February 23, 1961

Dr. Emil W. Haury
The University of Arizona
Tucson, Arizona

Dear Emil:

Many thanks for yours of February 16th and for the report on Richard. I have yet to hear from him and am most curious to know if he picked up those walls on the site at Tucson. However, I suppose I will hear shortly and then we will know whether we are ready to start design on the new instrument.

There is no need to wait for Richard's return to send you $16.88. I will simply have a cheque sent on from here at once. This means it will follow in a day or two. Many thanks for handling the shipment for him.

You will not be surprised to learn that no jets could land at Philadelphia the day I left Tucson and hence I came in on a Prop plane, only two hours after the field had been opened. Also, by great good luck the road to my house was plowed out just before I arrived. The mess here was something unbelievable and it was a shuttering contrast with Tucson. However, it is all gone and we are now back to the normal wet cold.

I should have written you and your wife a bread and butter letter long before this, but I have still to catch up with correspondence so I can only apologize. In any case, it was certainly very nice of you to put us up and I do hope we can continue testing in your area.

Loren and I are planning to sneak away a few days in the spring and I will try hard to make things come out right so we can try out the new instrument at Tucson. Also, I may say that I have stirred up the whole Department of Anthropology here with an account of what you are doing in Tucson.

Very best wishes,

FR:ah

Froelich Rainey
Director

THE UNIVERSITY OF ARIZONA
TUCSON

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ANTHROPOLOGY

February 16, 1961

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

Dear Fro:

The geophysicists have come and gone and it isn't clear yet what the outcome of their investigation has been. They moved on to Globe yesterday to test out the equipment on stone-walled sites. I talked at some length with Richard, but was unable to get out on location because of infernal office demands.

Richard had some equipment shipped to me here, collect, amounting to $16.88 which I took care of, and when he returns to Philadelphia you might remind him of the amount. When I talked with him about it I was not able to give him the exact figure. Reimbursement should be made to me and not to the University. Sorry to bother you about this.

It was good to have you here and I hope that you and Loren can find some excuse to come west.

As ever,

Emil

Emil W. Haury

EWH:lvg

Enclosures

September 11, 1963

Dear Emil:

There is nothing I would like better than a crack at Snaketown with our various instruments. Also, with our moon drill. Could you tell me when, and perhaps get somebody there to write out as much information as possible about the nature of the site, so that we can decide what instruments might be useful. If it seems possible, I can get some of our operators out there, with instruments including a proton magnetometer to show you what we know, and the useful ones then could be left with you to continue the survey.

Do you think this sounds possible ?

Very best wishes,

Froelich Rainey
Director

Dr. Emil W. Haury
Department of Anthropology
College of Liberal Arts
The University of Arizona
Tucson, Arizona

THE UNIVERSITY OF ARIZONA
TUCSON

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ANTHROPOLOGY

August 27, 1963

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

Dear Fro:

In a little over a year we expect to launch a pretty ambitious operation at Snaketown, restudying the place after a lapse of 30 years. What are the latest developments re a proton magnatometer? And what is your advice with respect to gadgets of this kind for work in a site where the soil is generally soft with no adobe walls of the Casa Grande type?

I hope you had a good summer.

Best regards,

Emil W. Haury

EWH:vg

October 3, 1963

Dear Emil:

Just a note in reply to yours of September 24. Beth and I think the Snaketown project looks very good for the proton-magnetometer. We should be able to locate those hearths. I only regret that you won't get started until October 1964.

We think we could do this job for about $1,000, if you could put us up at the site. In any case, it is a reasonable estimate for a survey at Snaketown, which you might put in your budget.

I should be going down to Guatemala again, in January or February and if things look promising for you I might stop by and look at the site.

Very best wishes,

Froelich Rainey

Dr. Emil Haury
Department of Anthropology
College of Liberal Arts
The University of Arizona
Tucson, Arizona

THE UNIVERSITY OF ARIZONA
TUCSON

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ANTHROPOLOGY

September 24, 1963

Ralph
what do you think
Fro

Fine -
see costs on
2nd page
Both

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

Dear Fro:

I was really delighted with your response of September 11 about the possibility of testing out some instruments at Snaketown.

