The Port Sanilac Ice Meteorite
The first Recognized Ice Meteorite with Aquatic and Ice Biology

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Abstract

Ice meteorites (Ice falls) have been reported falling from the sky since the 1800's. The consensus of opinion of scientists is that they are not ice meteorites at all, but formed under unusual conditions affecting the earths troposphere. Some scientists refer to these ices as megacryometeors. Some scientists believe that some megacryometeors have an extra-terrestrial origin and should be referred to as ice meteorites. However, no one has been able to demonstrate any exhibitable evidence that may indicate that an Ice meteorite is extraterrestrial in origin.

New data discovered by this author relating to a new ice fall favor an extraterrestrial origin for the new ice fall. Although admittedly speculative at the time of this papers writing, this author theorizes that this particular ice fall is an ice meteorite having an extraterrestrial origin, and may have originated from Saturn's E ring or from the surface of Saturn's moon Enceladus.

KEYWORDS:
Ice Meteorite, Extraterrestrial, Megacryometeors, Saturn's E Ring, Enceladus

1. INTRODUCTION

It is not uncommon for large chunks of ice to fall to earth. This has occurred even during cloudless days, and these ice falls have led to extensive debate as to their origin (Beech, 2006; Martinez-Frias, et al. 2006, 2007; Bobrowsky & Rickman, 2007; Orellana, et al. 2008). Some scientists argue that they form under unusual atmospheric conditions because some ice falls share several isotopic hydrochemical and textural similarities to large hail stones (Bobrowsky & Rickman, 2007; Martinez-Frias, et al., 2005, 2007; Rull et al. 2010; Deshpande, et al., 2013). Many believe that these ice falls should be referred to as megacryometeors to try to avoid terminological confusion and to emphasize the existence of such atmospheric phenomenon. However, the formation mechanism of megacryometeors is still poorly understood (Deshpande, et al., 2013) (Fu, et al. 2011).

Ice falls have been observed and recorded in the mid-1800's, much earlier than the invention of airplanes. Ice falls due to airplane toilets are well understood as distinctly blue disinfectant is used (Beech, 2006; Bobrowsky & Rickman, 2007).

More recently, a modeling of an atmospheric hypersonic transit of a 10,000 Kg body of porous waterice (S.G. Coulson, M. K. Wallis, N, C. Wickramasinghe 2014) shows that ice meteoroids of one meter radius can survive atmospheric entry to impact with the Earth's surface. And much has been published on the assembled evidence for Cometary Panspermia and Cosmic Biology (N. C. Wickramasinghe 2015).

The favored explanation for large ice falls is that they are megacryometeors formed in the

troposphere. However, if some of these Ices were formed in space, then they are not megacryometeors. Ice falls that have an origin outside Earth's atmosphere should rightly be referred to as ice meteorites. The question then arise as to how the ice meteorites formed and where is their place of origin. One possibility is that they broke off from passing ice comets, and fell to earth. However, Beach (2006) argues that there are two reasons which rule out large ice falls as having originated from comets (cometary bolides). For large ice falls to impact the earth, the velocity restriction requires that the cometary meteoroids must encounter the earth's atmosphere at very low relative velocities, less than 12-13 km/s. The second reason for large ice falls to be ruled out (Beach, 2006) as having originated from comets, is that the needed initial sizes of ice meteorites, to make it through the atmosphere to the surface, need to be in excess of 20 to 50 meters across. However, all previous ice falls were not observable until after their entry and impact on this Earth. This may be due to their smaller initial size. The initial sizes of cometary bolides, of any recovered ice meteorite, will depend on a variety of factors and cannot be estimated with any degree of confidence. Ice comets cannot be totally ruled out as a source of ice meteorites.

Another possibility, as to the origin of ice meteorites that may have been formed outside of earth atmosphere, may be Saturn's icy moon Enceladus. Enceladus, having as many as 12 ice water plumes ejecting hydrothermal water, material, and ice into the E ring of Saturn, may also have episodically active tectonic events and localized catastrophic overturn of the rigid ice surface (O'Neill & Nimmo 2010). Other icy moons of Saturn and Jupiter may also be considered as possible origins of ice meteorites.

Thus, the question of the origin of some of the ice falls within our troposphere or outside earth's atmosphere must still be addressed, as nobody knows where these ice falls originate (Snyder, 2015). In January 2016 this author was provided a second unique opportunity to investigate the origins problem.

At 4:41 PM Eastern standard time on 9 December 2015 near the small town of Port Sanilac, Michigan, USA, an ice fall was witnessed by three people and it's impact recorded by a nearby security camera. This author was able to obtain the largest chunk of two surviving pieces of ice (fig. 1). The rest of this suspected ice meteorite was allowed to melt away into the the soil. The impact left a crater approximately 3 to 3 1/2 feet across and 7 to 8 inches deep in the soil. The suspected ice meteorite's initial weight was estimated to weigh about 330 kg.

Figure 1

2. METHODS AND RESULTS

Six vials of meltwater of the suspected ice meteorite were sent to Geochron laboratories, Cambridge, Massachusetts for stable isotope ratio analysis and tritium analysis.

The Tritium and Stable Isotope Analysis is as follows:

Port Sanilac	Water vial #	Tritium Units	Delta “D”	Delta “18O”
	Vial #1	10 units	-43	-6.1
	Vial #2	8 units	-43	-6.3
	Vial #3	5 units	-46	-6.5
	Vial #4	5 units	-49	-7.0
	Vial #5	7 units	-41	-6.1
	Vial #6	10 units		

These high tritium levels are indicative of exposure of the water and the ice to cosmic radiation in space, or, of meteoric precipitation exposure to cosmic radiation at high altitude here in Earth’s atmosphere.

On 5 April 2016, a vial of meltwater of the suspected ice meteorite was sent to the chemistry lab at Western Michigan University in Kalamazoo, Michigan. Using recent local rain water and distilled water as baselines, conductivity tests of the baselines and the ice melt water were performed. All tests indicated similar results, all conductivity was less than .1 micro HOS/CM (uS).

A silver nitrate distilled water solution was sonicated and introduced to the rainwater and to the distilled water baselines with no reaction. When the silver nitrate solution was added to the vial of meltwater from the ice there was a rapid reaction, turning the water opaque light blueish white. This reaction indicated the presence of chlorides. This suspected ice meteorite meltwater is not rainwater nor atmospheric precipitation.

