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Our Moon - Window to the Space Age

by David Talbott

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Introduction

Researchers exploring "the electric universe" say that a *comet* with its sharply sculpted surface may have much to tell us about the history of our solar system. Are comet displays due to electrical discharge as they move through the electric field of the Sun? If so, they may provide the best example of what happened to *planets* in the past.

Electrical theorists contend that planets have not always moved on their present, predictable orbits. Our planetary system evolved through unstable phases in the past, they say, when certain planets behaved more like comets than the quiet bodies we observe today. Moving within a sea of charged particles, planets and moons experienced intense electrical activity, as cosmic "thunderbolts" raked across their surfaces, excavating material up to *miles* deep, redistributing sediment and rubble in layers across continental-scale distances.

Artistic simulation of a large-scale plasma discharge cutting out a crater on the lunar surface.
Credit: Wallace Thornhill.

But how can one assess the electrical hypothesis millions of years after the claimed events? An assessment is possible because most of the rocky bodies in the solar system have surfaces unaffected by atmospheric or fluid erosion. If electric discharge carved the surfaces of planets and moons, massive scars should still be visible today. In fact, some electrical theorists suggest that catastrophic electrical scarring did not cease until just a few thousand years ago.

Assessing this new vantage point requires a suspension of prior theory - at least long enough to apply logical tests and fresh critical thinking.

Unsolved Lunar Mysteries

> "We can make many suggestions about the moon, but we have rather greater difficulty in proving that what we say is more than just possibilities."
> - Harold Urey, *The Nature of the Lunar Surface.*

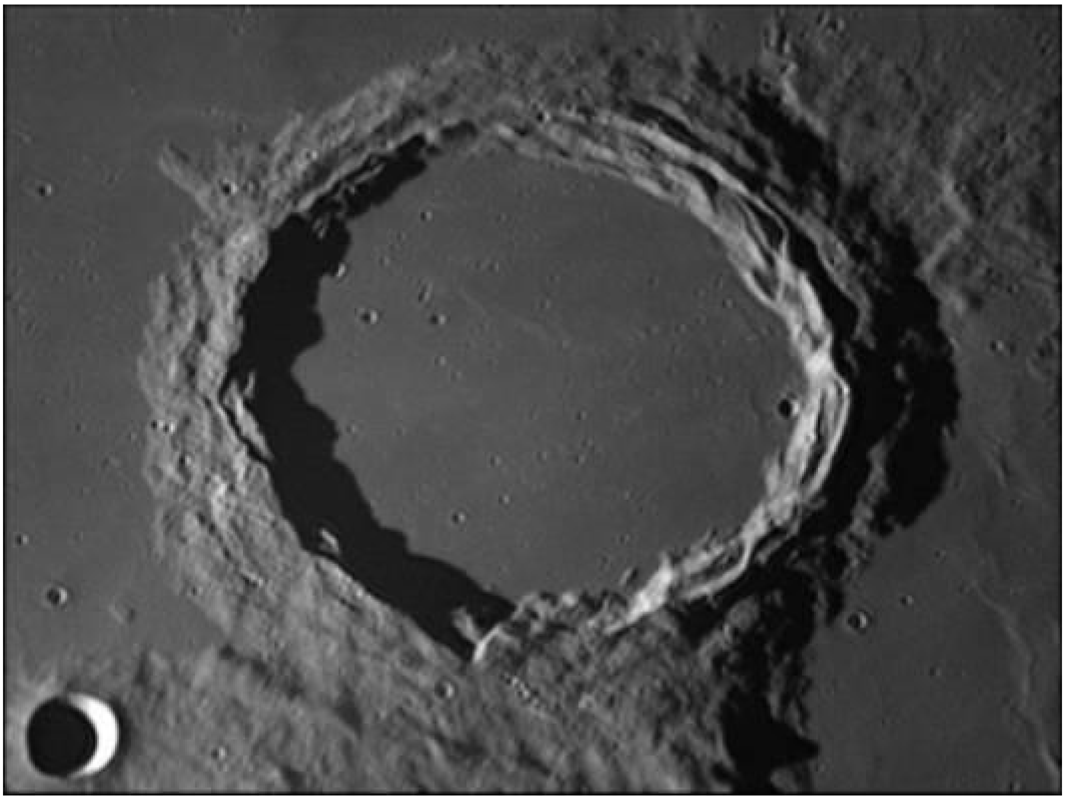
High definition image acquired by lunar explorer "KAGUYA" (SELENE), which was injected into a lunar orbit at an altitude of about 100 km on October 18, 2007.

At the beginning of the space age our Moon helped to clarify scientists' expectations as to what they would find on other rocky bodies in the solar system. For several decades astronomers debated whether lunar craters were caused by bombardment from space or by volcanism. These seemed the only alternatives, to conventional astronomers on the one hand, and conventional geologists on the other.The issue was decided in favor of the impact hypothesis shortly after the beginning of the space age, when astronauts walked on the moon and Apollo mission close-up images of craters excluded the volcanic interpretation. Far too often the required volcanic vents and lava flows were missing.

For planetary science this was a turning point. Within a few years the vision of scarring by impact had set the direction of space programs, and billions of dollars were spent in the confidence that astronomers were asking the right questions. The general rule became: where there is a crater, an impact occurred in the past. Within discrete regions, planetary scientists believed they could count craters to determine the age of the surface.

By the time our space probes reached Venus and Mars, and eventually returned closeup images of the moons of Jupiter, Saturn, Uranus, and Neptune, prior theories had frozen into a consensus. And even when our probes later rendezvoused with asteroids and comets - exceedingly unlikely attractors for meteoric bombardment - many astronomers came to see these heavily cratered surfaces as a record of impact.

Once the impact theory took hold, planetary scientists sought to replicate experimentally the unique patterns of cratering on the moon and elsewhere in the solar system. Occasionally, news releases touted the "successes" of such experiments. But where unique cratering patterns demanded experimental confirmation, the experiments failed. The explosive effects of a high velocity impact will not produce the shallow, steep walled, flat-floored look of numerous craters on the Moon, for example. Not even an atomic bomb can melt enough material to create a flat-floored depression.



The lunar crater Archimedes is a large lunar impact crater on the eastern edges of the Mare Imbrium. The crater reveals an exceptionally flat floor and a complex terracing of walls, a common pattern in cratering by electric discharge.
Credit: Damian Peach 2006.

The consistent circularity of craters, the lack of collateral damage where one crater overlaps with another, enigmatic terracing of crater walls, chains of smaller craters along the rims, and innumerable concentrations of crater chains across the lunar surface, all posed questions yet to be resolved.

This high resolution KAGUYA image of the lunar south pole emphasizes more than one challenge for the impact explanation of crater formation. The challenge comes from the large flat-floored crater toward the center of the picture, the terracing of the crater behind it, and the repeated placement of adjoining or overlapping craters with no collateral damage by the one to the other.

