Dedication

My introduction to Alfred Degrazia came from my reading of 'The Velikovsky Affair, which i devoured in 1972 close on the heels of finishing 'Worlds in Collission'. I have read much on the outrage since including Velikovsky's own recollections, but nothing so far has had the same effect on my normally phlegmatic political consciousness. But, after all, that is to be expected from the pen of a sociologist. What has surprised and sometimes hurt my pride is that everytime I googgled a technical or mythological issue related to this article such as downpours of gravel, references to such exotica as Kuglers twin meteors and velikovsky's take on Agassiz, gues whose name usually comes up first? I might as well be up front about it since it will be obvious from my list of references. So Degrazia, slow down a little! And don't worry, there's not a chance in hell that anyone is going to catch up with you.

CURRICULUM VITAE

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EDUCATION

A native Torontonian, received a Bachelor of Arts degree at University College, University of Toronto, in 1958. Graduated from the university's law school in 1962,.

PROFESSIONAL ACTIVITIES

Involved since 1960 in the design and production of machinery and components for the international bedding and furniture industry.

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Culture and Entertainment

1977

Purchased the film rights to “A Shining Furrow", subsequently released as "Circle of Two", a feature film starring Tatum O’Neal and Richard Burton, directed by Jules Dassin. Sold screenplay to Film Consortium of Canada, for cash, a percentage of profits and credit as executive producer.

The Earth Sciences. Took a strong interest in neo-Catastrophism in the Earth Sciences. Wrote and lectured on the subject. Founding member of CSIS, (The Canadian Society for Interdisciplinary Studies) and published its newsletter. Helped organize annual seminars and funded and organized an international symposium at the University of Toronto campus in 1990 entitled ‘Velikovsky Reconsidered".

2002-2005 Raised funds for the production of ‘The Song Is You’ a musical food bank benefit review, celebrating the career of Oscar Hammerstein 2. Starring the Toronto Mendelssohn Choir, it opened at Toronto’s Hummingbird Centre, May 19th 2005

In 2008,entered into a joint venture with Gunnar Heinsohn to produce a documentary provisionally entitled ‘The earth Builders’, focusing on the role of comets in planetary evolution.

PUBLICATIONS:

Catastrophism 2000, Toronto July 1990 Co-edited with Clarke Whelton

Tales of a recent comet, Toronto July 1997 (With Frank Wallace)

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From Tail to Trail-Reconsidering Erratic Theory in Light of Recent Observations of Splitting Activity in Comets

Milton B. Zysman

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Abstract

In the early 19th century, a competition arose regarding basic geomorphic mechanisms. The debate turned on the origin of erratic, enormous boulders found far from their presumed source. Louis Agassiz (1807-73) ultimately convinced his peers that the earth is periodically covered by great –bedrock-grinding sheets of ice, capable of plucking and transporting these erratics for great distances. This article reconsiders the contribution of a dark horse, Ignatious Donnelly, who entered the race in 1883, with Ragnarok, The Age of Gravel and Fire. The author proposed a cometary origin for the erratics and their associated rocky debris.

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The contributions of competing catastrophic proponents of ice , flood and comets, are reconsidered in light of recent breakthroughs in the observation of solar system surfaces and the splitting behaviour of comets.

The new evidence not only supports Donnelys claim, it appears that he underestimated the contribution comets make in planetary evolution.

"The phenomena of the Glacial Period in Britain contain some of the most interesting problems it has yet been the lot of geologists to attempt to solve. It, therefore, behoves us to approach the subject in a spirit of humility. That such varied explanations have been proffered from time to time, that most contradictory conclusions should be drawn from well-ascertained and generally acknowledged facts, is curious and somewhat depressing. There is, however, this reflection to comfort us: however strange, however contradictory, however devoid of common-sense the various explanations and theories of the Glacial Period appear to the various observers and reasoners upon them, the total effect is, like that of the hypothetical Ice-Sheet, a push forward. Without opposition, observation stagnates, so that the first effect of enthusiasm, even if directed in lines that afterwards prove to be mistaken, is to advance the science we love so well. Even if a theory be utterly false, it may prove of great educational value…

Mellard Reade 1896: From 'Problems in the Glacial Theory' [1]