Observations of this ice indicate that the ice is a formation of stratified frozen precipitation deposited and arranged and laid down in layers similar to glacial ice. No circular onion layering of the ice (as may be seen in hail) was observed. (fig. 2)

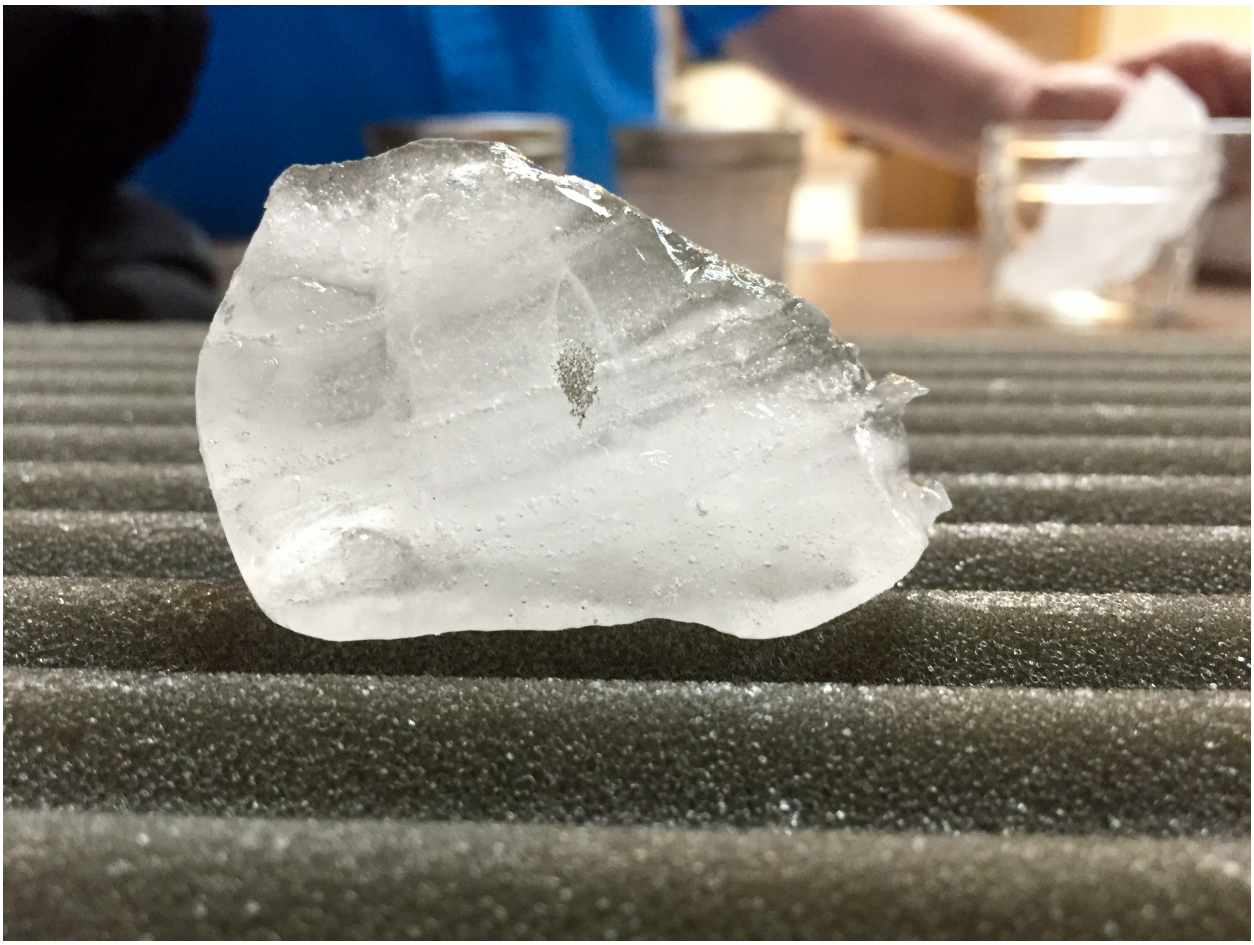


Figure 2

On March 15, 2016 the entire chunk of the suspected ice meteorite was transported to the x-ray department of South Haven community Hospital, South Haven, Michigan. X-rays and X-ray CT scans (X-ray Computed Tomography) were taken of the ice. (fig. 3). The X-rays indicated structure within the ice. The X-ray CT scans brought more clarity of understanding as to the structure within this ice. The unknown structure in the ice is a bubble structure of many kinds of shapes of gas bubbles, one even a bent bubble.

Figure 3

A vial of meltwater from the suspected Ice meteorite was sent to the labs of Avomeen Analytical Services, located in Ann Abor, Michigan for analysis. The meltwater was sonicated and then transferred to a copper mesh TEM grid. Imaging using STEM provided various magnifications in atomic number contrast mode (ZC) and transmitted electron mode (TE). Chemical analysis was performed with a Bruker Quantax EDS system.

Mass spectra analysis of four nano-dust particles (16nm dia. or less) (figs. 4, 5, 6, 7) found in the meltwater of this ice indicates the presence of Si and O as highly significant particle constituents, indicating the presence of hydrothermal nano-silica (SiO2). A high level of carbon is also present. The presence of copper is due to the copper mesh TEM grid.

Mass spectra analysis of larger nano-dust particles (greater than 20nm dia.)(fig. 8) indicates the presence Na, K, Ca, Mg, and Cl. These salts indicate that the hydrothermal water is salt water.