The site itself is a rather large one geographically. It includes approximately half a square mile on the upper terrace of the Gila River south southwest of Chandler, Arizona. Features which stand above the desert terrain are mounds, and those we tested in 1934 were all of trash. The assumption is that all of them, meaning approximately 60, large and small, are composed of rubbish. The highest of these is about 3 meters. Taking this depth with what usually occurs below desert floor, we may expect a total cultural depth of 5 meters in some localities. Another prominent feature which sticks above the surface is the ball court, that is, the sides of it, perhaps 2 meters high. Otherwise, the big flat areas between the mounds are where one finds the cremation areas and the houses. Of these there is no hint whatsoever on the surface. There is also, along the southern margin of this site, a prehistoric canal which is quite easily traceable, at least in some parts.

The soil is soft throughout. In fact, it is one of the nicest places I have ever dug in from that point of view. Softness of the soil of course makes it difficult in some instances to trace features. This must be done largely by color and content changes, sometimes on hardness differences. There are no rocks native to the locale, and when rocks are found you can be sure that man has brought them in.

My plans are to get started on the project in October, 1964, a little over a year hence. If I can raise

the necessary support, I hope to have 20 to 25 men working for 6 to 7 months. In addition to hand labor, we intend to employ some power equipment, including a backhoe scraper, front-end loader, and hopefully a ditcher. It will be necessary to do extensive testing as quickly as possible so as to localize the areas that are going to be most productive of the kind of things we are looking for. One of these is the strengthening of the early end of the Snaketown chronology and pushing it back into pre-ceramic times if possible. The oldest evidences at Snaketown already indicate settled village life at around the time of Christ, which presupposes a form of agriculture in this arid country, and we would like to know just what this came out of and whether or not we can pin down more closely the beginnings of settled existence.

The budget will be a large one, in excess of $100,000, and I don't know if I can swing it but I'm going to try. Which leads me to ask what should be included in the budget to cover any involvement with your organization and any doodlebugs you have in your kit bag.

It would be fine if we could sit down and talk this thing over.

Best regards,

Emil W. Haury

Emil W. Haury

EWH:vg

Signed in Dr. Haury's absence

Suggest that our expenses would be travel for 3?

air cost Phila.-Tucson = $256 ; for 3 plus local transportation, approx. $1000
& return

plus lodging at the site

Beth

Arch. Techniques

July 30, 1964

Dear Emil:

I note from your letter to Beth Ralph that you did not get any funds for the instruments survey at Snaketown, but even so, I think we can manage this if you are still interested. Our grants for experimentation with the instruments should cover the costs, and we are carrying out such experiments all over the place. The trouble is that most of our staff will again be in Italy this fall, and could not get out to Arizona until sometime in December. How does this fit you timing?

We have some promising new instruments in the proving stage, and we are interested in trying them on different kinds of sites. Also, as you know, I still like to have a good excuse to come back to Arizona.

Very best wishes,

Froelich Rainey
Director

Mr. Emil W. Haury, Director
The Arizona State Museum
University of Arizona
Tucson, Arizona

Dr. Rainey

THE UNIVERSITY OF ARIZONA
TUCSON

ARIZONA STATE MUSEUM
ESTABLISHED 1893

July 9, 1964

Dr. Elizabeth Ralph
University Museum
University of Pennsylvania
33rd and Spruce Streets
Philadelphia 4, Pennsylvania

Dear Dr. Ralph:

A conversation with Ed Wilmsen, who recently visited your museum, reminds me that I have been remiss in keeping you and Dr. Rainey abreast of developments. Regarding the projected work at Snaketown this coming winter, the truth of the matter is that I was not able to build into the budget, an item which would permit the kind of testing of equipment which I had written Dr. Rainey about earlier. I was quite fortunate to get some support for power equipment, but the ancillary projects thought about earlier had to be omitted. I would, of course, be very happy to have testing done, but it will not be possible to provide any financial support for it.

