Ralph would this interest us
7/10

7 Amherst Road
Great Neck, N. Y.
October 5, 1963

Dr. Froelich Rainey, Director
Applied Science Center for Archaeology
University Museum,
Philadelphia, Pa.

Dear Dr. Rainey:

For the past two years I have been associated with Dr. Nicolas Platon, director of the Acropolis Museum in his excavations of a Middle Minoan Palace at Kato Zakro in eastern Crete.

This year I have brought back two interesting materials which might prove fruitful for testing or chemical analysis. The first is some carbonized wood from a burnt beam in the palace which is believed to have been destroyed between 1600 and 1500 B. C. by earthquake. The chronology is fairly certain from over 2000 complete ceramic objects found, many of them with painted designs. A carbon 14 test could probably not give us any more definitive dating but might be desirable for other reasons. The second load of material comes from one foot square compartments, eight in number, not heretofore known in Minoan Palaces. The presence of a drain in the room and depressed flooring, plus cabonized earth level of two inches in adjoining area, has suggested the possibility of a dyeing room for cloth. Numerous loom weights indicate a substantial production of cloth. I have scraped these compartments for the purpose of determining whether mineral or organic dyes may have been stored in them.

If either or both of these materials would be of interest for testing, please advise and I will forward them promptly.

Cordially,

Leon Pomerance

October 8, 1963

Dr. Leon Pomerance
7 Amherst Road
Great Neck, N. Y.

Dear Dr. Pomerance:

Dr. Rainey has asked me to reply to your letter of October 5, 1963.

We should like very much to date your carbonized wood from a burnt beam of a Middle Minoan Palace at Kato Zakro in our radiocarbon laboratory. Since it is preferable to date more than one sample from a site, is there a possibility that the carbonized earth associated with the dyes contains enough carbon for a C-14 date? Since our counters are large, we require, at least, 12 grams of charcoal and larger quantities of mixed materials. We are not, especially, interested in the dyes themselves, but if we can help you to find some one who is, we shall be glad to try.

We plan to date several series of samples from Mediterranean regions in the spring (1964) and shall plan to include your sample(s) if you decide to send it (them) to us. I have included a list of the information which we require before accepting "new" samples for dating.

Sincerely yours,

Elizabeth K. Ralph

EKR/deh

Encl.

LEON POMERANCE
LEON POMERANCE
[illegible] ASHBURY ROAD
[illegible] NEW YORK

October 6, 1965

Dear Dr. Bass:

I am seeking assistance and information on a problem in Cretan archaeology that perhaps you and your colleagues might be helpful.

In the August 14th 1965 issue of the London Illustrated News is a story of the find by Dr. Alexiou of the tombs at Katsaba, the harbor town of Knossos.

Dr. Alexiou is convinced that there are other tombs at this site and I, after a visit feel that there would be considerable merit in attempting to find these other tombs which are in a readily available field of about ten acres, just outside of Heraklion.

The tombs are about thirty feet down, carved out of rock and connected by a long stairway. The field is presently used by the Greek Agricultural Service and it is only due to frequent watering of the experimental plants that a subsidence takes place and shows the entrance to the stairways.

As you know there is a great lack of knowledge of Minoan tombs, so few of the Middle Minoan and Late Minoan tombs have been found. Although these tombs are undoubtedly of late Mycenaean origin (Katsaba) if we are able by some technical, mechanical or electronic device to find them, the potentials for finding the Minoan ones which might be constructed in the same location would be greatly improved.

What I have in mind is that if such techniques are successful, we might well use them at Kato Zakro where we have as yet found no indications of tombs of the Late Minoan period.

I would be glad to come to Philadelphia any week day in November that was convenient to you to discuss this matter further.

With kind personal regards to you and Mrs. Bass.

Sincerely,

Leon Pomerance

Dr. Rainey,
I don't know if you know Pomerance, but he has been the major sponsor of Platon's extremely important excavation at Kato Zakro in Crete. I suggest that this letter should be of great interest.

