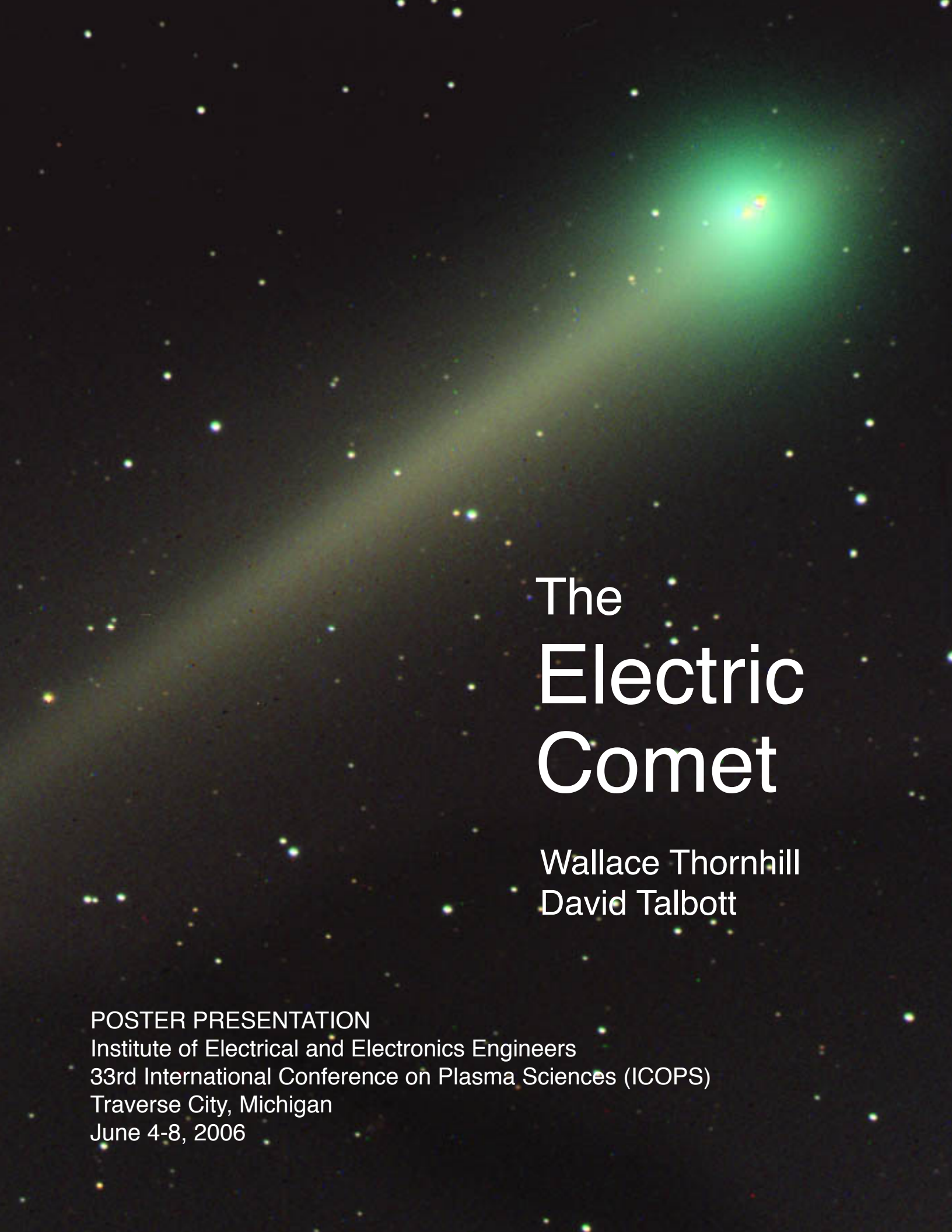

The Electric Comet

Wallace Thornhill
David Talbott

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Introduction

"Comets are perhaps at once the most spectacular and the least well understood members of the solar system."
M. Neugebauer, Jet Propulsion Laboratory

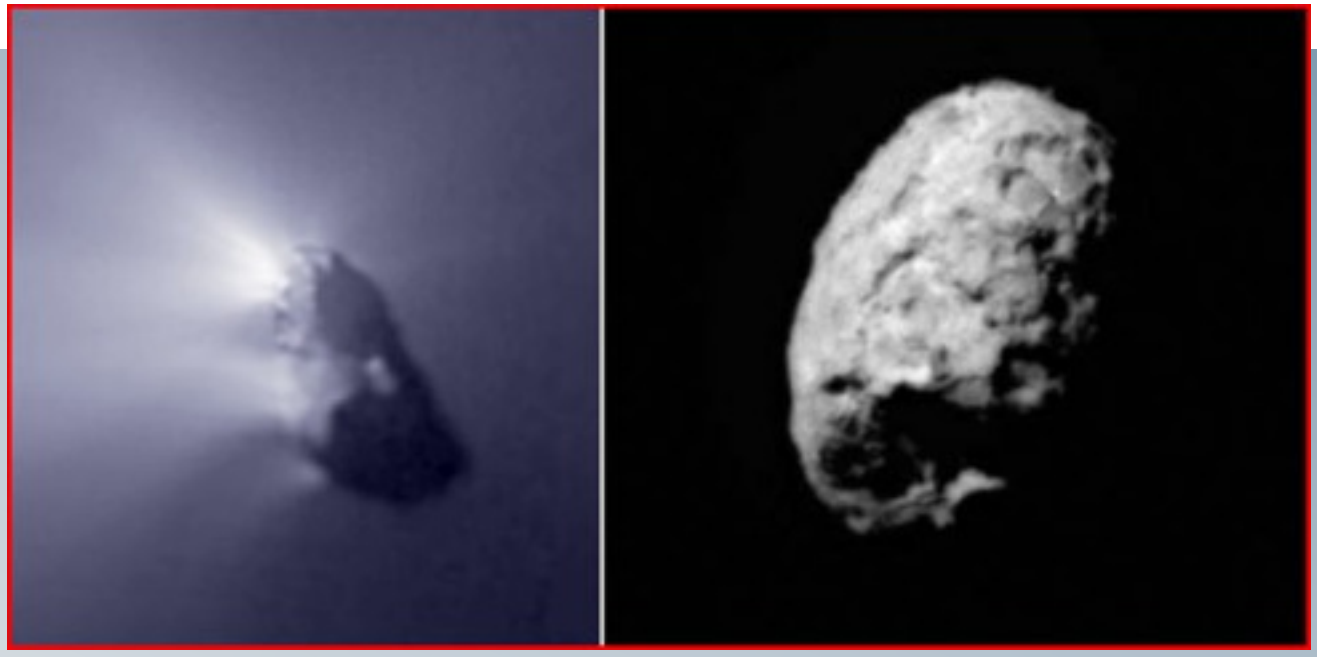
For several decades plasma cosmologists, inspired by the work of Hannes Alfvén, have urged astronomers to consider the role of electric currents and plasma discharge in large scale cosmic events. According to these theorists, electricity may be the dominating force in galaxy and star formation.