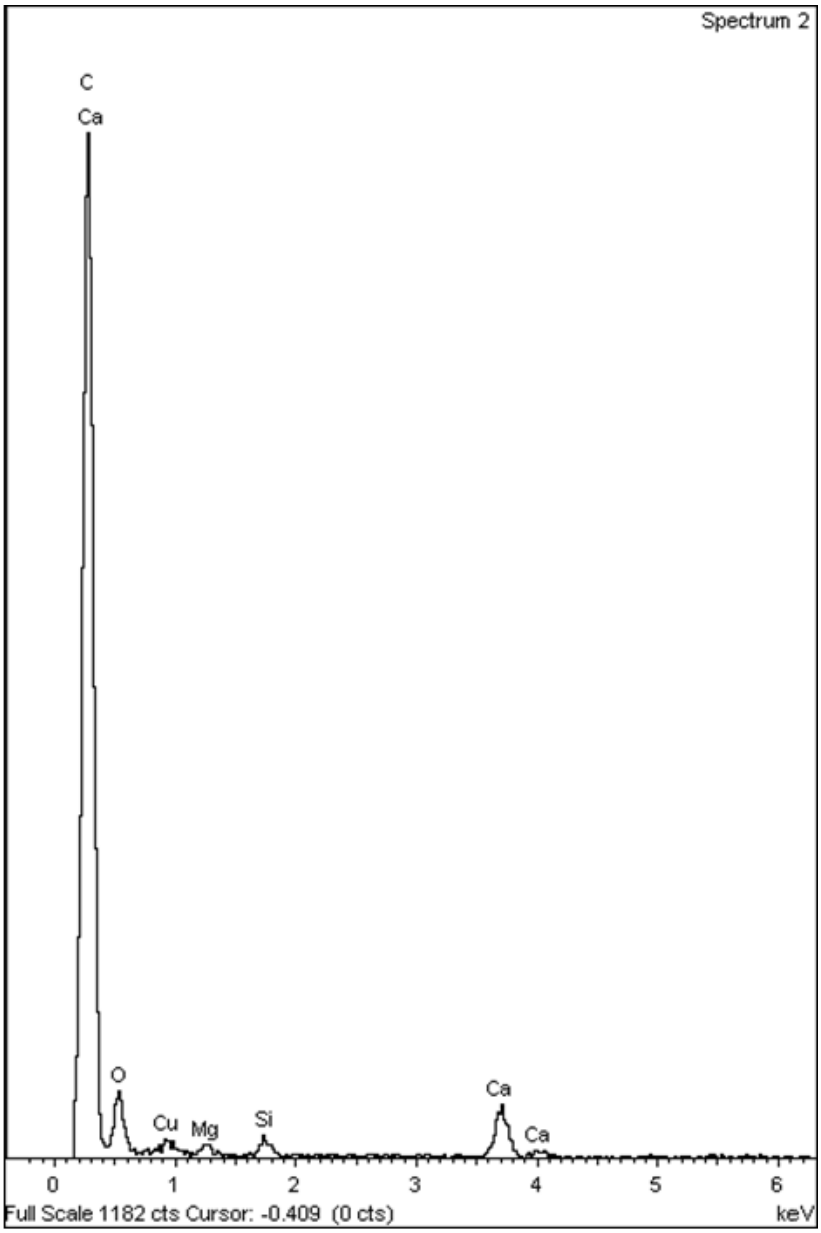

Spectrum 2
C
Ca
O
Cu
Mg
Si
Ca
Ca
0
1
2
3
4
5
6
Full Scale 1182 cts Cursor: -0.409 (0 cts)
keV

Figure 4

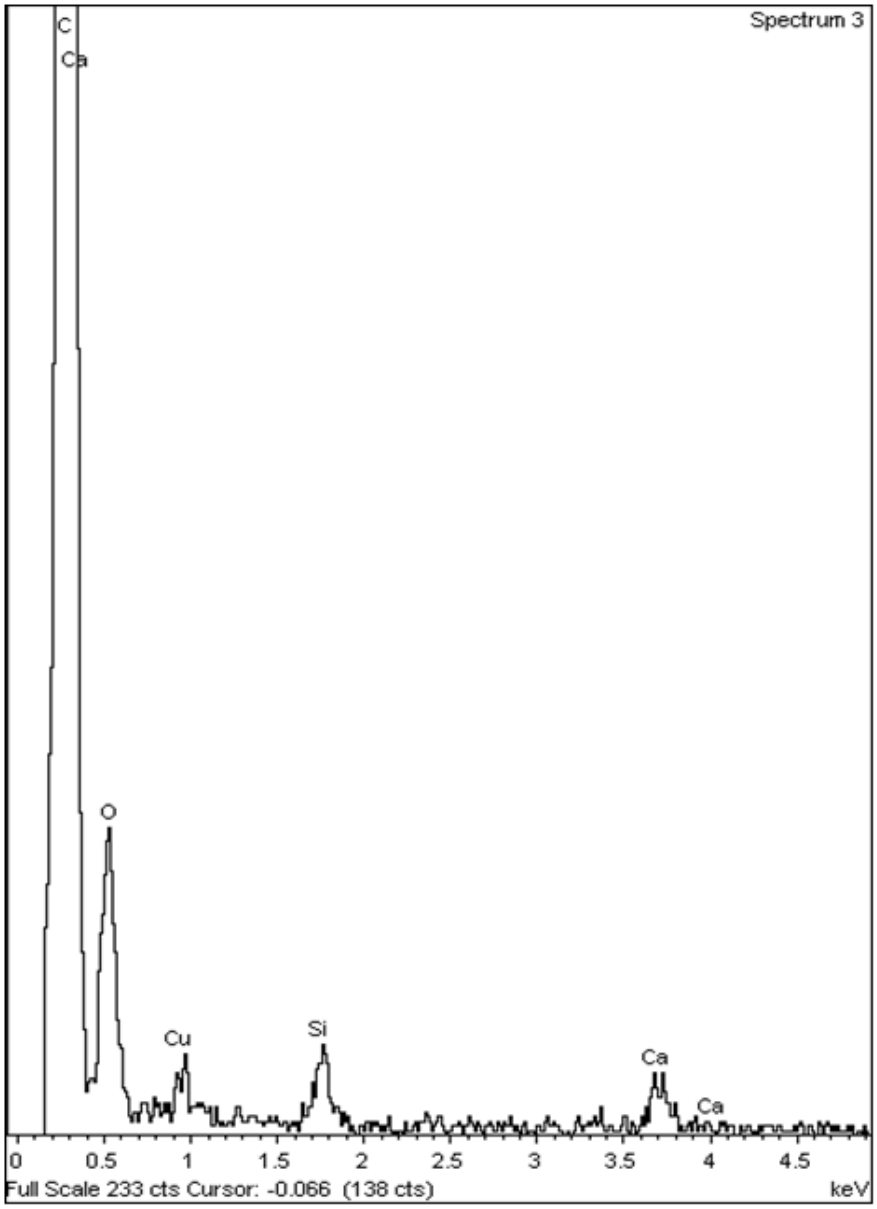

Spectrum 3
C
Ca
O
Cu
Si
Ca
Ca
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Full Scale 233 cts Cursor: -0.066 (138 cts)
keV