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Erratics

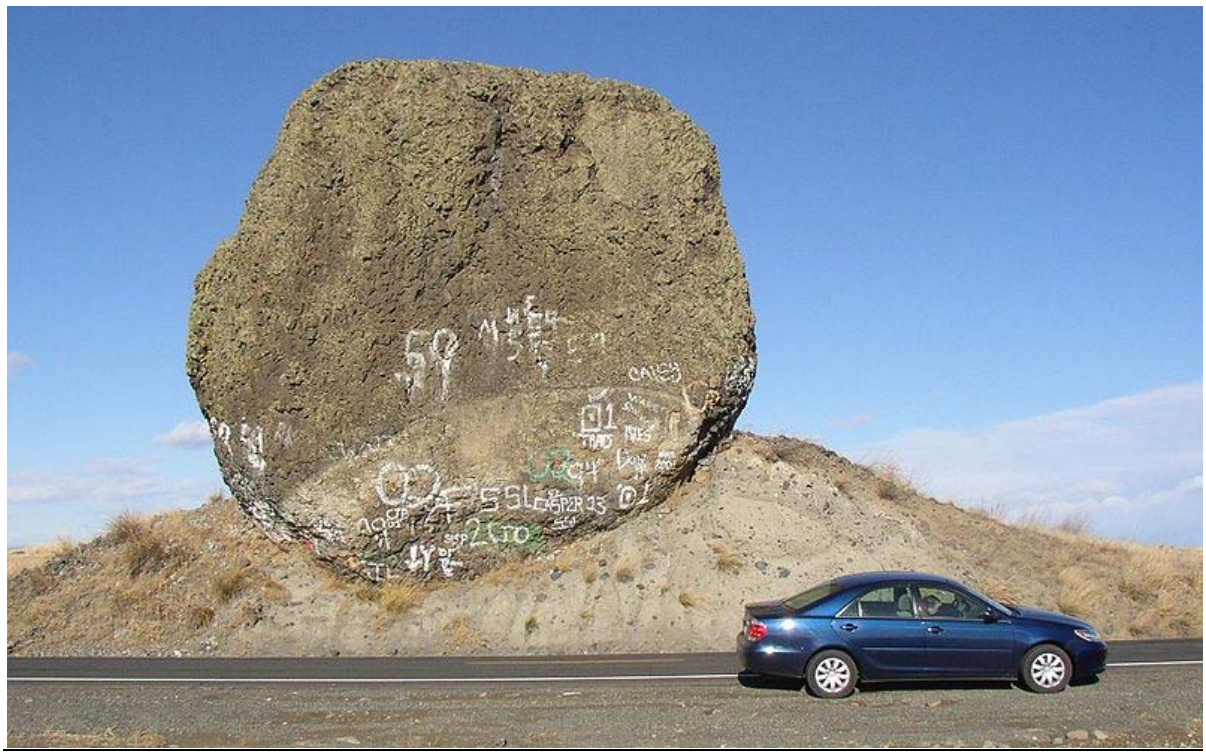

Figure 1 an erratic called Yeager Rock, Waterville Plateau, Washington, USA

Determining the origin of erratics, the largest rocks found in the drift, (a term inherited from the original belief that these boulders were the residue of the biblical deluge)has been a surprisingly critical objective in geology's internecine battles. Pummelled relentlessly by deluvialists, the glacialists for the last 150 years have held their tattered flag aloft in an uneasy victory as the reigning explicators of the origins of these sometimes awesome anomalies. To these main contenders, we shall add a dark horse, Ignatius Loyola Donnelly (November 3, 1831–January 1, 1901). Donnelly proclaimed these great stones part of the blankets of cometary debris, covering a large part of the globe.

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Erratics are boulders (defined as stones of any chemical make-up and greater than 30 cm in diameter) found a significant distance from their presumed source. These giant stones (see illustrations) achieved their present geological significance from the clue they provided for the continent-covering ice sheets imagined by their leader Louis Agassiz.

The following tale, is now a minor classic in the history of geology:

"As early as 1815 a sharp-eyed chamois- hunter of the Alps, Perraudin by name, had noted the existence of the erratics, and, unlike most of his companion hunters, had puzzled his head as to how the bowlders got where he saw them. He knew nothing of submerged continents or of icebergs, still less of upheaving mountains; and though he doubtless had heard of the Flood, he had no experience of heavy rocks floating like corks in water. Moreover, he had never observed stones rolling uphill and perching themselves on mountain-tops,)... Yet there the stones are. How did they get there?