But only a few have considered the role electricity might play in the spectacular displays of comets.

Recent findings about comets call for a new perspective on these bodies. The more we have learned about comets, the more the discoveries support an *electrical* interpretation. Highly energetic and focused jets explode from comets' nuclei. The jets exhibit narrowly confined filamentary structures over great distances, defying the expected behavior of neutral gases in a vacuum. And the surfaces reveal sharply carved relief—exactly the opposite of what astronomers had predicted of these "dirty snowballs," but a telling clue as to the true nature of cometary displays.

Comets have unexpectedly high apparent coma temperatures and are sufficiently energetic to emit extreme ultraviolet light and even x-rays. Water and other volatiles are in short supply or are completely absent on comet nuclei. Observed electrical transactions with the solar wind now fascinate cometologists, but their "explanations" remain obscure and contradictory. And a perplexing number of comets mysteriously explode as they dart around the sun.

None of the newly discovered attributes of comets were expected by the standard model. But the recent findings are not "surprises" to the electrical theorists. They are the *predictable* behavior of an *electric comet*.



CONTRASTING MODELS OF THE COMET

The popular metaphor for comets as "dirty snowballs" no longer fits with space age findings about these bodies.

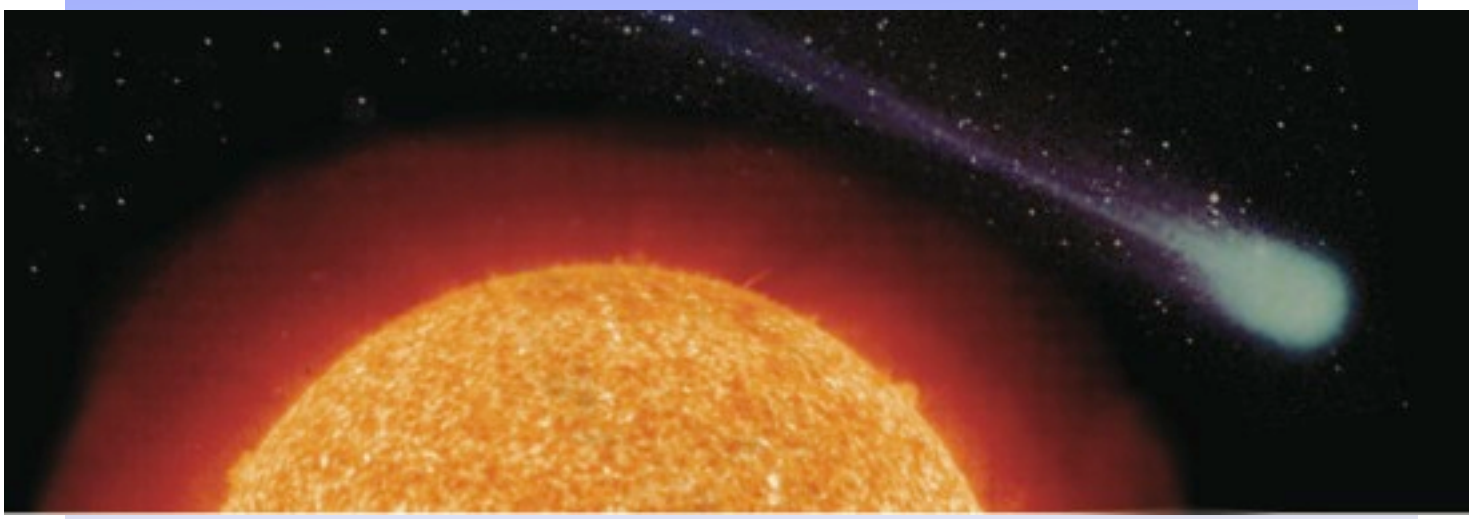
When a theory fails to anticipate discoveries, or the theorists themselves are continually surprised by new findings, it is only reasonable to question the original suppositions.

DIRTY SNOWBALL MODEL:

- Comets are composed of undifferentiated "protoplanetary debris"—dust and ices left over from the formation of the solar system billions of years ago.
- Radiant heat from the Sun sublimates the ices. The vapor expands around the nucleus to form the coma and is swept back by the solar wind to form the tail.
- Over repeated passages around the Sun, solar heat vaporizes surface ice and leaves a "rind" of dust.
- Where heat penetrates the surface of a blackened, shallow crust, pockets of gas form. Where the pressure breaks through the surface, energetic jets form.

