Memorandum: JFK assassination January 1970

Topic... The alleged fragmentation of bullet CE 399

To..... Harold Weisberg
Gary Schoener
Howard Roffman

From.... Dick Bernabei

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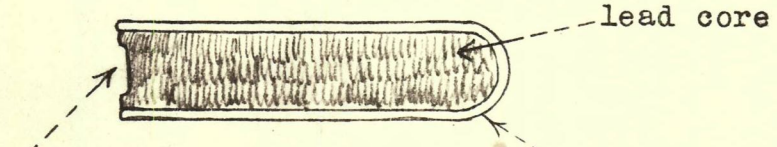
This memorandum deals with the question whether bullet CE 399 lost any of its substance in the form of fragments from any place on its surface. The evidence bearing on the question proves that CE 399 lost no fragments.*

## The construction of CE 399

CE 399 belongs to a class of bullets which technically are referred to as full metal cased (FMC). Like other FMC bullets, CE 399 is composed of a lead alloy core that is encased all around its surface by a copper jacket, except at the base, the trailing end, where the lead core is exposed. The following diagram illustrates the pristine construction of bullets like CE 399.




## The copper jacket

Expert testimony regarding the condition of CE 399 precludes the possibility that the bullet lost any fragments from any place on its copper surface.

FBI firearms identification expert Robert A. Frazier examined CE 399 and reported on the condition of its jacket. Frazier testified that the copper surface of the bullet was completely intact when he

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* Readers who are not familiar with the way in which CE 399 is alleged to have figured in the assassination of President Kennedy should now read the Appendix that is attached at the end of this memorandum.

first received it on the evening of the assassination. He stated that the copper jacket bore the imprint of the lands and grooves of the rifled barrel through which the bullet had been fired, and that the bullet was slightly squashed longitudinally near the base, but that the copper surface was not otherwise disturbed.

## Removal of fragments for spectrographic analysis

The present condition of CE 399 differs from its condition when Frazier first examined it. In order to determine the metallic composition of the bullet by spectrographic analysis, Frazier manually removed substance from two portions of the bullet: in 1964, before the Warren Commission, Frazier testified that he scraped a small amount of metal from the copper jacket at the nose of the bullet, its leading end; and in 1969, at the trial of Clay Shaw in New Orleans, Frazier testified that he also removed a small amount of metal from the lead base of the bullet.

Exhibit 1 (attached) shows CE 399 with the defect that resulted when metal was removed from the bullet's nose. The defect resulting from the removal of a portion of lead from the base is discussed below (p.8).

## The base of CE 399

The testimony of firearms identification expert Frazier concerning the condition of CE 399 establishes beyond doubt that until Frazier removed substance from the nose of the bullet, CE 399 lost no fragments whatever from any place on its copper surface. Physical characteristics of the base of CE 399 conclusively establish that until Frazier removed a small amount of lead from the base, CE 399 lost no fragments from any place on its base.

Frazier did not testify regarding the condition of the base of CE 399. The analysis that follows depends on observation of two photographs which depict the base of CE 399.

Photographs of the base of CE 399

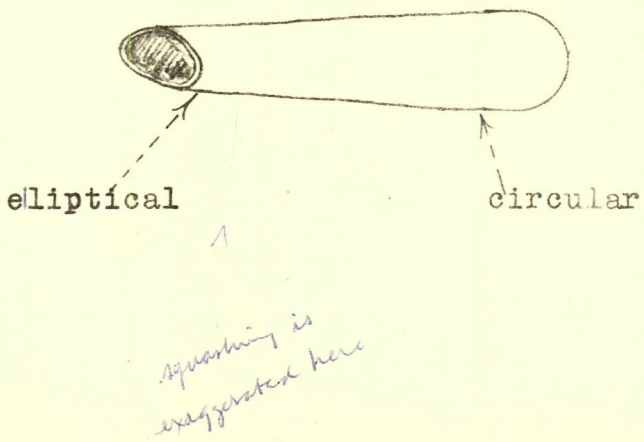
Exhibit 2 (attached) is a Xerox copy depicting two separate photographs that show the base of CE 399. This exhibit and others like it are intended only to illustrate the location of various topographical features that occur on the surface of the base. Details discussed in this memorandum refer to the photographs themselves which are in the possession of those who receive this memorandum.

