Traces of Ball Lightnings in Apparatus

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Abstract

Researchers of electrical discharge and electrolysis experiments have been finding microscopic markings that are unusual and anomalous. These markings are made by microscopic objects that are in the size range of 400 micrometers to 1 micrometer. These objects are a type of microscopic ball lightning. They share the anomalous characteristics of natural ball lightning (BL). Pictures of the markings and anomalous effects that were taken by six groups of researchers are shown and explained in this article.

Introduction

Microscopic ball lightning (MBL) leave microscopic markings and residual effects similar to those caused by natural ball lightning, tornadoes and experimentally produced plasmoids. Since 1992, Matsumoto, Dash, Shoulders, Miley and Lewis, Savvatimova, Urutskoev, and Iviolov, have published pictures of microscopic ball lightning markings and effects, and the photographs show patterns of behavior that are identified and explained in this article. These effects can be classified as 1) the effect of ball lightning motion by removing material: bore holes, scratches and pits, 2) ball lightning radiation and emission effects, 3) residual markings such as trails and rings and residues, 4) areas of atomic motion such as sloshing, change of crystalline structure, phase transitions, the disappearance of atoms, crystals, dendrites and filaments, and 5) transmutation and isotopic residues. Photographic examples of each of these types of behavior are explained in this article.

Experimental researchers have produced interesting and beautiful pictures of MBL and their effects that require explanation. People have experienced the anomalous behavior of natural BL and experimentally produced plasmoids, but a theory was lacking. One of the basic ideas presented in this article is that atoms may enter a state in which they behave anomalously. In 1991, T. Matsumoto published an article on elemental transmutation in which he showed microscopic voids with transmuted elements.[1] He published pictures of the anomalous microscopic markings left on electrodes and witness sheets (nuclear emulsions used for particle detection) during his electrolysis and discharge experiments. It was hypothesized that microscopic BL were being formed at the site of the voids or that BL were causing the voids.[2,3] The many kinds of markings he and others have found are evidence that the hypothesis is a valid one, since the markings show that the objects behave like BL.

There is a state of existence of substance and space like that of natural BL. Objects in a BL state behave in ways that are anomalous to generally accepted theory. These objects may travel through materials, move anomalously, move at low energies or low heat, transmute, combine to form bigger plasmoids, divide, emit plasmoids and beams, convert to energy, and form interesting structures. These behaviors are evident in the five categories of BL behavior photographed by the researchers. These objects have been researched for decades, but only recently have the more anomalous BL-like behaviors been clear and a full theory is still lacking. These objects have been called by various names including EVs and charged clusters by Shoulders, EB filaments and plasmoids by W. Bostick and other researchers, ectons by Mesyats and other researchers, and microscopic BL by me.

The evidence is that these MBLs behave like the larger natural ones. Maybe BL smaller than a millimeter weren't reported because they are difficult to see and people mistake the objects for something else. When I was a small kid I may have seen BLs about 1 millimeter in size that I made by breaking a rock with a hammer, but I called them sparks. If I remember correctly, they changed colors, gave off a high-pitched sound, and one of them circled me and hit me on the wrist causing pain for a second, but left no mark. About ten years ago, Matsumoto reported the microscopic markings left by natural microscopic BL generated during the Matsumae earthquake in Hokkaido where he lives.[4] He was using special Acrylite sheets called nuclear emulsions for artificial MBL experiments. Markings that he found on these sheets after the earthquake remind me of a hole left by a whirlwind type effect because there was a cone of material left intact inside a ring shaped pit and there was evidence of whirling behavior in the mark.

Five Classifications for Traces of Ball Lightning

Class 1) The effect of BL motion by removing material: bore holes, scratches and pits.

