November 1st, 1967

Techniques

Dear Mr. Bodine:

I have been talking with Dennis Puleston about your idea of mapping Maya sites in the Petén with the sonic device. Dennis tells me that you thought, while you were at Tikal, that this actually could be done and, of course, the ideal place to experiment with this technique would be the ground map section of Tikal.

Recently, I have been carrying out experiments with the U.S. Air Force in remote sensing for archaeological sites, and therefore, have become much interested in techniques like this. Moreover, we have had some very successful collaboration with the Varian Associates in Palo Alto, and now they asked for new ideas for technical developments in archaeology. Is there any way in which we, or the Varian Associates, or both of us together, could collaborate with you in exploring the sonic idea for mapping?

Very best wishes,

Froelich Rainey
Director

Mr. A. G. Bodine
Bodine Soundrive Company
7877 Woodley Avenue
Van Nuys, California

FGR/vg

BODINE Soundrive COMPANY
LOS ANGELES, CALIFORNIA

MAIN OFFICE AND LABORATORY
7877 WOODLEY AVENUE
VAN NUYS, CALIFORNIA

May 1, 1967

Mr. Dennis Pueleston
Tikal
Guatemala, C.A.

Dear Mr. Pueleston:

We are having conferences here, to determine what we have available which might tie in with the more definite requirements I have learned under your guidance. It is interesting that the gang here shares our enthusiasm for the aerial preliminary contour scanning probe idea, as well as for the seismic probe.

Looking over past budget phases of these projects surely points out the advisability of letting the big commercial projects finance the advances as much as possible. It would be a shame to use archeology funds for something that will be duplicated in a big commercial project very soon. This timing factor is what we are looking at now.

We will keep you advised.

Cordially,

A. G. Bodine

AGB:jef

Not all our excitement has come from the sustaining area and brechas though. A few weeks ago a physicist named Bodine showed up down here with his wife. Apparently Rainey had met him and got him interested in finding tombs with seismographic equipment and computors. His company apparently wants xxxxx an ppportunity to test out some new machines on known quantities so I took him into Nick's tomb and the tunnels under the 5-story palace. This was to be all at their expense (unless perhaps we were interested in digging out some tomb they located in Temple II)xxxxxxxxxxxxxx. It seemed to me though that in view of the terminal situation here a batch of new tombs wasn't something that was going to be particularly useful, just more last minute headaches. Anyway I took him around but I started wondering about applying the same techniques to mapping. I asked him if there was such a thing as sonic contouring. He said there was but that research on it had been abandoned years ago in favor of xxx aerial photography. I began explaining to him our problem here with vegetation and the impossibility of useful aerial photography. He started to get interested. The next day I took him out about 4 km. on the north brecha to show him how our survey was done, the vines, the logs, and the hills. By this time he began to see the point, we looked over housemounds and studied foliage, trees, etc. As we walked his mind began churning out calculations of impedence differentials, optimum scanning xxxx speeds while he mentally rebuilt oscillographs and programmed computors to factor trees out of sonic data. I had to keep watching him so that he didn't bump his head on overhanging branches or trip over fallen logs.

The basic idea is simple, planes fly over the jungle with great bullhorns blaring away (I can just imagine what Rafa would say about this) while machines record elapsed time on a sort of television screen from where the data goes onto tapes. These tapes are later fed into an oscillograph that draws the contour maps. Contour intervals can potentially be brought down to something like 10 or 12" though initially it would be more like 10 feet. There are plenty of kinks to be ironed out before this thing would work but this is why they're interested. An oil company that has a machine or a staff of technicians a little more sophisticated than those of the next oil company gets the worm so to speak. Bodine, who runs a laboratory that makes these instruments apparently feels there is a chance, even if a slim one, that he can get commercial research interested in bullhorn contouring in the Peten. As I said to Bill H. if this comes through it will be the biggest thing in Peten survey since Bullard's mule. I am enclosing a copy of Bodine's latest letter to let you know we're still on our toes down here and haven't succumbed to Tikal lotus-eating yet.

UNIVERSITY OF CALIFORNIA

LAWRENCE RADIATION LABORATORY
BERKELEY, CALIFORNIA 94720

Physics Department
Building 50, Room 205

October 25, 1967

Dr. Froelich Rainey, Director
The University Museum
University of Pennsylvania
33rd and Spruce Streets
Philadelphia, Pennsylvania

Dear Dr. Rainey:

Your recent letter has arrived in our office, and I am writing to advise you that Dr. Crowe is presently at CERN, Switzerland, where he will be until the first of next year. I have forwarded your correspondence to him.

Sincerely yours,

Jane Hamann

Jane Hamann, Secretary to
Kenneth Crowe

cc: K. Crowe

NLC

by vg Dec. 8, 1967

Ing. Lartigue
Cia. Mexicana de Aerofoto, S. A.
Obrero Mudnial 338
Mexico City, Mexico

INFRARED FILM BEING BROUGHT TO
MEXICO CITY WITH MR. JAMES HERNANDEZ
SUNDAY DEC. 10 AMERICAN AIRLINES
FLIGHT 25 ARRIVING 12:20 pm. PLEASE
MEET PLANE AND CLAIM FILM
MANY THANKS /Rainey

Yale
203 787-3131

November 17, 1967

Techniques lib

Dear Ing. Lartigue:

You are undoubtedly familiar with infrared film and with the flight plan for the San Lorenzo archaeological site, following your telephone conversation with Professor Michael Coe. But, to be on the safe site, I am enclosing, here, some details about this experiment.

As you know, infrared film must be kept refrigirated before it is used and until it is developed. So, I hope you can put this directly into your refrigirator until the time of the flight.

As you will remember from conversations with Dr. Coe, we wish to cover the 75 square kilometer area of your present topographical map of the San Lorenzo: that is, the region between the Rio Coatzacoalcas and the Rio Tatagapa, bounded on the north by the Rio Chico. We would like to have this done at an altitude of 5,000 ft.

You will also recall that we also wish to run a flight at 1,000 ft, which will bracket the rea of your flight line 4, photographs 3 and 4; and flight line 5, photographs 8 and 9, which you ran on February 6, 1966.

I hope you can develop the infrared film there, If not, please advise. Also, will you airmail the negatives and prints to Dr. Michael Coe, Dppartment of Anthropology, Yale University, New Haven, Connecticut, with the bill for your services.

We are all most interested in the results of your experiments, and we will certainly keep you posted on the results.

Very best wishes,

Froelich Rainey
Director
University Museum

Ing. Gerardo Lartigue
Cia. Mexicana de Aerofoto, S. A.
Obrero Mundial 338
Mexico City, Mexico

FGR/vg
cc: Dr. Michael Coe

sent with infrared film.

2 rolls

370/ct

430 rp. pr rol.

150 — per Rol.

~~[illegible]~~

Send here

[signature]

wcllianr.

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2 Rolls
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B+W. 5424

Rollon 25 filter for B.

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$9\frac{1}{2}$" x 180'

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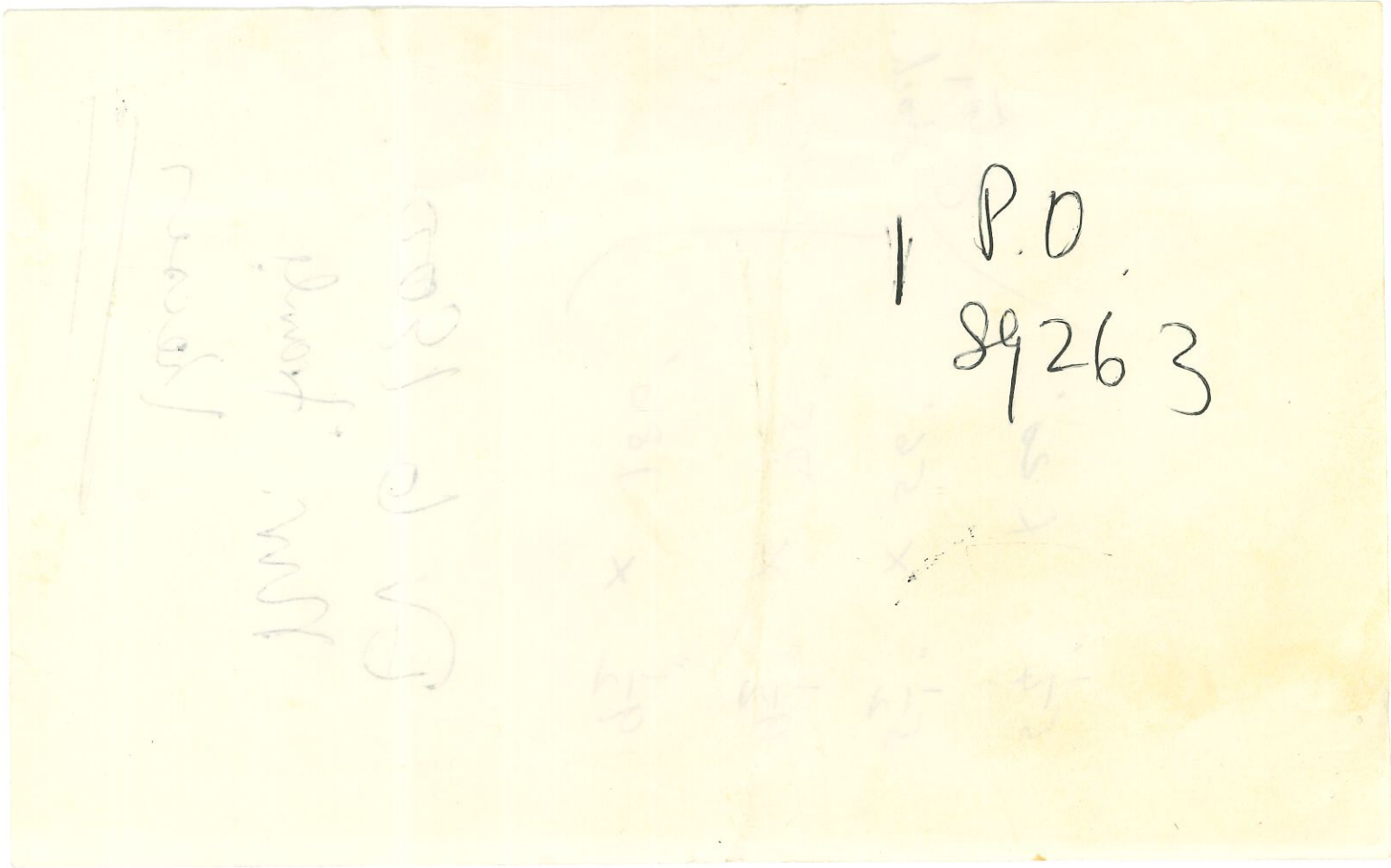
Mr. Frank

Keiser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89263

Inspection time

refrigerator - below 50°

flight line - on last aerial photography -

San Lorenzo araba - lito

(Bracket this area) flightline 4 - photograph 3- and 4 - (run of Feb 6 1966)

1000 ft.

flight flight line 5 - phot. 8-9

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75 square km. coastal

5000 feet by top of mon. - below

rio Coatzacoalcos & rio

Tatagofa - [illegible]

Chinese - air mail to Bil Coe

Advice us regarding

Con... ? development of ... -
send ... permit -

Ing. Gerardo Lartigue
Cia. Mexicana de Aerofoto, S.A.
Obrero Mundial 338
Mexico City

Tel. 43-38-30

~~Wxxxx~~ Wilz RC 8 Camera

Fairchild aerial photo

Frank B. Loretta
Prospect
4-4372
Fotos aer.
[illegible]

December 8, 1967

Dear Mr. Hernandez:

We have cabled Aerofoto in Mexico City to have your plane met so that the film might be turned over. Should no one appear at the airport, could we further impose on you to have them delivered? They are very perishable and should be refrigerated.