Even before scientific opinion had converged on the impact theory, a much different possibility was being explored by the amateur astronomer Brian J. Ford. He suggested in the British journal *Spaceflight* that most of the craters on the moon were carved by cosmic electrical discharge. (*Spaceflight* 7, January, 1965). In Ford's experiments, he used a spark-machining apparatus to reproduce in miniature some of the most puzzling lunar features, including craters with central peaks, small craters preferentially perched on the high rims of larger craters, and craters strung out in long chains. He also observed that the ratio of large to small craters on the Moon matched the ratio seen in electrical arcing. Unfortunately, the scientific mainstream took no notice, and no mainstream researcher or institution followed up on Ford's investigation.

On the eve of the first Moon landing on July 21, 1969, the New York Times invited the controversial theorist Immanuel Velikovsky to anticipate what might be found. A colleague of Albert Einstein, Velikovsky was the author of the best selling book on planetary catastrophe, Worlds in Collision, published in 1950. Responding to the invitation, he suggested that rayed craters on the Moon were the result of electric arcs-- cosmic thunderbolts between planets in near collision. Since terrestrial lightning can magnetize surrounding rock, Velikovsky predicted that lunar rocks would be found to contain remanent magnetism. Astronomers saw no reason to consider such possibilities, and they were caught by surprise when lunar rocks returned by Apollo missions did indeed reveal remanent magnetism.

Hannes Alfvén

Throughout the twentieth century, astronomers showed only a limited appreciation of plasma science, and most ignored the role of electric currents in space plasma, a subject largely unfamiliar to them. Their elegant theories rested on the assumption that gravity alone is the ruling force in the heavens. Electricity does not "make things happen" in space.

Hannes Alfvén, the father of modern plasma science, receiving his Nobel Prize from the King of Sweden in 1970.

Through systematic observation and experiment, Hannes Alfvén, the father of modern plasma science, came to a contrary viewpoint. In his acceptance speech for the Nobel Prize in 1970, he warned astronomers that the study of plasma behavior requires attention to experimental plasma dynamics. Sadly, he observed, the plasma universe became “the playground of theoreticians who have never seen a plasma in a laboratory. Many of them still believe in formulae which we know from laboratory experiments to be wrong.” Alfvén warned astronomers against ignoring the role of electric currents in space because, under certain conditions, the gravity of a star or galaxy would give way to something else - the electric force, which is inherently many billions of times more powerful than gravity.

According to Alfvén, all stars have electrical circuitry. Equatorial "current sheets" encircle stars, and the movements of charged particles aligned to magnetic fields form polar current streams. The local circuits of the Sun are part of the larger circuitry of the Milky Way, in a web of connectivity he said. In the end, Alfvén concluded that gravitational systems in space are the "ashes" of electrical systems. Most formative events begin electrically.

Gravity-defying behavior of stars and galaxies may, in fact, provide essential clues to the early history of our own cosmic neighborhood, the solar system. Irregular movements of planets and intense electrical events in the past can no longer be excluded. And most importantly, events we observe on planets today cannot serve as a reliable guide to events in the past.

Craters on the Moon

Tycho Crater on the Moon.
Credit: Steve Mandel, Hidden Valley Observatory

Of all the features on the lunar landscape that are commonly identified as "impact craters," the most prominent is the crater Tycho in the Southern hemisphere. The central peak within the crater, said to have been formed by a "rebound" of subterranean material, rises about 2 kilometers above the crater floor. Planetary scientists suggest that the flat floor of the crater was formed by the pooling of melted material. But that conjecture finds no support in impact experiments or in high-energy explosions. The force of such explosions shocks and ejects material. It does not hold the material in place to "melt" it into a lake of lava.

A few decades ago a brilliant yet little-known engineer, Ralph Juergens of Flagstaff Arizona, took a new look at the lunar craters Tycho and Aristarchus. What he found were the distinctive features of electrical discharge. He wrote in 1974:

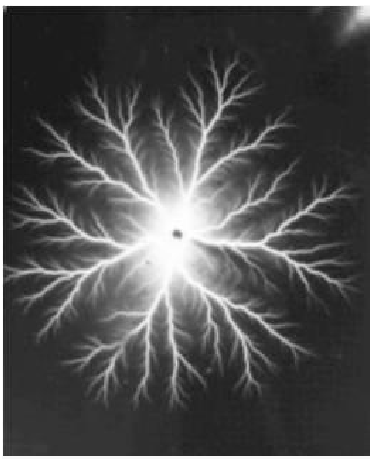
> “The abilities of discharges to produce melting on cathode [negatively charged] surfaces and generally to ‘clean up’ those surfaces have been remarked upon since the earliest experiments with electric discharges.”

The Tycho crater site appears to be at the summit, or very close to the summit, of terrain that trends downward in every direction away from the site for hundreds of kilometers. For the impact theory, this location can only be an accident. But for electrical theorists following in the path cut by Juergens, the elevation on which Tycho sits is not accidental. Lightning is attracted to the highest point on a surface. (That is, of course, the principle behind lightning arrestors placed on the pinnacles of tall buildings).

Juergens envisioned an *interplanetary* arc between the Moon and an approaching body (for his analysis, he summoned the planet Mars). While an instantaneous explosion does not have time to create a lava lake, an electric arc, involving a long-distance flow of current between two approaching bodies, would persist beyond the instant of the touchdown explosion, leaving material melted in place, he said.

Juergens saw Tycho as a "cathode crater," which means a crater formed by electrical discharge on a negatively charged surface. If Juergens’ analysis of Tycho was correct, it’s essential to see two phases of electrical activity superimposed on one formation. First, he drew special attention to Tycho’s "spectacular system of rays." These long narrow rays, he suggested, are tracks of electron streams rushing across the surface to the highest point. The visible tracks suggest this focus was close to the western lip of the present crater. These extended markers do not radiate from the crater we now observe. At the point of convergence, the onrushing electrons produced an explosion that destroyed the topographical prominence. In the grip of an external electric field, the electrons rushed outward into space to form what is called the "leader" stroke of a lightning discharge.