BLs move through materials either by boring or without boring. One of the anomalous behaviors of natural BL is making holes in glass windows and in walls.[5] BL, tornadoes, and whirlwinds may move loose materials and pick up leaves, dirt, rocks and other objects. They sometimes leave trenches or grooves in the ground or on materials. The transported materials may revolve around these objects or may simply be moved by them. These behaviors are discussed in prior articles. Sometimes, BLs pass through glass windows without visible effect to the glass. The manner of passage of BL through material may depend on the properties of the material. For example, some windows are made with lead.[6] Some of the microscopic objects Matsumoto produced experimentally may have passed though glass and plastic sheets without leaving an apparent hole before they left markings on his acrylite plastic nuclear emulsions.

Figures 1-3 show typical tunnel-like borings.[7] In Figures 1 and 2, the holes are in aluminum foil that is 6 micrometers thick, and are the entry and exit holes of a BL-like object. The pit in Figure 1 is about 2 micrometers wide, and the one in Figure 2 is about 3 micrometers wide. Perhaps the object grew as it passed through, which is a typical BL behavior. Figure 3 shows a cross section of EV boreholes through a 1/2 millimeter thick aluminum oxide plate. The aluminum oxide has a melting point of 2,050 degrees centigrade. This shows some of the power of these little objects to make holes. Natural BL is often seen paired or in chains or rings of individual BLs. For example, someone reported a train of 25 to 30 blue globes the size of bowling balls roll rapidly down a mountain path during a thunderstorm.[8] This alignment is evident in Figure 3. Roberto Giudici took a picture of four waterspouts that were aligned in a straight row on August 1999 near Albania in the Adriatic Sea. Prior articles will explain that I identify BL and tornadoes as types of the same general kind of plasmoid.[9] Figure 4[7] is a typical BL ring mark of pits arranged in a circle. Sometimes BL and tornadoes will leave a trench in the ground. Here is one example; I've read several reports similar to this:

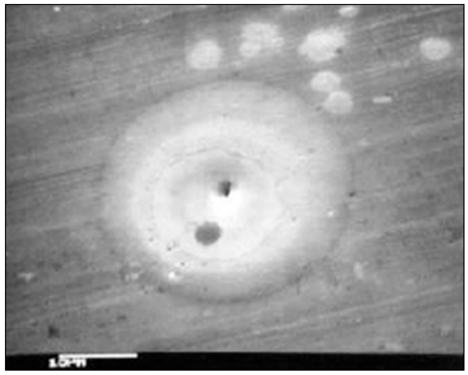

Figure 1. Entry pit of EV into aluminum sheet.

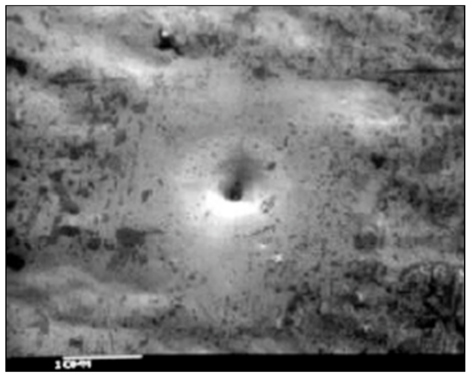

Figure 2. Opposite exit pit of EV from the sheet.

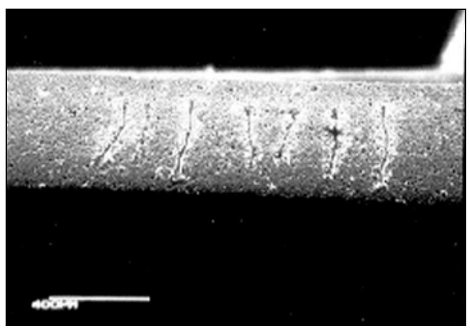

Figure 3. Scale is 400 micrometers.

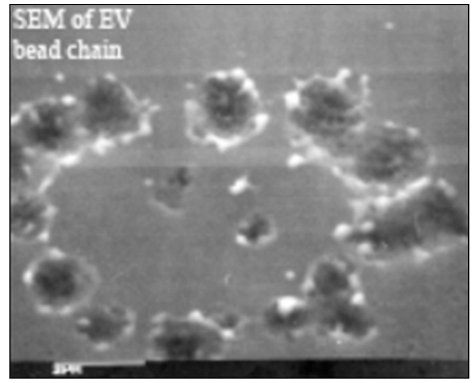

Figure 4. Scale is 25 micrometers.