May I take this opportunity to thank you for all your help in getting these down.

Most sincerely,

Froelich Rainey
Director

Mr. James Hernandez

FGR/vg

letter del. at
airport Phila with films

February 2, 1968

Dear Sam:

There is nothing quite like the frustrations of infrared. There is no word from Mike Coe in Mexico, even though I have made one telephone call and sent two cables. He must really be lost in the bush. In any case, I would hope to hear from him before our meeting of the Expeditions Committee on February 7. I hope things are set so that we can get off to Mexico by February 20.

In the meantime, enclosed is another statement about a meeting on aerial photography which you might like to look in on. Apparently this sort of thing is all the rage these days.

Regards.

Sincerely,

Froelich Rainey
Director

W. Sam Carpenter, 3rd
1060 DuPont Building
Wilmington, Delaware

FR/jc
Enclosure

W. SAM CARPENTER, 3RD
1060 DU PONT BUILDING
WILMINGTON, DELAWARE

January 10, 1968

Dr. Froelich Rainey, Director
The University Museum
Thirty-third & Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Fro:

Thank you for your letter of January 5th. I will try to cover the Symposium at the University of Michigan in April. I wonder if there is any other member of the Expedition Committee who would like to go out as well.

With regard to Mike Coe, I plan to be back in this country by February 1st, and although I have quite a number of commitments up through February 19th, from February 20th on might be a good time to see the Olmec site.

Please let me know what his plans are.

Sincerely,

W. Sam Carpenter, 3rd

WSC:EBC

Hotel Insurgentes
Insurgentes Sur 1168
Mexico 12, D.F.

February 25, 1968

Dear Fro:

I hope that you and Sam had a satisfactory visit to San Lorenzo and our camp, and a safe return. I have not yet heard from anybody down there or from yourselves about the visit, but trust that you found the place interesting.

As of today still no word from Aerofoto about the infra-red flight. When I talked to them on Thursday, they claimed the flying conditions were still bad (in spite of the beautiful weather which we saw from the Cessna looking down in the direction of Orizaba). As soon as I hear, I will let you know how things stand.

The talk I think was success at the Museum. I had such a bad cold that the terrors of having to give it in Spanish faded. I was doing all I could to make myself heard in any language.

Best regards,

Mike

Michael D. Coe

SAN LORENZO

February 28, 1968

Dr. Sheldon Breiner
Analytical Instruments Division
Varian Associates
611 Hansen Way
Palo Alto, California 94303

Dear Shelly,

Dr. Rainey has probably talked to you today by telephone upon his return from Mexico. I am just writing to say that we are shipping some samples which he collected there to you today by air freight.

Our proton magnetometer is a bit shaky these days, but as far as I could tell, the magnetic characteristics of the samples from the site in Mexico are as follows:

1) Brownish earth - negligible magnetism
2) Reddish earth - some magnetism
3) Rock - strongly magnetic (may contain ferrous ores)

The structures there are made of this same rock and there are not natural rocks, so this looks promising.

Best regards,

Elizabeth K. Ralph

EKR/abn

CLASS OF SERVICE

This is a fast message unless its deferred character is indicated by the proper symbol.

WESTERN UNION

W. P. MARSHALL
CHAIRMAN OF THE BOARD

TELEGRAM ®

R. W. McFALL
PRESIDENT

SYMBOLS

DL = Day Letter

NL = Night Letter

LT = International Letter Telegram

The filing time shown in the date line on domestic telegrams is LOCAL TIME at point of origin. Time of receipt is LOCAL TIME at point of destination

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MEXICOCITY 19/NL 9

DR FROELICH RAINEY

UNIVERSITY MUSEUM

PHILADELPHIA P A

USA

INFRARED FLIGHT TENOCHTITLAN AREA COULD NOT BEEN EXECUTED UP TO THIS DATE DUE TO VERY BAD METEOROLOGICAL CONDITIONS

CIA MEXICANA AEROFOTO SA

DC ?

Tenochtitlan

SF1201(R2-65)

Telegram to

Sheldon Breiner
Varian Associates
611 Hansen Street
Palo Alto, California

CARPENTER CANNOT GET AWAY TO MEXICO UNTIL
MAY WHICH IS TOO LATE THEREFORE SUGGEST YOU GET
OFF SOON AS CONVENIENT FIRST CALLING COE MEXICO
CITY ALSO PHONE ME WHEN YOUR PLANS ARE MADE.

Fro Rainey

March 6, 1968

Teeh

March 14, 1968

Dear Mike:

Probably you have been on the phone with Sheldon Breiner from Varian Associates. At least, he said he would call for final arrangements and he tells me that if satisfactory with you, he should be arriving in Mexico City,on March 26 with one assistant who will stay on to complete the magnetometer survey in San Lorenzo. He also said he would speak with you about bringing a photographer from Varian Associates and perhaps I should explain something about this. Sheldon would like some publicity on the instrument. This is all right with me, as long as he cleared with you and also made sure that any statement included Yale and the University Museum.

I have also an ulterior motive. We have been paying Varian a good deal of money for development work and I think this is something they should pay for in the future. The problem is convincing the president of the company, and I think a little publicity would help. However, this is really up to you.

I am off for the Near East on Monday, but Jim Pritchard, the Associate Director, is here in charge and if there are any problems, please get in touch with him. Sam Carpenter would like to come down but cannot get away until May and I didn't want to delay this experiment that long.

Here is how the whole thing works. Do let me know what happened about the infra-red films.

All the best,

Froelich Rainey
Director
FR/ek

Michael D. Coe
Hotel Insurgentes
Mexico City, Mexico

Yale University News Bureau

#371 (P)

New Haven, Connecticut 06520

787-3131, Ext. 344

Steve Kezerian, Director

For release to SUNDAY papers, May 19, 1968.

* *

A Special Science Feature:

New Magnetometer Provides a Powerful Scientific Tool For Yale Archeologists In Their Mexican "Dig."

by Harold Helfrich,

Yale News Bureau

* *

New Haven, Conn., May 19:-- A new magnetic detection instrument, similar to the device which located the sunken submarine Thresher in 1963, takes the educated guesswork out of archeology.

The spectacular success of the new cesium magnetometer, which was tested recently at a Yale University archeological site in Mexico, is almost certain to revolutionize the formula for hunting artifacts. By determining variations in the earth's magnetic field, it is able to detect disturbances (anomalies) below the ground surface.

more

Michael D. Coe, Yale's Professor of Anthropology, says, "I wish I had it three years ago when I started work" in the Mexican state of Veracruz. He has been conducting archeological excavations at San Lorenzo, political center of the Olmecs, which was destroyed during a violent internal outburst some 2,900 years ago, between 1000 and 900 B.C.

The new portable cesium magnetometer was designed by Varian Associates of Palo Alto, California. Earlier models have been used before for archeological work, primarily in Greece and Italy. But the results were not so clearcut, according to Prof. Coe, as at San Lorenzo where an extensive survey by a Varian geophysical team resulted in the discovery and unearthing of four outstanding monuments, as well as the designation of scores of locations for future excavations.

"This magnetometer was particularly well suited to San Lorenzo," said Coe. "The huge Olmec monuments which were upset and mutilated in that political upheaval long ago were dragged into long rows on the peripheral ridges of the town and buried under thousands of cubic meters of fill. "However, the rock from which the monuments were fashioned originated in distant, extinct volcanoes. This basalt - a substance rich in iron - is quite different from the non-ferrous, magnetically-clean fill in which it is hidden, and the cesium magnetometer had a picnic in designating its location and depth."

The traditional methods of determining an excavation site require training and careful study, and the results often prove negative after a lot of digging, he said. "With the magnetometer, archeologists can get the most out of their financial resources and manpower, while achieving more extensive and meaningful reconstructions of ancient sites."

more

At the invitation of Prof. Coe, Sheldon Breiner of Varian Associates led the geophysical team which made the survey. Collaborating in the work was Froelich Rainey, Director of the Applied Science Center for Archeology, University Museum, University of Pennsylvania, who was involved in development of the physical detection devices.

Forty-eight significant monuments had been brought to light by Prof. Coe in his previous two expeditions to the site. Within a few days, during the recent third and final expedition, the cesium magnetometer picked up 50 anomalies, which leads the Yale archeologist to revise the forecast he made last year.

"I estimated in 1967 that there are conservatively a couple of hundred more monuments hidden below the ground surface at San Lorenzo," Prof. Coe says. "The magnetometer's success so far in 'seeing' the buried monuments makes me suspect that there may be up to 500 waiting to be excavated."

Before funds supplied by the National Science Foundation were exhausted, Coe and his workers had dug up four monuments located by the Varian magnetometer. They included:

1. "A beautifully smooth basalt stela (upright ceremonial slab), broken off at the top but still 1.8 meters high.

2. "The back part of a helmet from a basalt head.

3. "A ten-ton oblong block, perhaps an altar, covered with ax-grinding marks probably meant to destroy the designs, of which none is left.

more

4. "The most perfect statue ever found at San Lorenzo of the Olmec rain-god, a were-jaguar with its snarling mouth and traditional cleft in the top of its head."

He explained that "usually the statues had their heads knocked off in the relentless rampage that was apparently intended to destroy memorials to former Olmec rulers. This remarkable, three-foot-high statue of the rain-god, the Olmecs' chief deity, is unusual in being complete except for its hollowed-out back. Since it was found near the start of the 656-foot drainage system we uncovered, I suspect that it may have been intended as part of the drain."