G. B.

**THE UNIVERSITY MUSEUM**
UNIVERSITY OF PENNSYLVANIA
THIRTY-THIRD AND SPRUCE STREETS
PHILADELPHIA 4, PENNSYLVANIA
CABLE ADDRESS "ANTIQUE"
TELEPHONE: EVERGREEN 6-7400
(AREA CODE 215)

for Arch. Techniques

October 13, 1965

Mr. Leon Pomerance
7 Amherst Road
Great Neck, New York

Dear Mr. Pomerance:

Thank you for your most interesting letter of October 6th. Our museum has been pioneering in the use of both new means of electronic underground detection ( resistivity measuring devices and various types of magnotometers ) and new aerial film and cameras for archaeological surveys. This work is under the direct supervision of Dr. Rainey, the Director of the Museum,and Dr. Elizabeth Ralph. Both are now in Italy using some of the new instruments, but Dr. Rainey should be back in Philadelphia in a few days. I am passing your letter on to him in the hope that the two of you might be able to get together in November to discuss this matter further. In the mean time I am sending to you the first number of the ASCA Newsletter which describes some of the work being done by the University Museum.

Please give my best wishes to Mrs. Pomerance; my wife and I thoroughly enjoyed the evening we spent with you last winter.

Yours truly,

George F. Bass

GFB:SCW
Enclosure

cc. Dr. Froelich Rainey, Director of the University Museum

Techniques

February 18, 1966

Dear Mr. Pomerance:

I note your letter of January 30th regarding the exploration of tombs on Crete, upon my return from Guatemala.

As you may have heard, we and the Varian Associates have developed in the last few months a new magnetometer called the cesium magnetometer, which is adapted especially to archaeology. The new instrument was tested at Sybaris, in south Italy, last fall and we found it to be highly successful. Not only could we pick up Greek ruins lying more than 20 ft. deep, but we could cover about ten acres a day of intensive survey. At the moment there are only two of these instruments, built for us by Varian and we are beseiged by requests to try out these instruments on various sites. However, I have heard to much about the new discoveries on Crete and the good possibility for finding tombs there, that I am anxious to try it out on the site. We will be working again at Sybaris during the period April-May-June, and I have promised Professor Marinatos to make a brief try at Helice sometime before Marinatos leaves for Australia in June. What would be the most convenient time on the island of Crete? Late June or sometime in the fall? We have a highly skilled crew now, consisting of Miss Ralph and her trained assistants. Also I expect to have along two more geophysicists from Cal. Tech. working with her this summer.

We may be able to finance this on our own, but it would be helpful if you could assist in covering the cost of our work on Crete. We calculate with the crew and the instruments, travel and so forth, that surveys cost us about $3,000 a month. I should point out that

at this stage, ssurveys with the new cesium magnetometer are indeed a tricky business and it is for that reason that it is unwise to attempt these surveys without an experienced crew.

I should be very glad to hear from you with regard to this matter,

Most sincerely,

Froelich Rainey
Director

Mr. Leon Pomerance
Seven Amherst Road
Great Neck, New York

FGR/vg

For your file

February 11, 1966

Mr. Leon Pomerance
Seven Amherst Road
Great Neck, New York

Dear Mr. Pomerance:

Sheldon Breiner has just forwarded a copy of your letter of January 30th in regard to a rubidium (or cesium) magnetometer survey in Crete. Your site and the problem of finding tombs at such great depth may be a real challenge for the cesium magnetometer. It would certainly be worthwhile to give it a try.

Dr. Rainey will be in Guatemala until February 15th so that I am writing in the interim merely to say that we are interested in this challenge, and hope that a satisfactory plan and time to do it can be arranged.

Sincerely yours,

Elizabeth K. Ralph
Associate Director

EKR/rs

FR

Dr Ramey,
I received this letter and answered it per attached letter. I talked to Bert who said that any request must come from the dept of antiquities of Crete — but I thought if you did not get from this individual, now might be a good time to talk to him — in the way of support, etc.
This detection problem at a depth (30 feet I admit is difficult but may be possible. It is out your hands now, at any rate.
Thanks
Sheldon

LEON POMERANCE
SEVEN AMHERST ROAD
GREAT NECK, NEW YORK

January 30, 1966

Dr. Sheldon Breiner
Quantum Electronics Division
Varian Associates,
Palo Alto, California.

Dear Dr. Breiner:

I have recently read with great interest your article in SCIENCE entitled "The Rubidium Magnetometer in Archeological Exploration."

I am an amateur archaeologist with a great interest in Crete. Beginning in 1962 and for four years, we have sponsored with the Greek Archaeological Society under the direction of Dr. Nicholas Platon, the extraordinary find of the fourth Minoan palace of Crete at Kato Zakro. In addition I have helped to sponsor the find of the royal tomb at Archanes in Crete last fall by the archaeologist J. Sakallarakis.

Last September I examined the tomb area of Katsaba with Dr. S. Alexiou, director of the Herakleion Museum. The enclosed photostat of the Illustrated London News article, gives the results of one of his tomb finds in this area.