The photograph designated "photo-W" was made at the National Archives for Harold Weisberg in 1967; the photograph designated "photo-R" was made at the National Archives for Howard Roffman in 1968. Photo-R was taken at a considerably greater distance from the bullet than photo-W, and therefore fails to resolve minute details of the base as clearly as photo-W.

The deformity of CE 399 near the base

When a bullet leaves the rifle barrel from which it is fired, the circumference of the bullet retains the circular shape of the rifle bore until the bullet strikes some substance that may cause it to become deformed.

The generally elliptical shape of CE 399 at and near its base indicates that in the course of its trajectory it came into contact with a substance of sufficient density to squash the rear portion of the bullet longitudinally. The circumference of CE 399 is circular near the nose; the elliptical deformity is apparent about half way down the bullet's length and becomes progressively more pronounced as it approaches the base. The following diagram illustrates the elliptical deformity of CE 399:



The cause of this deformity cannot definitely be ascertained, but the most likely explanation of the deformity is that, inhibited by the substance which it penetrated, the velocity and spin of the bullet were reduced sufficiently to cause the bullet to be unstable and to tilt. Proceeding along its trajectory in this tilted posture, one side of the bullet pressed heavily against the resistent substance and thereby became squashed.

Since there are no marks on the surface of the bullet which indicate that it struck anything else, it is reasonable to conjecture that the bullet came to rest in the same substance that caused its deformity.

Two possibilities may with certainty be eliminated from consideration of the cause of the eliptical deformity: CE 399 did not brush forcibly against any hard surface in the course of its flight; and it was not fired into cotton batting.

When a bullet brushes forcibly against a hard substance, a substance that does not readily yield to pressure, the hard substance disrupts the regular pattern of lands and grooves that are imprinted on the copper sides of the bullet. The imprinted lands and grooves on the surface of CE 399 are thoroughly regular and undisturbed.

Cotton batting possesses certain special adherent qualities which inhibit the deformation of bullets that are fired into it. When a bullet spins rapidly into cotton batting, tiny fibers adhere to the bullet and begin to spin with it as it proceeds along its trajectory. Additional fibers accumulate progressively around the fibers which adhere directly to the bullet, and thereby form a tight, protective ball of cotton that does not allow the bullet to be in any way deformed. Bullets recovered from cotton batting retain the form that they had when they struck the cotton.

The explanation of what happens to a bullet when it is fired into cotton batting does not preclude the possibility that CE 399 was fired into some other fiberous substance than cotton.

Nomenclature and location of topographical features of the base

The following arbitrarily selected terms apply respectively to various topographical features that are evident in the two photographs which show the lead core at the base of CE 399. The locations of these features are designated in Exhibit 3:

jacket (copper)
rim
rim indentation
valley
crater
lumps A, B, and C
hollow (area surrounded by other structures)

Factors leading to the conclusion that the base of CE 399 lost no fragments

It is evident that in the course of being squashed the surface of the lead core at the base of CE 399 suffered some disruption, especially in the area where lumps and cracks appear. Heavy pressure on the impacting bullet caused some of its core to flow back slightly out of the jacket; when the bullet was squashed at the base, the protruding lead became slightly cracked and mangled.

Notwithsatnding its deformity, the surface of the lead core at the base of CE 399 displays no characteristics which indicate that any fragments were lost from this region of the bullet. On the contrary, two factors offer positive indications that no fragments were lost: (a) the absence of flat, striated surfaces; and (b) the presence of what appear to be fine grains of gunpowder.

(a)Absence of striated surfaces: Striae, microscopically small scratches in the form of parallel lines, occur when two solid objects rub against one another and the harder of the two surfaces imprints elongated marks on the softer. Because lead is an extremely soft metal, almost any solid surface that rubs forcibly against it will imprint the surface of the lead with these tiny parallel scratches. The absence of striae on the base of CE 399 precludes the possibility that the base of the bullet brushed forcibly against any hard object with a rough surface.

