glenn Seaborg is making speeches all around the country in which he used Sybaris experiments as an example of how science is aiding the humanities. His speech writer is sending me copies with a bit of a

chuckle because we both realize that Seaborg is leaning over backwards to be nice to the humanities.

Very best wishes.

Froelich G. Rainey
Director

FGR/fk.

Enclosure

December 20, 1962

Mr. Frederick Romberg
Texas Instruments Company
P. O. Box 5474
Dallas 22, Texas

Dear Mr. Romberg:

My apologies for having been so slow in sending you the data about the Etruscan ship and the most recent data on the archaeology of Crete, but here it is finally. One trouble was that we had a student digging out the data on the Etruscan ship and this was delayed. I am also sending you a color slide of the ship so that you can see it for yourself.

I wrote Mr. McDermott saying that MacLaughlin has spent all of the $5000 grant from him on his current project in sonic research, and have heard nothing. Is he around and is he all right? I take it that MacLaughlin is in touch with you about what he is doing and that we all agree that we should continue along this line. Also I understand that Beth Ralph has sent out to you a report of what has been going on at Petty, and also that she has interested Professor Edgerton from M. I. T. in carrying on some investigations along this line. I have urged everyone to keep informed as to what the other is doing.

It was very pleasant to meet you and your wife again in Dallas last month and I very much enjoyed our conversation. With very best wishes for Christmas and the New Year,

Sincerely yours,

Froelich Rainey
Director

FR:ad
enc.

January 7, 1963

Mr. Frederick Romberg
Texas Instruments, Inc.
13500 North Central Expressway
P. O. Box 1079
Dallas 21, Texas

Dear Mr. Romberg:

Many thanks for your help with these monetary and other problems.

I have enclosed a copy of my memo to Dr. Rainey in regard to MacLaughlin's expenditures.

With best regards,

Elizabeth K. Ralph

EKR:dml

encl.

Arch Technics

January 22, 1963

Mr. Eugene McDermott
c/o Texas Instruments, Inc.
13500 North Central Expressway
Dallas, Texas

Dear Mr. McDermott:

Many thanks for yours of January 3rd. I have just now heard from Dr. Bernard List, who says he will be here on February 1st, so we can discuss the possibility for the new proton-magnetometer. I hope you have by this bime the account of Sybaris, in the Illustrated London News which I sent out to you last week, and that you seriously consider visiting us there in the spring. As you know, we should be there from the 1st of April to the end of June, but I must fly back to Seattle at the end of May to preside at my last meeting of the American Association of Museums. Thank the Lord, I retire from that job in May.

I understand our physicist, Miss Ralph, will see Romberg late this month, and that he should have by that time a report on the instrument being constructed by McLaughlin. She is also going on down to San Antonio to see what is going on at Petty. We are very anxious to have some new equipment on the new site at Sybaris.

Very best wishes,

Froelich G. Rainey
Director

FGR/vv

TEXAS INSTRUMENTS
INCORPORATED
CORPORATE OFFICES: RESEARCH BUILDING • 13500 NORTH CENTRAL EXPRESSWAY • DALLAS, TEXAS

January 3, 1963

Dr. Froelich Rainey
The University Museum
Thirty-Third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Rainey:

Forgive me for taking so long to write to you about the helium magnetometer. Various meetings and holidays seemed to delay my getting with the TI people with whom I wanted to discuss both its status and your potential use of it. I have now gone into the subject and find that there have been several laboratory models built and there is a little development work yet to be done which should not take too long.

Dr. Bernard H. List, now Manager of the Advanced Systems Development Department of our Apparatus division, under whose direction in our Central Research Laboratories the development work has been and is being done, plans to be in Philadelphia sometime this month, and I have asked him to see you when he is there. Dr. List will drop you a note as far in advance of his visit as he can in order to help ensure being able to see you then.

The McDermotts send best wishes to you for the New Year.

Sincerely,

Gene McD.

Eugene McDermott

EMcD/ek
cc - Dr. Bernard H. List

MAILING ADDRESS: POST OFFICE BOX 5474 • DALLAS 22, TEXAS • ADAMS 5-3111 • CABLE: TEXINS

for Dr. Rainey Arch Techniques

Applied Science Center for Archaeology

THE UNIVERSITY MUSEUM • UNIVERSITY OF PENNSYLVANIA
33rd & SPRUCE STREETS • PHILADELPHIA 4, PENNSYLVANIA
Froelich Rainey, Director EVergreen 6-7400 (Area code 215)
Elizabeth K. Ralph, Associate Director
EVergreen 6-0100 Ext. 8168 (Area code 215)
Cable Address "Antique"

February 12, 1963

Dr. Bernie List
Apparatus Division
Texas Instruments, Inc.
6000 Lemmon Ave., P. O. Box 6015
Dallas 22, Texas

Dear Dr. List:

We appreciated your coming here and telling us about the TI magnetometer.