The site it seems to us would be an excellent testing ground for a magnetometer experiment. The site is now used by the government as an experimental agricultural project and so is free of buildings. The tombs found by Alexiou have been the result of subsidence of the soil where the watering of the experimental plants has taken place. But because of the depth (30 feet) and the sandy nature of the soil it has been dangerous to dig trial trenches at random.

Katsaba is only ten minutes from the major town of Herakleion and was the harbor town of the great palace at Knossos. From the finds already made here it is clear that there can be a "break-through" in the knowledge of Minoan Crete of the 13th Century B. C. if we can find the rest of the tombs in this area. This time period is now the subject of much heated controversy in archaeological circles.

My purpose in writing is to determine if it would be possible to borrow or rent the Varian magnetometer for use at Katsaba under the direction of Dr. Alexiou. We would have available also Mr. Michael Schulhof, a graduate student in applied physics at Cornell University. The experiments could take place in September 1966.

I would be pleased to hear from you at your earliest convenience.

Sincerely,

Leon Pomerance

VARIAN associates

611 HANSEN WAY • PALO ALTO, CALIFORNIA • 326-4000

February 4, 1966

Mr. Leon Pomerance
Seven Amherst Road
Great Neck, New York

Dear Mr. Pomerance:

Thank you for your most interesting letter of January 30, regarding the application of a magnetometer to the detection of tombs in Crete. We read with interest your description of the work performed thus far and the newspaper articles on the tomb findings.

In order to detect a buried tomb by itself, one must have a somewhat uniformally magnetic rock or soil out of which the tomb has been carved, the more magnetic the medium the larger the disturbance. In weakly magnetized rock or soil the contrast between the zero magnetic susceptibility of the air in the tomb and the soil itself may represent an undetectably small anomaly. If the tomb contains artifacts, however, such as earthenware, roof tiles, or large quantities of sherds, its detection would be considerably easier. Under very general conditions in soil or rock of average magnetic susceptibility, the maximum depth to the top of a detectable tomb is something on the order of the diameter of the tomb itself. Therefore, if there is any chance of detecting a tomb at a depth of 30 feet, it would first require a very sensitive magnetometer.

Since the time of writing of the article in Science, an instrument was developed for use by the University of Pennsylvania that performs the same functions as that described in the above article but which is now completely portable. This instrument is the 4920 Precision Portable Magnetometer with a digital readout and effective sensitivity between 1/10 and 1/100 of a $\gamma$. The instrument was developed for the Applied Science Center for Archaeology of the University Museum of the University of Pennsylvania and was used with great success this past Fall Season on the plain of Sybaris. They succeeded in mapping out very extensive areas of buried buildings and shall return to Sybaris and Greece this coming Spring and Summer.

The only instruments available at this time are those committed to the archaeological work of the University Museum; therefore, I recommend that you contact Dr. Froelich Rainey or Miss Elizabeth Ralph of this University Museum to make arrangements for an experiment to detect these tombs or

VARIAN associates



associated distrubances. They are on a very full schedule but do plan on using the instrument in Greece and may therefore be interested in applying the instrument for this purpose. All arrangements will have to be made through the University Museum for any experiments to be attempted this year. I have already taken the liberty of recommending to Miss Ralph that she look into this request and have also forwarded her a copy of your letter.

We have enclosed descriptions of the instrument described above and a reprint of the article in Science. We thank you very much for your interest and recommend that you keep in contact regarding the lease of an instrument, perhaps next season.

Sincerely,

Sheldon Breiner
Geophysicist
Quantum Electronics Division

SB:GT

Enc. Science Article
4920
Flyer

cc: Dr. Froelich Rainey

Miss Elizabeth Ralph

Dr. Rainey



# New Findings Hint Daedalus Existed

By SANKA KNOX
Special to The New York Times

PROVIDENCE, R. I., Dec. 28 —Was Daedalus, the fabled designer of the fabulous Labyrinth of Crete, more than a myth?

A suggestion that such a man did exist in the rich island civilization of 3,500 years ago was put forward today at the opening session of the annual meeting of the Archeological Institute of America.

According to myth, Daedalus, an Athenian who became architect to King Minos, built an infinitely bewildering maze in which the Minotaur, a monster half bull and half man, was confined.

Imprisoned there afterward with his son, Icarus, Daedalus devised wings and the two escaped, the legend says, but Icarus flew too close to the sun and perished when its heat melted the wax that attached the wings to his body and he fell into the sea.