Sincerely yours,

Emil W. Haury

Emil W. Haury
Director

EWH:hm

Techniques

September 2, 1964

Dear Emil:

Thank you for yours of August 7th, which I have on my return from Vermont. Delighted to know you visited Louis at Onion Portage. I am a little afraid of going back there myself, for fear I might again get involved in the Arctic, but I suppose you are safe.

Good, we will figure on being in Snaketown sometime in December, with a whole battery of gadgets with no cost to you, and I hope at least some of them work. Hopefully, we will have a new sonic probe, and I shall certainly come out myself, even if only for a few days.

The very best of everything,

Froelich Rainey

Mr. Emil W. Haury
The Arizona State Museum
University of Arizona
Tucson, Arizona 85721

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

ARIZONA STATE MUSEUM
ESTABLISHED 1893

August 7, 1964

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

Dear Fro:

Your letter of July 30 has put my mind at ease. I was worried about the fact that I discussed the instruments survey problem at Snaketown with you earlier and then apparently reneged. I would be delighted, of course, to have you and your group come out in December. This is quite time enough, since we will not be getting started until about mid-October and will be running at least until the first of May. In other words, should the instruments show up any useful leads, there will be ample time to follow through with ground work.

We will be renting the BIA day school, the Santan School not now in use, and I expect our housing facilities will be limited, but I can give you a better idea about this at a later time. When I know what kind of a crew you will have, both as to numbers and division of sexes, I will be able to give some definite answers. I would not expect the food situation to give us any trouble. If you need an excuse to come to Arizona you've got it, and it will be a delight to have you with us.

I had the special privilege a little over a week ago of visiting Louis Giddings at Onion Portage. He has a fabulous site, at least in terms of its stratigraphic clarity, and we hope that he will be getting enough material out of his sub-Denbigh layers to shed some new light on stages of Early Man in the Arctic.

Warmest regards,

Emil

Emil W. Haury

EWH:vg

December 3, 1964

Dear Emil:

My apologies for the long delay in replying to yours of November 19, but I have had a problem. Beth Ralph had some sort of heart attack in Italy, and has been laid up and recovering. She is going to be all right, but will have to take it easy, so I have had to find somebody else capable of repairing these electronic instruments, to do the job at Snaketown. Just yesterday, I got Hugh Berg pinned down do to this in January, if this is all right with you. Will you let me know when in January would be best for you.

The new rubidium magnetometer, which was so successful at Sybaris, this fall, has gone back to the shop to be stream lined for archaeology so we will not be able to use that. We will bring the proton magnetometer and the little German resistence apparatus called the Geohm. With luck, we might have the new sonic device which should be tested in Dallas this month. I would like to come out fairly early in January with Hugh for a week to try out the two instruments at least, and then if either one of the two works satisfactorily, we will train one of your people to use them and leave them with you. Surely, one of the two ought to pick up the rubbish deposits. So, we will plan on being there sometime in January if this is all right. I am delighted to have an excuse to come back to Arizona.

Very best wishes,

Froelich Rainey

Mr. Emil Haury
The University of Arizona
Tucson, Arizona 85721

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

ARIZONA STATE MUSEUM
ESTABLISHED 1893

November 19, 1964

Dear Fro;

In your letter of September 2 you set December as the time of your visit of Snaketown. Have you established any firm dates? The digging is moving ahead quite rapidly and one of the things that we have learned is that the Hohokam were a restless people and had a compulsion to dig deep holes. What they were after was caliche for house floors. But the resulting pits made convenient places for dumping trash which happily filled up fast and therefore gives us reasonably pure period samples. I think we can say that we have more rubbish below the desert floor than above it. Your gadgets ought to help us find areas of deepest sub-surface trash accumulations.

It will be great for us to have you and your crowd here. I was shocked to hear of Louie Giddings' misfortune.