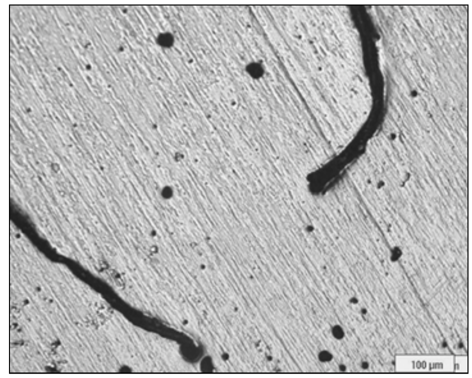

Figure 5. Scale is 100 microns.

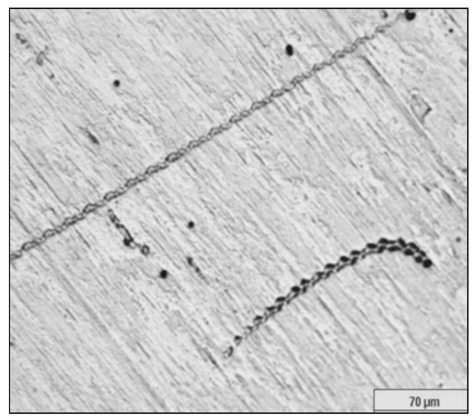

Figure 6. Scale is 70 microns.

> A tornado or an accompanying fireball dug a trench in a hard-packed clay tennis court at Curepipe, Maritius, in the Indian Ocean, on May 24, 1948: A trench running in a north-south direction, 60 feet long and 1 to 2 1/2 feet wide, was cut in the bare surface of the court to a depth varying from 1 to 4 inches. The material lifted from the trench was all thrown to the west to a distance of 50 feet; pieces weighing about one pound were thrown as far as 30 feet. The surface material was slightly blackened as if by heating, and a crackling that of a sugar-cane fire was heard for 2 or 3 minutes. . .one claims to have seen a ball of fire about two feet in diameter which crossed from a football pitch to the tennis court through a wire-netting fence without leaving any evidence of it passage. . .[10]

Maybe the trench-like markings in the next several pictures were caused by a similar effect. Savvatimova (Figure 5) found these ditch-like trench marks and pits in the surface of palladium used in a glow-discharge experiment[11] that are due to the movement of BL over the surface. Some tornadoes and BL showed a tendency to hop up and down making holes, and as was explained previously[12] some of the markings shown by Matsumoto show the same effect of hopping. Figure 6 shows two BL trail-like markings.[11] The top linear mark may show that a BL entered the pit or made the pit. Notice the short, thin, shallow trench mark below the long one. Markings like that remind me of marks in the 1993 article by Silver *et al.*[13] and in components of Miley's experiment.[14,15] Figure 7 may show that a BL made pits[11] as it traveled in a fairly straight line. The pits may be connected by a shallow and narrow scratch mark. There are other such marks. It seems less likely to me that a string of MBL left the string of pits. Brush discharges connected pits and rings in a picture shown by Nardi *et al.*[16] Figures 8 and 9 show ring marks on the microspheres from an experiment by Miley *et al.*[14] As explained previously,[12] this cell registered the highest recorded energy output of various runs. Compare this to Figure 4. Figure 8 shows a ring of pits in the metal coating of the microsphere.[14,15] And Figure 9 shows a faint white ring

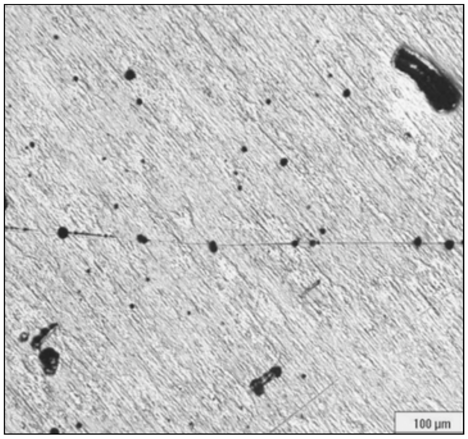

Figure 7. Scale is 100 microns.