Dr. Rainey is now in Guatemala so that I don't know about any subsequent arrangements that may have taken place. However, I thought that I would let you know that I have ordered a Differential Amplifier (cic Model 3104B plus cic Differential Input Mode Model D3PB) and that we shall adapt a Brush Recorder BL201RS and Amplifier BL905 for use with this to monitor telluric ground currents at Sybaris.

I think that these measurements will be quite interesting, especially in combination with your helium magnetometer.

With best regards to you, Dr. Green, and Mr. Birch, I am,

Sincerely yours,

Elizabeth K. Ralph

EKR/deh
cc: Dr. F. Rainey, Univ. Mus.

Andi: Technique

March 15, 1963

Mr. Eugene McDermott
4701 Drexel Drive
Dallas, Texas

Dear Mr. McDermott:

I am just now off for Cairo and Sybaris. I would like you to urge you to talk with your man List about the possibility of testing your helium-magnetometer at Sybaris. Of course, I understand that the real question is whether or not such magnetometers have a commercial sale and whether testing at Sybaris would be useful to you and of this I have notidea. However, I do think that if testing foruseful to you, Sybaris is a wonderful place to do it, because we already know a great deal about that site and actual field testing could probably be done more cheaply here than anywhere else.

It was very good to see you and Mrs. McDermott here and I do hope you can really visit us in Sybaris before the end of June. I will let you know from the field how everything is.

Very best wishes,

Froelich Rainey

FR/vv

MacLAUGHLIN ELECTRONICS

PERKIOMENVILLE, PENNA.

INSTRUMENTATION
AUTOMATION
RESEARCH
MANUFACTURING

rec'd 8/15/63

Dear Beth:

The T.I. Unit is coming along very well. I expect to be field testing again in about a week. It has worked out as a nice flexible instrument. Since the unit is so near completion, an additional report at this time would be redundant.

Several electro-mechanical problems and the impossibility of obtaining reasonably priced help has delayed the completion of this unit.

Leeds & Northrup, Philco, Minneapolis Honeywell, General Electric, Burroughs and Univac have all moved into this area. Everyone with any technical background has been absorbed. This resulted in me spending more of my own time on the unit than I had planned.
Attempts to utilize outside machine shops has not been successful.

I have collected the schematics for the various equipment built for the Center and when I have time I will make copies for your files.

Hope you have a nice trip to Texas.

Sincerely,

D. MacLaughlin

TEXAS INSTRUMENTS
INCORPORATED
100 EXCHANGE PARK NORTH • DALLAS, TEXAS
SCIENCE SERVICES DIVISION
GEOSCIENCES DEPARTMENT

7 January 1964

Miss Elizabeth K. Ralph
Associate Director
Applied Science Center for Archaeology
University of Pennsylvania
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Miss Ralph:

This answers your letter of December 18 asking about Mr. MacLaughlin's report. I studied it and sent it to Mr. McDermott with comments, the sense of which follows:

The device appears to be workable, given the mechanical improvements that the author suggests. The electronics are sound and well conceived, according to an electrical engineer in this department. The records show that seismic energy can be recorded. In my opinion this indicates that the device can with a reasonable amount of de-bugging be made into a useful tool - as useful, that is, as the fundamental limitations of the problem allow.

These limitations are of course set by the kind of energy that can be put into the ground (source coupling) and by its behavior between source and receiver. There is no doubt that shallow refractions can be observed if they exist. Whether reflections can be differentiable from the noise even in favorable cases remains to be seen. However, if reflections cannot be observed with the (improved) MacLaughlin device they will probably not be observable with anything else procurable or developable at reasonable cost.

Mr. MacLaughlin's experiments with source coupling are important to the application of the device. If I were doing the work I should use dynamite caps buried at various depths in hand-auger holes.

After you and I had talked today, I talked to Mr. McDermott and he authorized Mr. MacLaughlin to do further work on the seismic device, requesting that it be put into field-worthy condition so it could be operated smoothly by a properly trained operator. He was glad to hear that you intended to work out with MacLaughlin and to operate the device in Italy if it were finished in time.