Best regards,

Emil W. Haury

Dr. Froelich Rainey
The University Museum
University of Pennsylvania
Philadelphia 4, Pennsylvania

Techniques

March 25, 1965

Dear Emil:

I am just now back from the Near East and have your note of February 11th; also the photographs, for which many thanks. Actually there are a great many things about Arizona which I infinitely prefer to the Near East and I hope our experimenting with divining rods will lead to further experiments in the Southwest. Naturally we are most curious to learn what turned up in those hot spots and whether Bill Wasley also had some luck with the instruments before you returned it to Beth.

The next time I would like to try that new rubidium magnetometer on some site in the Southwest, preferably next winter. In the meantime I have been visiting Helice in Greece, which is the mother city of Sybaris and believe it or not, it was destroyed by the same kind of catastrophe - and is located in the same kind of situation. We should have a go at that this summer.

Very best wishes to all of you in Arizona,

As always,

Froelich Rainey

Dr. Emil Haury --
Department of Anthropology
University of Arizona
Tucson, Arizona 85721

FGR/vg

February 16, 1965

Dear Dr. Haury:

We just received your letter of February 11th and the photographs. Dr. Rainey left Saturday night for Europe and the Near East and will be back around the 10th of March.

Dr. Rainey will be in touch with you as soon as he returns.

Sincerely,

Mrs. John C. Gwinn
Secretary to the Director

Dr. Emil Haury
Department of Anthropology
University of Arizona
Tucton, Arizona 85721

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

ARIZONA STATE MUSEUM
ESTABLISHED 1893

Snaketown Project
General Delivery
Sacaton, Arizona
February 11, 1965

Dr. Froleich Rainey, Director
The University Museum
University of Pennsylvania
Thirty-third and Spruce Streets
Philadelphia, Pennsylvania, 19104

Dear Fro,

Now that you're back from Cairo and have a basis for comparison, perhaps the enclosed pictures will remind you that Arizona isn't such a bad place after all.

Beth Ralph has sent me a copy of Hugh's paper and also instructions regarding the return of the magnetometer. Wasley has made some use of it but we haven't turned up anything dramatic. The spots you and Hugh marked off to the east produced a house, a cremation, and a pit. We are deeply indebted to you and Hugh for helping us out in January, and we know that everybody has gained a new respect for the assistance modern divining rods can give the archaeologist.

Best wishes from everyone at Snaketown.

Sincerely

Emil

Emil W. Haury

Technique

April 29, 1965

Dear Emil:

I have just been talking with the Varian Associates people in California, who are rebuilding our rubidium magnetometer, and I am sorry to say that they will not complete it in time for work in Italy during May and June. Also, they are very anxious to test this new instrument in America before sticking their necks out at Sybaris. Naturally, I think of the University of Arizona, and I wonder if you or Ray can think of one or two sites in Arizona where we could try this out in July. As you know, it is much more sensitive than the proton magnetometer, but operates in the same way. Maybe the Point of Pines site would be the best one. But we certainly ought to try it on those burning pits at Snaketown, also. This is just to see what bugs it has, before sending it abroad in the fall. We will cover all costs, of course, but it would please me if we could do you some good with the instrument.

As you know, I will be at Onion Portage in Alaska this summer, and therefore, will send Beth Ralph to meet a Varian Corporation engineer at Tucson. Maybe, if it works well, we can think of a serious job for it out there next winter. Do let me know if this is satisfactory with you.

Very best wishes,

Froelich Rainey
Director

Dr. Emil Haury
Department of Anthropology
University of Arizona
Tucson, Arizona

FGR/vg

March 20, 1969

Dear Emil:

At long last I am sending you a set of standard black and white aerial photographs taken by the U. S. Air Force of Casa Grande and Snaketown. I have had this for some time, but I have been waiting for the more interesting experimental data from color camouflage and other types of remote sensing. I thought this was all being studied by NASA, but in fact Lt. Williams at Hanscom Field tells me that they still have all this data there, and so I will have copies for us in about a month.