Leon Pomerance, a trustee of the institute, reported to the meeting today that recent Cretan excavations had yielded some "Daedalic contraptions."

Mr. Pomerance said the discoveries made it a logical assumption that a flesh-and-blood Daedalus was active in Crete and, very likely, was responsible for a school of followers.

The excavations turned up an elaborate wine press and a stone pedestal for a variety of table tops dating to the 16th Century, B.C., a period of great innovation at Knossoso, the chief city of ancient Crete.

With thousands of other discoveries of the last two years, these came from the fourth major palace to be unearthed on Crete.

Mr. Pomerance, who with his wife sponsors the excavations and enthusiastically takes part in them, offered his theories about Daedalus during an informal discussion.

The wine press was found in the village of Apano Zakro.

Mr. Pomerance said it had been built in layers of rock with carved-out hollows and apertures for pottery pressing pans and drip jars.

Unlike other wine presses of the period, this one had two pressing pans at the top level, "perhaps for a blended wine," Mr. Pomerance said.

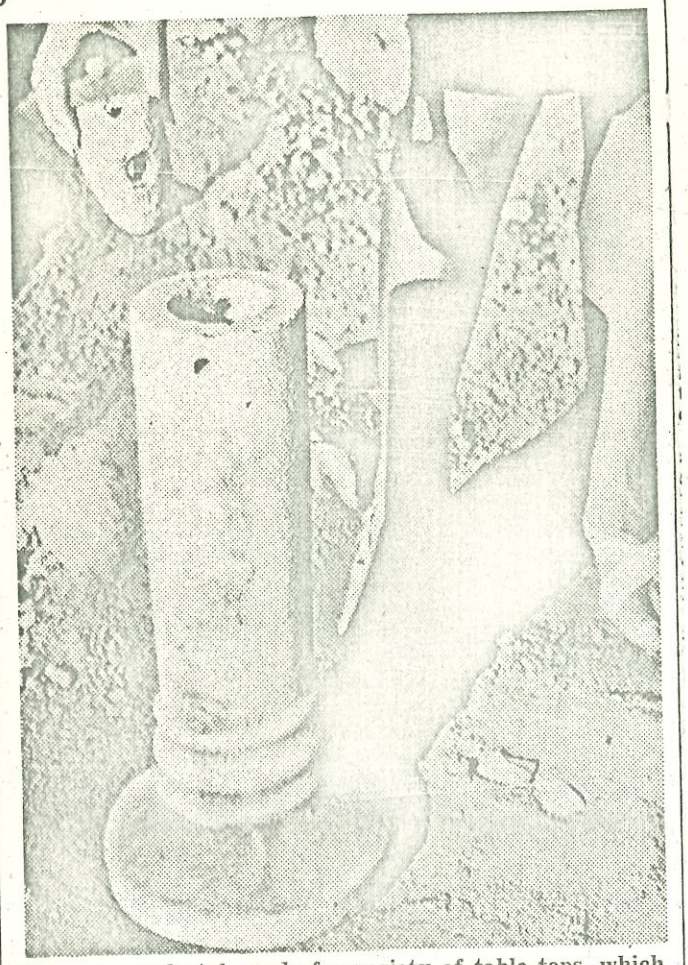
A jar below received the grape juice through spouts in both pans, and transmitted it to a jar below. A third jar, unconnected with the second, was sunk in bedrock and channeled the fluid to a rock-cut tank, which had a channel running through the building for outside disposal of waste.

The 17-inch-high pedestal, with rows of ring carving near its base, is hollowed out on top to receive a perfectly fitting stone member that once supported table tops of varying sizes. The stone was fixed to the base by a bronze pin, which was inserted through holes in the pedestal and stone.

The excavations also turned up a nine-inch, bronze mirror, the largest ever found on Crete, and dinner service containing hundreds of cups, plates, warming dishes, pots and tripods, most of them made of terra cotta.

The diggings were conducted at a palace in the Sitea area of eastern Crete. It is a wilderness with huge gorges and a harbor below. A few farmers earn a meager living there now, but in the heyday of the palace the area was an international trading center, its harbor alive with ships on the sea route to Cypress and the Middle East.

The palace, whose foundations cover 25,000 square feet, has so far yielded about 150 objects. Experts speculate it was destroyed by earthquakes around 1450 B. C.