Yours sincerely,

F E Romberg

F. E. Romberg

FER:pm
cc: Mr. Eugene McDermott

January 21, 1964

Dr. Frederick E. Romberg
Geosciences Department
Texas Instruments Inc.
P.O. Box 35084
Dallas 35, Texas

Dear Dr. Romberg:

Many thanks for your letter of January 7th. Dr. Rainey hurried off to Egypt and asked me to write to you while he is away to confirm, clarify, or confuse the various conversations which have taken place.

Grey MacLaughlin is now proceeding with the de-bugging and assembly (it is pretty much of a bread-board rig at the moment) of his recorder. Since MacLaughlin has a habit, as many of us do, of underestimating the time and funds required, I shall keep my fingers crossed about its being ready to take to Italy in April or May. In view of the lack of success that I had with his oscilloscopic detector and associated equipment, I feel that several trial tests should be made locally before taking it overseas. In addition to the fact that it is so difficult to find components to make changes and laboratory test equipment is so limited in southern Italy, there is the big advantage of making sure the "bugs" are out before it leaves the designer. From this point of view, it would be better if MacLaughlin would come with us to Italy, but he does not seem to want to.

In regard to the funds, if MacLaughlin's minimum estimate was $3500, I suspect that $5000 to $7000 would be more realistic. I assume that the same arrangement will continue - that the funds will be given to the University Museum and MacLaighlin will submit monthly bills.

Many thanks for your generous help in these matters.

Sincerely yours,

EKR:pc

Elizabeth K. Ralph

TEXAS INSTRUMENTS
INCORPORATED
100 EXCHANGE PARK NORTH • DALLAS, TEXAS
SCIENCE SERVICES DIVISION
GEOSCIENCES DEPARTMENT

31 January 1964

Mr. G. D. MacLaughlin
Perkiomenville, Pennsylvania

Dear Mr. MacLaughlin:

In a recent conversation Mr. McDermott suggested that it might be appropriate for you to demonstrate your new portable seismograph system to us in Dallas. The demonstration should be made when you consider that a field-worthy model has been achieved, and would serve as a field test preliminary to transporting the instrument overseas. As veterans in exploration, we are naturally interested in the field performance aspects of the instrument as well as in its design. In addition, I should like personally to consider the possibilities of application outside of archeology.

If this suggestion suits you would you please tell us when the instrument is ready for a field test so that we can arrange a date and location? Thank you.

Sincerely,

FER

F. E. Romberg
Chief Geophysicist
Geosciences Operations

FER:pm
cc: Mr. Eugene McDermott
Miss Elizabeth K. Ralph

FL 7-5411 ext 639
~~AD 5-3111~~

Technigues

February 7, 1964

Dear Mr. McDermott:

I am just now back from Egypt and learn from Dr. Ralph that Mr. Romberg has put McLaughlin to work on a new model of the sonic probe for archaeology. So far they have not had a chance to talk with Jack Pew and Sam Eckert about continuing with the Petty Company, but I assume that after your conversation with Jack, we will sign off with Petty and hope that McLaughlin can produce the kind of instrument we want.

Also, I was very glad to see a letter from Romberg to McLaughlin putting some pressure on him to complete this apparatus and to take it down to Dallas for trials this spring. That should keep McLaughlin on the job so that he does not get distracted with other things.

I take it you are financing McLaughlin's work, and I wonder if you are doing it direct or if you would rather do it through us.

Incidentally, I am going back to Tikal again, just after the middle of February and should be there about two weeks. Is there any possibility that you and Mrs. McDermott could join me there? This is our last big season of excavation at Tikal and I am sure you would enjoy seeing this thing in operation. If you can make it, do let me know so that I can have one of the cottages at Tikal set aside for you. I should be returning from Tikal at about the end of February and then be in Philadelphia during the month of March. Very best wishes, to you and Mrs. McDermott,

Sincerely yours,

Froelich Rainey
Director

Mr. Eugene McDermott
Texas Instruments, Inc.
Dallas, Texas

February 13, 1964

Dear Mr. Mayne:

I owe you a very sincere apology for the long delay in replying to the proposal that you submitted to produce the archaeological probe. I realize that the Company made an effort to get this proposal to us in time for a meeting of the Pew Foundation and you certainly must be wondering what happened to that.

Mr. Howard Pew advised me that the Foundation had expended their funds for 1963 and that the proposal could not be considered until January 1964. Then in January, I was advised that at most we could expect only half of the cost from the Foundation and Mr. Eckert was to dig up somewhere the other half. At that point, I left for Nubia and having just now returned, I am trying to unscramble the business before leaving for Guatemala. At this point, I can only say that I hope we can hold this in abeyance for the time being, until I can straighten out the financing.