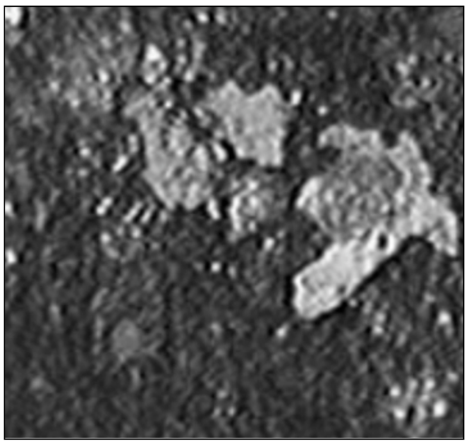

Figure 8. Two rings of pits in thin film of Ni on plastic microsphere.

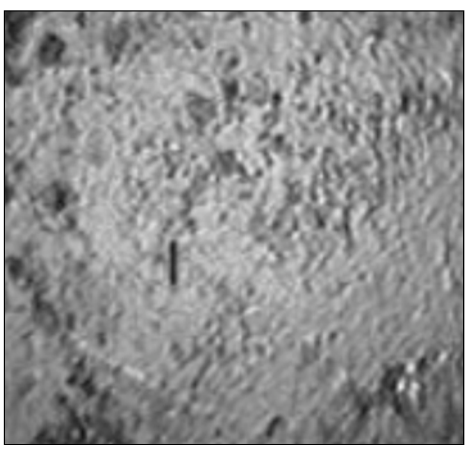

Figure 9. Faint ring in plastic microsphere.

Figure 10. Optical picture of revolving EVs. Taken with a special camera.

in the plastic substrate of a microsphere.[14,15] Figure 10 is an optical photograph taken by K. Shoulders[17] of a revolving pair of EVs loosening up. In nature, two or more BLs and tornadoes often revolve. Shoulders used a special form of particle sensitive camera. The photograph is included to compare it with the marking on the electrode shown in Figure 11 and the trace on X-ray film shown in Figure 14a. The evidence is that the plasmoids he has researched are individual objects. Figure 11 shows the mark of a BL or maybe a pair of them[11] which left a dark mark on the surface of the palladium used by Savvatimova.

Could the trenches, tunnels, ring marks, pits and other markings be made by a beam of some type and not by individual objects? Ken Shoulders told me that EB-filaments studied by Bostick, Nardi, and other researchers were found later to be individual objects traveling very fast when a very fast camera was used.[18] Shoulders has recently written that Winston Bostick came to recognize that the plasmoids he studied, also called EB-filaments, were composed of the EVs. Shoulders wrote: ". . .Winston did his work, he did not know that EVs were the main component of his plasmoids. Years later, when I employed him as a consultant on EV technology, he came to see the effect and love it."[19]

Maybe the pictures here show two ways that MBL leave holes, one is by traveling through and the other is by drilling without passing through, like a tornado. As an example of the second way a BL makes holes, Egon Bach reported that two large BL drilled holes in the ground in the Soviet Union.[20] A slightly flattened glowing ball about 400 m in diameter hung for an hour low over the ground over the same spot—only one kilometer from seven observers. Afterwards they found a huge hole that they thought the object had probably dug. No trace of the excavated material could be found. Another group of seven men saw a similar, smaller red object about 3 kilometers away from the first. Professor Zolotov was asked to study the holes. One of the strange holes was three to four feet wide but 30 to 40 feet deep. It widened to eight feet in diameter at the bottom. The walls were covered with a layer of carbon dust about .2 mm thick. The carbon fiber had a radiation three times above normal. The carbon dust is an example of residues left by BL as discussed in the section for Classification 3. Carbon residues have been reported by Matsumoto and Savvatimova and some other cold fusion researchers.