**Columnar pedestal, made for variety of table tops, which was found on Crete. Hollowed out on top, it received a perfectly fitting stone member, which was fixed to base by bronze pin. Pin fitted into holes at top of pedestal.**


Fig. 2. The splendid large three-handled amphora, with a painted design in the Palace style based on the papyrus flower. This was the largest pot found in the tomb. 70 cm. high.

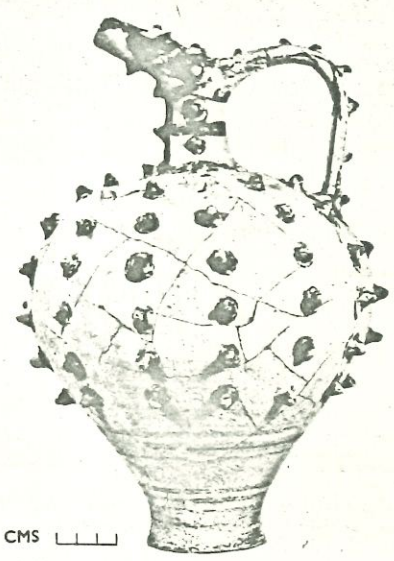



Fig. 3. A libation jug painted and moulded, perhaps imitating a metal original.

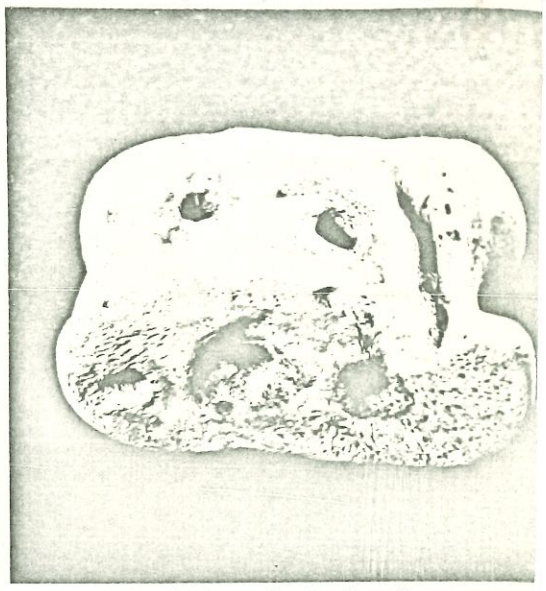


Fig. 4. A knucklebone die, its four faces drilled with one, two, three and four holes.


Fig. 5. A fine spouted stone vase, with three handles, of grey and white serpentine.

man with his spear, turned towards the bull, shows that the scene does not portray the usual bull-leaping of the kind practised at games and festivals, but shows rather the capture of a wild bull, these being then still to be found in Crete. The same conclusion is supported by the background of the scene, a rocky landscape over which flies a long-necked bird. In other words the action is not taking place in an arena among spectators, but in the open country. Bull-hunters are here shown for the first time armed with spears as in the lion hunt shown on the dagger from Mycenae. Perhaps the weapons were used to guide the bull towards the man trained to capture it. A similar scene is depicted on the Vaphio cup, but there instead of weapons the hunters are using nets. The workmanship and style are purely Minoan and clearly distinguishable from the ivory carving of the later Mycenaean times.

An ivory comb from the same tomb shows carved sphinxes. They have outstretched wings and wear diadems like those on the mirror handle from Zafer Papoura. A small figure-of-eight shield, a small seated animal and a knuckle-bone (Fig. 4) with small holes with different numbers of holes drilled on each side, were also found. The knuckle-bone was obviously designed for gaming; and some black and white draughts of ivory and stone clearly belonged to the same game.

The vases, apart from the jug mentioned above, included a three-handled amphora decorated with papyrus flowers (Fig. 2), two stirrup-jars, tripod altars, incense burners, *kylikes* and cups. A large stone vase (Fig. 5), two bronze razors, stone weights in the shape of sling-bolts and a number of faience rosettes were also found in the tomb.

The floor of the tomb near the square pillar still preserved a vivid blue colour. Evans found the same colour on the ceiling of the crypt in the Temple Tomb near Knossos and interpreted it as a symbol of the sky.

The last discovery took place outside the chamber, in the entrance passage. There on the floor in front of the doorway were found two broad leaves of gold with a tongue-like pattern at the edge, probably designed to cover the dead man's eyes. In the filling of the doorway, at about 2 metres from the floor, two fine stone vases were found; and it looks as though the tomb robbers had left them there as being too heavy to carry off. One of them belongs to a well-known Egyptian Old Kingdom type.