We very much appreciated the work you have done and I am sorry for the long delay in replying, even more for the uncertainty at the present moment, but it is apparent now that we cannot get this organized for the spring season in Italy, although we should resolve it somehow before the fall season.

Very best wishes,

Froelich Rainey
Director

Mr. W. Harry Mayne, Vice President
Petty Geophysics Company
San Antonio, Texas

Arch. Techniques

July 31, 1964

Dear Mr. McDermott:

Grey MacLaughlin has been in touch with Romberg and apparently they agree that MacLaughlin cannot complete rebuilding the sonic device in time to test it in Dallas, and then get it over to us for testing at Sybaris, this fall. There are apparantly some problems about getting the materials, and I gather it is a pretty thorough rebuilding job which is necessary. This is too bad, because it is our last big season at Sybaris, but I am sure it should be thoroughly worked out in Texas, and that Beth Ralph should be trained in this operation before we actually test it out on an archaeological site. In the meantime, I have told Grey to push it as fast as he can, and to send us his bills.

I hope you will continue to contribute to this job, since the N. S. F. has cut down on our appropriation for the laboratory, here, this year. MacLaughlin tells me he will need another $5,000.

That N. B. C. television show "Sunday", showing the use of our instruments in Canada, was canceled last week, because of an special show on race riots in New York, but it is going to be on this Sunday, so I hope you have a chance to see it. Also, you will be interested to know that we are now trying to get an astonishing new aerial camera on the job, at Sybaris. Apparently, it is one used with the U-2, but now declassified, and being developed for commercial uses. It is being produced by the ITEK Corporation in Lexington, Massachusetts, and they are equally anxious to try it in our search for Sybaris . Also we are trying out a new rubidium

magnetometer there this fall, and the technique of inducing artificial magnetic field, which we discussed on the phone. So, even though we do not have the sonic device, we will have some other new technique to experiment with.

I feel sure we have the spot of Sybaris nicely outlined now, but I still expect to find the city itself inland, and up, off the plain. Our Ambassador in Rome has finally got our difficulties with the Italian Government ironed out.

Very best wishes,

Froelich Rainey
Director

Mr. Eugene McDermott
Texas Instruments, Inc.
Dallas 35, Texas

[circa aug. 1, 1964]

MacLAUGHLIN ELECTRONICS

PERKIOMENVILLE, PENNA.

Instrumentation
Automation
Research
Manufacturing

University of Penna.
Philadelphia, Pa.

Museum Seismic Fund	Order No.108978	July bill,1964
5 747B Eagle	.23@	1.15
22 MN1400 B Mallory	.75@	16.50
4 E233 Everready	2.65@	10.60
1 RM312 Mallory		.24
1 Guncase -plastic		7.95
5 5HK 350 Sprague	.27@	1.35
3 2N1595 Scr.Silicon	3.75@	11.25
C.O.D. on above		.80
1 1560P52 Lead Zirconat Titanium Piezo Electric Element		102.52
4 TVA 1163 Sprague	1.38@	5.52
1 M500 Rectifier Silicon		2.43
5 5E4-75 Silicon Rect.	.59@	2.95
1 TVA 1104 Sprague		1.90
1 TVA 1105 Sprague		2.20
5 2N512 RCA	.43@	2.15
1 211 g cement		2.47
3 109 IRC Special		2.65
24 Polaroid 410 Oscillograph film	24.75 doz.	49.50
Labor 226 hours	6.00@	1356.00
		$1590.03

Pd from Discr. Fund 14 Aug.

Technipues

August 25, 1964

Dear Mr. McDermott:

I was glad to have your letter of August 11, when I returned from our summer place in Vermont, and to have your opinion of MacLaughlin's instrument. I, too, am puzzled as to why it takes so long and costs so much to make the necessary changes, but he tells me he has many difficulties finding the right materials and that he is doing a major job of rebuilding. Just now I have another bill for $1,590, of which $1,350 is for labor (226 hours.) I have paid it out of my Discretionary Fund and of course, we will keep him going. But I am glad you will continue to support this project! Let's hope it will come out right in the tests this fall.

Incidentally, we will have a technical group working with the people from the University of Arizona at Snaketown, in December, and perhaps we can try out the MacLaughlin instrument there, after testing it in Dallas.

We will be off again to Sybaris in September and October with all the necessary permits, and I hope with the new aerial camera. Tom Gates, head of the Morgan Guarantee Trust, is one of our Board members, and he is putting some heat on Prof. Kistiakovsky of ITEK Corp. to make us a more reasonable price for the job. Both of us think $18,000 is pretty steep for an aerial photograph of 100 square kilometers, but I gather the interpretation of this new film may require more than two months in the laboratory in California, and we may have to bring over the Italian head of their aerial service. Anyway, it is worth a good try.