Class 2) Ball lightning radiation and emission effects.

These objects emit particles, beams, sound, light, electrical discharges, and plasmoids of various kinds. Most BL photographs are simply a streak of light, due to the motion of the BL, like the pictures by Shoulders shown in this article. According to Feugeas, the EB-filaments that he studied with Nardi and Bostick traveled at a speed of .76 of the speed of light.[21] The path in Figure 11 is a streak of the light emitted from the moving plasmoid.

These objects emit neutrons and other particles. Nardi, Bostick *et al.*[16] reported that their plasma focus discharge device containing deuterium oxide produced neutrons. Lightning is known to produce neutrons,[22] and G. Dijkhuis and J. Pijpelink[23] reported neutrons during their experimental study. One trace shown by Matsumoto in his articles which he called a "superstar trace" (Figure 8 in the referenced article[24]) showed some type of particle or small plasmoid emission from a larger BL-like object that moved on the plastic sheet. A similar trail mark without marks of emissions is shown in Figure 3e of Reference 25.

Figure 12 taken by Urutskoev shows emission from the MBL that made the trace registered on a nuclear photoemulsion.[26] I am assuming that the long streak is a trail. He wrote: "Six such 'comets' were detected inside the area 4 cm^2. Their sizes varied from 300 mcm to 1300 mcm." They look like markings Matsumoto called traces of "white holes" in his articles in *Fusion Technology*.

Class 3) Residual markings such as trails and rings and residues.

Unlike a ditch-like marking due to the removal of material, this type of marking may be the placement of a residue of some type or a chemical change coloring the materials. Figure 13[27] is like some others Matsumoto has shown on acrylite showing both ring and trail marks as if BL slid and hopped on a nuclear emulsion in a tornado-like manner. Figure 14 shows markings on X-ray film outside (A, B) and inside the vacuum chamber after deuteron irradiation in glow discharge.[28] Figure 14a may show the trace of a MBL moving in a spiral motion.

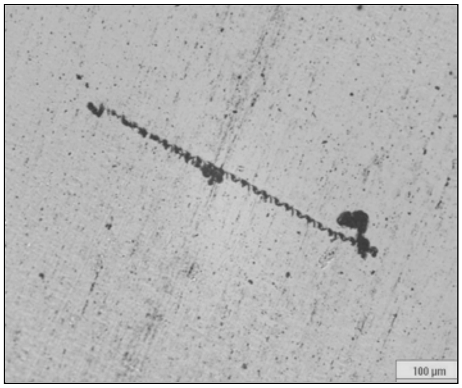

Figure 11. Marking in palladium by Savvatimova.

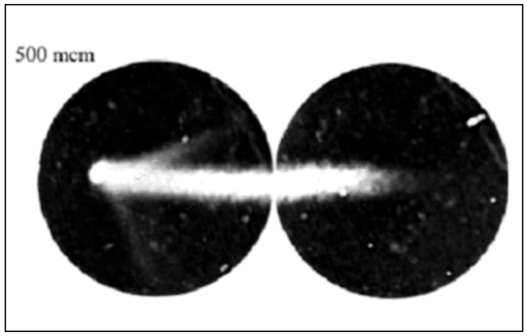

Figure 12. Comet-like marking with rays.

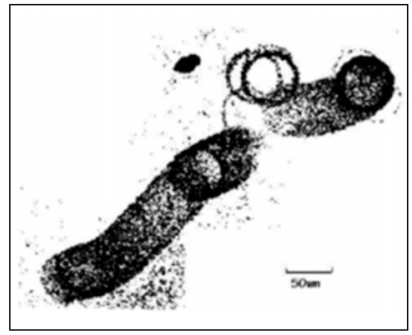

Figure 13. Ring marks and trail marks.