Archaeological Section No. 2230

# UNIQUE MINOAN IVORY FOUND NEAR KNOSSOS

BY Dr. S. ALEXIOU, Ephor of Antiquities in Crete, Director of the Heraklion Museum.

THE excavations of the Archaeological Society of Athens have been continued during recent years at a site where, some years ago, a group of rich tombs of the Late Minoan II period were found, near the mouth of the river Kairatos or Katsaba, east of Heraklion. These earlier excavations produced the well-known amphora of Thotmes III and a series of fine vases decorated in the Palace style. During 1963, however, we were fortunate enough to bring to light one of the great masterpieces of Minoan art, an ivory *pyxis* carved to show the capture of the wild bull; and some other important objects. The new tomb (Tomb VII) belongs to the second group of tombs lying to the north of those previously excavated. Its discovery was due to noticing a slight depression in the soil which could result from the collapse of a chamber tomb—as indeed proved to be the case.

About a month's work was needed to reach the chamber of the tomb (Fig. 1), which was cut out of the soft rock in the usual way; and the floor of the chamber was eventually reached at a depth of 9 metres. This depth, previously unrecorded in Crete, made the work especially dangerous, since at any moment the remaining portion of the roof could have collapsed. That this did not in fact happen may be due to the existence of a rock-cut pillar in the tomb which supported the roof. The entrance to the tomb is at the east end and has sides which incline together towards the top, as does the doorway which was still closed to some extent with a walling of stones.

It was immediately apparent that the tomb had been robbed in antiquity before the roof had collapsed. The signs of this were that all the contents were found to be broken and other objects scattered in various parts of the tomb. This was the case with a fine painted jug with moulded ornament (Fig. 3) resembling that found in Tomb B of the same cemetery. Two clay sarcophagi were found behind the pillar, obviously overturned in the search for their contents, and the skeletons had been tipped out on the floor. Even so, the finds from the tomb were extremely rich.

Undoubtedly the finest object is the ivory box (or *pyxis*) (Figs. 6 & 7); it ranks among the finest Minoan works of art and invites comparison with the carved stone vases from Agia Triada, especially the Boxers' *rhyton*, and with the gold cups from Vaphio. It probably belongs to the same period, roughly the first half of the 15th century B.C. and had been kept for some years as an heirloom before being deposited in the tomb in the Late Minoan IIIA period, the time to which most of the pottery belongs. As in the case of a similar example from Routsi, the *pyxis* is carved out of a section of elephant's tusk.