Further work at San Lorenzo will be in the hands of Mexico's National Institute of Anthropology and History, which provided essential cooperation to Prof. Coe during his three years of excavation. The Yale archeologist hopes that the institute "will do a complete magnetometer survey of the entire area, which now has an appointed guardian to protect it from souvenir hunters."

The San Lorenzo survey marked the first use of the new, highly portable version of the cesium magnetometer. Other models have been utilized for such widely diversified projects as the Thresher search at 1,400 fathoms, recovery of legal evidence, detection of buried munitions and mines, rapid inspection of non-metallic vehicles, boats and even armed persons, location of magnetically-tagged animal specimens, and in many areas of geological field study.

The small, lightweight instrument consists of a staff-mounted sensor shaped like a tin can, belt-carried batteries, and a very small belt-carried readout unit.

By utilizing a small voice tape recorder, an archeological team can store the readings on the spot, along with survey line numbers, etc., and speed up their survey to offset diurnal variations.

/ / / /

May 2, 1968

Dear Sam:

I have been trying to get you on the phone without any success, so I am sending on a copy of Mike Coe's letter and a report from Shelly Breiner on the magnetometer survey at San Lorenzo. As you will see, this has been even more successful than I had hoped. Mike tells me on the phone that the last anomaly excavated is the finest monument ever found in the Olmec field and he and I and Breiner are to coordinate a press release on this when he gets back up to New Haven next Sunday. Moreover, the Mexicans are very excited about it and he is working out an arrangement for us to work with the Mexicans with further instrument work at that site and other Olmec sites.

By all means let's have lunch before the Board meeting, this time at my club. Then I can tell you about prospective digs in the Mediterranean areas for the summer.

All the best,

Froelich Rainey
Director

Mr. W. Sam Carpenter, III
1060 DuPont Building
Wilmington, Delaware

FR/jt

April 24, 1968

Dear Mr. Carpenter:

Dr. Rainey is expected back on Friday and
I will have him call you on that day.

Sincerely,

David Crownover
Executive Secretary

Mr. W. Sam Carpenter, 3rd
1060 DuPont Building
Wilmington, Delaware

DC/jt

W. SAM CARPENTER, 3RD
1060 DU PONT BUILDING
WILMINGTON, DELAWARE

April 23, 1968

Dr. Froelich Rainey, Director
University Museum
Thirty-third & Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Fro:

In late May, Murton and I are planning to be in Europe on a trip that gives us several days in Athens and in Crete. I was wondering if there was anything interesting in the way of University Museum digs that we might find possible to look up in the short time we are there.

Also, possibly it might be helpful to come up before the meeting on May 14 a little bit early and get a short briefing and some information. Possibly I could prevail on you to have lunch with me that day.

Best regards.

Sincerely,

Sam

W. Sam Carpenter, 3rd

WSC:EBC

Hotel Insurgentes
Insurgentes Sur 1168
Mexico 12, D.F.

April 4, 1968

Dr. Froelich Rainey
The University Museum
University of Pennsylvania
33rd and Spruce Sts.
Philadelphia, Pa. 19104

Dear Fro:

Not knowing when you will be back from the Near East, I am writing you this letter just before I leave for a week in San Lorenzo. The other day I received a telephone call from Sheldon Breiner from Palo Alto (while I was in New Haven) telling me of the enormous success which his team has had in San Lorenzo.

This has been a truly fantastic stroke of luck, and puts an entirely new light on San Lorenzo. If he is right, they had already located about 40 anomalies by last week, all of which ought to be monuments, and some of which by testing definitely were such. This sort of puts me on the spot, as we had every intention of finishing all archaeological work there by the middle of this month!

I seriously doubt that because of present finances we will be able to dig much beyond April 15th. However, we might look ahead to next year. I have invited the Instiututo here to continue with the work which we have started, principally to discover many more monuments for the Mexican museums. The Instituto would thus inherit our camp. Ignacio Bernal, with whom I talked about 3 weeks ago, is quite enthusiastic about this. The magnetometer survey obviously opens up all sorts of new prospects. It seems to me that the entire site ought to mapped by magnetometer next year. Then, armed with this map, the Mexicans should be able to come up with a hundred new monuments a season.

I will talk today with Bernal about this, but I would rather hold off on the publicity until I get back late next week from looking over San Lorenzo. At any rate, we all (Varian, the University Museum, and Yale) should talk things over before we decide on our next move.

The Cia. Mexicana de Aerofoto told me yesterday that they have flown out three times recently to San Lorenzo, but it was cloudy all three times!

Congratulations again on your great foresight in seeing the possibilities of the magnetometer at San Lorenzo.

As ever, Mike

April 10, 1968

Dear Mr. Coe:

Dr. Rainey is away and will be back about the 26th. I will bring your letter to his attention at that time.

Sincerely,

David Crownover
Executive Secretary

Dr. Michael Coe
Hotel Insurgentes
Insurgentes Sur 1168
Mexico 12, D. F.

DC/jt

Beth Ralph University Museum Dr. Rainey

Report by Sheldon Breiner for Applied Science Center for Archaeology Newsletter, E. K. Ralph, Editor

NEW CESIUM MAGNETOMETER USED IN SURVEY AT SAN LORENZO OLMEC SITE IN MEXICO

A new highly portable version of the cesium magnetometer developed by Varian Associates was used in a field survey for the first time in March, 1968. This instrument, the model V-4971 portable search magnetometer is smaller and lighter consisting of a staff-mounted sensor, belt-carried batteries, and a very small belt-carried readout unit. The readout unit is a variable reference oscillator and mixer used to obtain the audio frequency difference between the sensor Larmor frequency and the selected reference frequency. Operating in a search mode, a low audio frequency tone can be set by the reference oscillator allowing the magnetometer to be used to rapidly locate anomalies, quickly estimate their depth and magnitude, and plot these on a map or mark them on the ground. Sensitivity in the search mode is approximately 1 gamma. In the magnetometer mode the reference oscillator is used to obtain a zero frequency difference between the reference oscillator and magnetometer sensor. The frequency of the reference oscillator which is then the same as that of the sensor is ~~then~~ read off the calibrated dial used to adjust for zero-beat. The sensitivity in this magnetometer mode is better than 0.1 gamma. Utilizing a small voice tape recorder, the readings can be read into the tape recorder together with survey line numbers, etc., and an extremely rapid survey is possible lessening the need to remove the diurnal variations.

The first field trial of the cesium portable search magnetometer was carried out by ASCA at a site in the southern part of the state of Veracruz, Mexico in an area currently under study by Professor Michael Coe of Yale University in cooperation with the Museum of Anthropology and History in Mexico City. The site is a low mesa approximately 3 kilometers by 2 kilometers with locally abundant mounds, ridges and lagoons, all man-made. Specifically the site is the San Lorenzo site of the Olmec civilization dated approximately 1200 - 900 B.C. and is one of the Olmec sites from which large stone heads, figures of men and jaguars, etc., were derived. The various monuments, at depths of 1 to 6 meters, are all made of volcanic rock transported from mountains 50 miles distant. The local terrain is underlain by very non-magnetic soil so that all anomalies present are expressions of archeological interest making this an ideal site for magnetic surveying.

Preliminary investigation of the site was performed by Froelich Rainey to assess the feasibility of such magnetic surveys. The susceptibility of samples thus obtained were found to be 5×10^{-4} and 2×10^{-5} cgs for the volcanic monuments and surrounding soils respectively. Sheldon Breiner and Marvin Harris of Varian Associates were employed to conduct a preliminary magnetic survey at the site to assess both the instruments and the site for magnetic exploration techniques. Several hundred discrete anomalies were mapped some of which were immediately excavated

revealing monuments at the location and estimated depths predicted by the surveys. The program is to be continued with the effort directed at providing an extensive magnetic survey over the entire mesa as an aid for archeological interpretation and as a guide for selected excavations to confirm the interpretation and obtain specimens for study.

Yale University News Bureau

New Haven, Connecticut 06520

787-3131, Ext. 344

Steve Kezerian, Director

#371 (P)

COE

Technology

For release to SUNDAY papers, May 19, 1968.

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"I estimated in 1967 that there are conservatively a couple of hundred more monuments hidden below the ground surface at San Lorenzo," Prof. Coe says. "The magnetometer's success so far in 'seeing' the buried monuments makes me suspect that there may be up to 500 waiting to be excavated."

Before funds supplied by the National Science Foundation were exhausted, Coe and his workers had dug up four monuments located by the Varian magnetometer. They included:

1. "A beautifully smooth basalt stela (upright ceremonial slab), broken off at the top but still 1.8 meters high.

2. "The back part of a helmet from a basalt head.

3. "A ten-ton oblong block, perhaps an altar, covered with ax-grinding marks probably meant to destroy the designs, of which none is left.

more

4. "The most perfect statue ever found at San Lorenzo of the Olmec rain-god, a were-jaguar with its snarling mouth and traditional cleft in the top of its head."

He explained that "usually the statues had their heads knocked off in the relentless rampage that was apparently intended to destroy memorials to former Olmec rulers. This remarkable, three-foot-high statue of the rain-god, the Olmecs' chief deity, is unusual in being complete except for its hollowed-out back. Since it was found near the start of the 656-foot drainage system we uncovered, I suspect that it may have been intended as part of the drain."

Further work at San Lorenzo will be in the hands of Mexico's National Institute of Anthropology and History, which provided essential cooperation to Prof. Coe during his three years of excavation. The Yale archeologist hopes that the institute "will do a complete magnetometer survey of the entire area, which now has an appointed guardian to protect it from souvenir hunters."

The San Lorenzo survey marked the first use of the new, highly portable version of the cesium magnetometer. Other models have been utilized for such widely diversified projects as the Thresher search at 1,400 fathoms, recovery of legal evidence, detection of buried munitions and mines, rapid inspection of non-metallic vehicles, boats and even armed persons, location of magnetically-tagged animal specimens, and in many areas of geological field study.

The small, lightweight instrument consists of a staff-mounted sensor shaped like a tin can, belt-carried batteries, and a very small belt-carried readout unit.

By utilizing a small voice tape recorder, an archeological team can store the readings on the spot, along with survey line numbers, etc., and speed up their survey to offset diurnal variations.