Moreover, since the raised structures on the surface of the base are rounded, it is not possible that that the bullet brushed forcibly against any exceedingly smooth object that might not scratch a lead surface. Such an object would flatten the tops of small lead structures; on surfaces of microscopically small dimensions, smoothness implies flatness.

The only flat, unstriated surface on the base of CE 399 occurs on the "rim" in an area less than one millimeter in length. The location of this tiny "plateau" is indicated in Exhibit 4 (attached). Physical characteristics of the "plateau" indicate that its flatness resulted from mild pressure being applied at that point by some hard, relatively smooth surface.

(b) Presence of "powder": Fine grains of gunpowder often become embedded at the lead base of bullets when they are fired. The intense heat and enormous pressure resulting from the combustion of gunpowder softens lead at the base of bullets during the course of firing. → temperature above that of molten steel While such bullets are being propelled through the barrel of a gun, many remnants of burned gunpowder may adhere to the softened lead and become embedded there.

The frequency with which gunpowder occurs in the base of a bullet depends greatly on the composition of the lead alloy. If the alloy is relatively hard and is not readily subject to softening by the heat and pressure of combusting gunpowder, few if any flecks of gunpowder may become embedded there. If, however, the alloy does soften under such heat and pressure, many flecks of gunpowder may adhere to the surface at the base.

Photo-W, the clearer of the two photographs in Exhibit 2, discloses the presence of a grainy substance (henceforth referred to as "powder") all over the lead base of CE 399, except on "lumps A and B" and in places where lead was disturbed in ways unconnected with the actual shooting of the bullet. (These exceptions are discussed below.) In the "valley" the flecks of "powder" look like tiny grains of sand on the "valley" floor. On "lump C", around the "rim", and in the "hollow" the grainy substance appears as tiny dots of reflected light.

The "powder" on the lead base of CE 399 may be gunpowder, dust, or a combination of both. The precise nature of the "powder" cannot be positively ascertained by the use of a single photograph, for apparent differences between various flecks of "powder", especially

those that appear as points of light, may result not from inherent differences in the flecks themselves, but merely from differences in the ways they reflect the light that strikes them.

Since many of the flecks of "powder" are irregular in shape and appear to be embedded in the lead, not merely resting on its surface, it is my firm opinion that most of the "powder" on the lead surface of the base is gunpowder. Some of the white dots, especially those that look like tiny white eggs resting on the lead surface, seem to be flecks of dust, but they are few in relation to the number of irregularly shaped flecks that appear to be embedded in the lead.

If the "powder" that occurs on the base of CE 399 is gunpowder, it is impossible that lead was detached from any surface where the "powder" appears. The removal of lead by any means implies the removal also of gunpowder adhering to the lead.

A further reason for believing that the "powder" consists mostly of gunpowder is that no irregularly shaped flecks occur on the copper jacket. Copper lacks the adhesive properties of softened lead and does not readily retain gunpowder that strikes its surface in the course of firing.

Absence of "powder" from "lumps A and B"

On most of their surface "lumps A and B" lack flecks of "powder" such as those that occur on other parts of the base. Since their roundness and the absence of striae on the surface of these "lumps" preclude the possibility that any fragments were detached from this area, it must be supposed that the flecks of "powder" were detached by attrition during normal processes of handling the bullet. Such attrition might result from the base being rubbed by a soft cloth, or even from the bullet moving inside a padded container.

The "rim indentation"

The indentation on the "rim" of the base results not from the detachment of substance by fragmentation, but from the displacement of substance by pressure. Between the time when the bullet was fired and the time when its base was photographed, the bullet bumped gently

against some hard object that caused the "rim indentation". Such an indentation can easily be reproduced by lightly tapping a lead surface with the back edge of a knife or with some similar object.

Sharpness at the edges of the "rim indentation", and the fact that its edges overlap the jacket and the surrounding lead indicate that the indentation occurred after the bullet was fired. The heat and pressure of burning gunpowder soften lead at a bullet's base and dull the sharp edges of tiny lead structures.