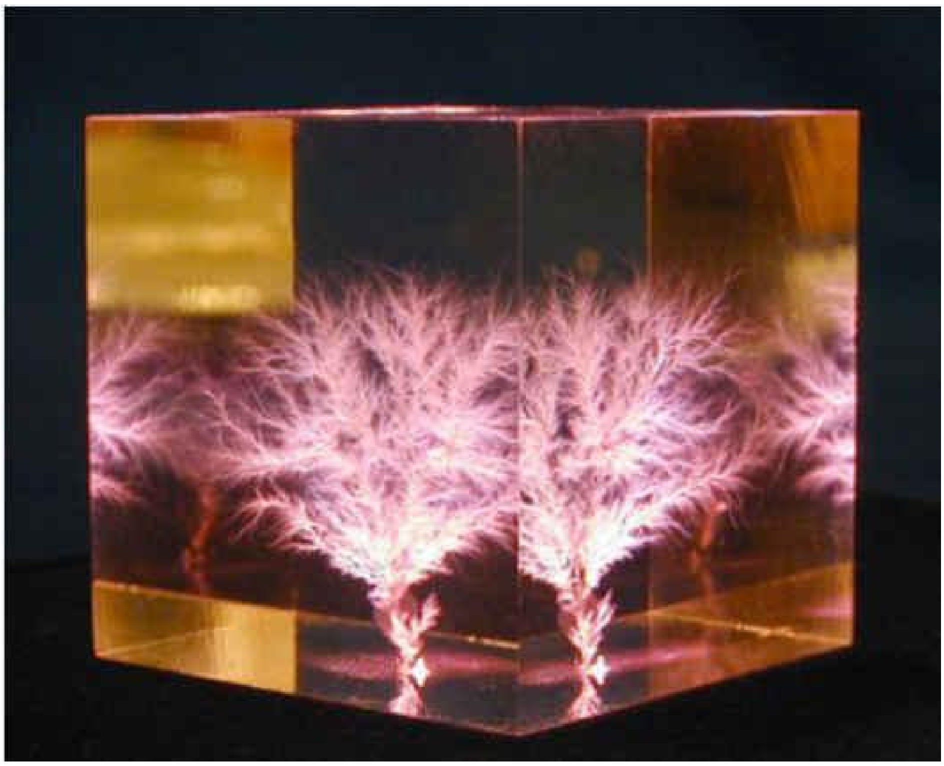
Minutes later, the powerful lightning "return stroke" arrived at a new high point to the east, explosively excavating the present crater. In the process it created a dendritic discharge pattern that will be recognized by everyone familiar with the behavior of electric arcs, including lightning. The pattern is called a Lichtenberg figure, named after George Christopher Lichtenberg, who (around 1777) documented such patterns in dark dust on a plate subjected to an electric arc.



A "Lichtenberg figure" from an electric discharge on a negatively charged surface.

All of the filamentary streamers left by such dendritic discharges will trace back to the central crater excavated by the "thunderbolt." The result of this second, more powerful explosion was a massive Lichtenberg figure laid down on top of the system of extended "rays" created only minutes earlier. The dark halo of ejected material around the newly formed crater is also evidence of the return stroke's explosive power. The picture below, showing the effect of a lightning blast on a golf course, nicely illustrates the dendritic branching pattern.

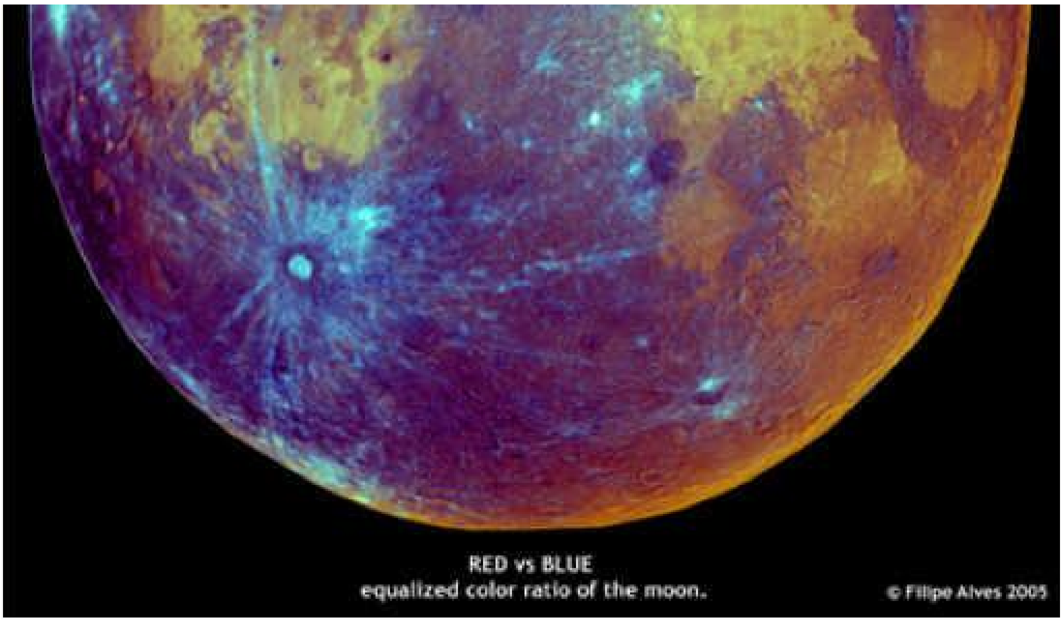
Effects of a lightning strike as seen on a golf course.
Credit: Kronia Group.



Today, beautiful examples of three-dimensional Lichtenberg figures (or "electrical treeing") are being produced in blocks of clear acrylic.
Credit: Bert Hickman, Teslamania.com

Juergens' analysis of a two-phased discharge event, based on well-documented behavior of electric arcs, can now be compared to the dilemmas left by standard geological analysis of Tycho. Astronomers have assumed that the extended "rays" from Tycho are the trails of material ejected from the crater into narrow paths over extraordinary distances. But as Juergens noted, these "rays" lack any discernible depth, something one would expect from irregular distribution of material along a trajectory. And of course a high-energy explosion would not distribute material in narrow coherent lines up to *940 miles* [1500 kilometers] long.

Look closely at the false color image below, produced by Felipe Aves, and you can see that the longest "rays" surrounding Tycho do not radiate from the center of the crater, a fact impossible to reconcile with an origin of the crater in an impact explosion. But the displacement agrees precisely with Juergen's electrical discharge analysis. It's also evident that if electrical activity produced unusual fusing of surface material, effects such as those seen here should be expected.



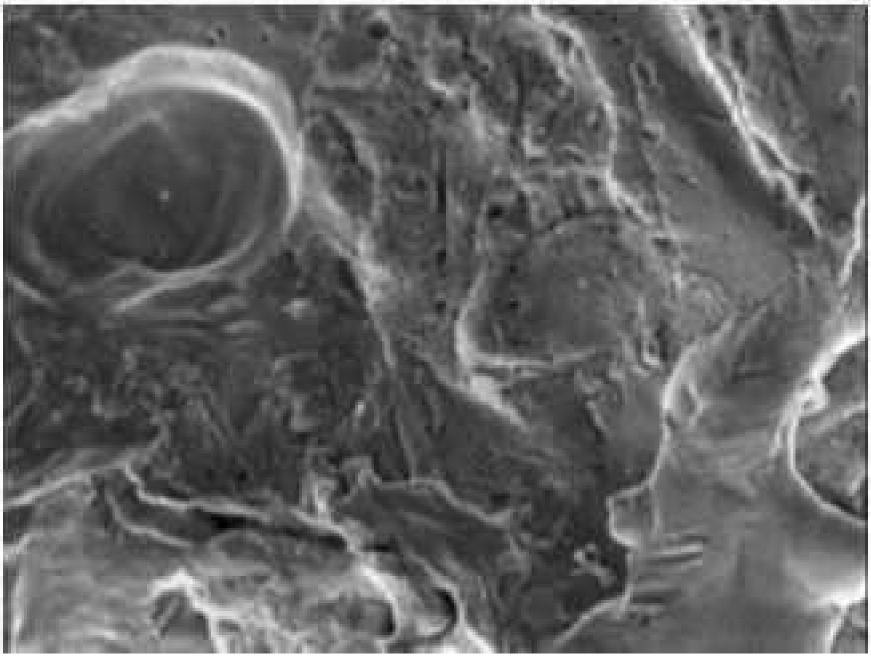
This extraordinary false-color image of the Moon accents the differences in reflectivity by different surface materials.
Credit: Felipe Aves.