Figure 5

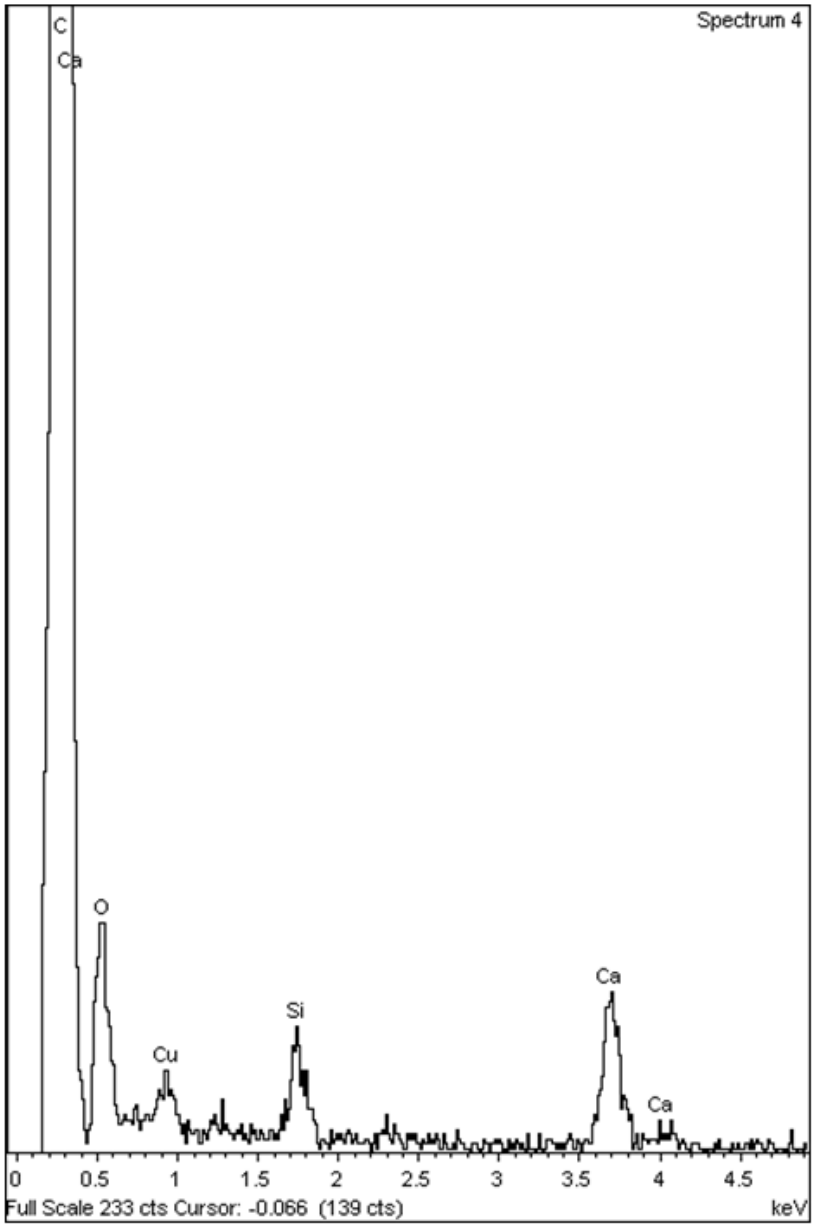
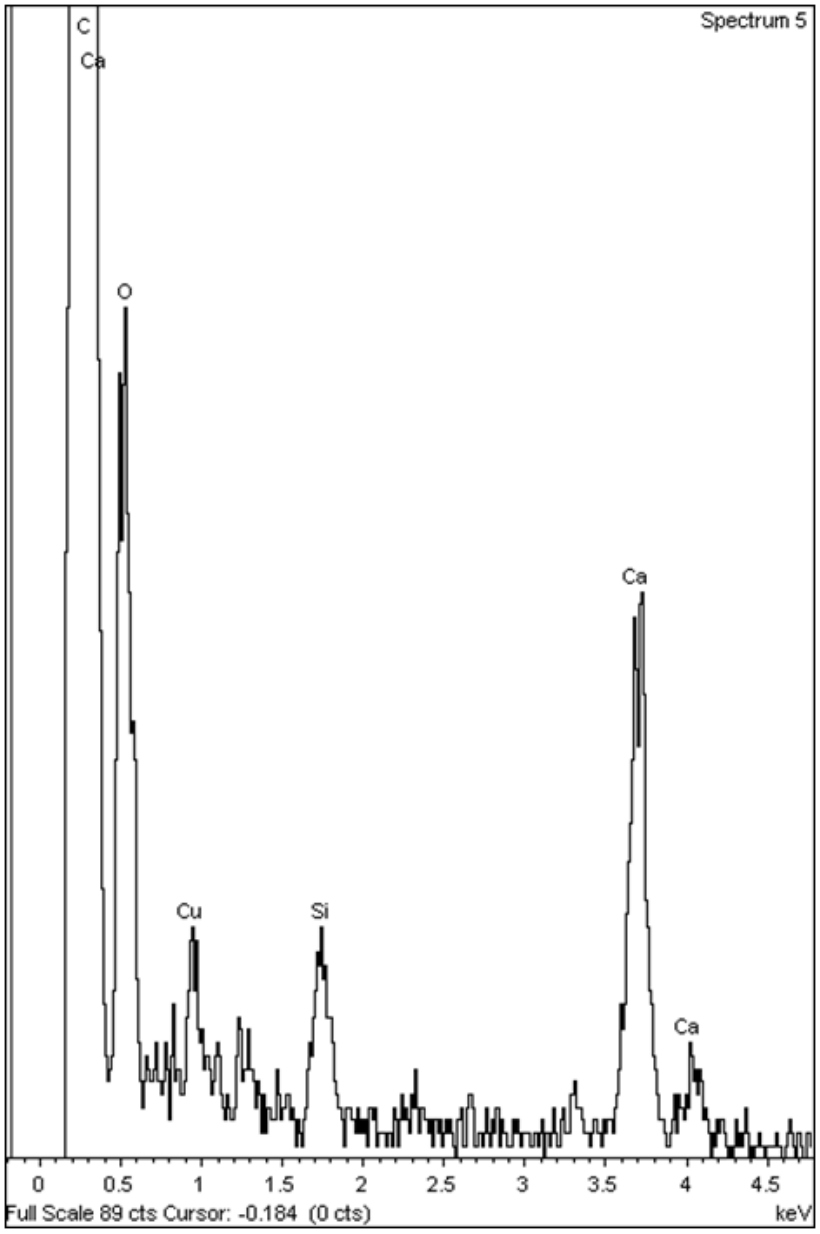

Spectrum 4
C
Ca
O
Cu
Si
Ca
Ca
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Full Scale 233 cts Cursor: -0.066 (139 cts)
keV

Figure 6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Ca
O
Ca
Cu
Si
Ca
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Full Scale 89 cts Cursor: -0.184 (0 cts)
keV