The blots in Figure 14c look like the round darkened areas on emulsions shown by Matsumoto[25] and may be like the round spots shown by Urutskoev in Figure 16c of his article.[26] There is obvious electrical discharge from BL and MBL. Some of Matsumoto's and Urutskoev's markings show the emission of beams or rays of some type. For example, Figure 2b of Matsumoto's article[25] shows a mark like a discharge from the object. The emission of beams, rays or sparks of some type are commonly reported about BL.[8] The spiral in Figure 14a opens from right to left, and looks similar to Shoulders' Figure 10.

Figure 15 is by Savvatimova of a marking on nuclear emulsion placed around a glow discharge chamber.[11] She found many such markings on emulsion set both inside and outside the chamber. It is about 100 micrometers wide. The fainter light colored marking to the right which is about 15 micrometers wide, seems more similar to the clear long trail markings on nuclear emulsions which Matsumoto called "loop-like"[24] traces (group six of Reference 24), which I thought were due to either some type of sloshing or shallow indentation of moving MBLs. Figure 16 is a marking on nuclear emulsion.[11] This may be a record of the radiation that the MBL was emitting. There is a marking shown by Matsumoto in Figure 3c and Figure 3d of Reference 25 that seems to show two objects that mimicked each other moving in opposite directions on an emulsion. Figure 3c has a light colored boundary and Figure 3d has a dark boundary. These two figures are simply different focusings of the microscope on the same track. But the track in Figure 3d of that article by Matsumoto looks much like this Figure 16. I am wondering if this may be the reason for the thick, dark border in Figure 16.

One of the anomalous behaviors reported about many BL and UFO objects is sharp angled turns without any deceleration. Egon Bach reported such objects emitted from volcanoes.[20] Large BL may leave residues and tracks similar to these of MBL. In Figure 17, a sharp angle of turn of MBL may be recorded in emulsion.[11] The track appears to be a chemical change or a deposit on the emulsion. From the looks of it, the MBL moved downwards leaving the thick stroke, backtracked slightly and then made the segmented track. The last position of the object on the thicker streak was at the intersection with the segmented track. This type of segmented track looks to me like the track an object traveling in a helical motion would leave. The object seemed to have been round because a round mark is evident at the point of intersection. Figure 18 is a similar sharp angle turn photographed by Shoulders.[17] It is evident that there was no acceleration of the MBL at the turns because the path shows the same brightness throughout.

Class 4) Areas of atomic motion such as sloshing, change of crystalline structure, phase transitions, the disappearance of atoms, crystals, dendrites and filaments.

Two ways atoms may move anomalously are as the result of BL contact or influence or due to stresses. Atoms may move, reorganize and transmute in the presence of BL leaving crystals or changing the crystalline structure or phase structure of material. Alternatively, stressing materials or substances may cause the formation of BL or the emission of plasmoids of various kinds, or cause atoms to be in the anomalous state to exhibit qualities such as superconductivity,[3,29] anomalous motion at temperatures below their melting point,[3] and change crystalline structure, transmute, or phase transition.[3,29] For example, Lipson's early experiments on superconductivity and cold fusion effects showed that when a

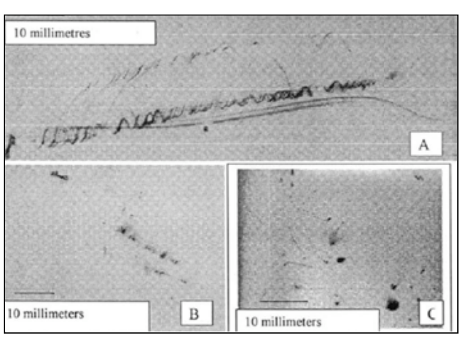

Figure 14. Markings on X-ray films set outside (A,B) and inside (C) vacuum chamber. Deuterium irradiation in glow discharge.