The mountaineer thought that he could answer that question. He saw about him those gigantic serpent- like streams of ice called glaciers, "from their far fountains slow rolling on," carrying with them blocks of granite and other debris to form moraine deposits. If these glaciers had once been much more extensive than they now are, they might have carried the boulders and left them where we find them. On the other hand, no other natural agency within the sphere of the chamois-hunter's knowledge could have accomplished this; ergo the glaciers must once have been more extensive.... He conceived one of the few truly original and novel ideas of which the nineteenth century can boast.." [2]

Not So Fast!

With all due respect, both Perraudins hagiographer and the chamois hunter could have had recourse to the bible in pondering the source of these stones.

Immanuel Velikovsky, the 20th century's leading catastrophist, and his predecessor Ignatius Donnelly, certainly did, for they both picked up on and were inspired by the famous story of the long day of Joshua. We will quote extensively from Donnelly's 'Ragnarok', in part because Donnelly, having died a half century before the publication of Velikovsky's heretical 'Worlds in Collision', has obvious priority , but more for the manner in which their use of the biblical material differed, with Donnelly making greater use of their collective insight in solving the enigma of erratic boulder origins.

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“Donnelly wrote: In the Bible we have distinct references to the fall of matter from
heaven. In Deuteronomy (chap. xxviii), among the consequences which are to follow disobedience of God's will, we have the following:

"The Lord shall smite thee . . . with an extreme burning, and with the sword, and with blasting, and with mildew; and they shall pursue thee until thou perish.

"And thy heaven that is over thy head shall be brass, and the earth that is under thee shall be iron.

Figure 2. Artistic Depiction of the dust from heaven

"The Lord shall make the rain of thy land powder and dust: from. heaven shall it come down upon thee, until thou be destroyed_. . . .

"And thou shalt _grope at noonday_, as the blind gropeth in darkness."

And even that marvellous event, so much mocked at by modern thought, the standing-still of the sun, at the command of Joshua, may be, after all, a reminiscence of the catastrophe of the Drift(??). In the American legends, we read that the sun stood still, and Ovid tells us that "a day was lost." Who shall say what circumstances accompanied an event great enough to crack the globe itself into immense fissures?

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It is, at least, a curious fact hat in Joshua (chap. x) the standing-still of the sun was accompanied by a fall of stones from heaven by which multitudes were slain. Here is the record:

> *"And it came to pass, as they fled from before Israel, and were in the going down to Beth-horon, that _the Lord cast down great stones from heaven upon them_ unto Azekah, and they died: there were more which died with hailstones than they whom the children of Israel slew with the sword."*
>
> *"And the sun stood still, and the moon stayed, until the people had avenged themselves upon their enemies. Is not this written in the book of Jasher? So the sun stood still in the midst of heaven, and hasted not to go down _about a whole day_.*
>
> *"And there was no day like that before it or after it, that the Lord hearkened unto the voice of a man: for the Lord fought for Israel."* [10]

It seems clear that Velikovsky was unaware of Ragnarok prior to finishing his manuscript. He was too original a thinker and much too proud to resort to plagiarism, but he was made aware of Donnelly`s priority before publication of 'Worlds in Collision 'and forced to make a grudging acknowledgment of Donnelly's prior claim.

He wrote in Worlds in Collision[3]:

> "Ignatius Donnelly, author, reformer, and member of the United States House of Representatives, tried in his book Ragnarok (1883) to explain the presence of till and gravel on the rock substratum in America and Europe by hypothesizing an encounter with a comet, which rained till on the terrestrial hemisphere facing it at that moment. He placed the event in an indefinite period, but at a time when man already populated the earth. Donnelly did not show any awareness that Whiston was his predecessor. His assumption that there is till only in one half of the earth is arbitrary and wrong."[2]

We must understand Velikovsky's chagrin. The Joshua story represented more than a synchronic link between a shower of cometary debris and a slowing of the earth's diurnal rotation. It provided for Velikovsky a method of linking early civilizations, since a lengthening of the day in the western hemisphere, he deduced, would lengthen the night in another. A significant portion of 'Worlds in Collision' is dedicated to the effects which the various cometary encounters had on overall chronology, including dysfunctional water clocks and sundials, missing months and shortened years.