One copy of this black and white stuff is going to Corbett at the National Park Service in Washington, and another set is here. Do you have someone out there who can have a go at this and let us know if anything interesting turns up? Also, when we get the more advanced stuff can you do anything about interpreting it there, or shall we get hold of Corbett and see if he can find an interpreter? The great problem with all this business is to get the film interpreters and the archaeologists together on any single project. So far, we have had no luck on the Sybaris films.

All the very best.

Sincerely,

Froelich Rainey
Director

Dr. Emil Haury
University of Arizona
Tuscon, Arizona

FR/j

Arch Technique

April 11, 1969

Deaf Emil:

Thanks for yours of April 8th. I have just written John Corbett urging him to go ahead with the Itek people to interpret the Air Force material from Snaketown and Casa Grande. Also, I will write Williams urging him to get that material available for Corbett just as soon as possible.

It may not be possible to get the missing pictures in the Snaketown site which you mention, but I do remember that Williams made a mistake on some of our photos of Sybaris, and later found the right prints, so I will forward your letter on to him and hope that he can straighten out the missing shots of Snaketown.

On another subject, I have just been urged by some of our financial backers here to support Leakey's investigations at the Calico Mountain site in the Mojave, and so we are sponsoring this for the coming year. Loren Eiseley and John Witthoft will be out to look at the setup sometime this summer. What do you make of that -- and have I stuck my neck out?

All the best,

Froelich Rainey
Director

Mr. Emil W. Haury
Department of Anthropology
College of Liberal Arts
The University of Arizona
Tucson, Arizona 85721

FR/j

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ANTHROPOLOGY

April 8, 1969

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

Dear Fro:

Thanks so much for yours of March 20 and the Air Force pictures of the Casa Grande and Snaketown areas which arrived a few days later. Corbett was in town yesterday, and we had a chance to talk over the problem of interpretation. He has an outfit in mind called "ITEK" which has done some work down in the southeastern United States and I think they might be in a position to do something about this series of pictures. I'll not try, therefore, to do anything at this end until we learn what success he has.

I am a little disturbed by the fact that the series of pictures of Snaketown is not complete. On the set scaled 1:4000, pictures 89 and 90, going from west to east, come to the western limits of Snaketown. On picture 89 the fork in the pre-historic canal and the two extensions thereof westward are beautifully shown. Picture 90 is one overlap further east and shows a short north-south road which about marks the west Snaketown limit. However, the next shot numbered 91 and about 30 seconds later has missed all of Snaketown and shows the right-of-way for the new Tucson-Phoenix Freeway and the Goodyear road overpass. Something must have happened. Either the camera got stuck or there was some other failure because the very pictures we want are not there. The numerical sequence, however, was maintained. No. 96 is also labeled as a part of the Snaketown series, but this is a section of mountains that can't be anywhere nearby. According to the clock dial, No. 96 was taken about 4 seconds after No. 91, but this is impossible because there is no blacktop road with painted mid stripe this close to the site.

Is there anyway this can be checked out with the Air Force?

Best regards.

Sincerely yours,

Emil W. Haury

EWH:jeh

May 16, 1975

Dear Emil:

It was good to see your son and, in that mysterious genetic way he does somehow have an intangible likeness to you. I urged him to come back and spend some time in the lab here hoping he might have some ideas about what we are doing.

I have had Beth Ralph run down the alpha recoil-track dating method and I gather she is skeptical about it because it has to do with the greater disintegration of U^{235} to U^{238} and the half life for this has not been determined with any precision. Apparently Fisher at the University of Miami takes a dim view of it also and he simply says that alpha recoil-tracks do not exist. But this is all old stuff with us when it comes to a new dating method and I am sure Beth will keep her eye on developments.