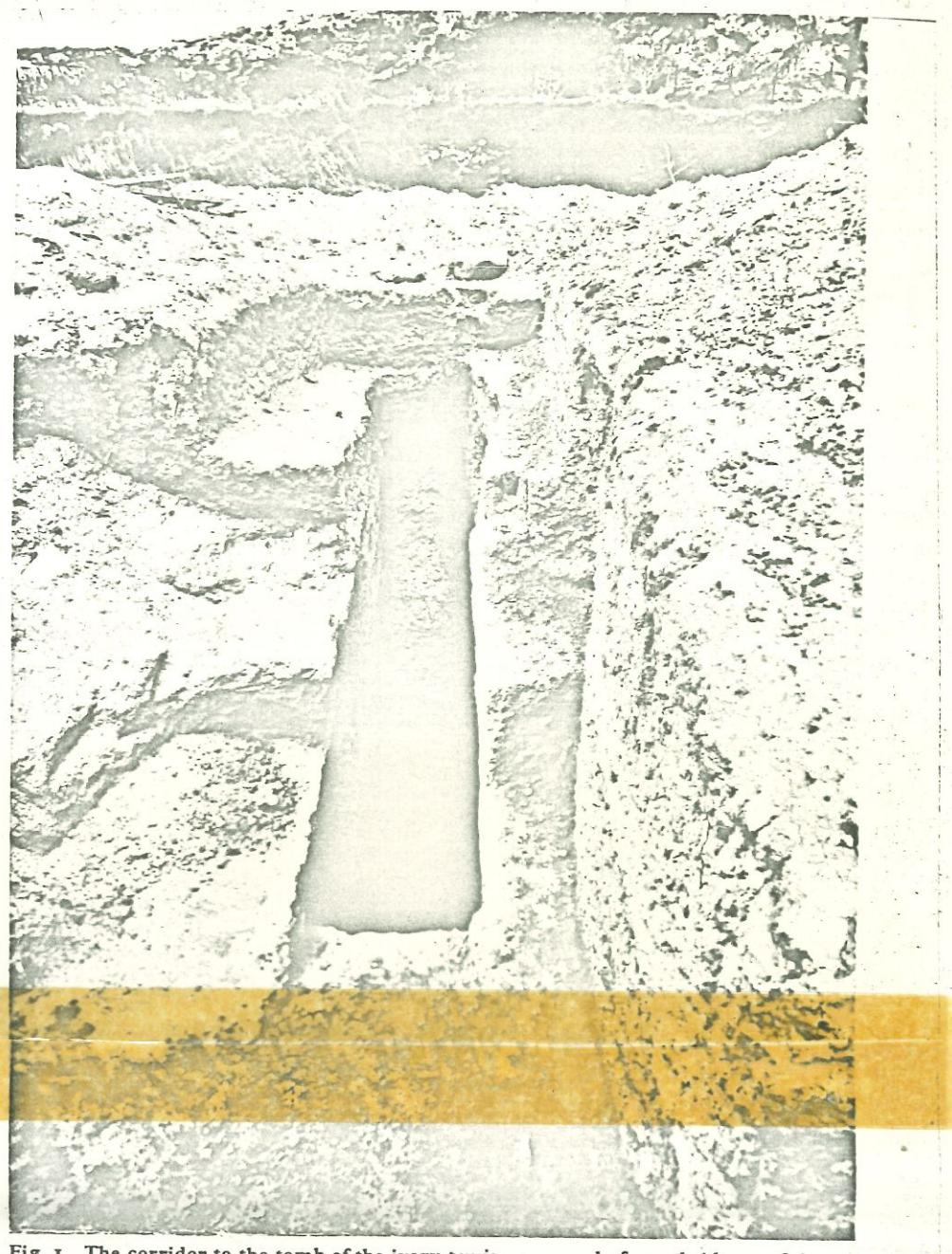
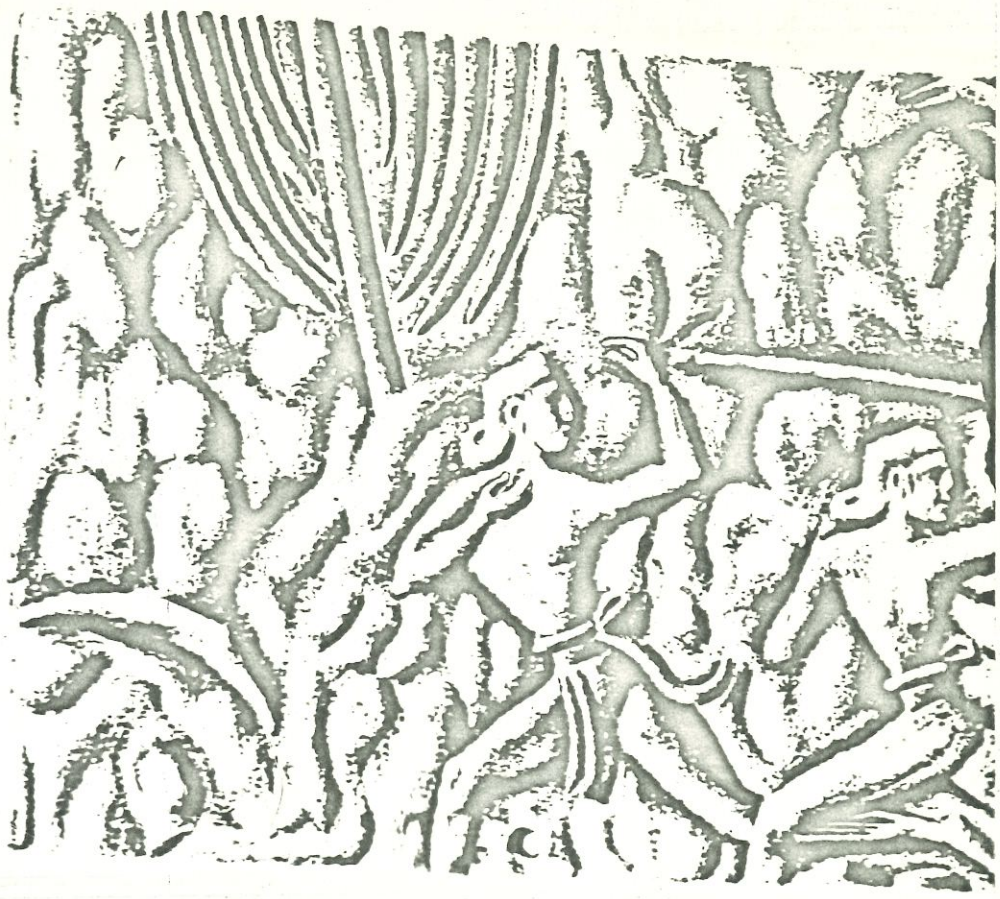