Figure 7

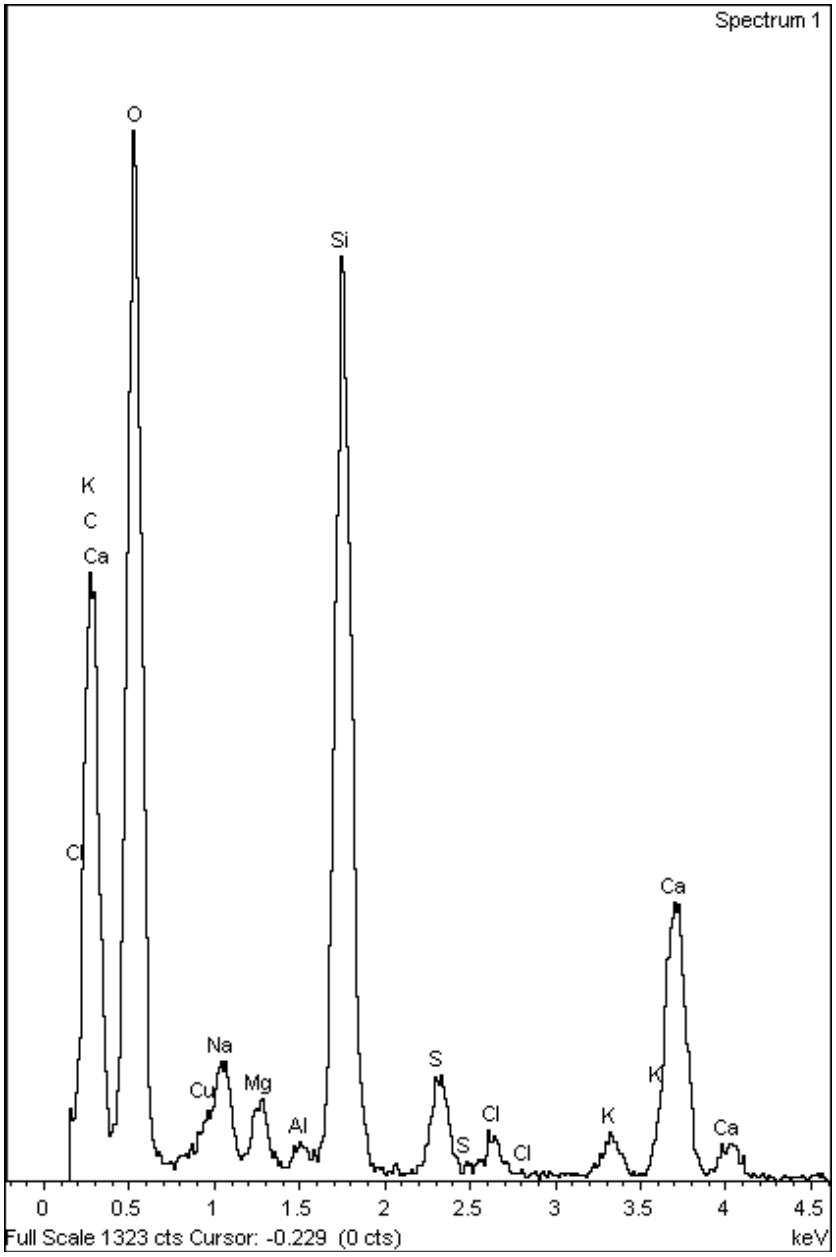
Spectrum 1
O
Si
K
C
Ca
Cl
Ca
Na
Cu
Mg
Al
S
S
Cl
Cl
K
K
Ca
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
Full Scale 1323 cts Cursor: -0.229 (0 cts)
keV

Figure 8

3. DISCUSSION

The current consensus of opinion of scientists is that ice falls are megacryometeors formed in earth's atmosphere and are not ice meteorites formed outside of earths atmosphere (Martinez-Frias &Travis, 2006). Megacryometeors are not ice from aircraft. They are not hailstones or are due to natural icing processes at high altitude.

There are reports that the number of ice falls have increased, due perhaps to global warming and climate change (Deshpande, et al, 2013). The fact is, there is no positive evidence that megacryometeors are formed in the stratosphere. It is a fact that ice chunks, weighing more than 22 pounds do fall to the surface of Earth. There have been reports that the number of these ice falls have greatly increased in the past few years over the entire globe. This may be due to increased access to the news media by people reporting these events. There are many documented references to falls of large blocks of ice since the 1800's in newspapers as the news media began to expand and grow.

Previous studies of ice falls and magacryometeors focused on their isotopic composition, hydrochemistry, stratification and layering, air bubbles and cavities, and textures. All of these studies evidencing a complex history of formation. Micro-Raman spectroscopy of bands of layering have indicated that formation and growth takes place within a range of temperatures (Ruff, et al, 2010). This argues that the place of formation and growth of these ices must have been subject to a range of temperatures over and during a significant period of time. There is no known formation process in which a chunk of ice weighing more than 22 pounds could remain in the upper atmosphere for a long enough period of time to form, grow, become layered and stratified, and form many kinds of gas bubbles under a range of temperatures. The origin of megacryometeors is still unknown. No one person has, until now, been able to demonstrate any positive exhibitable evidence that may indicate that an ice fall is an ice meteorite and is extraterrestrial in origin.

However, the gas bubble structures found in the Port Sanilac ice meteorite are exhibitable facts. The observation of this Ice is that it has been formed with stratified frozen precipitation, laid down in layers, similar to glacial ice. Many of the various kinds of gas bubbles, bent, spherical, oval, and linear, seen in the ice, cross the stratified layers of ice (Fig. 2). This very significant discovery was an unexpected surprise this author. These kinds of gas bubbles cannot form in Earth's atmosphere. These gas bubbles could only have formed after the glacial-like stratified ice layers were laid down or formed as a frozen chunk of ice. This ice formed first, then the gas bubbles had to have formed afterwards.

The question now is, How does these kinds of gas bubbles, some bent, form in an already frozen chunk of stratified ice?

It is speculated by this author that the only way these kinds of gas bubble can be formed in an already frozen chunk of stratified ice is biologically, from the inside out. The gas bubbles may form and enlarge over a period of time due to microscopic biological processes, in place, on the inside surfaces of the bubbles. This microscopic biological process may consume the ice (containing deuterium/tritium carbon rich water) and produce gas as a biosignature by-product.

These bubbles argue in favor of this ice is being extraterrestrial in origin.

While it is possible for gas bubbles to become trapped in ice in bodies of water here earth, the trapping of gas bubbles takes time and this lengthly period of time for the gas bubbles to form does not allow for the rapid formation of bent bubbles to take place in this ice while this ice is in free-fall in Earth's atmosphere.