ELECTRIC COMET MODEL:

- Comets are debris produced during violent electrical interactions of planets and moons in an earlier phase of solar system history. Comets are similar to asteroids, and their composition varies. Most comets should be homogeneous—their interiors will have the same composition as their surfaces. They are simply "asteroids on eccentric orbits."
- Comets follow their elongated paths within a weak electrical field centered on the Sun. In approaching the Sun, a charge imbalance develops between the nucleus and the higher voltage and charge density near the Sun. Growing electrical stresses initiate discharges and the formation of a glowing plasma sheath, appearing as the coma and tail.
- The observed jets of comets are electric arc discharges to the nucleus, producing "electrical discharge machining" (EDM) of the surface. The excavated material is accelerated into space along the jets' observed filamentary arcs.
- Intermittent and wandering arcs erode the surface and burn it black, leaving the distinctive scarring patterns of electric discharges.
- The jets' explode from cometary nuclei at supersonic speeds and retain their coherent structure for hundreds of thousands of miles. The collimation of such jets is a well-documented attribute of plasma discharge.
- The tails of comets reveal well-defined filaments extending up to tens of millions of miles without dissipating in the vacuum of space. This "violation" of neutral gas behavior in a vacuum is to be expected of a plasma discharge within the ambient electric field of the Sun.
- It is the electric force that holds the spherical cometary coma in place as the comet races around the Sun. The diameter of the visible coma will often reach millions of miles. And the visible coma is surrounded by an even larger and more "improbable" spherical envelope of fluorescing hydrogen visible in ultraviolet light.
- The primary distinction between comet and asteroid surfaces is that electrical arcing and "electrostatic cleaning" of the comet nucleus will leave little or no dust or debris on the surface during the active phase, even if a shallow layer of dust may be attracted back to the nucleus electrostatically as the comet becomes dormant in its retreat to more remote regions.



Electric Comet, Electric Sun

The electric comet model does not stand alone but in partnership with another hypothesis—the electric Sun.

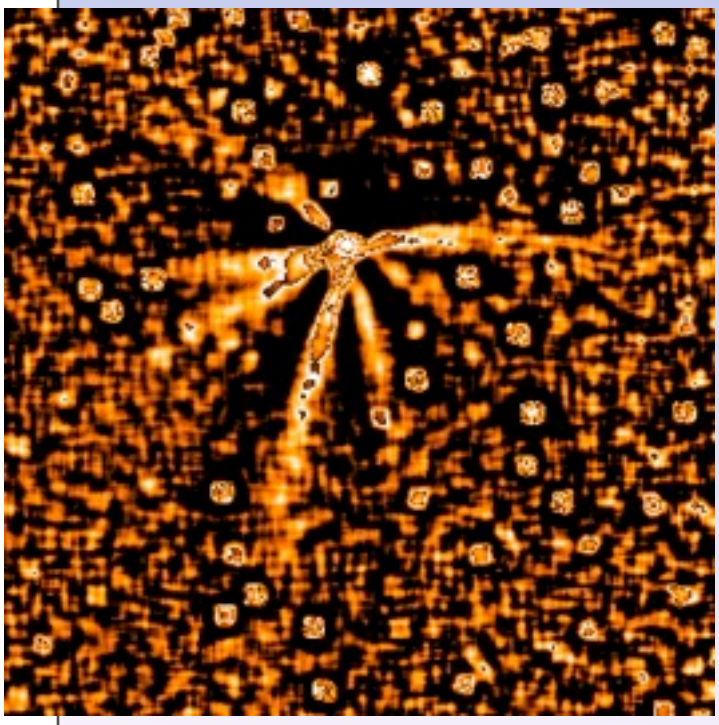
In the 1960s, engineer Ralph Juergens, an admirer of Hannes Alfvén, proposed that the Sun is a glow discharge, the center of an electric field extending to the heliopause. This field is the cause of solar wind acceleration. In the 1970s Juergens elaborated the theoretical concept and suggested that a comet's display is provoked by its electrical exchange with the Sun.

The comet spends most of its time far from the Sun, where the plasma voltage is low relative to the Sun. In remote regions, the comet moves slowly and its charge easily comes into balance with its surroundings.

But as the comet falls toward the Sun, it begins to move at a furious speed through regions of increasing voltage. The comet's charge, developed in deep space, responds to the new environment by increasing internal electric polarization and by forming cathode jets and a visible plasma sheath, or coma.

The jets flare up and move over the nucleus irregularly, leaving scars typical of electric discharge machining, The comet may shed and grow anew several tails. Or it may explode like an over-stressed capacitor, breaking into separate fragments or simply giving up the ghost and disappearing.

If the electric theorists are correct, there is no mystery in the gravity-defying behavior of comets. A gravitationally insignificant rock on a highly elliptical orbit can be an electrically powerful object.



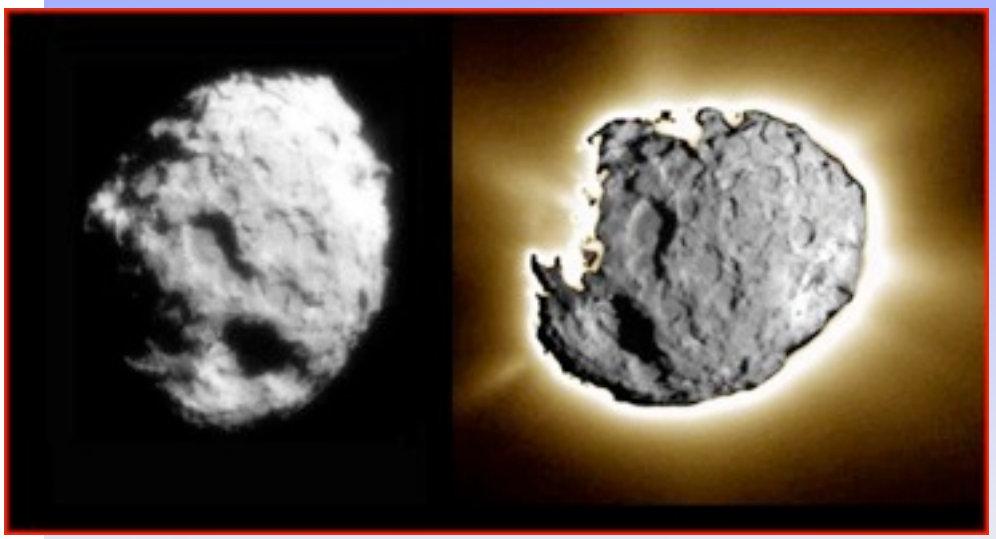
The Jets of Comet Hale-Bopp

One comet after another violates the "dirty snowball" criterion. Hale-Bopp in particular ignored the rules. In the photo seen here, it is still too far from the sun for a "snowball" to melt, but it already displays seven jets.