## The crater: removal of lead for spectrographic analysis

Characteristics of the conical "crater" and of a small surface adjacent to it on "lump B" indicate that it is from these places that FBI agent Frazier removed substance from the base for spectrographic analysis. Evidently Frazier used the tip of a sharply pointed knife with which to cut away a small portion of lead from the base. Conical craters similar to the one that occurs on the base of CE 399 can easily be reproduced by such means. Moreover, a pointed knife of a certain degree of sharpness regularly reproduces not only the conical "crater", but also minute lumps of lead at the bottom of such craters, lumps similar to those that occur at the bottom of the "crater" on the base of CE 399.

The reason for believing that a part of "lump B" was removed by a knife edge is that the surface in question is flat and striated.

The precise areas affected by the edge of a knife are indicated in Exhibit 4.

## "Flake of lead" accidentally detached

In conversation with Howard Roffman and in personal correspondence...

In personal correspondence with Harold Weisberg an official of the National Archives recently reported that a small "flake of lead" was accidentally detached from the base of CE 399 on a date prior to the time when the base of the bullet was first photographed.

Concerning the question from what area of the base that "flake of lead" originated, the foregoing analysis eliminates all possibilities except that the "flake" was detached from some area associated with the "crater", for that is the only area of the bullet where any substance is missing.

sb. "base"

Summary of conclusions

There is no area on the surface of bullet CE 399 from which any fragments are missing, except those areas where copper and lead were manually detached after the bullet came into the possession of official investigative authorities.

FBI firearms identification expert Frazier examined CE 399 microscopically and testified that when he first received the bullet no fragments had been detached from its copper jacket.

Certain features of the lead portion of CE 399 conclusively establish that when Frazier first received the bullet no fragments had been detached from its base: although the base is squashed, mangled, and slightly cracked, no flat and striated areas occur on its surface; and a photograph of the base discloses the presence of what appear to be fine grains of gunpowder embedded in the surface of the base.

Relevance to the wounding of President Kennedy and Governor Connally

The foregoing analysis proves that CE 399 lost no metallic substance in the form of fragments. That conclusion precludes the possibility that the Warren Commission is correct in its assertion that CE 399 wounded Pres. Kennedy and Gov. Connally. The numerous metallic fragments that were deposited in the bodies of the two victims of gunfire must have originated from a source other than CE 399

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Attachments

Attached to this memorandum are an Appendix and four Exhibits.

Appendix

Summary of the Warren Commission's conclusions regarding the role of bullet CE 399 in the wounding of President Kennedy and Governor Connally

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When the shooting occurred, President Kennedy was sitting on the right rear seat of an open convertible limousine. Governor Connally was seated on the jump seat of the same limousine, directly in front of the President. The Report of the Warren Commission asserts that bullet CE 399 wounded both men in the course of its trajectory.

Alleged trajectory of CE 399

According to the Report, CE 399 struck Kennedy low in the back of the neck, traversed his body without striking bone, and emerged from the front of his neck; continuing its flight, CE 399 then seriously wounded Connally in three separate parts of his body.

The Report concludes that, after exiting the body of the President, CE 399 passed through the torso of Connally where the bullet struck with sufficient force to shatter a part of the fifth rib on the right side and thereby to cause fragments of that rib to become secondary missiles; after exiting Connally's chest, the bullet penetrated and fractured Connally's right wrist, exited the wrist, and finally came to rest in Connally's left thigh.

The Report further asserts that the bullet gradually worked itself out of Connally's thigh and fell unnoticed on the hospital stretcher on which Connally was transported to an operating room. The bullet was found on a stretcher in the hospital a few hours after the injured persons arrived there.

Metalic fragments in the bodies of Connally and Kennedy

According to records published by the Warren Commission in 1964, metalic fragments were deposited in all the parts of Connally's body that were struck by gunfire: in the right side of Connally's torso a metalic fragment was deposited on the fifth rib; several metalic fragments were deposited in Connally's right wrist; and a metalic fragment was embedded in Connally's thigh.

In 1969 it was officially disclosed that several small metalic fragments in the area of Kennedy's neck are visible in X-rays that were made during the autopsy of the President's body.