To claim that gas bubbles grow and expand in ice is a very extraordinary claim. This author has previous experience with bubbles that expand and grow in ice. In the study of the Pullman Ice meteorite (Snyder, 2015) this author photographed gas bubbles in that ice in year 2000. In the year 2009 this author noticed the gas bubbles appeared to have expanded, however, this author did not believe that it was possible that gas bubbles could have expanded in the ice. In the year 2014 this author intended to provide this ice sample to NASA only to find that the gas bubbles had expanded until they intersected each other and the structure of the ice sample was lost into a crumbled pile of small pieces. Left behind in the small pieces of ice were colonies of carbon black microbiology. This author lost the opportunity to photograph this discovery because of this authors disbelief of growing bubbles in the ice.

The bent gas bubble structure found crossing the stratified layers in this ice is extraordinary factual evidence.

The water conductivity analysis of the meltwater from this ice indicates that this water is fresh water. Introducing a silver nitrate distilled water solution to this meltwater cause a rapid reaction indicating that this meltwater contains chlorides. The presence of these chlorides indicates that this water has been in contact with various rock structures and has leached the chlorides from the rocks. These two water analysis indicates that the meltwater may be ground water. However, tritium analysis of the meltwater indicate that this water has been exposed to cosmic radiation and could not have come from any natural occurring bodies of water, such as lake, river, ocean, or ground water here on earth.

The 5 different tritium and stable isotope measurements indicate five different sources of water. For these different variations to be preserved, fixed in location in this ice within inches of each other, this stratified ice must have been formed in and during frozen precipitation conditions. Frozen precipitation conditions that include leached chlorides, hydrothermal water and hydrothermal nano-silica. These conditions of glacial-like surface ice formation at the south pole of Saturn's moon Enceladus is known. There may be as many as 12 ice water plumes driven by hydrothermal activity at the south pole of Enceladus. Each of these plumes may have a different stable isotope measurement. Subsurface cooling of hydrothermal fluids leads to stable isotope variation in fluids and precipitations. Various kinds of material and rock in which the hydrothermal activity takes place adds to the variations in the isotopes. These plumes vent hydrothermal ice water, ice and material into the vacuum space, exposing the ice water, ice, and material, over varied periods of time, too high and varied levels of cosmic and solar radiation. This varied exposure to cosmic radiation may change the isotopic and tritium levels in the water and the ice.

Any gravitational return of the exposed hydrothermal water, ice, and material to the surface of

Enceladus will lay down a glacial-like stratified surface of frozen precipitation and ice, fixing in place any and all variations in isotopic values.

Mass spectra analysis of the nano-dust found in the meltwater of this ice indicates the presence of Si and O as highly significant particle constituents. A high level of carbon is also found. When the carbon and Si and O are taken into account, the elemental composition of these particles are in agreement with the hydrothermal nano-silica (SiO2) particles found by NASA's Cassini CDA in the E ring of Saturn. Also, NASA's Cassini CDA found that carbon was the most abundant contaminate element in Saturn's E ring.

When the carbon found in the analysis of the particles found in the meltwater is taken into account, the elemental composition of these nano-silica particles are again in agreement with the hydrothermal nano-silica (SiO2) particles found in the E ring of Saturn.

The presence of hydrothermal nano-silica in this meltwater indicates that the water that forms this ice is hydrothermal water.

4. BIOLOGY

This author took many hundreds of microscopic photographs of the biology found in the meltwater of this ice. These photos show many, as of yet unidentified species of aquatic biology, including a broken spicule of a sponge, biology that may be in cryptobiosis, and what be cyanobacteria. (figs. 9, 10, 11, 12)

It is well known that the Earth's atmospheric water is derived from the Earth's evaporative water cycle. When this happens, all salts, particles, and aquatic biologies are left behind, remaining in their bodies of water.

All aquatic biology, including sponges and cyanobacteria live in water and depend the water for their motility and biological activity.

Any megacryometeor that is formed in and with Earth's atmospheric water cannot contain aquatic biologies, sponges, and cyanobacteria. Ices falling thru Earth's atmosphere containing many species of aquatic biology are in fact Extraterrestrial Ice Meteorites.