One of the observations leading to the dirty snowball theory of comets was that most of the periodic comets begin to grow tails at about the same distance from the Sun, between Jupiter and Mars. The determining factor was thought to be the distance at which the comet became hot enough for water and other volatile substances to evaporate into space, creating the coma, or “head,” and tail of the comet.

But this general pattern did not hold up. In fact, four years after the comet Hale-Bopp left the inner solar system, it was still active. It displayed a coma, a fan-shaped dust tail, and an ion tail—even though it was farther from the Sun than Jupiter, Saturn or even Uranus. The comet's tail was shrinking, but it was still about five times longer than the distance between the Earth and the Moon. At this distance, the Sun's heat will not melt ice. If it could, the icy moons of Saturn and Jupiter would be as dry as our own scorched Moon.

Enigmas abound. The frequent erratic motions of comets—in apparent violation of gravitational laws—have long been attributed to the jets erupting from the nucleus. But in the electric model, the jets are not released under pressure. The imagined “jet chambers” do not exist. The jets are created by electric arcs to the surface, accelerating particles into space. It is these arcs that carve out the well-defined surface features. (See page 15)



The Jets of Comet Wild 2

NASA's Stardust spacecraft captured the above images of Comet Wild 2 (pronounced VILT 2) on January 2, 2004. On the left is a Stardust image of the comet nucleus and on the right a composite of the nucleus and a longer exposure highlighting the comet's jets.

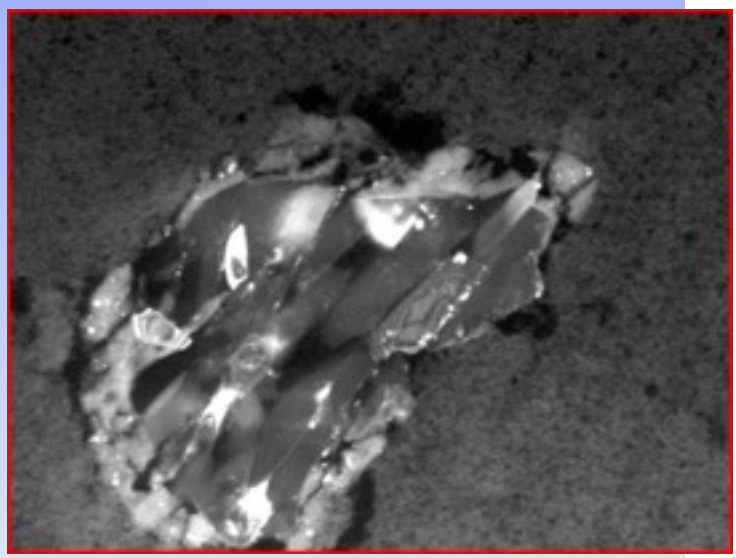
According to a Stardust project press release, mission scientists expected "a dirty, black, fluffy snowball" with a couple of jets that would be "dispersed into a halo." Instead they found more than two dozen jets that "remained intact—they did not disperse in the fashion of a gas in a vacuum.

Some of the jets emanated from the dark *unheated* side of the comet—an anomaly no one had expected. Chunks of the comet, including rocky particles as big as bullets, blasted the spacecraft as it crossed three jets. A principal investigator also spoke of energetic bursts "like a thunderbolt."

The electrical model explains the observations: an electric field accelerates matter in the jet; an electromagnetic "pinch effect" provides densities in the thin jets many orders of magnitude higher than those predicted from simple radial sublimation; and instabilities and fluctuations suddenly relocate jets in exceedingly short periods of time.

Recent images of comet Wild 2 have also revealed unexplained "bright spots" or "hot spots." From an Electric Universe point of view, these are the sparks where electric currents from the Sun impinge on the more negatively charged nucleus of the comet, as electricity etches the surface to create the observed "spires, pits and craters." Such features, described as "mind boggling," could only be carved on *rock,* not on sublimating ice or snow.

"Stardust" Shatters Comet Theory



The first results from NASA's Stardust mission are in, leaving mission scientists in a state of shock and awe. The tiny fragments of comet dust brought back to Earth did not accrete in the cold of space, but were formed under "astonishingly" high temperatures.

On January 2, 2004, the Stardust craft entered the dusty clouds around comet Wild 2, gathering samples of the minute particles as they struck the "aerogel" in a 100-pound capsule. The capsule returned to Earth and parachuted to touchdown on a Utah desert on January 15, 2006.

A surprise—the particles revealed abundances of minerals that can only be formed at *high temperatures*. Mineral inclusions ranged from anorthite, which is made up of calcium, sodium, aluminum and silicate, to diopside, made of calcium magnesium and silicate. Formation of such minerals requires temperatures of *thousands of degrees.*

"How did materials formed by fire end up on the outermost reaches of the solar system, where temperatures are the coldest?" asked Associated Press writer Pam Easton.

"That's a big surprise. People thought comets would just be cold stuff that formed out ... where things are very cold," said NASA curator Michael Zolensky. "It was kind of a shock to not just find one but several of these, which implies they are pretty common in the comet."

This theory-busting discovery must be set alongside a cascade of surprises in comet exploration, all contradicting the hypothesis of "dirty snowballs" originating in an imagined "Oort Cloud" at the solar system's outer limits.

Advanced Predictions on “Deep Impact”

On July 4, 2005,the Deep Impact spacecraft fired an 820 pound copper projectile at Comet Tempel 1. Just prior to this occasion, we registered a series of predictions at Thunderbolts.info, including but not limited to the following*:

- Considerably greater energies will be released than expected because of the electrical contributions of the comet.
- An electric discharge in advance of impact is likely. We also expect an interruption of impactor transmission before it reaches the surface.
- Scientists will find considerably less water ice and other volatiles than expected, both on the surface and beneath the surface of Tempel 1. A completely “dry” nucleus should not be surprising.
- The discharge and/or impact may initiate a new jet on the nucleus (which will be collimated—filamentary—not sprayed out) and could even abruptly change the positions and intensities of other jets due to the sudden change in charge distribution on the comet nucleus.
- The cameras will reveal sharply defined craters, valleys, mesas, and ridges—the opposite of the softened relief expected of a sublimating “dirty snowball”. (A chunk of ice melting in the Sun loses its sharp relief, just like a scoop of melting ice cream.)
- Electrostatic cleaning will have cleared the surface of dust and debris.