Very best wishes,

Froelich Rainey

Mr. Eugene McDermott
P. O. Box 5474
Dallas, Texas 75222

13500 N. Central Expressway

August 14, 1964

Mr. Eugene McDermott
13500 North Central Expressway
P.O. Box 5474
Dallas, Texas 75222

Dear Mr. McDermott:

Dr. Rainey is away from the Museum. I will bring your letter to his attention immediately upon his return at the end of next week.

Sincerely yours,

David Crownover
Executive Secretary

EUGENE McDERMOTT
13500 NORTH CENTRAL EXPRESSWAY
P. O. BOX 5474
DALLAS, TEXAS 75222

August 11, 1964

Dr. Froelich Rainey
The University Museum
Thirty-Third and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Rainey:

I am sorry too that we will not get the sonic device for your use this fall, but I do think it is more important that we not only give it a final check, but that we instruct someone in the use of it. The main difficulty with the present device was the type of crystals used in the pick-up. The temperatures were higher than MacLaughlin expected and in view of the fact that you may encounter similar temperatures it seemed imperative that we change these. Fortunately, Larry Johnson participated in the field tests and conference and knew exactly what the trouble was and what to do about it. We also decided to change the batteries and the transistors from germanium to silicon. This was not really necessary as the box can be kept at a satisfactory operating temperature, but we felt we might as well make that change as long as we had to make the change with the pick-up. I am surprised that it has taken MacLauglin so long to do this; perhaps it is because of backlog of other business.

I will continue to support this development... though $5,000 seems a little on the high side.

I did not get your letter in time to look at the TV show, and I am sorry I didn't. I am glad to know that you are using the magnetometer in combination with an induced magnetic field and also that you are using the U2 type camera. This should give you a well rounded package for exploration.

All best wishes.

Sincerely,

Gene McD

EMcD/nj

Techniques

November 18 1964

Dear Mr. McDermott:

I am just back from Italy again, and have been checking up on Gray MacLaughlin. He says he is getting on with our sonic device, but is still delayed by difficulties in finding the right parts. The only thing I could do is to urge him to write to Mr. Romberg giving him a kind of proper report and explaining his difficulties, since I am sure Mr. Romberg would understand this much better than I. These delays make me very uneasy, but your comments on what he has already done makes us optimistic that he will finally come through with the apparatus. He is still our best possibility for an instrument useful in all kinds of fields.

However, I do wish to tell you about the great success we have just had with a kind of bread board model of the Rubidium magnetometer. The Varian Corporation sent this out to Sybaris with a young man to operate it, and on that site it worked like a charm. He had two sensors and an automatic recording apparatus. One sensor was fixed near the recorder and the other was carried over the ground by one man, walking steadily. Magnetic changes were automatically recorded on a graph. Once the thing was operating, we soon realized that we could pick up structures up to five and six meters deep and with much greater accuracy then with the proton magnetometer. In a couple of weeks, we charted a whole series of buildings which were beyond the depth of the proton magnetometer and were able to chart them with extraordinarily sharp outlines on a magnetic contour map.

With this instrument, we realized that in Two or three months of work we could accurately map all of the ruins in the three or four square miles area, and at a relatively small cost. This is what I call the port area of Sybaris, and it will probably never be excavated, because it lies so far below the water table.

However, we also realize that our great success with the magnetometer was due to the very peculiar physical situation and with stone structures buried in clays which contrast in magnetic intensity. Hence, it is only in rare circumstances such as this that a magnetometer can be so useful. It emphasizes again what you could do with a sonic device at more normal sites.

On the lighter side, I think you will be amused to learn that almost all the Italians are convinced that we have found Sybaris, while I am in the awkward position of saying I do think we have. There are many reasons for this decision which I won't go into here, but I am happy to say that Orville Bullitt backs me up in my lonely decision and so we will continue in the spring, this time with a new aerial photography technique.

You will also be glad to hear that our young friend George Bass has proved the great usefulness of a two-man submarine for underwater archaeology. It is back at the Electric Boat Corp. getting its wiring improved, but we now know it is going to open up a whole new world in archaeology, and George is bubbling with plans for next summer.

I expect to join Emil Haury at Tucson for some experiments at Snaketown this winter, and I hope before too long I can stop over in Dallas to talk to you about where we go with the sonic device.

Obviously, Gray should get that thing out to you for testing very soon.