Glad to hear about the status of the Snaketown report and can bet it will be a relief to you to see a final publication. As for me, I should be retiring shortly at 68 but I am looking for something else amusing — and exciting to do since I don't at all feel ready for the shelf. My current interests are all raised up in Southeast Asia where I hired Chet Gorman to take charge of an ambitious program in Northern Thailand uncovering what is sure to be the earliest bronze age in the world. In fact, I expect to spend some time there digging after Christmas.

It is good to hear from you and we should keep in touch.

Regards,

Froelich Rainey
Director

Dr. Emil W. Haury
The University of Arizona
College of Liberal Arts
Department of Anthropology
Tucson, Arizona 85721

THE UNIVERSITY OF ARIZONA
TUCSON, ARIZONA 85721

COLLEGE OF LIBERAL ARTS
DEPARTMENT OF ANTHROPOLOGY

Ralph
Knew about
this?

7 May 1975

Fro,
See letters to & from
Barringer.
EKR

720

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

Dear Fro:

My son Allan tells me that he recently chatted with you at the University during the time he was checking out the hypobaric chamber with a team of Westinghouse fellows. I appreciate the fact that you gave him so much time. Among other things, he said that you were unfamiliar with the alpha recoil-track dating method now under development at the University of Arkansas. Geologists have, of course, used the system for geological dating, but Bob McGimsey and his colleagues are applying it to archaeology. I supplied Bob with a series of Hohokam pot sherds from Snaketown stratigraphically arranged. His tests showed that alpha recoil-track densities on mica plates increased with stratigraphic age, and his findings in that way verified the reliability of Snaketown's stratigraphy. By using a specific Hohokam type dated at 600 AD as the basis for calibrating the series with the Christian calendar, we came close to 300 BC for the oldest Hohokam pottery, which is in general agreement with selected radiocarbon dates and with archaeomagnetic dates.

McGimsey and his colleagues have a paper which has been submitted to Science. I suggest if you are interested, that you contact him directly, and I am sure that he will be glad to send you a copy of the manuscript.

I have seen galley proof of the Snaketown report and am awaiting page proof. With luck, the book ought to be available before this calendar year runs out.

My best personal regards. As ever,

Sincerely,

Emil

Emil W. Haury

EWH:ie

THE BARRINGER CRATER COMPANY

BRANDON BARRINGER
President
2106 TWO GIRARD PLAZA
PHILADELPHIA, PENNSYLVANIA 19102

May 13, 1975

Dr. Elizabeth K. Ralph
Associate Director
Museum Applied Science Center for Archaeology
The University Museum
33rd & Spruce Streets
Philadelphia, Pa. 19104

Dear Beth:

Do appreciate your help. Think you will be interested in the following quotations from a letter just received.

"I have talked to David Fisher of the U. of Miami who is our local authority on dating by fission tracks, etc.

He tells me that alpha recoil track dating is not a valid method. (He was involved in refereeing a paper sent to Science by Walker et al of Washington Univ.). The trouble is that alpha recoil tracks apparently do not exist. In principle they should exist but it was not demonstrated that they are in fact what Walker examined.

In any event, no one has been able to definitely identify alpha recoil track in archeological material.

Fisher believes that the methods may eventually prove workable but a lot of basic work must be done first. Certainly the method cannot be applied as of today or in the near future.

Fisher believes that Walker should publish a retraction of his work based on what is known as of now."

Sincerely,

Brandon Barringer

BB:mcb

Brandon Barringer

THE BARRINGER CRATER COMPANY

BRANDON BARRINGER
President
2106 TWO GIRARD PLAZA
PHILADELPHIA, PENNSYLVANIA 19102

May 9, 1975

Dr. Susan Kieffer
University of California, Los Angeles
Department of Geology
Los Angeles, Calif. 90024

Dear Sue:

I enclose a copy of a letter from Dr. Elizabeth Ralph. Would you, by any chance, have 5 grams of crystals in your specimens that you could send her? Think we have no uranium!