Also telling is the distribution of small craters along the "rays," a feature inconsistent with a simple explosion. Moreover, as astronomer Gene Shoemaker (of comet Shoemaker-Levy fame) found from his analysis of Apollo images:

> "...many small secondary craters, too small to be resolved by telescopes on earth, occur at the near end of each ray element."

This is precisely the point made by today's pioneer of Electric Universe theory, Wallace Thornhill - electrical discharge streamers frequently *terminate* at a crater.

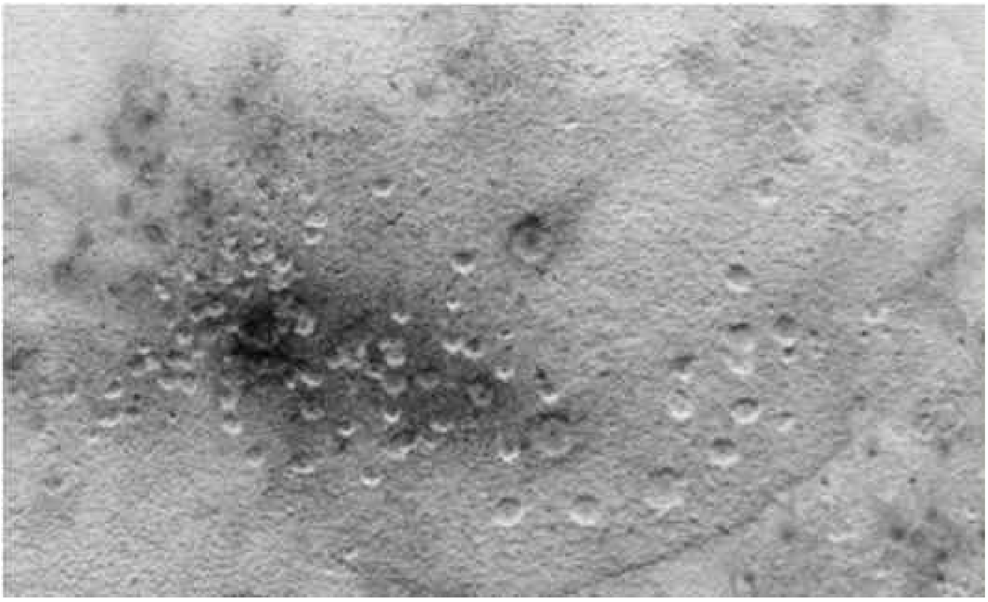
Tycho's crater rim rises about one kilometer above the surrounding terrain and the crater walls exhibit terraces that are *not* characteristic of high energy explosions. However, such terracing *is* observed in innumerable instances of electrical discharge machining (EDM), as in the picture below. This terracing, a well-established feature of electric scarring, is explained by the tendency of currents in plasma to form rotating twisted filament pairs, producing a cutting action eating away at crater walls as the depression is being excavated.



The image above shows the effects of electric discharge machining (EDM) on a metal plate. The terraced walls of the crater in the upper left of the picture is strikingly similar to the terracing of many lunar craters.
Credit: Kronia Group.

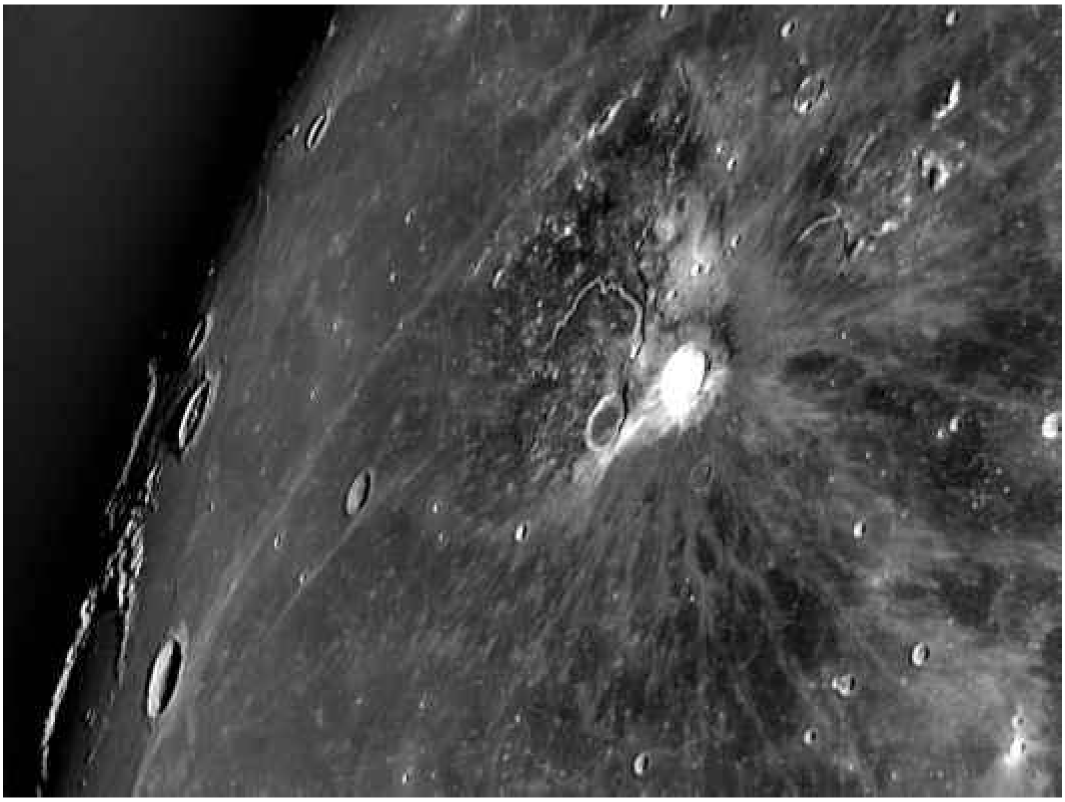
This is a false color image of the crater Tycho. Although the natural color of the Moon is a brownish-gray, the color here has been artificially "stretched" by computer to aid in visual interpretation, revealing scattered concentrations of different material chemistry, particularly in the case of the central peak.
Credit: LPI, USRA

Also curious is the presence of a central mound in Tycho, something geologists often call a "rebound peak." And though experiments have occasionally produced a rebound peak toward the center of an explosion, such a peak is not typical. But on the Moon the abundance of central peaks is impossible to miss. And as we noted earlier, Brian Ford’s experiments drew attention to craters with central peaks in laboratory spark-machined craters. In recent electrical cratering experiments by plasma physicist CJ Ransom, seen below, central peaks were often the norm. In the general patterns, the central mound or peak was burnt, suggesting electrical fusing of material. This analogy may, in fact, apply very aptly to the central peak of Tycho.