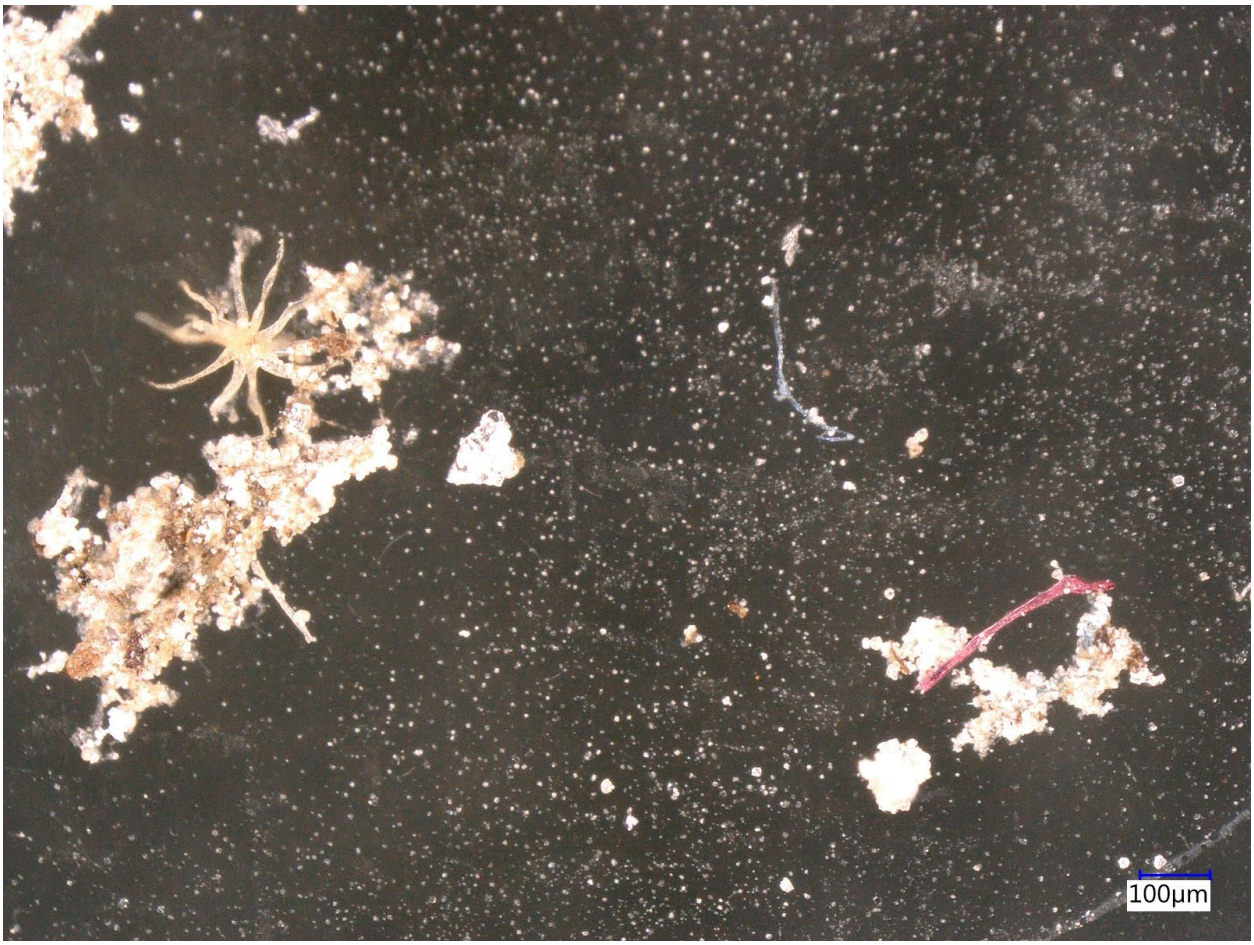

Figure 9

Figure 10

Figure 11
Broken spicule of sponge

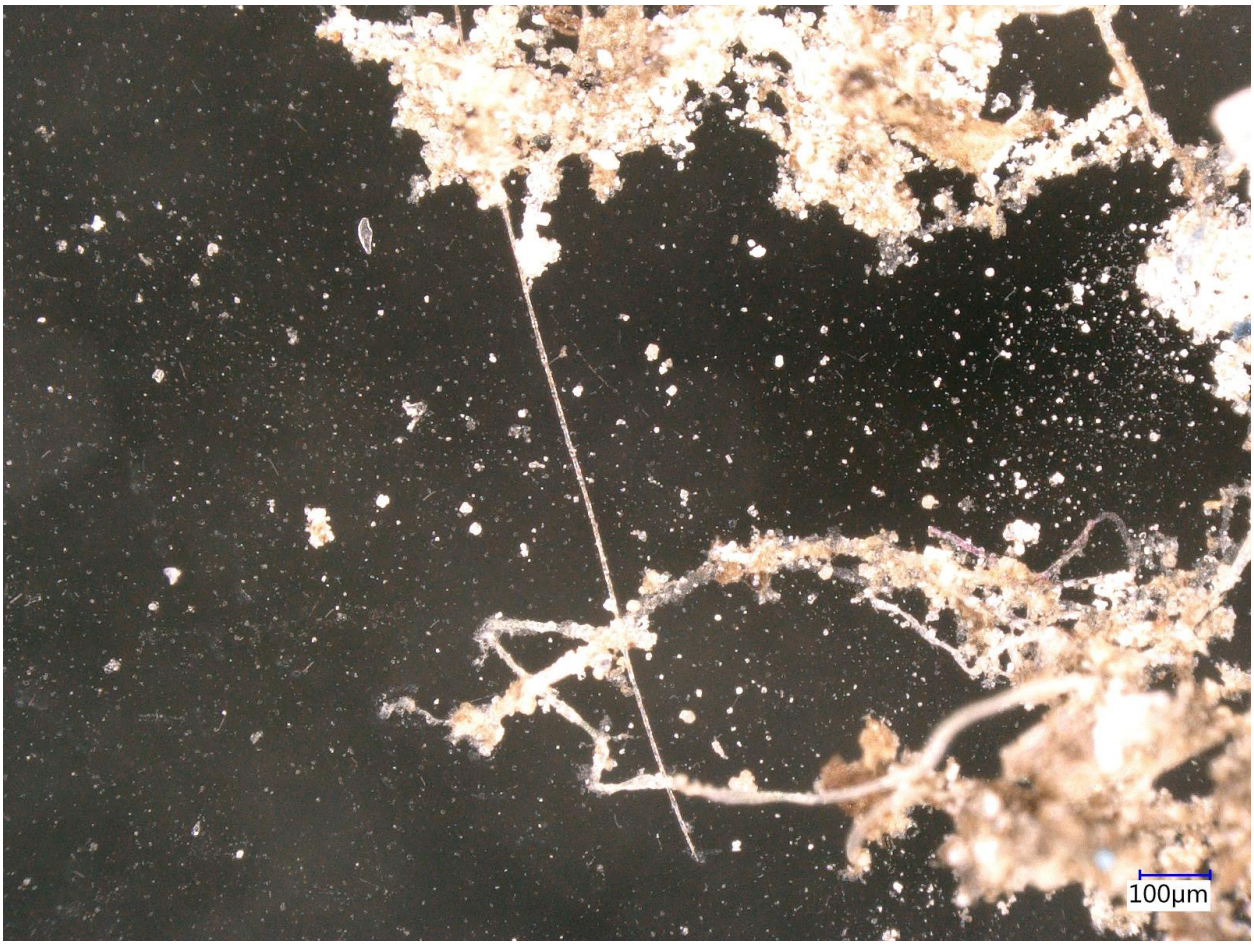

Figure 12

5. SPECULATION: ENCELADUS AS AN ORIGIN FOR ICE METEORITES

Enceladus, the six largest moon of Saturn may have as many as 12 cryovolcanic ice water vapor plumes that replenish the E rings of Saturn with material. These plumes contain hydrothermal ice water, ice particles, trapped salts, organic compounds, water vapor, and hydrothermal nano-silica. The gravitational return some of the ejected material, the ice water, ice particles, and dust particles, to the surface of Enceladus will lay down a stratified glacial-like ice surface. The vacuum evaporation of the returning water may cause the loss of any positive and negative charged ions of any salts dissolved in solution in the water. This loss of any positive and negative charged ions may be due to their interaction with Saturn's magnetosphere or due to sputter erosion from cosmic and solar radiation (Postberg, et al, 2011). The loss of positive and negative charged ions of salts in the gravitationally returned water will cause any sample of water from the surface of Enceladus to indicate that it is fresh water when using ionic conductivity as a measure of salinity.

The meltwater from this ice contains chlorides indicating that the water may be fresh ground water. These chlorides are not in solution in ionic form and may be bonded to other material such as hydrothermal nano-silica. Such leached chlorides are not found in terrestrial precipitation here on earth. This fresh hydrothermal ground water with tritium activity, chlorides, and nano-silica argues in favor of this meltwater being extraterrestrial ground water.