The very best to you and Mrs. McDermott,

Regards,

Froelich Rainey
Director

Mr. Eugene McDermott
13500 North Central Expressway
P. O. Box 5474
Dallas 22, Texas

November 25, 1964

Dear Mr. Langan:

Following the publication of the press release Dr. Rainey wrote on the rubidium magnetometer, we have had several phone calls and latters asking for more technical information about the instrument.

Do you have any pamphlet or publication, which you could send us, inconcerning the rubidium magnetometer, so that we could send out to people who are interested in this instrument?

If anything of this sort is available, and is not too bulky, we certaihly could use at least 30. Maybe more. Many thanks in advance,

Sincerely,

Mrs. John C. Gwinn
Secretary to Dr. Rainey

Mr. Lee Langan
Varian Associates
Palo Alto, California

Techniques

April 20, 1965

Dear Mr. McDermott:

Professor Jameson, of the University of Pennsylvania, and Mr. Julian Whittlesey, apparently have been in touch with Dr. Feder, Mr. Arnett and Mr. Leonardo from Texas Instruments, about new methods of aerial photography. So, I thought you would be interested in the experiment we are carrying out in Italy this spring, with that 9-lens ITEK camera, using various types of color film. General Sorie Smith, at our Embassy in Rome, has arranged with the Italian Air Force to photograph the region of Sybaris. So we should know later on this spring how well this new type of aerial photography applies to archaeological mapping. If there is any way we could cooperate with your people on this kind of experiment, of course, I would be very pleased.

To give you some idea about how our techniques program is getting on, I am enclosing a copy of our first ASCA bulletin.

Grey MacLaughlin still seems to be backing and filling with his sonic device, but again tells me he will be in touch with you before long. I just don't know what to make of that fellow.

Very best wishes

Froelich Rainey
Director

Mr. Eugene McDermott
P. O. Box 5474
13500 North Central Expressway
Dallas, Texas 75222

Enclosure

WHITTLESEY & CONKLIN

ARCHITECTS AND CITY PLANNERS

JULIAN HILL WHITTLESEY FAIA
WILLIAM J CONKLIN AIA

ASSOCIATES
JAMES S. ROSSANT AIA
JONAS VIZBARAS AIA
WILLIAM HAMILTON ROEHL AIA

April 2, 1965

Prof. Michael Jameson
University of Pennsylvania
Bennott Hall
34th & Walnut Streets
Philadelphia, Pennsylvania

Dear Mike:

On Monday, I saw the Texas Instrument prople in Washington where I had been giving a paper at the American Society of Photogrammetry.

There had been some interesting papers on infra red work by their Charles W. Lancaster and Dr. Allen M. Feder, also by James H. McLerran of the Army's Cold Regions Research & Engineering Laboratory (CRREL) who have one of my Bipods.

All this led to a conversation later with Richard A. Arnett and Earl S. Leonardo of the Texas Instrument Company. The former is Manager of their Geosciences Department. I told him what you want in the Argolid and how I was securing a regular commercial proposal for pan chromatic coverage from an Italian firm (though I have not yet gotten to it). We discussed the additional fruit to be gained from interpretation of infra red. You will be able to pick up walls and drains, etc., below the earth by positive signs other than change in plant growth or drainage and the like, provided the coverage is taken under the right micro climatic conditions. This can be very exciting and they were interested in its application to your problem referring occasionally to Mr. Jean McDermott.

Texas Instrument is doing research on multisensory work of this sort including infra red. Much of the equipment is

31 UNION SQUARE NEW YORK 3, N. Y. TELEPHONE WA 4-4700 CABLE ADDRESS: WHITCOECH, NEW YORK

classified. So too is much of the imagery - though not all. So too is some of the interpretation proceedure. However, this does not stand in the way of getting coverage for you in Greece - if we have a bit of luck and co-operation in various quarters.

For instance they can fly classified equipment from a U.S. military base such as Athens. They have or can rent a plane capable of taking coverage as low as 500 feet. Interpretation can later be done in their lab with you present. The archaeological results will then become available to you although the imagery itself might still remain classified - at least for a while until our government declassifies it. These limitations, of course, do not apply to the panchromatic or regular black and white work.

Needless to say this will take a bit of co-operation with our Air Force people in Greece. Considering how interested our government is in this field of photo interpretation of sensory data, the Texas Instrument Co.'s role in the work, and your need for it, I strongly recommend enlisting Dr. Rainey's and Mr. McDermott's enthusiasm. You can certainly count on mine and some support thrown in if we can get this put on the track.

Mr. Arnett encouraged me to write them a letter stating just what is wanted and where, giving the boundaries of the mission much as I did to Nikolopoulos (who has not answered). The letter should ask for a proposal. It should give the purposes, namely for the University's or the University Museum's archaeological work. And it should, he suggested, be brought to Mr. McDermott's attention.