Craters produced in laboratory experiments by Dr. C J Ransom, of Vemasat Laboratories.
Credit: Mel Acheson, C J Ransom.

The Crater Aristarchus



Credit: P. van de Haar

The crater Aristarchus stands out in all Earth-based telescopic images of the Moon. Of the larger formations on the Moon, this rayed crater is considered the brightest. It is also distinguished from its surroundings by its elevation on a rocky plateau, rising more than 1.25 miles [2 kilometers] above the dark "mare" (latin, "sea") of Oceanus Procellarum. High points are essential considerations in the eyes of electrical theorists.

Remember that in the electrical interpretation, two dynamic aspects of electric arcing or lightning offer the best explanation of such formations. The effect of the second is superimposed upon the first. The first pattern will be the extended tracks left by electron streams racing toward high points to provoke a lightning "leader" stroke. These can be seen clearly in the Aristarchus image above. They are not the straight lines expected from a simple explosion, and they are not all radial to the bright crater of Aristarchus.

The second event is the explosive primary discharge producing a crater and a Lichtenberg figure - this effect being superimposed on the earlier electron flow pattern. Look at the picture above again to see if the explanation appears to make sense.

Something else of interest has also been observed in the case of Aristarchus. It seems that many (and perhaps all) of the "rays" are not deposits of ejecta, but *depressed channels*, as if material was *removed* along these pathways by the very event that produced the crater. That is, in fact, a predictable pattern in the electrical explanation.

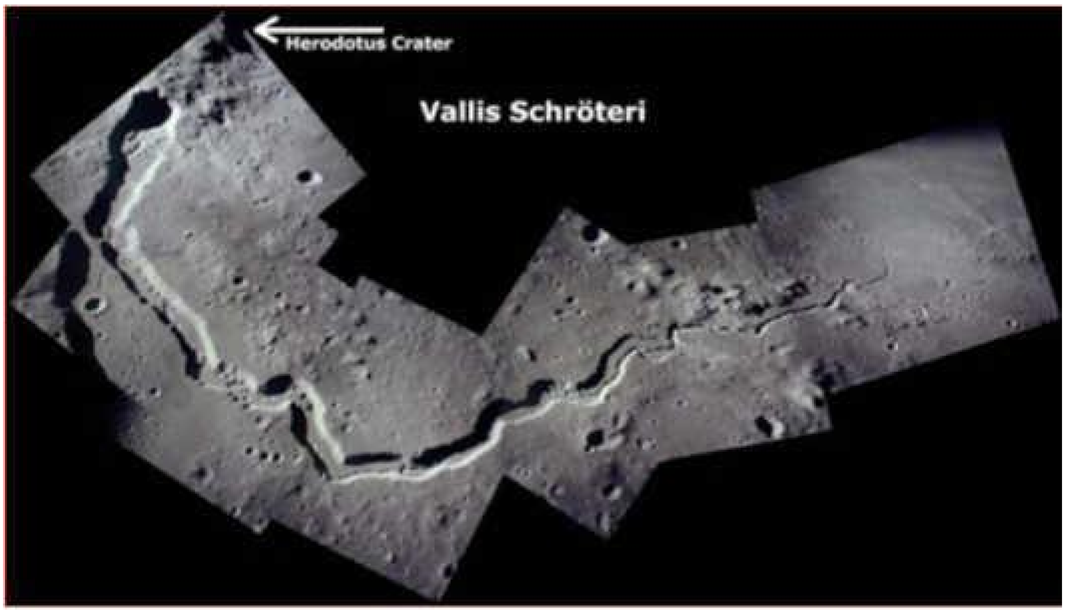
The large bright crater toward the center of this image is Aristarchus. On the right is the crater Herodotus, from which extends the great rille of Schroeter's Valley
(See discussion of enigmatic "crater chains" below).
Credit: NASA

The Mystery of Lunar Rilles

The surface of the moon is replete with long channels or grooves that continue to create unsolved puzzles for geologists. Traditional theories, when tested against the photographic evidence, have consistently fallen short.

As an introduction to the mystery, we could not do better than examine the great lunar rille called Schroeter's Valley. It appears to have its origin in the flat-floored crater Herodotus, lying close by Aristarchus (as seen in the image above). Planetary scientists tell us that the channel was cut by lava flowing either across the surface or beneath the surface to form a "lava tube" whose roof eventually collapsed.

But closer examination of Schroeter's Valley and its many counterparts on the Moon does not support attempts to describe them in such terms.



Composite of the lunar "sinuous rille" Schroeter's Valley. The photographs in the composite shown here were taken from the Endeavour Command Module of Apollo 15.
Credit: NASA

The long, winding channel of Schroeter's Valley is the most prominent "sinuous rille" on the lunar surface - 100 miles [160 kilometers] in length and up to 6.25 miles [10 kilometers] wide. It is also up to 4,265 feet [1,300 meters] deep - a profound contrast to any observed effect of flowing lava on Earth.

Both the width and length of Schroeter's Valley far exceed anything accomplished by lava on Earth. But the reverse would be expected under the standard interpretation. On the Earth, the atmosphere is insulating, allowing lava to retain its heat. In the vacuum of space, heat will be much more rapidly radiated away.

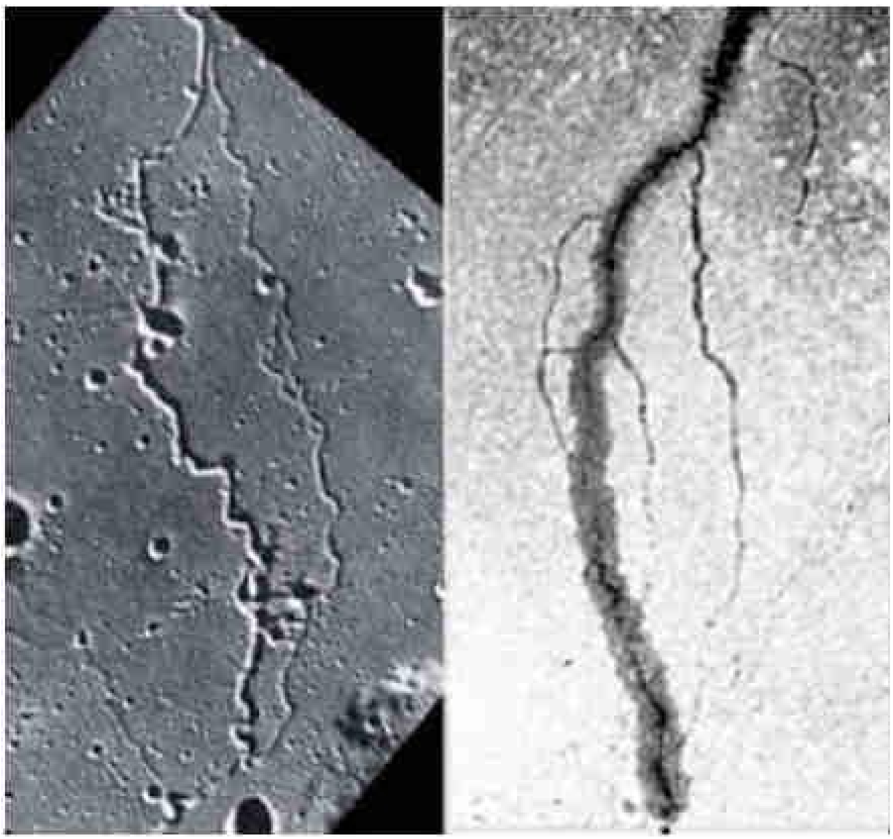
Schroeter's Valley as seen by the astronauts of Apollo 15. Herodotus crater lies to the right of the rille's termination, and Aristarchus Crater lies above it.
Credit: NASA.