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What is important here is the use each man made of his Joshua epiphany. Velikovsky's day job was psychoanalysis. , and his reputation was solid enough to gain consultation fees from His fellow practitioners. His avocation was revising ancient Middle-eastern history. His first completed manuscript was not the best selling 'Worlds in Collision', but Ages in Chaos, a series devoted to radically reconstructing Egyptian and Mesopotamian monarchies to suit biblical dates.

Despite lukewarm sales, he persisted in his efforts, publishing three more titles dealing with the topic before his death in 1979 [24] [25] [26]. Donnelly had no particular interest in chronology . He was much more a dilettante than Velikovsky, with wider professional interests. He was a successful populist, serving as lieutenant governor of Minnesota and U.S. congressman, and he was as obsessed with the true identity of Shakespeare and the location of Plato's Atlantis as he was with the nature of comets. But in the end his exploitation of the Joshua event produced greater geological dividends.

What must have furthered irritated the more scholarly Velikovsky, was the off-handed manner in which Donnelly treated the Joshua story.

> " I do not propound these questions as any part of my theory, but merely as suggestions. The American and Polynesian legends represent that the catastrophe increased the length of the days. This may mean nothing, or a great deal. At least, Joshua's legend may yet take its place among the scientific possibilities." [10]

Velikovsky mellowed little in his evaluation of Donnelly's work, and 25 years later in his autobiographical *Stargazers and Gravediggers* he still bored in on his predecessor's lack of chronological credentials:

> ".. … nor did he assign the catastrophe to any particular time. He did not suspect any resulting change in the astronomical position of the earth or of its satellite or in the duration of the day, the month, or the year.

Neither (did he suspect) the role of Venus or of any other planet generally, nor did (he) recognize the times of the Exodus, Joshua, or Isaiah as periods of great upheavals."[3] .

But Donnelly achieved much by sticking closely to the task of tracing these deadly showers to other cultures. He concluded the Joshua passages by returning to the theme of Ragnarok's sub-title 'The Age of Fire and Gravel'.

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> " But it is in the legend of the Toltecs of Central America, as preserved in one of the sacred books of the race, the "Codex Chimalpopoca," that we find the clearest and most indisputable references to the fall of gravel "'The third sun' (or era) 'is called Quia-onatiuh, sun of rain, because there fell a rain of fire; all which existed burned; _and there fell a rain of gravel.'

Outlooks Compared

Velikovsky was a true catastrophist. Although he understood that the global upheavals he described so vividly had a positive evolutionary dimension (he admitted as much in a conversation with this writer in 1978) , at the conclusion of Worlds in Collision, he took on the tone and dark outlook of the Hebrew prophets he frequently quoted. He issued a warning to stir our slumbering minds to the past lest we replay the chaotic epics of the past by setting off a nuclear holocaust [3].

Donnelly had a broader outlook on his age of fire and gravel which he pitched in a Whitmanesque hymn to cometary debris:

> "THE DRIFT**,** What is it...Go out with me where yonder men are digging a well. Let us observe the material they are casting out. First they penetrate through a few inches or a foot or two of surface soil; then they enter a vast deposit of sand, gravel, and clay. It may be fifty, one hundred, five hundred, eight hundred feet, before they reach the stratified rocks on which this drift rests. It covers whole continents. It is our earth. It makes the basis of our soils: our railroads cut their way through it; our carriages drive over it; our cities are built upon it; our crops are derived from it; the water we drink percolates through it; on it we live, love, marry, raise children, think, dream, and die; and in the bosom of it we will be buried."

Where did it come from? That is what I propose to discuss with you in this work [10] "And discuss he did , making such a destructive assault on the Ice Age explanation for the origins of the drift and its associated boulder population, that we must revert to the opening apologia ,however strange, however contradictory, however devoid of common-sense the various explanations and theories of the Glacial Period appear to the various observers and

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reasoners upon them, the total effect is, like that of the hypothetical Ice-Sheet, a push forward." Let us therefore "push forward" with a proposed resolution to the origin of erratic boulders that well might stretch even the imagination of our radical protagonists.