End of Appendix

Exhibit 1

(to be inserted)

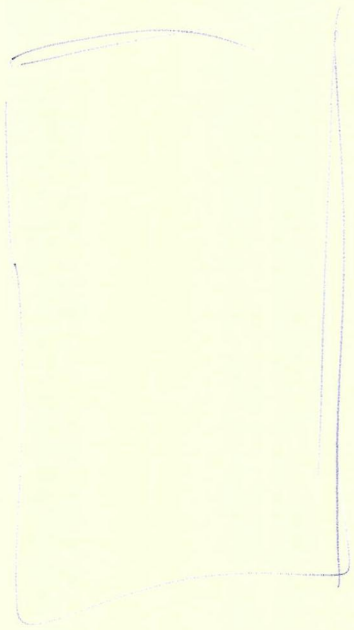
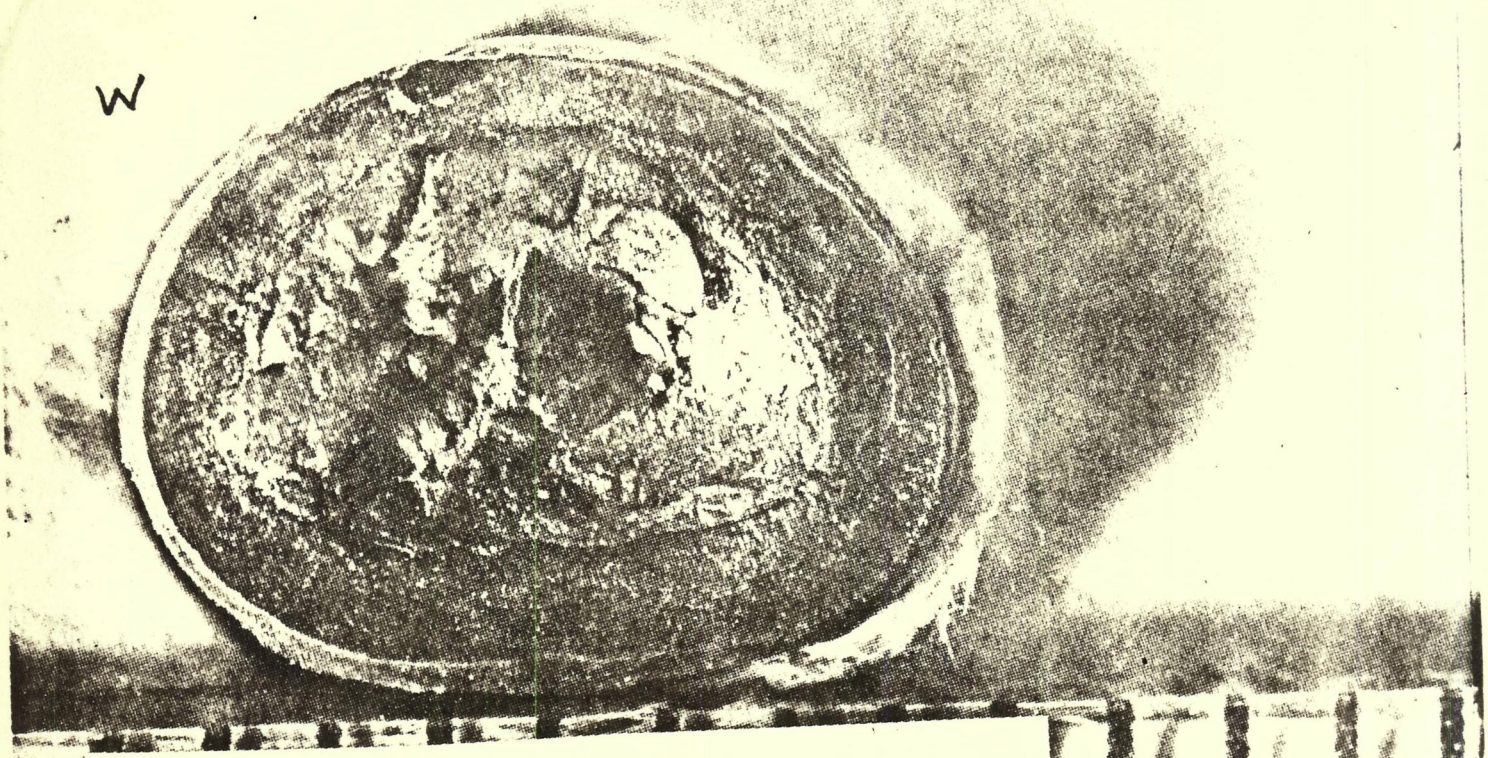