The moon has only about one sixth the gravity of the Earth, and it is gravity that gives flowing liquid its velocity, its erosive force, and (most importantly in the case of heated and melted rock) its ability to cover distance.

The walls of Schroeter’s Valley are both steep and deep. If it was cut by flowing lava, as geologists now assume, where did all of the lava go? Flowing lava eating away surface material to cut a deep channel would have to show up somewhere. We should see either breeches in the deep walls or evidence of abundant outflow. But instead, the channel simply dwindles into a series of small craters. It is as if the material that once occupied the channel simply disappeared.

By all appearances, the "lava" must have possessed many remarkable features. This rapidly moving, molten rock, would have made turns up to 90 degrees without affecting the "bends in the river" in any way. Consider, for example, the sharply pointed prominence in the most dramatic change of direction about a third of the way down the rille from its "source" in Cobra head. If the lava had the power to create such vertical cliffs - up to *4,265 feet high* - how did that sharp prominence survive?

It is too often the things barely noticed, or too easily forgotten, that provide the most telling clues. Within the meandering channel of Schroeter’s Valley is a narrower *secondary* rille. While planetary scientists are well aware of this rille-within-a-rille, almost nothing is said about its defining feature - a chain of small craters running virtually the entire length of the rille. Yet this feature is not uncommon. A nearby rille, Rima Prinz I reveals the same "preposterous" characteristic.



On the left, a sinuous rille network on the moon. On the right, a pattern traced by a spark across an insulating surface dusted with fine powder.
Credits: left: NASA; right: W. Thornhill.

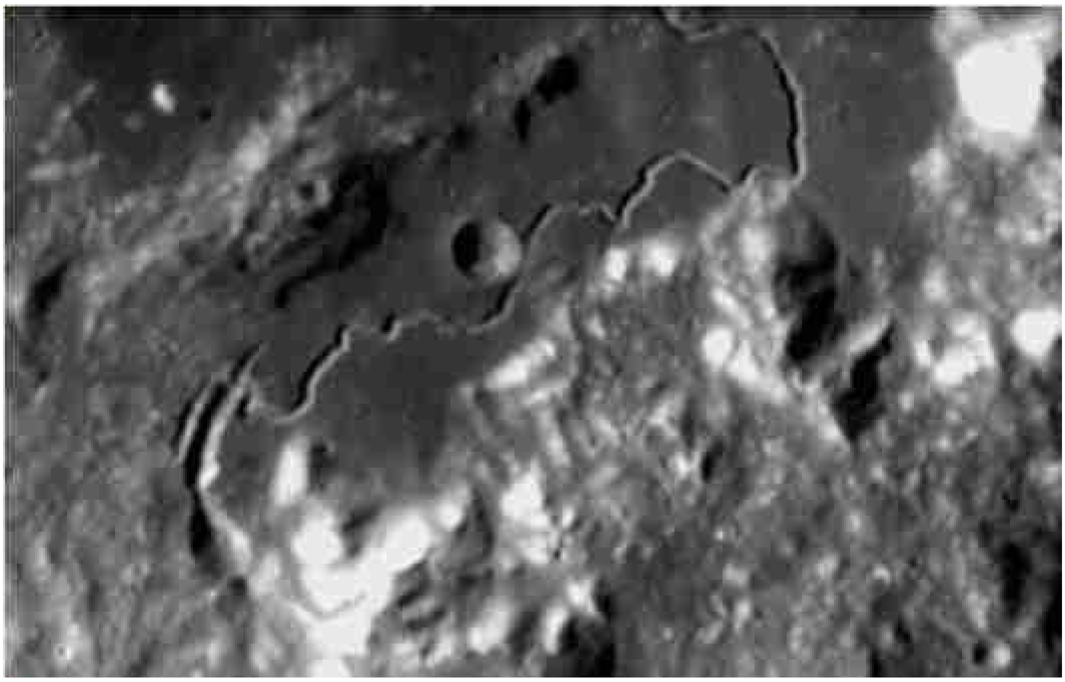
Now consider the lunar rille shown above (left) and compare it to the channel cut by an electric spark (right). In the electric scar, note the deep secondary channel running along the center of the primary. It is composed of a stream of pits. Lunar rilles reveal features remarkably similar.

When geologists looked at the lunar rille above, they hastily identified it as a channel cut by flowing lava. They did not seem to be bothered by the "tributary" connecting to the channel at both ends. In electrical discharge, however, this is not uncommon, as seen in the picture on the right.

There is, in fact, a demonstrable link between crater formation and rille formation in laboratory experiments, suggesting that a unified answer to the lunar mystery has been available for decades.

Hadley Rille

A lunar channel that gained much attention during the Apollo missions is Hadley Rille (pictured belw), explored by the Apollo 15 astronauts in 1971. The channel winds across some 75 miles [125 kilometers] of lunar maria. It is almost 1,300 feet [400 meters] deep in places, and almost 4,900 feet [1500 meters] wide at its widest point. Planetary scientists often say that it was formed by molten lava, and they draw comparisons to lava channels in Hawaii. But the differences between the two are profound.



Hadley Rille on the moon, a long meandering channel, spans some 75 miles. Note the deep gash cutting across the rille at the lower left.
Credit: ESA/Space-X

Many planetary scientists have suggested that Hadley is a "collapsed lava tube." As flowing lava cools, it will develop a crust, and eventually a stationary "roof" may form over it. A lava tube has the advantage that it enables lava to retain its heat as it flows underground, thereby covering greater distance and collecting less debris from surface cooling. The flowing lava of a lava tube can produce relatively continuous and smooth walls, while a surface channel of lava is continually creating its own obstructions by cooling, with subsequent overflow. For this reason, it will typically meander chaotically across its own debris field.