With best regards,

Sincerely,

BB:mcb

Brandon Barringer

Encl.

cc: Dr. Elizabeth K. Ralph ✓

May 3rd, 1975

Mr. Brandon Barringer, President
The Barringer Crater Company
2106 Two Girard Plaza
Philadelphia, Pa. 19102

Dear Mr. Barringer,

Thank you for your letter of April 29th. Personally, I do not have a great deal of faith in Alpha-Recoil-Track-Dating. It is partly dependent upon the rate of disintegration of U^{235} to U^{238}, and the half-life for this has not been determined with any precision. If some one has a large sum of money to donate for research, some of these questions could be answered. Also, if the uranium content of the soil is high the dating would be easier.

However, there must be some way to date your crater. I suppose that you have made a search for charcoal and that there is none. Perhaps, the crystals from the ejecta that were subjected to intense heat along with the surrounding earth could be dated by thermoluminescence. If you would like to send us at least 5 grams (of crystals ~~of~~ and earth) we could give it a try.

With best regards,

Beth

Elizabeth K. Ralph

THE BARRINGER CRATER COMPANY

BRANDON BARRINGER
President
2106 TWO GIRARD PLAZA
PHILADELPHIA, PENNSYLVANIA 19102

April 29, 1975

Dr. Elizabeth Ralph
c/o University Museum
33rd & Spruce Streets
Philadelphia, Pa. 19104

Dear Beth:

Can you tell me anything about the reliability of Alpha-Recoil Track Dating described in the attached from the current Arkansas Archeological Society Newsletter? I have mentioned it to Dr. Haas.

As you know, I have always been anxious to date the formation of this crater. We finally got some wood from the ejecta but it turned out to be modern roots! Some years ago the United States Geological Survey got a date of 22,000 years B.P. from snail shells from the lake beds which formed immediately after the impact, but I believe these pick up "dead" carbon and give excessive ages. I have been using 15,000 years B.P. but would greatly like something better.

The ejecta has crystals whose "clock must have been stopped" by the intense heat resulting from the shock wave and these might be used <u>if</u> an amount of alpha decay streaks subject to accurate measurement occur in 15,000 years. The authors claim they can measure the date of potsherds which can't be more than 2,000 or 3,000 years old so there might be almost too many.

In any case, I thought you would be interested in seeing the article.

With personal regards,

Sincerely,

Brandon Barringer

Brandon Barringer

BB:mcb

Encl.

cc: Dr. F. Otto Haas

ALPHA-RECOIL TRACK DATING: A BRIEF HISTORY AND EXPLANATION

Ervan Garrison
Arkansas Archeological Survey, Fayetteville, .

The alpha-recoil track dating method is based on naturally occurring changes (referred to as decay) in radioactive elements. This is the same principle that is used in the well-known radiocarbon method except that it is the decay of uranium and thorium atoms, rather than radioactive carbon, which is measured. Since uranium and thorium occur in crystals which are commonly found in pottery as intentional tempering agents or as a natural component of the clay itself, it seemed possible as early as 1969 that the detection of the decay of these radioactive elements might lead to a way to date that ubiquitous artifact--the pot sherd.

Basic work by Dr. R. M. Walker (now of Washington University in St. Louis) and his associates had demonstrated that two types of tracks (or short tubes) are found in some solids containing uranium and thorium. "Fission tracks" are formed when uranium spontaneously breaks (or "fissions") and alpha-recoil tracks are formed when uranium and thorium decay by giving off subatomic alpha particles. (The term "recoil" is important since the alpha particle itself does not leave a discernible track in the crystal but rather it is the recoiling heavy nucleus from which the alpha particle is ejected that forms the track.)

Experimentation at the University of Arkansas was begun in 1969 by the author and Dr. Otto Zinke in cooperation with Dr. Charles R. McGimsey III of the Arkansas Archeological Survey to determine if the alpha particle emission could be utilized for the dating of archeological artifacts. This experimentation grew out of a course taught by Dr. Zinke in which the author was a student. Dr. Zinke had theorized that the detection of alpha-particle emission in pottery or inclusions found in pottery might offer a more sensitive method for archeological dating than the then newly developed fission track method which was being applied to geological materials more than 10,000 years old. Fission is a rare event relative to alpha decay (2,000,000 times less probable). Thus it is easy to see that such a greater chance for the occurrence of a track produced by alpha decay could enable the archeologist to date something as small as a microcrystal from a pot sherd.