////

Telegram

May 24, 1968

Dear Mike:

I seem to have got myself jammed up here worse than I thought. I have a lecture on the evening of the 5th, and a meeting here at the Museum in the morning of June 8th, one which I can't miss because I have invited people from all over the country to discuss the Bicentennial celebration. Then on the 12th, I must be in Washington and on the 13th I have my last meeting of the Expeditions Committee. By the 15th, I should leave for the Near East. If it is urgent and you have Bernard pinned down for the 7th, I suppose I could fly down on the morning of the 6th and back on the evening of the 7th, but this precludes my getting to the Varian Company in Palo Alto before I go abroad again. So, what do you think? Should we make the effort to talk with Bernard now or should we delay it until later, perhaps when he happens to be in the States. The question is first, when do we continue the instruments survey at San Lorenzo and other Olmec sites? I suppose this depends upon the next burning period. In any case, I leave this to you. I can make it on the 6th with effort, but if there is no great urgency, it would be easier later on.

One other question: if your air-photo people have not made the infrared film as yet, I wonder if we should call this off. With the success of the instruments, we know we will proceed with this and it may be foolish to spend another $1500 on an infrared aerial flight when we know we have a much more efficient system of locating ruins. Again, I leave this to you because, of course, we committed ourselves to making those photographs. But at this point, I hardly think it's worth it. What do you think ? Could you think over both questions, and let me know by the 5th?

Our public relations man is digging up the clippings on last Sunday's story, but I haven't seen any of them yet. Apparently it did appear in the New York Times. Your publicity department at Yale is also sending us clippings, and you will probably get them soon. Incidentally, as I said on the phone, Sam Carpenter is truly interested in this whole business and is very keen to continue with us.

All the best.

Sincerely,

Froelich Rainey
Director

Dr. Michael Coe
Avenida San Francisco
558 Contreras
Mexico 20, D. F.

FR/jt

Telegram to Sheldon Breiner at Varian Associates

Confirming arrival Palo Alto Monday June 10 for meeting with Stegner and Ginsen. Will call you sometime Tuesday.

Fr~~oxxx~~

6/6/68
jt

Av. San Francisco 558
Contreras
Mexico 20, D.F.

Yale University *New Haven, Connecticut 06520*

DEPARTMENT OF ANTHROPOLOGY

June 11, 1968

Dr. Froelich Rainey
University Museum
33rd and Spruce Sts.
Philadelphia, Pa.

Dear Fro:

I had an extremely pleasant and productive conference with Ignacio Bernal last Friday.

Your offer of matching funds up to $5,000 and support of all magnetometer activities is gratefully accepted by the Instituto. I, on behalf of Yale, am turning over the camp at Tenochtitlan and all its facilities to the Instituto as of Aug.1st. In its turn, the Instituto will furnish the archaeological staff for next season and all the rest of the funds necessary.

We talked about possible directors for this coming season. Bernal hopes that Carlos Navarrete will be able to act in this capacity, and I am very enthusiastic about the idea. I could not think of a more capable person for the job. Paco Beverido will definitely be on the archaeological staff to provide the continuity so necessary to the project.

My suggestion is that this be a Mexico-Pennsylvania effort, with the cooperation of Yale. I also suggest that you get into direct contact by correspondence with Bernal, to make it official. You might also ask Varian to send on to him what literature they have available.

Presumably, the digging and survey could begin in January 1969.

With best regards,

As ever,

Mike

Michael D. Coe

Mexican
Res.

June 14, 1968

Dear Mr. Ginzton:

I am grateful to Wally for giving us the opportunity to meet in Los Altos and certainly it was a pleasure to find that you have a personal interest in this kind of research and development in archaeology. Upon my return there was a letter from Mike Coe in Mexico City saying that he had met with Ignacio Bernal last Friday and they had worked out an agreement whereby we can continue our experiments at San Lorenzo in collaboration with the Instituto in Mexico. Mike will continue to act as an advisor on the interpretation of the results. Thus everything is officially arranged for the kind of thing we discussed; that is, the Varian Associates, University Museum, Mexican Institute experiment in charting all of the stone remains at the San Lorenzo site.

This means that we can plan on beginning some time in January of 1969 with the kind of experiment Shelley Breiner outlined to me while I was there. Moreover, you really should try to visit the site while the experiment is under way, because I am sure that the significance of this kind of development can be appreciated more fully in the field. Also, it is exciting to watch them turn up these extraordinary stone monuments of the Olmec period.

Under separate cover we are sending to your home a copy of our "Search for Sybaris" which I am sure you will not read, but perhaps you will find time to look through it to see how the cooperation between the Museum and Varian

Associates developed over the last few years. Also, I will send you a report on the results on Elis in Greece when Beth Ralph gets back and writes this up for us.

Certainly we will remain in touch with your people at Varian and hopefully our very successful collaboration will continue and expand.

All very best wishes.

Sincerely,

Froelich Rainey
Director

Mr. Edward Ginzton
President
Varian Associates
611 Hansen Street
Palo Alto, California

FR/jt

June 14, 1968

Dear Dave:

Ed Ginzton sends his very best regards. I have just now returned from Palo Alto where we had a thoroughgoing discussion about expanding the kind of collaboration we have had with Varian Associates over the past five or six years. As you probably know, they have been developing electrical search equipment for us and the last instrument has been extraordinarily successful in an experiment we carried on with Varian in Southern Mexico. Moreover, this newest instrument is now sold out to the Defense Department. Neither Ginzton nor I can feel any enthusiasm for aiding the war effort in Viet Nam but it does put these things into production and makes them less expensive for the archaeologist.

I was pleased to find that you and Ginzton must really have gotten well acquainted in Hungary, and I feel sure this is going to help in our long-range development work with Varian. We agreed that it is much more practical to have such companies carry on the development research with the possibility of commercial results than to try and employ this kind of technical person here in the Museum laboratory. Incidentally, I will be carrying on another experiment with them in Mexico in January and Ginzton is anxious to join us to see how it goes.

After you left for Russia, I reported to Howard Petersen on how I was using the Discretionary Fund this year and he got rather upset about the

salary business. As Gaylord undoubtedly has informed you, Howard came in to see him about this and stirred up the whole business which I think at this point is unfortunate. However, I do hope that this will not in any way effect the present arrangement regarding the staff of the Museum. As far as I can see, the present setup is good and I would like to leave it that way.

I am off on Sunday to Italy, Greece and Cyprus, but expect to be back by July 15.

All the very best.

Sincerely,

Froelich Rainey
Director

Mr. David R. Goddard
Office of the Provost
102 College Hall

FR/jt

Mex Res

June 15, 1968

Dear Mr. Bernal:

Mike Coe tells me that you did get together last week, and I just want to say that I am extremely sorry that I could not get down there to meet with you. I just got too jammed up here with meetings I could not avoid, and I leave again on Sunday for the Near East, for at least a month. However, I did manage to meet with Mr. Ginzton, the President of Varian Associates in Palo Alto, and we worked out a very satisfactory agreement to continue our joint development of these electronic archaeological search instruments. I find that he is personally interested in the sort of thing that we have been doing over the last five or six years with Varian and wants to continue and probably expand the kind of thing we have been doing.

This means that Varian will certainly get one or more of their men to Mexico in January of 1969 to carry out the survey at San Lorenzo which you discussed. The financing is not entirely clear as yet, but at least they will supply the instruments and the men which is one of the most expensive parts, and we will supply additional funds, however you want to work this out. More important, of course, is someone from your organization to direct the research. Mike mentioned Carlos Navarrette whom, of course, I remember from Guatemala. That sounds very good to me. Also, Paco Beverigo seemed to me a very competent fellow. As I guess Mike informed you, we are primarily interested in the best possible testing grounds for these instruments, and surely San Lorenzo

is a natural. I suspect that your people can make good interpretation of the whole site after the survey, and this would be an extraordinary step forward in archaeological technique. We have had very good results with the same instrument at Elis in Greece, and I will send you a report on that as soon as I get it.

Sam Carpenter, who is a member of our Board of Managers and primarily interested in our techniques development thinks that he and I should get down to talk with you about the whole operation sometime before January and perhaps this is a good idea, since we could fly down on his plane sometime during the Fall. However, if you are anywhere along the East Coast, do let me know and we can get together here. Perhaps you remember that Matt Sterling and I began our experiments with these survey techniques at Scerro de las Mesas in 1960 and thus it is most gratifying to see one of our most successful experiments work out in the same region eight years later.

All the very best.

Sincerely,

Froelich Rainey
Director

FR/jt
cc: Dr. Coe

Dr. Ignacio Bernal
Instituto Nacional de Antropologia
Cordoba 45
Mexico 7, D. F.

varian/611 hansen way/palo alto/california

PRIVATE

Sheldon Breiner

Dec 19, 1967 and June 21, 1968

Resistivity Survey using Alkali Vapor Magnetometer

Resistivity surveys are useful in mineral, ground water, and archaeological exploration where an ore body or other source represents a conductivity, (i.e., resistivity) anomaly in a more homogeneous background. The usual practice in such surveys is to place direct current in the ground through electrodes and measure the potential drop across two closely spaced electrodes which are implanted in the ground and moved about with either a fixed spacing between them or a variable spacing. The measurements are plotted throughout the area and compared to the ideal potential distribution around these electrodes. The different configurations of electrodes are commonly known as Wenner or Schlumberger arrays. Two difficulties exist in such surveys, however, the first being the extremely slow speed of such surveys, the second the limitations in dc response and repeatability using electrodes which require physical contact with the ground. It might also be desirable to have a magnetometer survey along with the resistivity survey but this would normally have to be carried out at a different time. The purpose of this suggestion is to correct all three shortcomings by the proper use and interpretation of an alkali vapor magnetometer.

The suggestion I present is that the "potential-drop" electrodes be replaced by a sensitive optically pumped magnetometer such as a cesium or rubidium magnetometer to be used to measure the current instead of the potential. This is essentially what is accomplished by the "Turam" device made by the Swedish company ABEM except that they use a carefully levelled 3 foot long vertical induction coil. The current would, of course, be measured by its associated magnetic field and the current paths and current density would exhibit a precisely predictable pattern if the ground and sub-surface were homogeneous laterally. As the magnetometer would move over the ground, as one normally carries a portable magnetometer for static field surveys, the intensity would change as a function of the current density. Since the optically pumped magnetometers measure total intensity, the component of the current-associated magnetic field perturbation would be along the total field direction, which for the purposes of these measurements is constant throughout the survey area. Moreover, the current electrode and connecting surface cable and the associated magnetic field would behave according to the current path in addition to the current density. A template of the magnetic field perturbation component along the total field from various given electrode configurations and spacings can be computed. A wide or multiple electrode configuration would provide the most uniform distribution (perhaps) for the area between the electrodes and would

make recognition of the anomaly easier. The problem is analogous to designing a coil system with a uniform field over a large volume. The leads to the electrodes might present a problem unless a special configuration were established to minimize their effects in the survey area. At present, it is best to make a squared "U" layout between the electrodes. The anomaly, representative of the conductivity inhomogeneity would be identified as the difference between the observed magnetic field and the ideal as predicted by the template or a locally anomalous conductivity anomaly in the central region of the electrodes.