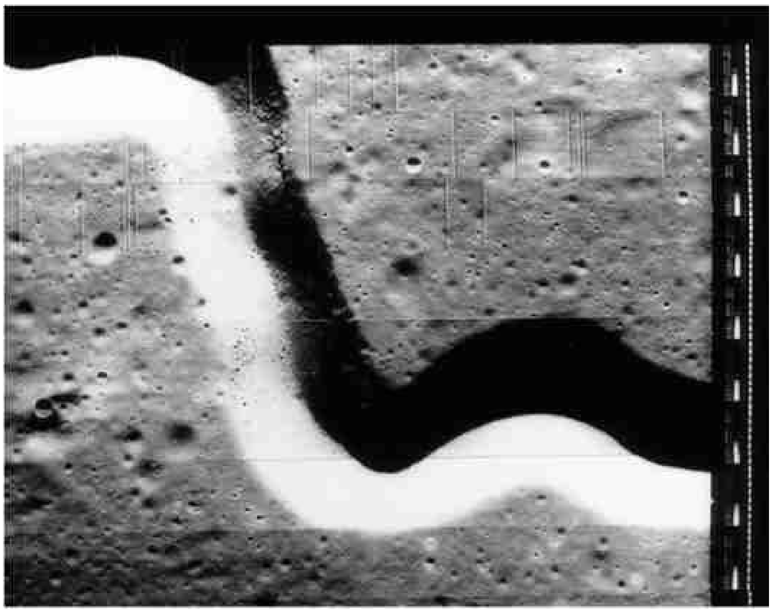
Hadley does not show the appearance either of a lava river emptied of its contents, or of a lava tube. Known lava tubes on Earth reveal a much different profile. The record breaking lava tube of Barker's Cave in Australia is 21 miles [35 kilometers] long and only about 115 feet [35 meters] in height. It achieved its length because the crust that formed over the flowing lava allowed the lava to retain its heat and continue flowing beneath the surface. It is clear that no such event occurred in the case of Hadley Rille. Practically speaking, it would be impossible to sustain a roof a thousand meters or more across, and there is no evidence of either a roof or of rubble from a roof's collapse.

Barker's Cave in Australia, called the world's longest lava tube.
Credit: David B. J. Thomae.

Indeed no lava tube on Earth comes close to the dimensions of Hadley, and that is only the beginning of the problem. The rubble left from a collapsed lava tube roof is impossible to miss, as can be seen in the picture below:

Four-wheelers do not have an easy time navigating this collapsed lava tube in Hawaii.
Credit: Michael Uslan & Peter Parks.

In contrast to a collapsed lava tube, high resolution images of Hadley show a complete absence of large-scale rubble. Whatever once lay within the cavernous depths of Hadley is no longer there, just the minor residue of a shattering event - a field of relatively small boulders strewn along its floor.



A close-up look at a small section of Hadley Rille, taken from the orbiting Apollo craft. Where the play of light and shadow emphasizes their presence, fields of small boulders can be seen on the floor of the channel.
Credit: NASA

Unlike lava flows, Hadley reveals no explicit overflow or outflow. It is just an empty channel that, enigmatically, grows narrower as it meanders across a relatively flat valley floor. In fact, well-qualified specialists had already acknowledged the failure of the common theory more than thirty-five years ago. In 1970, University of Pittsburgh scientists Bruce Hapke and Benn Greenspan drew attention to Lunar-Orbiter photographs showing strings of craters along the floors of lunar rilles. These features, they said, could not all be impact craters and must have something to do with the formation of the rilles. Their conclusion: direct evidence *contradicts* “those hypotheses for the origin of sinuous rilles by simple down-cutting by a moving fluid.” (From a report published in *EOS Transactions*, American Geophysical Union (51), 1970).

One explanation of Hadley and other lunar rilles has yet to be considered by planetary scientists. It is the one explanation that does not produce contradictions or conflict in any way with what we see on the moon. Juergens, who offered a radical explanation of cratering patterns on the moon, also explored an alternative explanation of sinuous rilles. In 1974 he suggested that these channels are the effects of electrical discharge. Juergens’ work, in turn, helped to inspire the lifelong work of today’s leading electrical theorist, Wallace Thornhill, who has taken the investigation into many new areas of research opened up by more recent space exploration.

Juergens undertook a dispassionate and meticulous comparison of earlier explanations offered for sinuous rilles. He knew that an electric discharge of the magnitude implied would require an approaching charged body - another planet or moon:

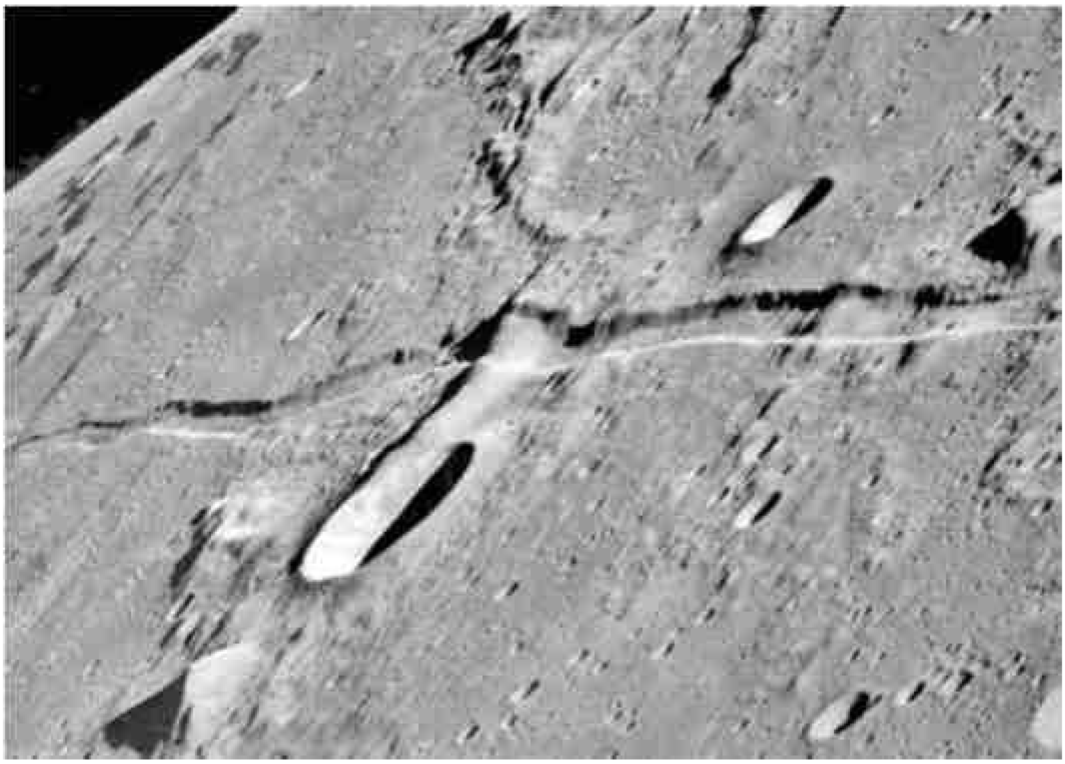
> “The electric field between anode and cathode [positively and negatively charged bodies] must build to an intensity great enough to "pull" electrons from the cathode by sheer force, … tearing electrons from non-conducting lunar crustal materials and in numbers sufficient to trigger an interplanetary discharge.”