I will draft the letter to Texas Instrument as soon as possible - hopefully before next week is out - and send it to you for your comment. Perhaps the letter finally best go from you or Dr. Rainey or whomsoever, but not necessarily from me.

Sincerely,

Julian H. Whittlesey

JHW:fl

TEXAS INSTRUMENTS
INCORPORATED
8000 LEMMON AVENUE • DALLAS, TEXAS
SCIENCE SERVICES DIVISION

SCA file

6 April 1966

Mr. Julian H. Whittlesey
Whittlesey and Conklin
31 Union Square
New York 3, New York

Dear Mr. Whittlesey:

Texas Instruments is very interested in the application of an airborne infrared scanning system to achaeological studies. We believe that the idea is sound and that careful pre-flight planning followed by the proper interpretation of the observed data will provide a valuable tool in the search for buried ruins.

At this time, we feel that the cost for logistic support would be high to fly the relatively small areas that you propose. We suggest that you contact the Air Force Reconnaissance Officer in the Pentagon to determine if an aircraft and infrared scanning system can be made available in Europe. The Air Force, working with TI, may be interested in aiding cultural development programs such as this, particularly if it is associated with national interest or is sponsored by a nationally recognized group. The best source for this information is

Colonel Floyd Stockton, AFRST
Pentagon Room [illegible]
Washington 25, D. C.
Telephone: Oxford 5-2798

You may advise Colonel Stockton that we are interested in this study and would be happy to cooperate by consulting on planning a test program, implementing the data collection and data evaluation as well as the interpretation phases. These services would be provided on a time-manpower basis. It should not involve more than two engineer-interpreters from Texas Instruments. The initial step will be to perform an on-site survey in order to establish a preliminary plan.

4 April 1966

If equipment is not available through the Air Force, Texas Instruments will investigate further the possibility of providing an aircraft, equipment and the total manpower necessary to carry out the project.

Your interest in Texas Instruments is greatly appreciated. We shall look forward to being of service to you in this interesting work.

Sincerely yours,

L. A. Yarbrough

L. A. Yarbrough
Manager, Remote Sensing

LAY:cb

October 13, 1966

Tech.

Dear Mr. McDermott:

It does seem a long time since I have seen you to talk about our techniques program in archaeology, but I have been hearing about you through Mr. Griffith who has apparently been dealing with your people at Texas Instruments in connection with aerial photography. I have also been experimenting with the new ITEK 9 lens camera in Italy, but was unable to get the Air Force to include the experiments at the site in Greece where Mr. Griffith was interested. Anyway, we are still going strong and we have had some real success in developing the thermoluminescence method for dating pottery and in developing the new cesium magnetometer for archaeological survey.

Now Dr. Ralph tells me that Mr. Romberg has the four channel recorder for the sonic device built by MacLaughlin, here in Pennsylvania, But that Mr. Romberg has had so much to do that he has not yet gotten around to testing it. Our magnetometers will not work in many regions because of the soil conditions and so we are still much interested in the sonic device. Could you look into this and see if Romberg could be free for a few days of testing the instrument which he now has? I remember you felt that MacLaughlin's instrument had great possibilities and we would very much like to know whether we should proceed in developing this kind of instrument.

Very best wishes to Mrs. McDermott and yourself,

Regards,

Froelich Rainey

Mr. Eugene McDermott
Texas Instruments
Dallas , Texas

FGR/vg

GEOPHYSICAL SERVICE INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS
INCORPORATED

December 13, 1966

Miss Elizabeth K. Ralph
The University Museum
University of Pennsylvania
33rd and Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Miss Ralph:

The engineers testing MacLaughlin's final model could not seem to make it work. In consequence of this I recommend scrubbing that particular instrument and looking at what is available commercially.

I enclose an advertisement for a so-called Thiokol Geochrone which might do the job. It might also be a good idea to write to GISCO, (Geophysical Instrument Supply Company, 900 Broadway, Denver, Colorado 80203) and ask them to give you an overview of waht is available. They sell or rent all types of geophysical instruments, specializing in portable one-man types. If you explain your problem to them they may be able to tell you what is available.

It was a pleasure to talk to you, and if you want to pursue the portable seismometer plan I will be glad to correspond with you further.