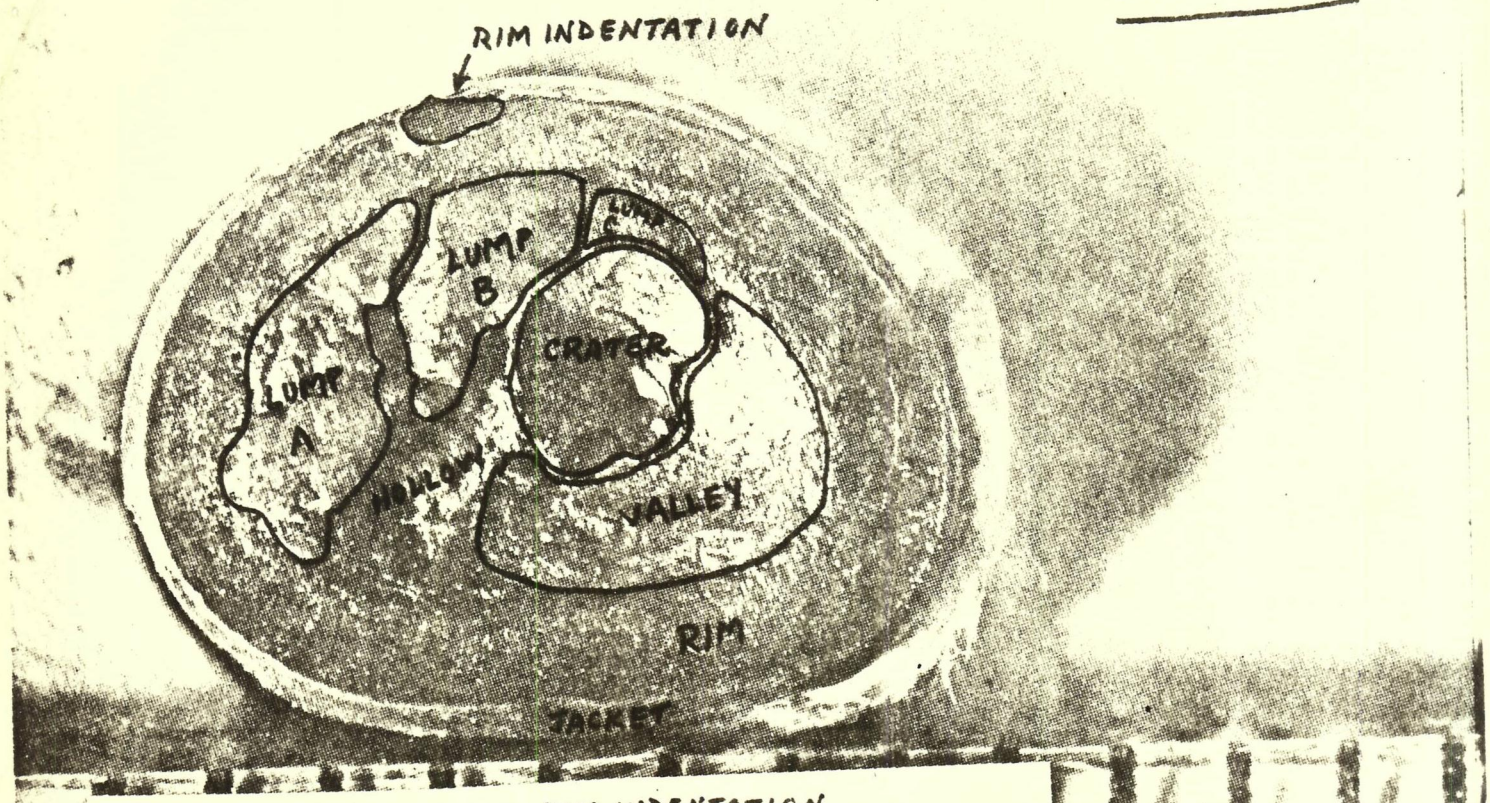
EXHIBIT 2





(MILLIMETER SCALE REFERS ONLY TO PHOTO-W)