The events as he envisioned them began with an electrical breakdown at a region of maximum stress, most likely a local prominence. Breakdown generates heat and explosively expanding plasma beneath the surface. In much the same manner that a powerful lightning strike can excavate a trench, the breakdown channel “tears hundreds of kilometers across the lunar surface at lightning speed.”

Then, as the onrushing electrons reach the local high point, the resulting electric surge blasts out a large crater, now known to be typical of rilles on the Moon and other bodies in the solar system. At virtually the same time, electron concentrations along the breakdown path “blast upward short of the main terminus, creating secondary onchannel craters at numerous points.”

Juergens' hypothesis was based on secure knowledge of the behavior of electric arcs. The fundamental mechanics can and have been verified in the laboratory. See the path of the electric arc above, with a secondary rille or crater-stream running down the main channel.

Juergens’ hypothesis can now be weighed against the present library of data on the lunar surface, including the surprising abundance of glassy spheres in Hadley Rille (a known byproduct of electric discharge), and the anomalous presence of remanent magnetism.



Lunar Rille Ariadaeus, exhibiting one of the distinctive features of an electric arc: Unlike flowing liquid, it disregards the irregular topography.
Credit: NASA

Crater Chains

To the electrical theorists, nothing is more compelling than the connection of rille-producing activity to crater-producing activity. Streams of craters running down the valleys of giant rilles can be compared to other forms of unexpected crater concentrations. These appear in varied contexts, from gashes, scoops, and gouges, to extended chains of craters and channel networks that appear to be nothing more than craters strung in a line.

Pitted channels in the vicinity of Aristarchus.
(Lower left corner of the larger Aristarchus image on page 12)

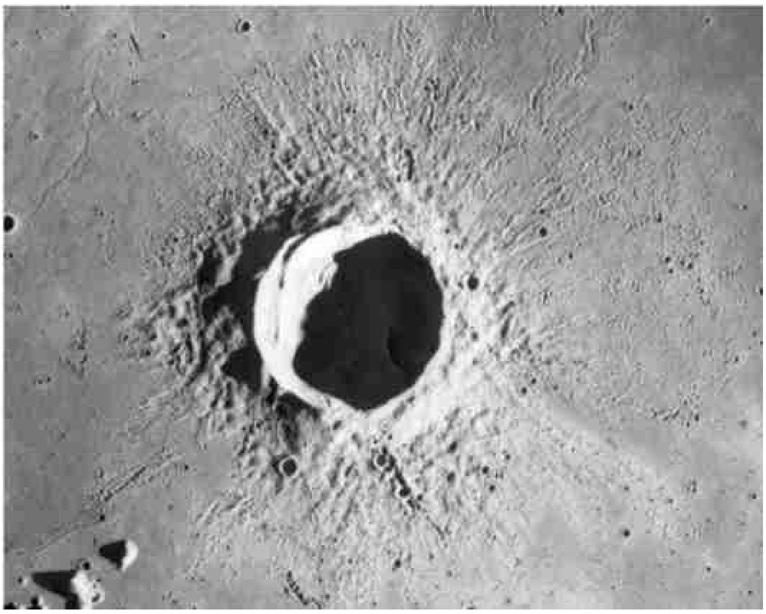
Pitted channels and chains of craters on the lunar surface underscore one of the most perplexing mysteries of lunar topography. As seen in the picture above, craters sometimes appear in alignment to form channels that could not be due to impact events. Once this pattern is noticed, it invites the observer to pay more attention to it. And suddenly, the profusion of "scoops," "gouges," and pitted channels will be obvious. No conventional explanation for such patterns has withstood scrutiny.

A remarkable example of a lunar crater chain can be seen in this KAGUYA image.

In the history of lunar exploration, the mysterious association of craters and rilles has provoked a number of mutually contradictory hypotheses, none of which is sufficient to explain things seen in high-resolution pictures of the Moon.

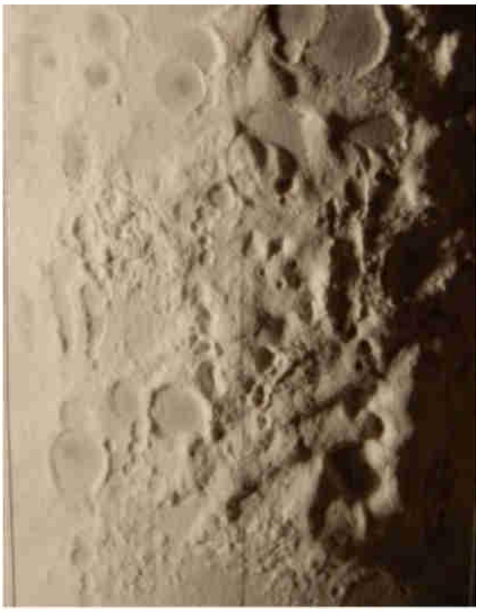
Dominating craters on the Moon are surrounded by non-radial crater chains, irregular concentrations of smaller craters, sinuous or filamentary channels, and deep gashes - the very features seen in electrical arcing experiments and in electrical discharge machining in industrial applications. To underscore these surface patterns, we include the image of Euler Crater below.

The picture shows innumerable small crater concentrations, crater chains, and gashes, one form merging with another in every imaginable way. A modest number of the gashes might be mistaken for impacts at oblique angles, were it not for the repeated instances in which the gashes are *constituted* of overlapping craters, or are too long, or change direction - attributes that exclude "explanation-by-impact." In this sense, an unbending adherence to the impact theory can only encourage theorists to ignore these defining features on the lunar surface.



When seen in its finer detail, Euler Crater puts an exclamation point to the enigmas of the lunar geology.

Are the crater concentrations and gouges perhaps the result of "surface collapse," as some might propose, or has material been cleanly *removed* from the surface by a force unknown to planetary scientists? Interestingly, at virtually no expense (a great contrast to public financing of planetary science!) a private researcher, James St. Pe, recently offered the pictures below as an alternative explanation for lunar features. It shows the effect of electric discharge on the dust collector of an ionic air purifier.



Credit: James St. Pe

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Circular craters, crater chains, and irregular gouges are all present, in striking contrast to the failure of standard theory to explain such features on the moon.

For additional perspective on all of this, we must remember that lunar surface features can now be systematically compared to analogs on other bodies in the solar system. In this way we can determine whether scientists have, in the decades since the Apollo missions, forged a coherent interpretation. It is this question we shall seek to answer in our next installment.

[Editor's Note: This Thunderblog is a copy of an article published by the Japanese magazine *Kaze No Tabibito* and is the first in a series of articles comissioned by that publication in a scholarly exploration of the Electric Universe.]

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