**Fig. 1. The corridor to the tomb of the ivory *pyxis* uncovered after subsidence of the soil had revealed the presence of a collapsed chamber tomb beneath, not very far from Knossos.**

The box shows in relief a man carrying a spear and running to the left. To the right another man is in the well-known acrobat's position in a bull fight: with his arms crossed he holds the horns of the bull and is being shaken off and over in a dangerous somersault.

The way in which the acrobat holds the horns and the presence of the armed

**(Below and below, right) Figs. 6 & 7. A unique masterpiece of Minoan ivory carving, this *pyxis*, a circular box carved from a section of elephant tusk shows (below) a "bull-vaulter" and (below, right) in a transcription by Th. Fanurakis, a hitherto unknown scene of the capture of a wild bull by an acrobat and two hunters, one armed with a spear. The background shows a rocky landscape with two palm-trees and, overhead, a long-necked bird.**



March 23, 1966

Dear Mr. Pomerance:

I also had a letter from Dr. Alexiou, expressing his satisfaction with the middle of September as the right time for work with the magnetometer on Crete. Miss Ralph, who will work with the instrument there, will be in London for a conference until the 15th, but she expects to arrive on Crete about the 18th of September, and she will advise Dr. Alexiou about the time of her arrival. Anything you can learn about the site in April would help, because we often find it hard to know whether the magnetometer will work, and it may be that with more knowledge of the site, Miss Ralph would then decide to take a resistance apparatus as well as the magnetometer. So, anything you can let us know about the physical setup there, before September, would certainly be helpful.

One small problem has come up since I wrote to you last. It is that we are besieged by archaeologists all over the world with requests to try the new cesium magnetometer on new sites. As I explained, we have put so much money into the development of the cesium magnetometer that we are now charging others $3,000 a month, for exploratory work, to cover our costs, and several of these people have agreed to finance the investigations at that rate. Hence, if you are asked about this research on Crete, I hope you will make it clear that you are also assisting on the financial end, so that others do not feel that we are being partial in what we decide to do. We will have two crews working this summer in Italy, Greece, England and the United States, and our costs are indeed running very high, since we have now engaged two geophysicists from Cal. Tech. I am grateful for your offer of $500 for the Cretan

job, and would be happier if you could contribute something more under the circumstances. But in any case, I will see to it that the crew gets there in September as planned, and that they continue until we can decide whether the instrument actually works on that particular site. Personally, I regret that I cannot get out there myself, because I have not been on Crete since 1938 and have always wished to return. Perhaps, if the cesium magnetometer works out there, I will have an excuse to return at a later time.

Very best wishes,

Froelich Rainey
Director

Mr. Leon Pomerance
7 Amherst Road
Great Neck, New York

FGR/vg

LEON POMERANCE
SEVEN AMHERST ROAD
GREAT NECK, NEW YORK

March 21, 1966

Dear Dr. Rainey:

I have just received a letter from Dr. Alexiou expressing great enthusiasm for the magnetometer project and advising that middle or late September would be a favorable time for him too.

As we will be leaving for the Cretological Congress in Chania on April 11th and will see Dr. Alexiou at that time, if there are matters that you would like me to explore with him, I would be happy to be of service.

With kind personal regards,

Sincerely,

Leon Pomerance

December 18, 1969

Dear Mr. Pomerance:

Many thanks for your good letter of December 15, which I am sure will pep up the kids who did the Homer show. I begin working with a class of our graduate students about the middle of January to try and develop these exhibitions with an idea, and such comments as yours will be very helpful.

As you know, we are launching ourselves into a campaign to try to date the late Bronze Age more precisely, and we have just now linked up with Professor Säve-Söderbergh of Uppsala, who will be our representative in Egypt and the Mediterranean, collecting short-lived organic material from the key sites. I certainly will get him in touch with Platon and Marinatos and others in the Minoan field in an attempt to fix that late Minoan date somehow. It should be interesting, and when you are next out there do keep this in mind.

All the best,

Froelich Rainey
Director

Mr. Leon Pomerance
Seven Amherst Road
Great Neck, New York

FR/j