EXHIBIT 3


RIM INDENTATION
LUMP B
LUMP A
CRATER
HOLLOW
VALLEY
RIM
JACKET

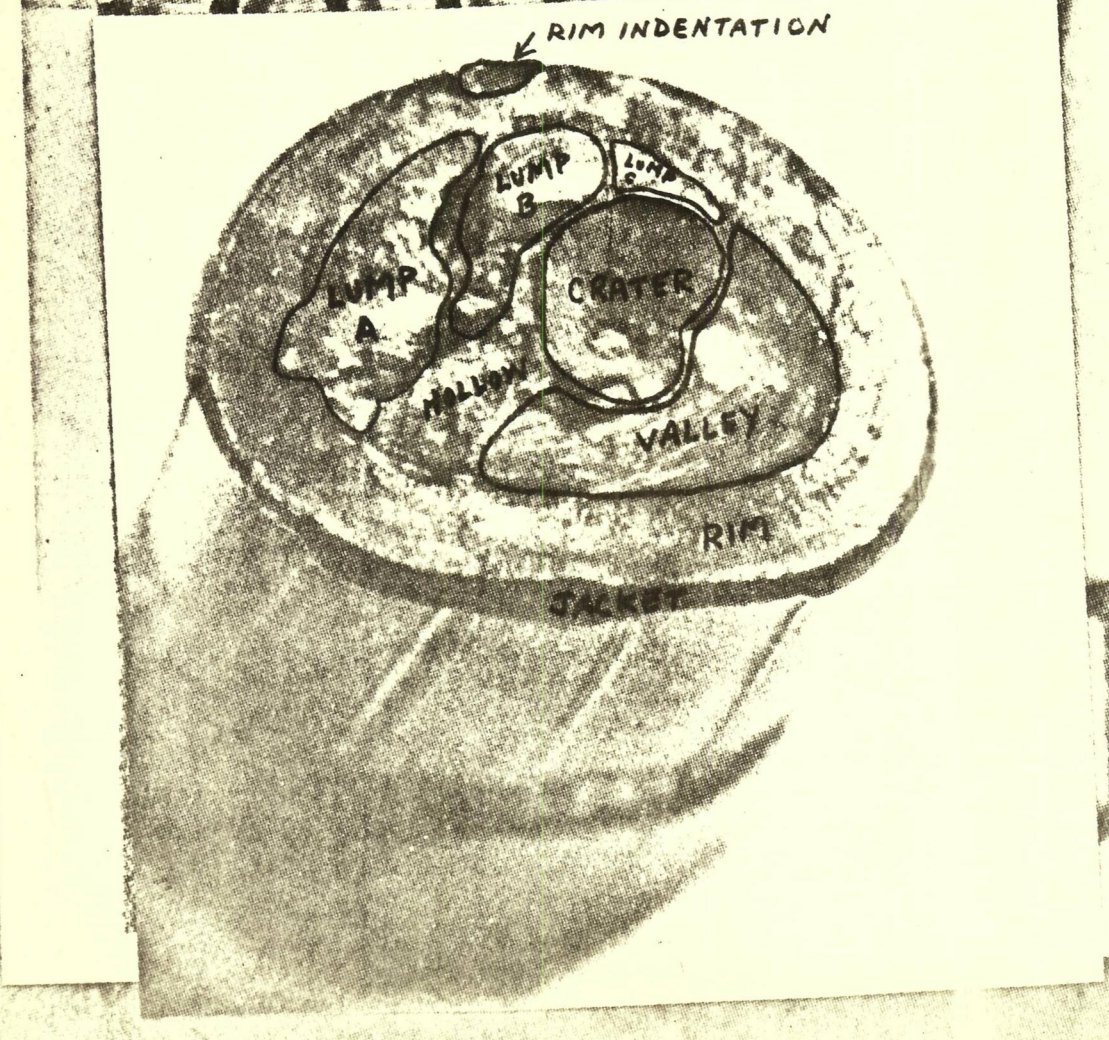

RIM INDENTATION
LUMP B
LUMP A
CRATER
HOLLOW
VALLEY
RIM
JACKET

EXHIBIT 4