- http://www.thunderbolts.info/tpod/2005/arch05/050704predictions.htm

“Deep Impact”: The Smoking Guns

These close-up images of Comet Tempel 1, taken by the camera on the impactor that struck the comet nucleus, reveal white patches that have continued to puzzle NASA scientists. Electrical theorists suggest that these are the predicted whiteouts from electric arcs at the surface.

The following is a partial summary of correct predictions for “Deep Impact” based on the electric comet model:

ENERGY OF EXPLOSION-
It is now well documented that every scientist associated with the project was stunned by the scale of the energetic outburst. These scientists understood the kinetics of impact, and they all agreed that the explosion would be equivalent to 4.8 tons of TNT. That’s a good-sized bomb, but not even close to what occurred.

ADVANCED FLASH-
Electrical theorist Wallace Thornhill predicted at least one flash from electric discharge prior to impact. From the standard viewpoint, that is an absurd prediction when considering an impactor being hit by a body at 23,000 miles per hour in “empty” space. But here is NASA investigator Peter Schultz’s description of the event: “What you see is something really surprising. First, there is a small flash, then there's a delay, then there's a big flash and the whole thing breaks loose.”

MISSING WATER

"It's pretty clear that this event did not produce a gusher," said SWAS principal investigator Gary Melnick of the Harvard-Smithsonian Center for Astrophysics (CfA). "The more optimistic predictions for water output from the impact haven't materialized…" (See following pages)

SHARP SURFACE RELIEF

We not only predicted the sharply defined relief, but the specific features. "The model predicts a sculpted surface, distinguished by sharply defined craters, valleys, mesas, and ridges." All of the expected features are present, and astronomers cannot agree on the cause, though all agree that Tempel 1 does not look like a melting "snowball."

SURFACE ARCING

The highest resolution photographs of Tempel 1, taken by the impactor, show numerous featureless patches of whiteout, most located where the electrical hypothesis would put them—on the rims of craters and on the wall of cliffs rising above flat valley floors. Electrical etching continually expands valley floors by eating away at the sharp edges of surrounding cliffs.

NEW JETS

Electrical theorist Wallace Thornhill was the only one to have anticipated a shift in the arrangement, number, and the intensities of the jets away from the impact site. The 2.5 meter NOT telescope of the El Roque de los Muchachos observatory at La Palma, Spain, released images just before impact and 15 hours after impact. The observatory report states, "New jets appeared after the impact." No explanation has ever been given.

ELECTRICAL DISRUPTION

In the final seconds before impact, the video transmissions from the impactor showed considerable interference, then stopped moments before it struck the nucleus of Tempel 1. The interference pattern appeared to be electrical.

ELECTROSTATIC CLEANING

The surface of Tempel 1 contrasts with the surface of the asteroid Itokawa (right). The asteroid appears to have attracted considerable surface debris electrostatically. We suggested an active comet will do the reverse.

Through much of the space age comet investigators have been hoping to confirm the presence of water on comet nuclei. But it seems that the comets themselves have been unwilling to cooperate.

Deep Impact—Where's the Water?

By the time of "Deep Impact" (July 4, 2005), comet theory had fragmented into contradictory hypotheses, due in part to the absence of detectible water on cometary surfaces—a prerequisite of standard theory.

In 1986, visits to Halley's comet by the European Giotto and Russian Vega probes failed to locate surface water and raised the distinct possibility that the nucleus might *not* be ejecting water into space.

In January 2004, the Stardust spacecraft passed by Comet Wild 2, identifying a dozen jets of material exploding from the nucleus. The craft plowed through surprisingly dense pockets of dust swirling around the comet, but investigators were astonished that, despite the energetic activity, they could not find even a trace of water on the surface.

According to a NASA report, the flyby of Comet Borrelly by the Deep Space 1 craft in 2001 "detected no frozen water on its surface.".

When comet Shoemaker-Levy 9 broke apart, astronomers reasoned that the fractured nucleus would expose fresh ices that would sublimate furiously. Several ground-based telescopes and the Hubble Space Telescope trained their spectroscopes on the tails of the fragments of SL-9, looking for traces of volatile gases. None of the gases were found.

When Comet Linear disintegrated in front of their eyes, astronomers were not just shocked by the event (a comet exploding many millions of miles from the Sun), they were astonished to find virtually no water in the immediate debris.

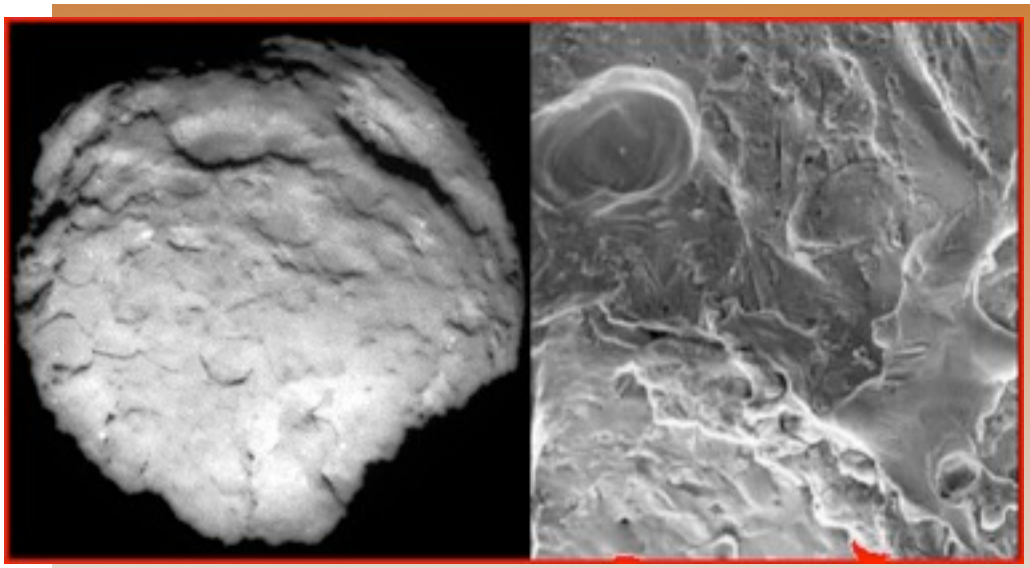
The absences of detectible water on comet nuclei had produced a crisis in comet theory well before Deep Impact. And the mission did nothing to rescue the theory. The Harvard-Smithsonian Center for Astrophysics summarized the early findings with the headline, "Deep Impact Was a Dust-up, Not a Gusher." Smithsonian astronomers reported the detection of "only weak emission from water vapor and a host of other gases that were expected to erupt from the impact site. The most conspicuous feature of the blast was brightening due to sunlight scattered by the ejected dust."