The magnetic field of the current distribution would be difficult to recognize in the presence of the background variations of the soil, underlying basement, and other static field anomalies. The magnetic field of the current distribution would, in fact, be very small at large distances from the electrodes which will have a large spacing since we are generally interested in deep penetration of the current paths. It is therefore proposed that a low frequency square-wave be applied to the current electrodes, say, at 0.5 cps., 1 cps., or perhaps 5 cps. The demodulated magnetometer signal would then be detected in synchronization with the input current by using ordinary coherent detection schemes. The detected signal need only be the peak-to-peak magnetic variation that occurs at the time of the input current. dc level of magnetic intensity can be ignored for this measurement. Various frequencies can be selected to be free of any possible manned-carried anomalies, micropulsations, or other systematic disturbances, optimizing the frequency for the coherent detection scheme. Very high sensitivity (0.001 gamma or better) could therefore be used. It might even be beneficial to utilize 2 or 3 frequencies simultaneously and observe the survey results as a function of each of the frequencies to produce information as a function of depth by means of skin depth phenomena.

At the same time, however, the filtered dc or static field measurements which one normally observes in carrying out a magnetic survey, could also be observed and similarily recorded. Two surveys would thus be obtained at one time from two completely independent parameters. The signal from the sensor could be telemetered back by ordinary radio transmitters to the base station established near one of the electrodes so that the synchronization pulse can be obtained directly from electrode generator. The current into the ground can either be made constant or can be used as a normalizing factor to insure that any current changes observed at the sensor will be purely a function of the point of observation of the sensor and not an error in the current generator or electrochemical reaction at the electrode.

In addition to the conductivity and relative susceptibility measurements thus obtained, it is also possible to monitor the decay of this field immediately after the turn-off of the dc input. The persistent currents and their rate of decay would be a measure of the capacity or "IP effect" of the local region and would provide a third measurement according to the schemes suggested by Seigel in his patent (U.S. No. 3,210,652, Oct 5, 1965), by M. Aitken in his magnetic viscosity metal detector, and by D. P. O'Brien in his airborne EM device.

It is further suggested that it may be possible to utilize ground based electrodes to make airborne measurements of this type over an area of perhaps one square mile. This would require multiple electrodes or two or three truck-mounted generators to produce an efficiently extensive field for the survey. For mining purposes this would probably be adequate if the trucks were able to move around and cover a few square miles per day. The ground based electrodes are suggested to overcome the difficulty of putting sufficient energy in the ground from the air to be making this type of resistivity survey.

It is contemplated at present to try this configuration at our magnetic test site, at a mining company site in Southern Arizona, and lastly at an archaeological exploration site in Mexico. The results will be forthcoming.

These three more-or-less independent variables should provide extremely valuable interpretive data to discriminate against non-economic anomalies. The greatest cost for these surveys is always the logistic support and surveying which in this case is accomplished at one time for all three variables. The data can be recorded digitally by conveniently portable apparatus.

varian/611 hansen way/palo alto/california 94303/u.s.a./415/326-4000

June 26, 1968

Dr. Froelich Rainey, Director
Applied Science Center for Archaeology
The University Museum
University of Pennsylvania
33rd & Spruce Streets
Philadelphia, Pa. 19104

Dear Dr. Rainey:

I am enclosing several copies of the June issue of our magazine which is devoted to the work at San Lorenzo.

If you would like additional copies, we have a good supply; just drop me a note indicating how many you wish.

Yours truly,

Jon W. Wilcox, Manager
Public Relations

JWW:cf

Enc.

Mail

UNIVERSITY of PENNSYLVANIA

PHILADELPHIA 19104

OFFICE OF THE PROVOST

July 3, 1968

Dear Fro:

I have returned to campus to find your letter of June 14 concerning Ed Ginzton and your relations with Varian Associates. If at any time I can aid you in your relations with Varian Associates do not hesitate to call on me. I think it might be appropriate if we tried to arrange to have Ed Ginzton visit the campus and you and I might jointly entertain him.

I have discussed the matter of salaries with Gaylord Harnwell and I believe satisfactory relationships have been worked out for the next year.

Sincerely yours,

Dave

David R. Goddard

DRG:JP

Dr. Froelich Rainey
Director
University Museum

P. S. Kelhamie enjoyed having breakfast with you at the London air field

Mex

July 19, 1968

Dear Mr. Ginzton:

Just a note to say that I am back from the Mediterranean and have a very enthusiastic letter from Igancio Bernal, Director of Antiquities in Mexico, confirming our arrangements for continued work at San Lorenzo beginning in January, 1969. Bernal will assign a Mexican archaeologist to work with us on that site since Mike Coe is finished there, although Mike will continue to act as an advisor. We also hope to extend this to other Olmec sites in Mexico, because as Bernal points out, this is an ideal locality for testing magnetometers and other survey equipment.

Sam Carpenter, from the DuPont Company, thinks that he and I should go down to talk with Bernal about the general set-up of this experiment sometime in the near future, perhaps. As you remember, Sam is one of our Board members primarily interested in the development of techniques.

Also, I have been trying to get Wally and Molly down to Central America with me for some time, so why don't you and Mrs. Ginzton get together with them and plan a visit to the San Lorenzo site in January or February while the actual survey and excavations are being carried out. This promises to be very exciting indeed.

Since we are getting you really involved in archaeology I am asking our people here to put you on their list to receive our publication called "Expedition."

All the best,

Froelich Rainey
Director

Mr. Edward Ginzton
Varian Associates
611 Hansen Street
Palo Alto, California

FR/jt

VARIAN ASSOCIATES
EXECUTIVE OFFICES
PALO ALTO, CALIFORNIA 94303 (415) 326-4000

EDWARD L. GINZTON
PRESIDENT AND CHAIRMAN OF BOARD

July 2, 1968

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

Dear Dr. Rainey:

It was indeed a pleasure for me to meet you at Wally Stegner's and to become better acquainted with your wide range of interests. Needless to say, I was pleased to know that some of our activities at Varian are applicable to your professional interests, and I shall do what I can to maintain our interests and momentum in this field.

You might possibly sense a greater appreciation of our interest in your work from the fact that our company has devoted a whole issue of our company magazine to your work in Mexico. I am reasonably sure that you have received copies of this magazine through other sources, but just in case you might wish an additional copy or two, I shall attach these to this letter.

We shall be delighted to remain in touch with your people and hope that we can make continued contributions to this important and fascinating work. I also hope that it will be possible for us to meet again before too long.

With all best wishes,

Sincerely,

E. L. Ginzton

ELG:mc

Enclosures (2)

July 19, 1968

Dear Dr. Heizer:

I have just now worked out an arrangement with Ignacio Bernal and Mr. Ed Ginzton, President of Varian Associates in Palo Alto, to carry out an extensive exploration of Olmec sites with the newest cesium magnetometer and other instruments now being developed by Varian. The plan is to start with San Lorenzo in January, and then move on to the other Olmec sites, depending upon the results and Bernal's plans. Since I know you have worked a long time in this area and are currently engaged there, we probably should get together on this to determine how and when these instruments can be utilized on your site. As you may know, we have been working with Varian for several years on the development of these instruments and there are at present only two or three of the newest types available. We have one operating in the Mediterranean and in Europe, the other in Mexico. But the success at San Lorenzo this past spring I hope has convinced Varian that they should take over the development costs and production costs, most of which we have been carrying uptto the present time. Roughly, our present agreement is that the University Museum will cover the field cost of survey, while Varian covers the development and production costs, which, as you can imagine, would be a great help to us.

In any case, let me know what you think because we certainly would be very glad to cooperate with you in any way, always provided, of course, that it meets with Bernal's agreement in Mexico. Incidentally, he will be designating some archaeologists in Mexico to take charge of the survey at San Lorenzo in January, since Mike has finished there but will continae to wct in an advisory capacity.

All the very best,

Froelich Rainey
Director

Mr. Robert Heizer
Department of Anthropology
University of California
Berkeley, California

FR/jt

July 19, 1968

Dear Dr. Bernal:

Just a note upon my return from the Mediterranean to say I have yours of June 19 and I am pleased that we can work out something to continue the study at the Olmec sites with instruments. I haven't yet seen Sam Carpenter since my return, but I know he enjoys flying his plane down to Mexico and has said that he and I should go down and talk with you about the details of this business sometime this fall. At the moment I am trying to get off for a vacation in Vermont, but we will be in touch with you during the fall, and I expect we will be seeing you then.

All the best.

Sincerely,

Froelich Rainey
Director

Dr. Ignacio Bernal
Director General
Instituto Nacional de Antropologia
S. E. P. Direccion
Cordoba Num. 45
Mexico 7, D. F.

FR/jt

Verox to Sam Carpenter
June 25, 1968
JT

INSTITUTO NACIONAL DE
ANTROPOLOGIA E HISTORIA
S. E. P.
DIRECCION
CORDOBA NUM. 45
MÉXICO 7, D.F.

June 19, 1968

Dr. Froelich Rainey, Director
The University Museum
University of Pennsylvania
Thirty-Third and Spruce Streets
Philadelphia, Pa. 19104

Dear Dr. Rainey:

Many thanks for your letter of June 14th, which brings the good news about the continued cooperation of Varian Associates in the work to be done at San Lorenzo starting next January. I have been talking at length with Mike Coe on the subject and the whole thing seems fantastic. With the help of these people it is very possible that we might recover an extraordinary amount of sculpture and a lot of knowledge. I remember when you started this work with Matt Stirling at Cerro de las Mesas. Probably no other area in Mexico would be as suitable for this type of work as the Olmec region.

I would of course very much like seeing you here sometime in the Fall with Mr. Carpenter. I have no plans to be on the East Coast for the rest of this year, since I was there last May and will be going to Germany in August. We are beginning to consider who will be the best man to have in the field and I am in contact both with Carlos Navarrete and Paco Beverido.

Many thanks for the great help you are giving us in this exploration, and I am,

Sincerely,

Ignacio Bernal
Director General

IB/cbc

Mex

UNIVERSITY OF CALIFORNIA, BERKELEY

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SANTA BARBARA • SANTA CRUZ

DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA 94720

July 26, 1968

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

Dear Fro:

Many thanks for your letter of July 19. I have been talking for the past couple of months with Doug O'Brien and Frank Morrison, both of whom you know, about a magnetometer survey of La Venta. We had even reached a tentative decision to try to do this in September of this year, but the shortness of time available in which to make the arrangements through Bernal and Marquina of INAH and raise the necessary funds led us, just before your letter arrived, to decide to postpone this work until the spring of 1969. Since the web of connection of sites, Varian Associates, and people seems kind of complicated, it is clearly best, as your letter suggests, that some mutually agreeable and productive plan and schedule be worked out.