Why Ice?

We will not rehash all the difficulties in the persisting claim that glaciers pluck boulders from bedrock, convey them, while eroding their surfaces, for hundreds of kilometres , somehow transfer them to the top of the towering ice sheet, and then carry them hundreds of metres uphill, embedding them in the crests of mountain ridges. Donnelly did too thorough a job, and the full text of Ragnarok is available on-line for those who wish to follow the entire argument. An excellent précis of the controversy is provided in a compilation taken from the admirable work of William Corliss. [29]

Suffice it to say that 120 years since the publication of Ragnarok, the earth's many glaciers have yet to grind out any tills. This show stopper, however, has never impeded geologists from producing thousands of learned articles based on the extremely shakey premise of a glacial origin for till. . But one can understand the earnestness of Agassiz's promotion of the ice age. After all, these boulders were initially found on the glacier-rich Alpine valleys.

Moreover, glaciers are quite capable of carrying large rocks on their slowly moving backs, although it is doubtful that they could support thousand ton behemoths without swallowing them. There was also a further detail that supported a glacial origin and appeared to argue against Donnelly's exogenous hypothesis. It is that many of the erratics could be traced to the chemical signatures of remote upstream mountain belts.

We shall return to this critical issue later, for this finding, as I will argue, supports an extraterrestrial origin for both erratic boulders and their alleged mother rocks. But we must now bring in Immanuel Velikovsky.

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The Deluge Connection

It is difficult to understand Velikovsky's rejection of an extraterrestrial origin for till. As noted above, they both started with the same insight, but Velikovsky had the advantage of having eventually read Ragnarok. His attribution of great meteoric storms to the global upheavals in the pre-Cristian era, pictured in his chapters on the maruts is masterful, employing all his dramatic gifts in describing the awe these celestial fireworks inspired in our ancestors. Yet when faced with the question of the source of erratics, his imagination seemed to dissipate into a conventional deluvial interpretation.

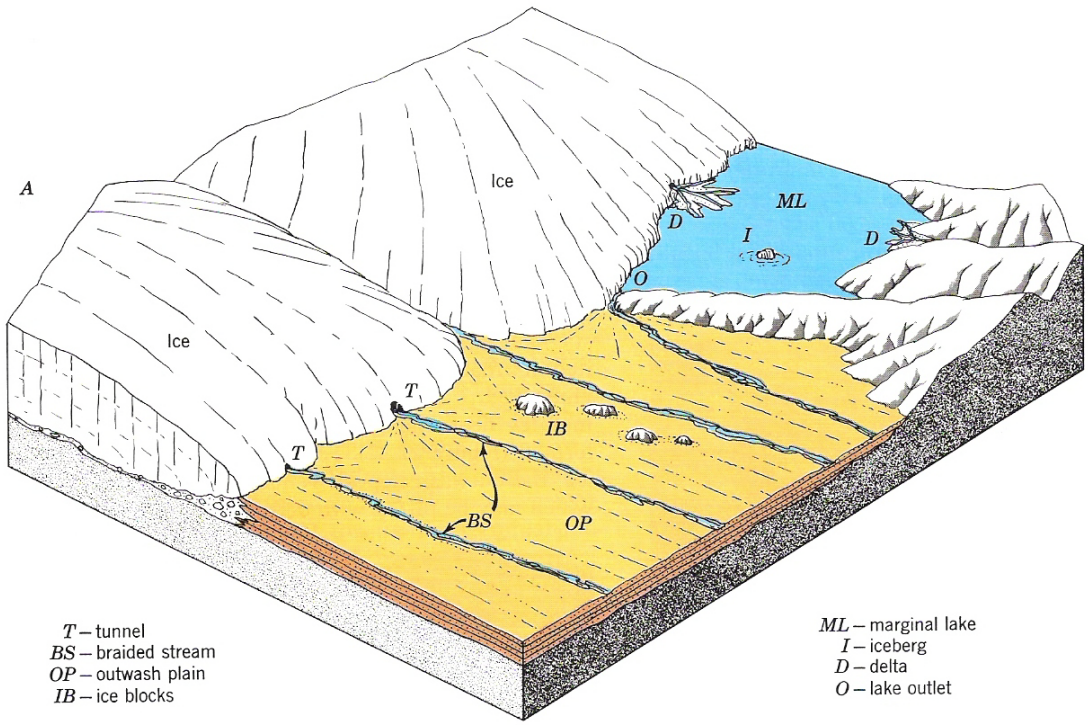

Figure 3.Sequence depicting the retreat of an ice sheet and the subsequent formation of a moraine feature