The six different tritium and five different stable isotope measurements along with the indicated chlorides and hydrothermal nano-silica found in this ice may indicate five different sources of cosmic radiated hydrothermal ground water. These various sources of water ice may be found on the surface of Enceladus due to its numerous hydrothermal ice water plumes. This may be due to the ice water plumes and the exposure of their ejecta material to cosmic and solar radiation before the material in the plumes was gravitationally returned and deposited as stratified layers of glacial-like ice.

It is currently believed by most in science that the isotopic composition of terrestrial sea water to be unique to the earth. This is because all terrestrial waters are primarily derived from evaporation of ocean water and therefore have a common source (Craig, 1961). This affects both the oxygen and heavy and light hydrogen isotopes in a similar way producing a linear relationship. There may be ongoing vacuum evaporation of the waters in the plumes of Enceladus. A linear relationship of these water isotopes may be due to a greater molar abundance of oxygen 16 (16O) and hydrogen (H) relative to oxygen 18 (18O) and hydrogen 2 (2H) in the ice water plumes of Enceladus, or in our solar system, also a common source of water.

Gas bubble structures, bent, spherical, oval, and linear gas bubbles crossing the stratified layers of this ice are observed facts. These facts may indicate that the bubbles formed after the glacial-like ice was formed. The forming of these gas bubbles in the ice after the ice was formed indicates that the bubbles had to have grown in place and a mechanism for the growth in the ice of the bubbles may be due to microscopic biological processes. it may be possible that the continuation of the growth of these bubbles over a period of time may be verified. X-ray CT scan programs can measure the size and the growth of these bubbles. Future periodic X-ray CT

scans are planned. Any growth of the bubbles over a period of time will indicate that a biological mechanism for growth does exist and is a fact.

A second avenue study of the gas bubbles may be the sampling and analysis of the gases in the bubbles. The gasses in the bubbles may be a biosignature byproduct of microscopic ice biology that formed the gas bubbles. It will not be easy or cheap to obtain a gas sample for analysis without significant damage to the structure of this ice meteorite. This ice meteorite must remain intact for the periodic X-ray CT scan measurements to be taken.

Recent research (Hsu et al, 2015) concludes that the dominant if not the sole constituent of most of Saturn's E ring stream particles are SiO2 (nano-silica). The research also suggest that the nano-silica particles with a diameter 16 nm or less observed by the Cassini mission Cosmic Dust Analyzer (CDA) (Srama et al, 2011) may have been formed over a period of months or years before being ejected into the E ring. This may suggest continuing hydrothermal activity within Enceladus. These nano-silica dust particles, initially embedded in icy grains, are presumably ejected from Saturn's moon Enceladus. These nano-silica dust particles in the icy grains are released by sputter erosion of the icy grains while in Saturn's E ring. Quantitative mass Spectra analysis of these particles indicates a maximum diameter equal 12 to 18 nm for the largest stream particles. This is in agreement with the upper particle radius size limit independently inferred by simulations of Rmax equal 8 nm. (Hsu et al, 2011).

Therefore, for an analysis to be interpreted as supporting evidence to the possibility that a suspected ice meteorite is from the E ring of Saturn or the surface of Enceladus, the suspected ice meteorite must contain the right size hydrothermal vent nano-silica. Should the suspected ice meteorite be glacial ice, and contain the right size hydrothermal nano-silica, then it may be possible that the ice is from the surface of Enceladus.

Plumes of hydrothermal ice water, water vapor, and particles ejected from the South Pole of Enceladus have been shown to contain simple organic compounds (McKay et al, 2008). Analysis of the composition of freshly ejected plume particles have found that salt-rich ice particles dominate the total mass flux of ejected particles (Postberg et al, 2011). However, the salt-rich ice particles may be depleted in the population escaping into Saturn's E ring due to sputter erosion. The salt-rich particles may also be depleted due to Saturn's magnetosphere sweeping collection and removal of the positive and negative charged ions of any salts.

The stratigraphic evolution of the south pole tiger stripe surface of Enceladus is indicative of material being laid down in a glacial-like process (Jaumann et al, 2008). The suggested episodically active tectonic events and the proposed localized catastrophic overturn of the rigid ice surface of Enceladus allows for the possibility of large bodies of ice to be ejected from Enceladus. The surface of Enceladus and the E ring of Saturn are exposed to cosmic radiation that creates the tritium activity found in the exposed hydrothermal vent ice water.

6. CONCLUSIONS

Facts are at the very foundation of discovery. The facts and the data from the Port Sanilac ice fall are compatible with a conclusion that this ice is a true ice meteorite.

The tritium and the stable isotope ratio levels in this ice indicate at least five different sources of water formed this ice. The tritium levels indicate that this water has been exposed to cosmic radiation. This ice either is cosmic radiation exposed atmospheric Earth water or it is cosmic radiation exposed extraterrestrial water. The witnessed ice fall either formed in Earth's atmosphere or it formed outside of Earth and its atmosphere.

The chemical signature of this water is unique. Using electrical conductivity tests, this water is fresh water. This water contains chlorides and salts, indicating that the water has been in contact with various rock structures. This water is not rain water nor atmospheric precipitation.

The right size nano-silica found in this ice indicates that the nano-silica is hydrothermal nano-silica and that the water is hydrothermal water. This argues against this ice as being terrestrial atmospheric water from Earth.

The many species of unidentified Aquatic biology, biology that may be in cryptobiosis, and what may be cyanobacteria, all located in one snowball size piece of Ice seen falling out of the sky argues argues against the ice being formed in the Earth's atmosphere.

The X-ray CT scans factually indicating bubbles structure crossing the glacial-like stratified layers of ice forming this ice has never before been observed in any ice fall.

By the process of elimination, these facts indicate that the source of the water that formed this ice is not atmospheric water from our Earth.

Based on the evidence, it is possible that this suspected ice meteorite, reported in this paper, is a truly genuine extraterrestrial ice meteorite. This ice is frozen, stratified, glacial-like, tritiated hydrothermal saltwater precipitation containing many unique bubble structures, carbon, and hydrothermal nano-silica, the chemical footprints of the E ring of Saturn.

Where the Port Sanilac ice meteorite may have formed is admittedly speculative. However, because of the hydrothermal nano-silica matching the Ering of Saturn and the five different sources of tritiated hydrothermal salt water found in this ice, it is possible that this ice was formed on the surface of Enceladus and is ejecta which eventually fell to Earth.

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