I have, as you perhaps know, a very strong interest in the La Venta site. Phil Drucker and I did a major excavation there in 1955, have returned to it briefly in later years for a bit of checking or verification, and in the summer of 1967 we put in two very intensive weeks of test excavation to collect carbon to check further the redating of the site that Rainer Berger, with Bill Libby's approval, did in the spring of that year. At that time Phil and I recognized the hitherto unsuspected form of the big mound (called the pyramid) at La Venta, made a rough Brunton map of the base plan and published a preliminary note in Antiquity. This was so intriguing that I, with John Graham, returned in January and February, 1968, with a sizable group of graduate students, cleared the pyramid, made a detailed contour map of it (copy enclosed), completed the rough map of the archaeological zone, especially the area to the south of the pyramid which had been in heavy bush in 1955 (copy enclosed), and made exploratory excavations in a new and large section of the site which we have called the Stirling Group. Here we found San Lorenzo type trough drains, a number of new sculptures, and other things, but our time was so short that we were unable to find the time to even expose a number of new monuments which we located there. As you can guess, we are most eager to return as soon as possible and study this new group, especially since we already know the location of a number of buried but still unseen monuments. It was in anticipation of our return that we began to think of a magnetometer survey, especially of the pyramid which we cleared at considerable effort and expense. Our curiosity about whether there are, or are not, tombs in the pyramid is clearly very great, and rather than attack such a large earth mound blindly, we figured that the magnetometer might tell us at least if there were stone constructions (cists or burial chambers) in its interior.

Our present plans, as yet not final, are that Phil Drucker will come to La Venta in February with a group from University of Kentucky, and John Graham and I with a graduate student group will come from Berkeley to join forces there for still another effort at understanding the extent, internal sequence, age, and sculpture of La Venta.

I gather that you have no plans for a major excavation at the site, but are mainly interested in doing a magnetometer survey. In this last we are, therefore, all interested in the same thing, and there seems every reason for us to do this in cooperation. Your group would benefit from the presence of Drucker, Graham and myself who know site intimately-- not an inconsiderable advantage in view of its size and complexity, and also of the extraordinary disturbance of the surface which the site has experienced in the last 13 years.

It might even be guessed that when you make final arrangements with Varian that Doug O'Brien might be their man who will do your instrument work. We could add to our party Frank Morrison who is also competent in this fiend, and who is a close co-worker of O'Brien. So, all we have to do, it seems to me, is to find some period of time when we will all be there and can carry out the instrument survey. We can save a lot of time since we already know much about the extent of the buried clay constructions as well as the location of five drains which we simply exposed and then reburied, and also a number of buried monuments. Doug has already tested a large number of soil samples from La Venta, and finds them suitable (as is true of the San Lorenzo soils) for good results.

There will, I thikk, be no brouble at all with the Instituto, by which I mean Bernal and Marquina. They have been most supportive of our work there, and are expecting us to return.

The idea of a magnetometer survey of a number of Olmec sites is a good one. Tres Zapotes is, of course, a prime target. Perhaps you will locate the balance of the elusive Stela C. On my last trip there I found the local people pretty rough, so there may be something more interesting than finding monuments involved in working there. Also, not far distant from the TZ colossal head site is the great mound group which we have seen and labelled Nestepe, and from which came the colossal head now in the plaza at Santiago Tuxtla. The El Meson (now Angel Cabada) locality is also crying for some kind of subsurface examination. The great El Meson stela was found next to a second buried stone, and the latter is still in place. The very extensive, but almost unknown, site of Laguna de los Cerros, not far from Acayucan, also begs for examination. There will be no shortage of work for you in this venture, and you cannot fail but come up with a whole new corpus of exciting stone sculptures.

Let us consider the above a favorable reaction to your suggestion of including La Venta in your survey plans, and a hope that you will consider us worthy of being your co-workers in it at a period after January of next year that is agreeable to both groups.

I am taking the liberty of sending a copy of your letter of July 19, together with a copy of this reply, to Bernal, Marquina, Drucker,

Graham, O'Brien and Morrison so that everyone interested can be informed.

I'm sending on some earlier publications which deal with the Olmecs of southeastern Mexico. We now have a big report in press on our work of 1967 and 1968 at La Venta which should be out in about a month, and I will make certain that a copy is sent to you. In the meanwhile, let me have your reactions to all this.

All best wishes, and thanks,

Robert F. Heizer

varian/611 hansen way/palo alto/california 94303/u.s.a./415/326-4000

We mex

July 31, 1968

Dr. Froelich Rainey, Director
Applied Science Center for Archaeology
University Museum
University of Pennsylvania
34th & Spruce Streets
Philadelphia, Penna.

Dear Fro:

Following the work we performed at San Lorenzo and our subsequent discussions, we have formulated a tentative plan for the major magnetic exploration effort nextyear of the entire mesa at San Lorenzo. The proposed effort represents essentially the task of total magnetic intensity mapping and perhaps some tentative experiments at applying new techniques to exploration.

The results of our work in Mar-April 1968 demonstrated that by mapping the relevant and accessible areas of the mesa with a Cesium magnetometer at a square grid interval of two meters, we should have obtained sufficient data to allow you, Dr. Bernal, and Dr. Coe to interpret the maps for archaeological information and exploitation. The size of the mesa is approximately one by two kilometers but only about two-thirds of the actual area is both of interest and mapable. I believe one man with two Mexican assistants can perform the field mapping in approximately four months if twenty working days a month can be achieved.

It is proposed that various discrete areas, 100 meters on a side, be outlined on the mesa and that each area divided into two meter grids using rope marked-at-intervals grid end boundaries and a single rope marked walking line. Furthermore, each grid will be located by the Site Engineer on his plane table. A magnetometer sensor bearer will be selected from the indigenous help who will carry a sensor, batteries, and transmitter. The signal from that sensor will be telemetered to a reference station where the Varian person will be measuring the difference between that magnetometer and a local fixed reference magnetometer. A coil will be placed about the reference magnetometer and aligned with the earth's field. A mercury battery reference supply will supply the current for the coil which will be varied by the digitally reading control knob on the audio

readout. The knob will be varied to obtain a zero-beat and the reading thus obtained will be written directly on the grid sheet at the location of each grid intersection. In this manner we will obtain data which can be contoured directly and which will have the time variations removed. We will avoid the complexities and potential problems of a frequency counter by using this manually adjusted technique which is both highly portable and low in power comsumption and sufficiently simple to preclude frequent instrument problems.

Other techniques will be tried at selected areas of the site to examine their usefulness in detecting monuments, structures and perhaps changes in the old topographic surface. Among these techniques will be that termed as a conductivity/permeability/capacitance survey as described on the attachments. We may also try some elementary electromagnetic techniques.

The estimated price for performing the services of magnetic mapping and presentation of results will be approximately as follows:

4 Months labor @ $1200 per month . . . . Varian Technician	$ 4,800
4 Months lease of Cesium Magnetometer equipment @ $1500 per month	6,000
4 Round trips to Mexico from Palo Alto by various persons @ $250 . . . . . (Varian will support salaries of persons involved in the application of new techniques)	1,000
Report, computer time, plotting and publication costs	2,500
Total	$14,300

Not included in the above prices is a considerable contribution by Varian in the development of the above instruments, the time of many of the persons involved and the labor rates which are at cost. You will note that included in the above program are instruments and people to be supplied by Varian so that your other programs now carried out by Beth Ralph with University Museum magnetometers will not be affected in any way.

The scope of the program is intended to provide sufficient information so that no further magnetic surveys need be performed at San Lorenzo. This information will be directly usable by the Mexican Government, by Yale University and by the University of Pennsylvania. The nature of the survey, the manner in wich it is carried out, and the expected production results are intended to be published (if permission is obtained) to obtain maximum benefit from the techniques developed and supported by the Applied Science Center for Archaeology of the University Museum. The site is, of course, ideal for such surveys and should represent a very clear cut application of magnetometers to archaeological exploration.

The above program is proposed within the framework of the agreement between Varian and the Applied Science Center of Archaeology to cooperate in the application of new geophysical instruments and techniques to archaeological research.

We welcome your comments on the proposed program and trust that it meets the objectives set forth in your recent correspondence and discussions with Dr. Ginzton.

Regards,

Sheldon

Sheldon Breiner
Manager, Geophysics Application Laboratory
Analytical Instrument Division

SB/tc

Encls:

varian/611 hansen way/palo alto/california

PRIVATE

Sheldon Breiner (S3

Dec 19, 1967 and June 21, 1968

Resistivity Survey using Alkali Vapor Magnetometer

Resistivity surveys are useful in mineral, ground water, and archaeological exploration where an ore body or other source represents a conductivity, (i.e., resistivity) anomaly in a more homogeneous background. The usual practice in such surveys is to place direct current in the ground through electrodes and measure the potential drop across two closely spaced electrodes which are implanted in the ground and moved about with either a fixed spacing between them or a variable spacing. The measurements are plotted throughout the area and compared to the ideal potential distribution around these electrodes. The different configurations of electrodes are commonly known as Wenner or Schlumberger arrays. Two difficulties exist in such surveys, however, the first being the extremely slow speed of such surveys, the second the limitations in dc response and repeatability using electrodes which require physical contact with the ground. It might also be desirable to have a magnetometer survey along with the resistivity survey but this would normally have to be carried out at a different time. The purpose of this suggestion is to correct all three shortcomings by the proper use and interpretation of an alkali vapor magnetometer.

The suggestion I present is that the "potential-drop" electrodes be replaced by a sensitive optically pumped magnetometer such as a cesium or rubidium magnetometer to be used to measure the current instead of the potential. This is essentially what is accomplished by the "Turam" device made by the Swedish company ABEM except that they use a carefully levelled 3 foot long vertical induction coil. The current would, of course, be measured by its associated magnetic field and the current paths and current density would exhibit a precisely predictable pattern if the ground and sub-surface were homogeneous laterally. As the magnetometer would move over the ground, as one normally carries a portable magnetometer for static field surveys, the intensity would change as a function of the current density. Since the optically pumped magnetometers measure total intensity, the component of the current-associated magnetic field perturbation would be along the total field direction, which for the purposes of these measurements is constant throughout the survey area. Moreover, the current electrode and connecting surface cable and the associated magnetic field would behave according to the current path in addition to the current density. A template of the magnetic field perturbation component along the total field from various given electrode configurations and spacings can be computed. A wide or multiple electrode configuration would provide the most uniform distribution (perhaps) for the area between the electrodes and would

make recognition of the anomaly easier. The problem is analogous to designing a coil system with a uniform field over a large volume. The leads to the electrodes might present a problem unless a special configuration were established to minimize their effects in the survey area. At present, it is best to make a squared "U" layout between the electrodes. The anomaly, representative of the conductivity inhomogeneity would be identified as the difference between the observed magnetic field and the ideal as predicted by the template or a locally anomalous conductivity anomaly in the central region of the electrodes.