The results of the Deep Impact mission were published in the journal *Science*. Team members reported that they found only a smattering of water ice on the surface of Tempel 1. In fact, to account for the water supposedly emitted into the coma of Tempel 1, the investigators needed *200 times more exposed water-ice* than they could find.

But a much different vantage point on the water question is possible. When astronomers view the comas of comets spectroscopically, what they actually see is the hydroxyl radical (OH), which they *assume* to be a residue of water (H2O) broken down by the ultraviolet light of the Sun (photolysis). This assumption is not only unwarranted, it requires a speed of "processing" by solar radiation beyond anything that can be demonstrated experimentally.

The mysteries find direct answers electrically—in the *transaction between a negatively charged comet nucleus and the Sun.* In the electric model, negative oxygen ions are accelerated away from the comet in energetic jets, then combine preferentially with protons from the solar wind to form the observed OH radical *and* the neutral hydrogen gathered around the coma in vast concentric bubbles. These abundances simply confirm the energetic charge exchange between the nucleus and the Sun.

The electric model thus resolves two problems for the standard theory: 1) Cometologists have never verified that the assumed photolysis is feasible on the super-efficient scale their "explanation" requires; 2) Neutral hydrogen is far too plentiful in the coma to be the "leftover" of the hypothesized conversion of water into OH. But if the negatively charged nucleus provides the electrons in a charge exchange with the solar wind, the dilemma is resolved and the vast hydrogen envelope is a *predictable* effect.



Carving of Surface Relief

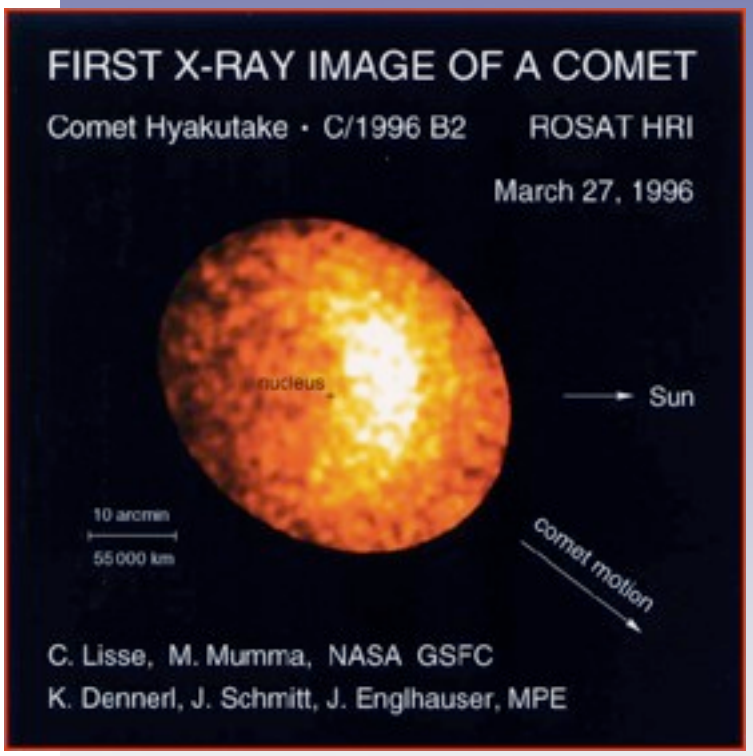
This image of Comet Wild 2 can be compared with the surface on the right, produced by electric discharge machining (EDM).

The single most dramatic prediction of the electric comet model is this: on close inspection a comet nucleus will reveal the well-defined effects of the electrical arcs that progressively etch away the surface and accelerate material into space. From the electrical vantage point, comets Wild 2 and Tempel 1 are "low voltage comets," but even in these cases the etching process has been more than sufficient to make our case.

On viewing the close-ups of Wild 2, several scientists initially declared that the craters were the result of impacts. But a small rock will not attract impactors, and it is inconceivable that such a small body could have been subjected to enough projectiles to cover it, end to end, with craters. And even if the inconceivable actually occurred, all surface relief would be quickly degraded by sublimation of the ices that are assumed to be responsible for the cometary display.

The nucleus of Wild 2 was, in the words of team members, "covered with spires, pits and craters," features that are more likely for a solid rock than a melting chunk of ice.

Today, most astronomers distance themselves from the "impact" explanation of Wild 2's surface. And rather than suggest an answer, the Deep Impact mission to Tempel 1 only deepened the mystery, revealing the very "craters, valleys, mesas, and ridges" that the electric model—and *only* the electric model—had predicted.



Cometary X-rays

A comet is claimed to be an icy body slowly wasting away in the heat of the Sun. But this ROSAT image from March 27, 1996 reveals a comet radiating x-rays as intense as those from the x- ray stars that are ROSAT's usual target.

The Sun's radial electric field is weak but constant with distance in interplanetary space. In a constant radial electric field, the voltage decreases linearly with distance. A comet on an elongated orbit spends most of its time far from the Sun and acquires a charge in balance with the voltage at that distance. But when a comet speeds inward for a quick spin around the Sun, the voltage of the comet becomes increasingly out of balance with that nearer the Sun—a situation leading to high-energy discharge.