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> " Agassiz, in 1840, assumed that just as the Alpine moraines were left behind by the retreating glaciers, so the moraines in the flat-lands of northern Europe and America could have beencaused by the movement of great continental ice sheets (and thus introduced the theory of iceages). Although this is correct to some extent, the analogy is not exact, as the glaciers of the Alps push the stones down, not up the slope. Meeting an upward motion of the ice, large boulders would probably sink into the ice. The problem of the migration of the stones must be regarded as only partially connected with the progress and retreat of the ice sheet, if at all. Billows miles high traveled over the land, originating in causes described in this book. ..".

His somewhat backhanded approbation of Agassiz's problematic ice theory would have irritated Donnelly, who determinedly argued the physical impossibility of moving ice uphill. Nonetheless, Velikovsky's connection of the tsunami-like "waves of translation" to the long day of Joshua is ingenious: "The fact that accumulations of stones were transferred from the equator toward the higher latitudes, an enigmatic problem in the ice theory, can be explained by the poleward recession of the equatorial waters at the moment the velocity of rotation of the earth was reduced or its poles were shifted. In the Northern Hemisphere, in India, the moraines were carried from the equator not only toward higher latitudes, but also toward the Himalaya Mountains, and in the Southern Hemisphere from the equatorial regions of Africa toward the higher latitudes, across the prairies and deserts and forests of the black continent." [3]

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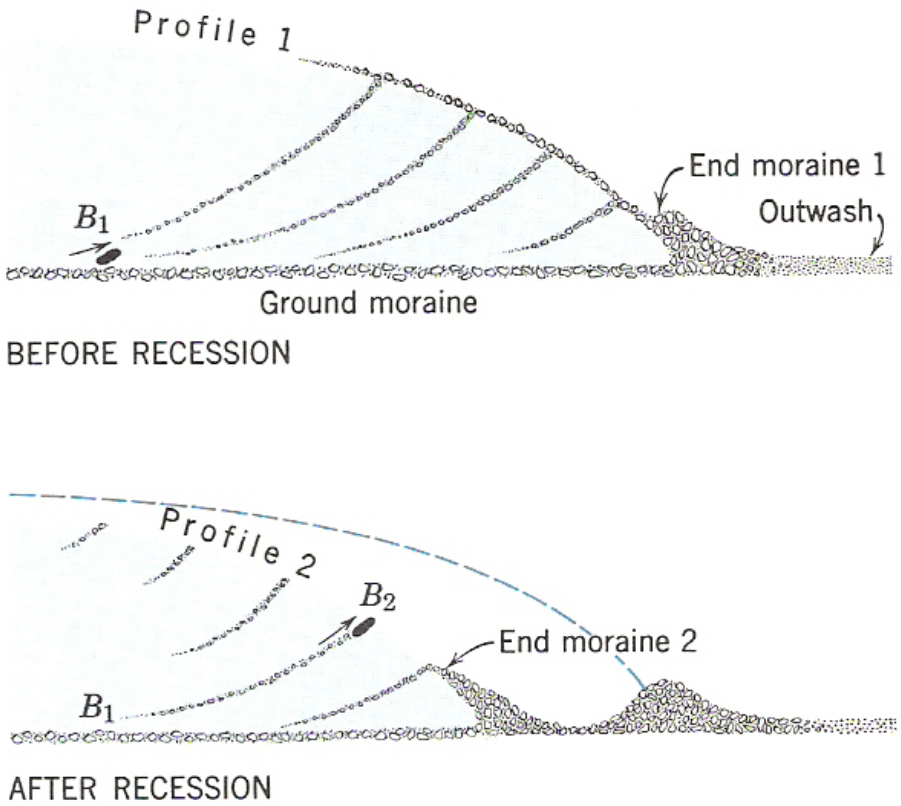

Figure 4. Proposed formation of Moraines

Despite these efforts, one cannot help thinking that Velikovsky was never fully engaged in pursuing the erratic problem . Even at the critical juncture of denying glacial transportation for boulders, he was thinking mainly of the chronological implications of the stones, for he pauses in his critical analysis of the question of erratic transport to make the somewhat irrelevant comment on the era in which these boulders were emplaced. But the problem, surely, was not boulder transport but origin, and Velikovsky was the 20th century's leading exponent of cometary encounters. In this matter he definitely was caught napping at the switch.