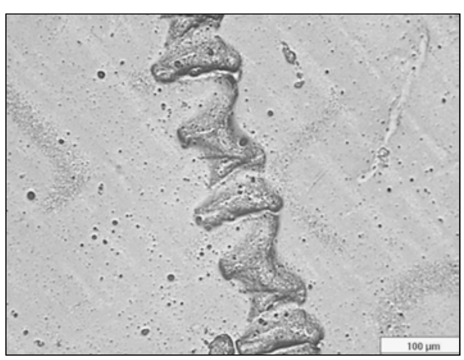

Figure 15. Residual trail mark on emulsion.

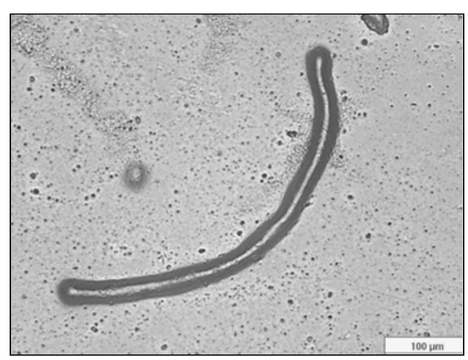

Figure 16. A trail marking on nuclear emulsion? From deuterium glow discharge experiment with W-W cathodes.

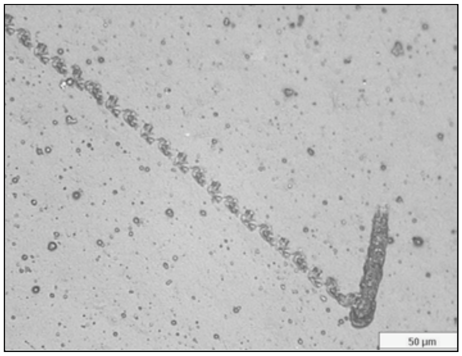

Figure 17. Sharp angle turn track on X-ray film.

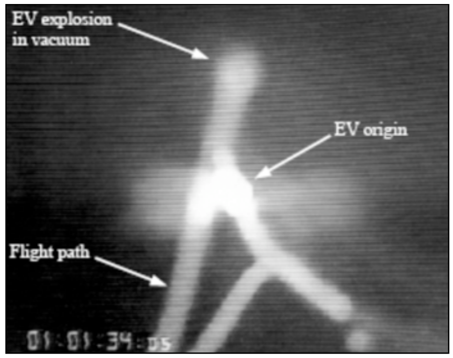

Figure 18. EV picture showing sharp angle turn.

sample of HTSC YBaCu3O7-x was heated,[30] starting from 77 degrees, there was definite neutron emission accompanying the loss of superconductivity and the phase transition to a non-superconducting state.

Figure 19 shows pictures of before and after electrolysis of the Ti cathode and a magnified scratch mark showing some sloshing on the side.[31] It is known that electrodes under electrical current seem to become liquid at a temperature lower than normal. Benjamin Franklin researched the phenomenon of lightning striking metals inside insulating material such as clothing and seemingly merging together as if by melting without scorching the material.[3] Strangely, he called this effect "cold fusion." I think that this anomalous state of atoms exemplified by behavior like this is part of the key to understanding cold fusion. Cold fusion phenomena occur when atoms are in this state. Researchers note the anomalous appearance of crystals and metal deformation during electrolysis. Some researchers have noted that even after an experiment is finished, there is continued transmutation, change of metal morphology, growth of filaments, and radiation when a used electrode is set away in a closed container. Figures 20 and 21[32] both show filaments that grew on electrodes used by Dash. According to Dash,[32] Mizuno found similar growths. In Figure 21, if you look closely, you'll see that the particular fiber they analyzed looked different over time. The fibers in Figure 21 are particularly anomalous because they grew and changed after the experiment was long over.

As explained previously, there exists a state of substance which exhibits anomalous properties.[12] These properties include the propensity of atoms to transmute and move anomalously. I suspect that these two properties are similar since to fuse or fission an atom exhibits anomalous motion relative to its environment. Atoms in this state may tend to organize in geometric patterns. As shown by the mimicking tracks in Iviolov's ICCF11 presentation, Figure 3c and 3d of Reference 25 by Matsumoto, and Shoulders' research, plasmoids have a tendency to mimic each other even over relatively long distances when they are in a group. BL mimic each other in this way in a group.