The magnetic field of the current distribution would be difficult to recognize in the presence of the background variations of the soil, underlying basement, and other static field anomalies. The magnetic field of the current distribution would, in fact, be very small at large distances from the electrodes which will have a large spacing since we are generally interested in deep penetration of the current paths. It is therefore proposed that a low frequency square-wave be applied to the current electrodes, say, at 0.5 cps., 1 cps., or perhaps 5 cps. The demodulated magnetometer signal would then be detected in synchronization with the input current by using ordinary coherent detection schemes. The detected signal need only be the peak-to-peak magnetic variation that occurs at the time of the input current. dc level of magnetic intensity can be ignored for this measurement. Various frequencies can be selected to be free of any possible manned-carried anomalies, micropulsations, or other systematic disturbances, optimizing the frequency for the coherent detection scheme. Very high sensitivity (0.001 gamma or better) could therefore be used. It might even be beneficial to utilize 2 or 3 frequencies simultaneously and observe the survey results as a function of each of the frequencies to produce information as a function of depth by means of skin depth phenomena.

At the same time, however, the filtered dc or static field measurements which one normally observes in carrying out a magnetic survey, could also be observed and similarily recorded. Two surveys would thus be obtained at one time from two completely independent parameters. The signal from the sensor could be telemetered back by ordinary radio transmitters to the base station established near one of the electrodes so that the synchronization pulse can be obtained directly from electrode generator. The current into the ground can either be made constant or can be used as a normalizing factor to insure that any current changes observed at the sensor will be purely a function of the point of observation of the sensor and not an error in the current generator or electrochemical reaction at the electrode.

In addition to the conductivity and relative susceptibility measurements thus obtained, it is also possible to monitor the decay of this field immediately after the turn-off of the dc input. The persistent currents and their rate of decay would be a measure of the capacity or "IP effect" of the local region and would provide a third measurement according to the schemes suggested by Seigel in his patent (U.S. No. 3,210,652, Oct 5, 1965), by M. Aitken in his magnetic viscosity metal detector, and by D. P. O'Brien in his airborne EM device.

It is further suggested that it may be possible to utilize ground based electrodes to make airborne measurements of this type over an area of perhaps one square mile. This would require multiple electrodes or two or three truck-mounted generators to produce an efficiently extensive field for the survey. For mining purposes this would probably be adequate if the trucks were able to move around and cover a few square miles per day. The ground based electrodes are suggested to overcome the difficulty of putting sufficient energy in the ground from the air to be making this type of resistivity survey.

It is contemplated at present to try this configuration at our magnetic test site, at a mining company site in Southern Arizona, and lastly at an archaeological exploration site in Mexico. The results will be forthcoming.

These three more-or-less independent variables should provide extremely valuable interpretive data to discriminate against non-economic anomalies. The greatest cost for these surveys is always the logistic support and surveying which in this case is accomplished at one time for all three variables. The data can be recorded digitally by conveniently portable apparatus.

Mcf

August 6, 1968

Dear Mr. Breiner:

I will send your correspondence to Dr. Rainey who is on vacation. You will undoubtedly hear directly from him.

Sincerely yours,

David Crownover
Executive Secretary

Mr. Sheldon Breiner
Manager, Geophysics Application Lab.
611 Hansen Way
Palo Alto, California 94303

DC/ek
cc: Dr. Froelich Rainey

Mexico

August 6, 1968

Dear Mr. Breiner:

I will send your correspondence to Dr. Rainey who is on vacation. You will undoubtedly hear directly from him.

Sincerely yours,

David Crownover
Executive Secretary

Mr. Sheldon Breiner
Manager, Geophysics Application Lab.
611 Hansen Way
Palo Alto, California 94303

DC/ek
cc: Dr. Froelich Rainey

Mex

September 6, 1968

Dear Henry:

How marvelous you are in making suggestions for trips to Mexico. Following your lead, and with Mr. Terry in my other hand, our all too short stay was action-packed and delightful.

I hope this finds Italy and you in the best of form. Again, many thanks for all your help.

As ever,

David Crownover
Executive Secretary

Mr. Henry Clifford
Via Tian de Giullari
Firenze, Italy

DC/jt

W. SAM CARPENTER, 3RD
1060 DU PONT BUILDING
WILMINGTON, DELAWARE 19801

September 6, 1968

Dr. Froelich Rainey, Director
The University Museum
33rd and Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Fro:

Attached is a rough itinerary to show you how we might make the trip to Mexico and San Francisco.

I suggest either the first or second week in November as you will note. We could, of course, do it backwards, going to San Francisco first, if that suits you better.

Best regards.

Sincerely,

W. Sam Carpenter, 3rd

WSC:EBC

Enc.

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ARCHAEOLOGICAL RESEARCH FACILITY
DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA

September 26, 1968

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

Dear Fro:

Your good letter about the magnetometer survey at La Venta arrived some time ago. I have never found an opportunity to answer it, for reasons which I will spare you (but which have nothing to do ~~kke~~ with the survey), and I must ask you to excuse my lapse which does have reasons.

It seems to me that our only problem, and it can scarcely be called such, is to arrange our schedules in such a way that we will all be together at La Venta at the same time. Present plans (dependent upon raising the funds and securing permits from INAH) are for Phil Drucker to arrive at LV first, probably in late January, and for me to arrive with my group about or shortly after March 1. As of now, and depending upon the above-mentioned factors, anytime in that period would be suitable. We will not mess around with the pyramid-- that little plum should be reserved for the magnetometer survey, and we will avoid it until you and your group arrive.

We should have some plans made fairly soon, and I will keep you in touch with our progress. If worst comes to worst, I could send down one of our best graduate students who worked at LV earlier this year to help your people since he knows who to see to get the work crew mustered for brush clearing, knows the site well and could help a good deal.

Once more, my apologies for not writing sooner. If there is anything I can provide for you now don't hesitate to ask.

Sincerely,

Robert F. Heizer

Mek

October 4, 1968

Dear Sam:

I told Howard Petersen that you and I were off to Mexico on November 5, and therefore he would have to look after the Fellows' Dinner. But he really blew his top, saying that at this Fellows' Dinner we have essentially those people who have given us all the money for the new wing and therefore I couldn't possibly be away for this Dinner.

I guess he is right, so let me see what we can do about it. My fixed dates, then, are:

November 6 (Fellows' Dinner in the evening)
November 12 (lecture in Boston)
November 13 (lecture in Worcester)
November 15 (lecture in Baltimore) and
November 19 (lecture in Princeton)

Except for those dates, I can do it any time. Would you have a look at your calendar do that we can work out a schedule when I see you on Tuesday.

All the best.

Sincerely,

Froelich Rainey
Director

Mr. W. Sam Carpenter III
1060 DuPont Building
Wilmington, Delaware, 19898

FR/j

Mex
Res.

October 11, 1968

Dear Bob:

I was most interested in your note of October 7, and just want to bring you up to date on our plans here. Sam Carpenter and I were expecting to leave for Mexico early in November to talk with Igancio Bernal and to have a quick look at La Venta in order to get some soil and stone samples for pretesting in the lab here. But neither Sam nor I could get one clear week to fly down in his little plane. Sam is now off to Europe and I promised him that I would phone Bernal to see if it was wise for us to fly down commercial sometime in November to settle our arrangements with him. I have not yet called Bernal, but will do so shortly.

Certainly I know what you mean about the situation in Mexico at the present moment, and I have nothing really solid to add to your impressions, but I do think after the Olympic games it probably would be wise for me and Sam to take a quick trip to Mexico City and see for ourselves what we think about the present situation. Let's let this thing ride for a bit until we do that, and then I will be in touch with you directly. Otherwise we are all set to do the instrument survey at both San Lorenzo and La Vento, beginning at least by February.

All the best.

Sincerely,

Froelich Rainey
Director

Dr. Robert F. Heizer

UNIVERSITY OF CALIFORNIA, BERKELEY

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DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA 94720

October 7, 1968

Dear Fro:

This is the hastiest of notes to ask if you have been doing any second-thinking about your Olmec site magnetometer survey. I have been getting some detailed information of the situation in Mexico, and it is rather worse than we read about in the papers. The University in Villahermosa (Tabasco) has had some trouble with two students killed and a large number jailed. Extrapolating from the USA, I would guess that there is going to be real trouble in Mexico for a while. I ran into just enough at La Venta in Jan-Feb 1968 to make me not want to either do it again, or worse, to have them try harder. If there is any excuse that they can use, such as a general governmental license to roust students and professors, they will gladly employ this.

As of this moment I am thinking of not going. I have been seeing this happen in Guatemala (not the Peten but the other side) for some time, and that situation is clearly not improving.

Don't bother to answer unless you know things that might be of interest to us or are thinking it over yourself. I am not at all sure that INAH could deliver a contract now.

Sincerely,

RFHeizer

F. Rainey
Univ. Museum
Univ. Pennsylvania
Philadelphia

October 22, 1968

Dr. R. F. Heizer
Department of Anthropology
University of California
Berkeley, California 94720

Dear Dr. Heizer:

Thank you for the information sheet for the sherds from Cuicuilco B. I hope that you weren't in a great hurry for the results. We now plan to process them in January, and should have the results about a month thereafter.

I am wondering a bit about La Venta and if I shall be going there with our magnetometer in February. If it is as covered with trees now as it was in the old published photographs, it may be a bit difficult. If this comes about, there are also minor questions such as electricity to charge batteries, etc. In the meantime, I am trying to study a little Spanish, but probably should be learning Turkish for later in 1969.

With best regards,

Elizabeth K. Ralph

EKR/mrb

Mike Re.

October 22, 1968

Dear Mike:

Just a note to say that I expect to be going down to Mexico City on November 4 for a chat with Bernal. Heizer writes that with the student riots in Mexico, he is doubtful about security at La Venta, and may not work there this winter. What kind of a fuss-budget is he? Any comments before I see Bernal, or should I just report back to you after I see him?