The first tentative results of experiments initiated by the author were encouraging enough to convince Dr. Zinke and Dr. McGimsey that further research should be conducted. Comparison of our results with Dr. Walker's confirmed that what we had detected within muscovite mica crystals, which are commonly found in pot-sherds, were indeed alpha-recoil tracks produced by alpha decay. This research formed the subject of a Master's thesis during my graduate study and was supported by the Arkansas Archeological Survey and grants from the Research Corporation.

Radioactive decay of any element--carbon-14, uranium, thorium, potassium-40, etc.--is not affected by any other ordinarily occurring physical process. Extreme heat, cold, pressure, and the like have not the slightest effect on the decaying atoms. They exist and decay in their own time obeying their own unique laws and that of probability. While the inexorable decay process marking universal time

cannot be influenced or altered by man, the mica crystal within which they occur can. Investigators developing the fission track technique for the dating of ancient geological strata found when they checked their dates against those determined by other methods, that some dates were unduly "young". The explanation for this was that some thermal event in the earth's past had "annealed" or erased part or all of the fission tracks causing an incorrect reading of the age. Since the greater the number of tracks, the older the specimen, any reduction in the number of tracks consequently reduces the apparent age of the specimen.

Since alpha-recoil tracks were found alongside of fission tracks, it did not require a quantum leap of imagination to speculate that heating might erase alpha-recoil tracks also. This was found to be the case. These tracks are "erased" from the mica crystals at temperatures of 600° C. (1115° F.). The implications were immediately obvious: heating to high enough temperatures, typical of those commonly encountered in pottery manufacture, could "reset" the radiometric "clock" in the tiny crystals, by erasing all previous tracks. This it would be possible for the archeologist to date pottery by counting the tracks formed since the vessel was so heated. The archeological implications were tremendous.

Research conducted since that discovery has been directed at taking pottery of known age (dated by radiocarbon, dendrochronology, etc.) and simply counting the number of alpha-recoil tracks on a uniform area of mica to test the simple thesis: older pottery should have a greater number of tracks per crystal relative to younger pottery specimens. This proved to be true in almost every case tested. Alpha-recoil tracks were found to be formed at a rate of 1 - 2 per year depending upon the area (and geological history) where the clay used for pottery manufacture was obtained.

To date a vessel or sherd, one simply counts the number of alpha-recoil tracks over a uniform area (e.g. 1.0 mm^2). This value is compared to the rate of track formation calibrated utilizing a sherd of known date. For example, a sherd with a known date of A.D. 650 (1300 B.P.) with a total number of tracks of 1301 would have a track-formation rate of about 1 track per year. Thus, if we obtain a track count of 1200 per 1 mm^2 for another sherd, we obtain a date of 1200 B.P. (no. of tracks x rate of formation = no. of years B.P.: 1200 x 1 = 1200 B.P. or A.D. 750).

Extension of the alpha-recoil track dating method to other fired artifacts has been underway. In the past year fired daub found at Mississippian sites in Arkansas has been dated and the dating of the baked clay and rocks of fire pits or hearths seems totally within the range of the alpha-recoil track method.

Current research is being directed at applying the technique to these aforementioned materials plus historic ceramics as well as other materials such as obsidian, biotite mica and man-made glass. The alpha-recoil track dating method's potential is at present only partially developed. Like other dating methods, its refinement and application will be partially determined by other laboratories and investigators, but its origin was in the laboratories of the Arkansas Archeological Survey. Suffice to say, without the Survey, and the Arkansas Archeological Society which has supported its development, the alpha-recoil track dating method would be the province of other laboratories or other investigators had it been discovered at all.