Sincerely,

F E Romberg

F. E. Romberg

FER:blm
Enclosure

MAILING ADDRESS: POST OFFICE BOX 5621 • DALLAS, TEXAS 75222 • FLEETWOOD 7-5411 • CABLE: GEESYE

Dr. Rainey

GEOPHYSICAL SERVICE INC.
SCIENCE SERVICES DIVISION
TEXAS INSTRUMENTS
INCORPORATED

December 13, 1966

Technique

Miss Elizabeth K. Ralph
The University Museum
University of Pennsylvania
33rd and Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Miss Ralph:

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end of this

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This is std seismic - N.G. I'll follow up the other

It was a pleasure to talk to you, and if you want to pursue the portable seismometer plan I will be glad to correspond with you further.

Sincerely,

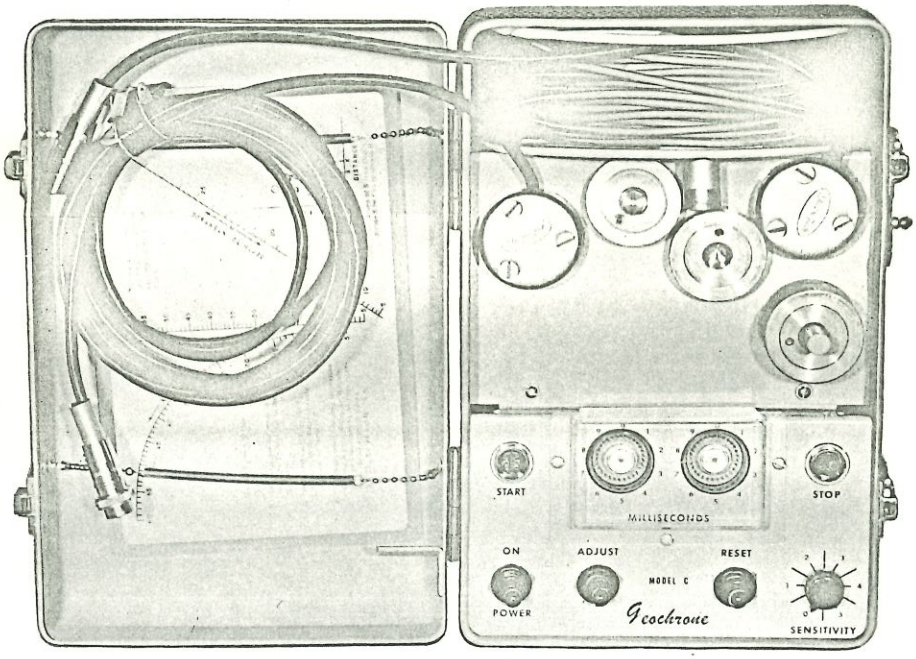
F E Romberg

F. E. Romberg

FER:blm
Enclosure

Thiokol GEOCHRONE

We can work out a Distributor's Franchise on Geochrone Instruments. Write us for complete details.



THE THIOKOL GEOCHRONE is a lightweight (15 lbs.) portable geophysical exploration device employed to determine refraction-type seismic measurements.

THE THIOKOL GEOCHRONE

- DETERMINES DIP AND STRIKE OF SHALLOW BEDS
- LOCATES FAULT LINES
- LOCATES GRAVEL PITS AND DEPOSITS
- DETECTS LARGE BOULDERS
- CORRELATES ROCK DENSITIES
- TAKES ECONOMICAL PRELIMINARY OVERBURDEN SURVEYS
- LOCATES BURIED STREAMBEDS
- SURVEYS FOR WELL CONSTRUCTION
- LOCATES NEAR-SURFACE DISCONTINUITIES
- DETERMINES RIPPABILITY OF ROCK

. . . and has many other applications as varied as the desires of the user.

December 15, 1966

Geophysical Instrument Supply Company
900 Broadway
Denver, Colorado 80203

Dear Sirs:

Dr. Frederick Romberg of Texas Instruments has suggested that I write to you in regard to our desire to experiment with or to develop a portable sonic-type instrument for archaeological prospecting. We have tested several portable seismographs but we find that the long wave lengths of the low seismic frequencies tend to by-pass the small buried structural features which we seek at depths of 2 to 6 meters. Preliminary tests indicate that a frequency of about 600 cycles would be appropriate for our use, but even at this relatively low frequency, there are problems of attention and coupling.

I have enclosed a reprint from Science in which some of our activities are described. We have experimented extensively with magnetometers, but there are many sites where the earth isvery magnetic or for some other reason magnetometers are not suitable. Also, the applications of resistivity instruments are limited. For these sites we are searching for a sonic or other type of instrument.

We shall appreciate it very much if you can offer some suggestions for this problem.

Sincerely your,

EKR/jmf
encl.

Elizabeth K. Ralph