All the best!

Sincerely,

Froelich Rainey
Director

Dr. Michael Coe
Department of Anthropology
Yale University
New Haven, Connecticut

FR/j

Av. San Francisco 558
Contreras
Mexico 20, D.F.

August 31st

Dear Fro:

Bernal has been away in Europe, but should be back by now. I will talk to him Monday, but as far as I can learn, everything is OK with the San Lorenzo project. I officially donated the camp & everything in it to the Instituto on August 1st. Domatila, the cook, is on the payroll, and so probably is her son Nacho.

I haven't yet gotten anything down here from the Varian boys, but presume that something is waiting for me in New Haven — for instance, the grid contour maps and the brochure they put out. By the way, I will see that Ian San Lorenzo makes get to the Instituto, plus $5 to you and $5 to Varian.

I get back to New Haven next Wednesday — now madly trying to get everything packed & shipped. I have established a long sequence for San Lorenzo, with no less than 6 formative phases alone. After full analysis of this material, the monuments still date to 1200 - 900 B.C., with destruction taking place shortly after 900.

Please keep me in touch with the project.

As ever

Mike

med
Res.

October 22, 1968

Dear Bob:

I am very pleased to know that you have tested samples from La Venta so that it is not necessary to pick up any more samples from that site. Your results obviously agree with those we had at San Lorenzo, so we have no worries on that score.

I have just had Bernal on the phone, and agreed to fly down there for a meeting on November 4, so perhaps I will have some more current opinions on what we can do there this winter.

With your concurrence, I will, of course, discuss La Venta as well as San Lorenzo, on the basis of two crews working on the sites simultaneously in March at least. We will be in touch after November 4.

All the best.

Sincerely,

Froelich Rainey
Director

Mr. Robert F. Heizer
Department of Anthropology
University of California
Berkeley, California

FR/j

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ARCHAEOLOGICAL RESEARCH FACILITY
DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA

October 14, 1968

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

Dear Fro:

I was glad to get your letter of the 11th. When we worked at La Venta in January and February, 1968, we were foresighted enough to collect samples of soils (the drift sand capping of the clay construction layers, and the clay layers themselves). We, of course, have large numbers of samples of monuments, basalt columns. We turned a big batch of these over to Jack O'Brien of Varian who carried out tests on them for their magnetic qualities, and the word he gave was that the sands and clays are non-magnetic, but the basalts, schists, serpentines and miscellaneous other stones used in quantity at the site give a good reaction. So, perhaps this is done. I have in my office at the moment the samples which he examined, and could easily send them to you if you were interested in testing these yourselves. If you go to La Venta/~~I would be~~ you should be careful to be equipped with an official letter to the Delgado Municipal, and if possible also to the officer in charge of the army detachment at La Venta. I do not know who could issue the latter, but if you appeared there with such an introduction the boss would probably send a couple of soldiers out with you and thus keep you from being molested. Let me know the results of your preliminary inquiry in Mexico. In the meanwhile we are still trying to make up our minds on what we will be able to do. We had such a rough time last trip that I am a little reluctant, especially with what has been going on recently, to take on the personal responsibility for a group of students.

Sincerely,

Robert F. Heizer

museo nacional de antropología
CALZADA DE LA MILLA
MEXICO 5, D. F.
I. N. A. H.
S. E. P.

México, D.F., 23 de octubre de 1968.

Sr. DAVID CROWNOVER
UNIVERSITY MUSEUM.
33 and Spruce St.
PHILADELPHIA, PENN., U.S.A.

Estimado señor Crownover:

Me refiero a su atento telegrama de fecha 21 del mes actual para informar a usted que la Exposición de Obras Maestras del Arte Mundial, que incluye las colecciones enviadas por Nigeria, será clausurada el 30 de noviembre próximo.

Habiendo obsequiado sus deseos, me es grato suscribirme como su atento y seguro servidor.

Antropl. Fís. ARTURO ROMANO PACHECO
DIRECTOR

ARP/mtms/

MEXICAN ITINERARY

NOVEMBER

Possible Dates		Day			
1 or	8	Friday	PM	Wilmington to Vredenburgh, Ala.	4 hrs.
2	9	Saturday	AM	Vred. to Matamoros (customs)	4 hrs.
			PM	Matamoros to Vera Cruz	2½ hrs.
3	10	Sunday		At LaVenta	
4	11	Monday	PM	Vera Cruz to Mexico City	1 hr.
5	12	Tuesday		Mexico City	
6	13	Wednesday	AM	Mexico City to Los Mochis	3 3/4 hrs.
			PM	Los Mochis to Tijuana	3 1/4 hrs.
7	14	Thursday	AM	Tijuana to San Francisco	2 1/4 hrs.
8	15	Friday		San Francisco	
9	16	Saturday & Sunday		San Francisco to Wilmington	

Mex

November 23, 1968

Dear Bob:

I have been away on a lecture tour and so have not got around to writing you since my visit with Bernal in Mexico City. Just the day I was there, Phil Drucker called to say that he was expecting to take over the dig at La Venta for you and Bernal thought this was quite all right with them. I agreed with Bernal that we would do the survey at both San Lorenzo and La Venta as a joint venture of the Instituto and the Museum, with you fellows doing the interpretation at La Venta, and Mike Coe doing the interpretation at San Lorenzo, along with Navarette, who will do the actual digging at San Lorenzo.

Actually, I was rather surprised to learn that Bernal wants to dig up as many monuments as possible and transfer all the best onesto the Museum at Mexico City. I told him I was glad it was his business and none of ours, because I suspect he may have trouble at both La Venta and San Lorenzo. However, I guess that is not our worry. In any case, let me know when your plans are firmed up because I agreed also that we would advise Bernal about the import of all this electric equipment, at least a month ahead of arrival. I suppose we should decide pretty soon when we actually begin work on these sites and in both cases it would probably depend on the best time for clearing or burning off the brush. I have tentatively alerted Beth Ralph for February, and hope this is all right with you.

All the best,

Froelich Rainey
Director

Dr. Robert F. Heizer
Department of Anthropology
University of California
Berkeley, California

FR/j

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DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA 94720

December 2, 1968

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

Dear Fro:

Many thanks for your letter of Nov. 23 regarding the magnetometer survey of La Venta. I am sending it on to Phil Drucker (Dept. Anthropology, Univ. Kentucky, Lexington) since it now appears that he will be the principal worker at La Venta this time around. He has a full semester free for the work while I have available not much more than a month in our Spring Quarter which begins April 1. If Phil gets the necessary funds and the INAH permit he should be on the spot by February. But when the work will be started up by Phil is up to him, and for that reason I send the letter with a copy of this to get you two directly in touch. If it was desirable, and it might be, I could possibly get off for a couple of weeks to come to La Venta to help Phil and your team by going over the site which we mapped in February of this year. However, we do have a detailed surveyor's map which would also handle this. But I think it best at this point for you to work out the schedule with Phil.

Sincerely,

Robert F. Heizer

Mex

UNIVERSITY OF KENTUCKY

LEXINGTON, KENTUCKY 40506

COLLEGE OF ARTS AND SCIENCES
MUSEUM OF ANTHROPOLOGY

10 December 1968

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

Dear Dr. Rainey:

A few days ago Heizer sent me copies of your recent correspondence concerning the magnetometer survey of La Venta, Tabasco, during the spring of 1969.

The excavation for 1969 was originally planned as a joint University of Kentucky-University of California project, Heizer representing the latter and I the former institution. We were in agreement on procedure (Heizer had informed me of his previous correspondence with you), and on thegeneral pattern of the application for the grant, which Heizer was preparing. When he suddenly withdrew from the project, I intended to go ahead with it. However, it was very late by that time to get everything organized-- I ran into some procedural snags, and simply could not get it set up in time. So I was obliged to postpone the operation for this coming year.

When I phoned Bernal I still thought I would be able to get under the wire. However I will not be at La Venta this coming spring. I am targetting for 1970, so I can make preparations in an orderly manner.

Whether this will affect your planning I cannot know. Any information that I have about La Venta and its problems, that might be useful to you I shall of course be glad to make available.

Sincerely yours,

Philip Drucker

Philip Drucker

PD/lc

Druck

December 17, 1968

Dear Mr. Drucker:

I have yours of December 20, and I am very sorry to learn that you can't pull off the La Venta excavations this winter. However, we will certainly go ahead with San Lorenzo, and hope that something can be worked out later for La Venta, since I am sure that we should do more than one Olmec site to understand what all these monuments and constructions are all about. Let us keep in touch and follow up on the Olmec studies.

Most sincerely yours,

Froelich Rainey
Director

Mr. Philip Drucker
University of Kentucky
Museum of Anthropology
Lexington, Kentucky 40506

FR/j

cc: Dr. Robert Heizer
Dr. Michael Coe

Beth Ralph
Mex

UNIVERSITY OF CALIFORNIA, BERKELEY

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UNIVERSITY OF CALIFORNIA 100 YEARS 1868 1968
A Tribute to the People of California

DEPARTMENT OF ANTHROPOLOGY

BERKELEY, CALIFORNIA 94720

December 28, 1968

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

Dear Fro:

I have heard from both you and Phil Drucker. It is too bad that La Venta cannot be dug during the dry season in 1969, but the cards didn't fall that way.

If you are going ahead with the magnetometer survey of San Lorenzo, it may still be possible to do the survey of La Venta even though a full-scale dig is not in progress there. Much of the site area is sufficiently open and cleared to be able to operate your equipment without further preparation than cutting off a bit of grass or brush. Part of the site is in second growth vegetation, and this can also be cleared without much expense or time. A few hundred dollars spent for labor to chop brush would give you plenty of space to examine. We have a couple of students here who were at La Venta in February of this year, and they know the site well and could act as expert guides and aides. The only rub I can think of is the local Delgado Municipal who was, for no good reason, quite unfriendly. If your instrument crew went in there you should not fail to get Bernal to arrange for a little military escort (when we were there this year the 7th Batt. Inf. was on the spot) to watch over you while you worked. The local people are convinced that the archaeologists are digging up gold, and nothing you can say or do will alter that impression.

If you want to give La Venta a try, and want one of our people on deck with our detailed map and a knowledge of the site's extent and monuments already found, we can help. The biggest chance is, of course, the pyramid. It was beautifully cleaned by us, and by the time you arrived would be somewhat grown over again, but that would all be young growth that could readily be cut. My own hunch is that the pyramid contains tombs, and that if these are made of stone the magnetometer could pick them up. If your work did indicate this, we would do the rest.

Let me know if you want to pursue the matter.

Sincerely,

Bob

Robert F. Heizer