Most of the voltage difference between the comet and the solar plasma is taken up in a double layer of charge, called a plasma sheath, that surrounds the comet. When the electrical stress is great enough, the sheath glows and appears as the typical cometary coma and tail. Diffuse electrical discharges occur in the sheath and at the nucleus, radiating a variety of frequencies, including x-rays.

The highest voltage differences occur at the comet nucleus and across the plasma sheath. So where the sheath is most compressed, in the sunward direction, the electric field is strong enough to accelerate charged particles to x-ray energies. That may explain recent crescent-shaped x-ray images in relation to the comet nucleus and the Sun. Flickering and occasional flare-ups are also expected, because plasma discharges behave in a non-linear manner.

When Comets Break Apart

The unexpected breakup of comets, some at considerable distances from the Sun, has long baffled comet researchers. But there is no mystery if comets are solid bodies discharging electrically as they move into regions of different voltage in the Sun's radial electric field.

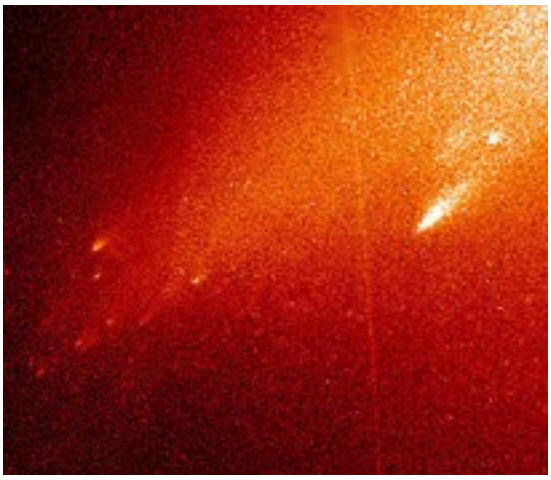
In 1976, Comet West never approached closer than 30 million kilometers to the Sun. So when a disruption occurred and the comet split into four fragments (subsequent to the display pictured above), astronomers were shocked.

In fact, according to Carl Sagan and Anne Druyan, authors of the book *Comet,* eighty percent of comets that split do so when they are far from the Sun. Comet Wirtanen fragmented in 1957 a little inside the orbit of Saturn, and something similar occurred to Comet Biela/Bambert.

In a paper published in the 1960s Dr. Brian G. Marsden, an astronomer at the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts, drew attention to the anomaly of comet fragmentation. Discussing the "sun-grazing" comets, he noted that two instances—1882 II and 1965 VIII—look as if they had split apart near ***aphelion*** (their farthest distance from the Sun) well beyond the orbit of Neptune and far above the ecliptic plane. Moreover, the relative velocity of their separation was far greater than could be due to solar heating.

"Unexpected" fragmentation and "anomalous" velocities of separation are predictable behavior of an electric comet`

According to Sagan and Druyan, "the problem is left unsolved." But they appear to have found a clue without recognizing its significance. "Splitting and jetting may be connected … At the moment Comet West split, the individual fragments brightened noticeably, and propelled large quantities of dust into space in the first of some dozen bursts." The same could be said for the more recent Comet Linear breakup.



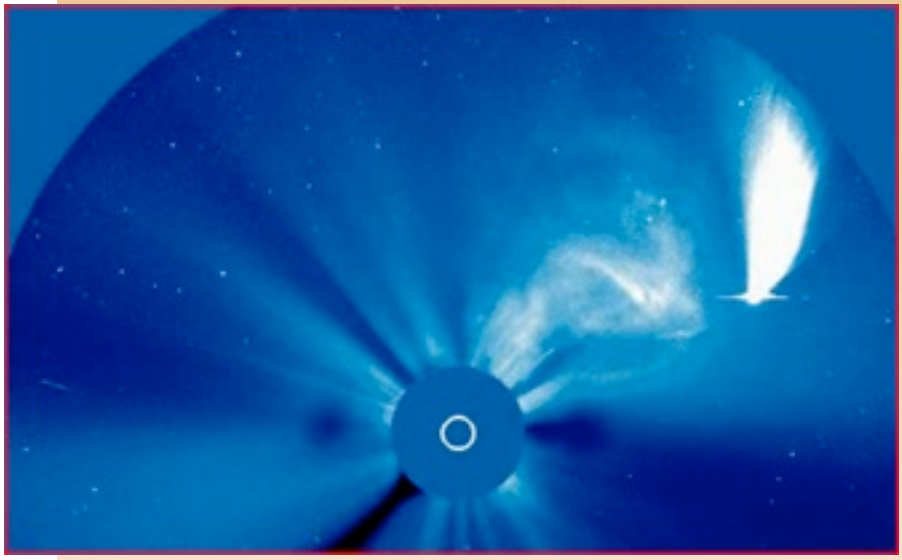
Comet Linear breaking up in the summer of 2000

Why would intense, high-velocity jets and explosions of dust, traveling at supersonic speeds, precede the fragmentation of a comet nucleus? In the electrical model of comets, the nucleus behaves like a capacitor. And as electrical engineers are well aware, if a discharge occurs within a capacitor it can explode violently. That is what causes comet nuclei to fragment and it is why the event is commonly preceded by outbursts far more energetic than could be explained by sublimating ices. The energy is provided by the stored electrical energy within the nucleus.

All that is required to trigger the comet fragmentation is an electrical breakdown within the comet. And that breakdown in the comet may happen with any sudden change in the solar plasma environment. The more sudden the change in the comet's electrical environment, the more likely that flaring and fragmentation will occur. NASA scientists were astonished to observe a remarkable 300,000 km wide flare-up of comet Halley between the orbits of Saturn and Uranus. (Under the assumptions of the "snowball" theory the nucleus should be frozen and inert at that distance.) But in the electrical model the event was no accident. It followed some of the largest solar flares ever recorded.