Class 5) Transmutation and isotopic residues.
Research of the various authors shows a relationship between the production of MBL and transmutation and isotopic changes. Matsumoto's transmutation experiments show this correlation, and Savvatimova wrote, "There are more tracks for experiments with increasing new elements on the cathode surface."[28] In Reference 7, Shoulders wrote that the only places on their deuterium loaded Pd that exhibited elemental changes were those places struck by the EVs.[7] There have been reports of residues left by UFOs that were highly unusual in that there were radioactive isotopes and rare and very heavy elements and other unusual materials. More evidence of this connection between MBL and transmutation is that the microsphere cell Run #8 in Miley's lab has many markings.[15]

Conclusion

Atoms enter an anomalous state in contact with MBL or when subjected to stresses. Atoms may remain in this state long after the cause is gone. It is this state that explains many of the reports of anomalous behavior of atoms after the end of an experiment, and during experiments. This article was written to summarize some evidence for microscopic BL, to explain evidence relating MBL to plasmoids produced experimentally, to summarize the recent (post-2000)

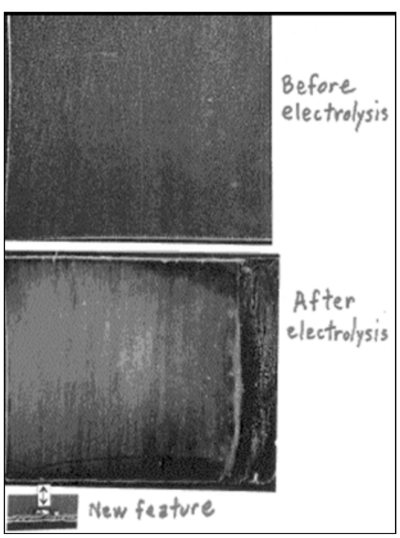

Figure 19. Trench on Ti cathode with sloshing on the sides.

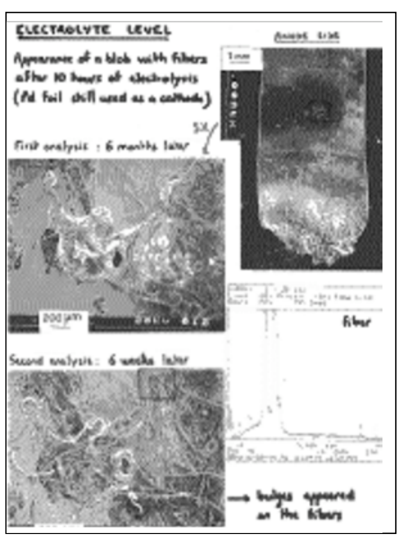

Figure 20. Fibers that grew during electrolysis.

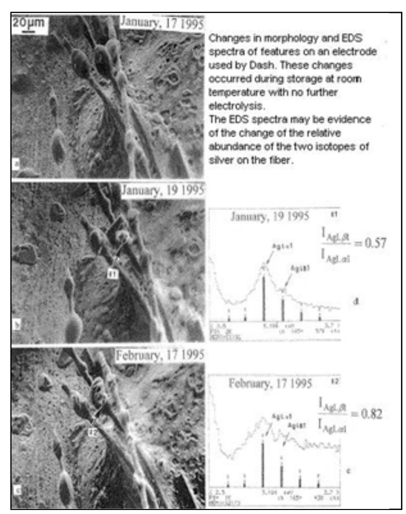

Figure 21. Fibers that grew after electrolysis during 1 month on the electrode with EDS charts.

experimental evidence and relate the work to earlier results, and to attempt to explain the kinds of MBL effects people have been discovering experimentally.

Acknowledgments

I would like to thank Savvatimova *et al.*, Shoulders *et al.*, Matsumoto, Dash *et al.*, Urutskoev *et al.*, and Miley *et al.* for permission to use their images.

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