The electrical model also explains why we should expect long-period comets to put on a brighter display than short-period comets. The long-period comets spend a longer time in a region of lower plasma potential than the short-period comets. Consequently, their voltage difference on their approach to the Sun will be higher, leading to a brighter and more energetic discharge.

Comets and Coronal Mass Ejections



When a coronal mass ejection greeted Comet NEAT, space scientists called it a spectacular "coincidence." But in an electric universe such events deserve a second look.

In the electric comet model, the electrified plasma environment of the Sun allows for two-way transactions that are inconceivable if interplanetary space is truly a neutral plasma medium, rather than a *quasi*-neutral medium.

In 2003, as comet NEAT raced through the extended solar atmosphere, a large coronal mass ejection (CME) exploded from the Sun and appeared to strike the comet, causing a "kink" to propagate down the comet's tail. Of course, for solar physicists the timing of the mass ejection could have no connection to the approach of the comet.

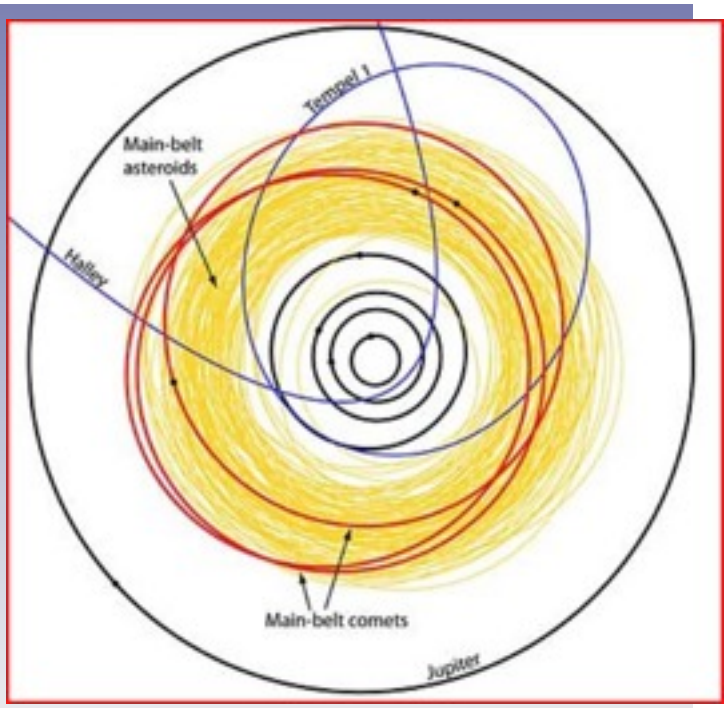
SOHO has, in fact, recorded several instances of comets plunging into the solar corona in "coincidental" association with CMEs. But the scientific mainstream allows for no electric force external to the Sun to have any influence on the Sun's atmospheric behavior.

But how would an *electric Sun* respond to the approach of a relatively small but strongly charged object? In electrical terms, the influence of the comet could be far more significant than its trivial *mass* in relation to the Sun.

What will occur electrically if the charged plasma or "atmosphere" of the comet interferes with the isolating double layer of the Sun's plasma sheath? Perhaps the observation of Nobel Laureate Hannes Alfvén, the father of plasma cosmology, can put the issue in context. It was his opinion that coronal mass ejections are caused by a breakdown or breach of the Sun's double layer—an event that provokes an explosive exchange between the insulated plasma cell of the Sun and the plasma of surrounding space.

When Asteroids Become Comets

The surprising discovery of asteroids with cometary tails supports the longstanding claim of the electrical theorists—that the essential difference between asteroids and comets is the shape of their or-



According to recent scientific reports, astronomers are "rethinking long-held beliefs about the distant domains of comets and asteroids, abodes they've always considered light-years apart." The discovery has forced astronomers to speculate that some asteroids are actually "dirty snowballs in disguise."*

For many years the standard view of asteroids asserted that they are composed of dust, rock, and metal and that most occupy a belt between Mars and Jupiter. In contrast, comets were claimed to arrive from a home in deep space, most coming from an imagined "Oort Cloud" at the outermost reaches of the solar system.

But now, "the locales of comets and asteroids may not be such a key distinction," states Dan Vergano, reporting on the work of two University of Hawaii astronomers, Henry Hsieh and David Jewitt. In a survey of 300 asteroids lurking in the asteroid belt, the astronomers detected three objects that "look a lot like comets … ejecting little comet tails at times from their surfaces." The three red circles in the illustration above describe the orbits of these "comet-like" asteroids.

In the electric view, there is no real distinction between a comet and an asteroid, apart from their orbits. Thus, the illustration makes the point for us: the red circles show greater variations in orbital distances from the Sun.

* Quote is from *USA Today*

CONCLUSION

Spacecraft have now visited four comets. What they found contradicts all expectations and falsifies accepted comet theory. But that theory is interwoven with every other astronomical theory into a cosmology that claims to define the universe as we know it.

Verification of the "electric comet," therefore, will have far-reaching effects on all theoretical sciences touching on the nature of the universe:

- An electric field sufficient to cause electrical discharging on a comet beyond the orbit of Saturn has the potential to power the Sun.
- We can no longer ignore the cosmic electricians' claims: they tell us that the Sun is not a nuclear furnace but an electric glow discharge; its nuclear reactions are occurring not in the interior but in the atmosphere of the Sun, where the intensity of the discharge is highest.
- The nebular hypothesis of planetary origins, with its gravity-only causation, rests on too many unwarranted assumptions. Astronomers must now ask: what was the role of electricity in solar system evolution?
- The fabled residue of the primordial nebula, the "Oort cloud," called upon to send comets into the inner solar system, has lost its rationale.
- The electric field implied by comet behavior suggests that planets may not have always moved on their present orbits. The history of the solar system may bear little resemblance to present textbook descriptions.
- Electric currents and electric events in our solar system appear to have countless analogs in deep space. Above all else, astronomers and cosmologists must educate themselves on the behavior of electric currents in plasma.

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* See David Talbott and Wallace Thornhill, *Thunderbolts of the Gods (*monograph and DVD).