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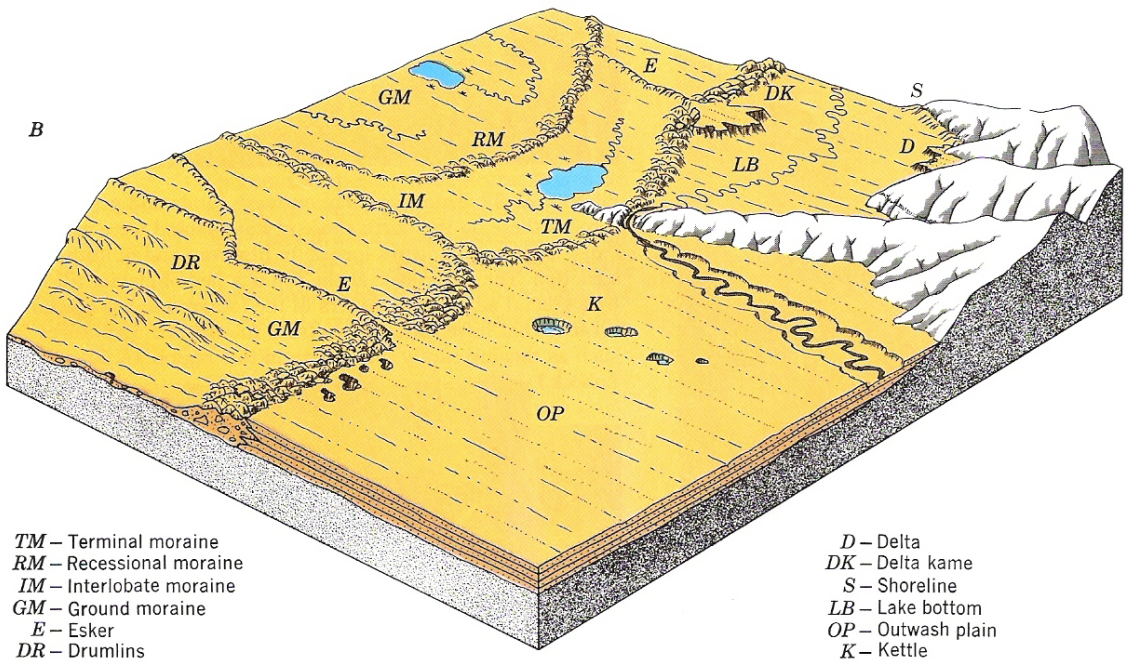

Figure 5. Remnants after the ice sheet retrieval.

There is little question that water, under high pressure can move boulders. They are easily sluiced away in mining for gold in the frozen mucks of the Yukon, and manufacturers use special water jet tools to cut delicate patterns in tool steel. When a dam broke in the famous Johnstown flood [4] the rushing waters carried burning houses and railway cars in its career down the watershed. But as we will demonstrate, flooding waters tend to displace rather than produce boulders which are found sitting upon and embedded in rather unexpected places, both on earth and elsewhere in the solar system.

Boulders and Comets

Only recently have we been able to verify Donnelly's claim for comets as the source for erratics. This is due to the paradox that materials heavy enough to move along a comet's orbit, are too large to be detected by conventional telescopes. On the other hand, the ionized light gases and the sub micron-sized particles that are light enough to be driven

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away from the comet's nuclei by the solar wind (described as type 2 tails), fluoresce and reflect light, clearly outlining the comets overall evanescent tail structure to the naked eye (see illustration).

The development of infra-red instruments, however, have permitted astronomers to detect and partially track a comet's debris tail which, unlike the type 2 dust and gas tails, move along the same orbit as the comet's nuclei.

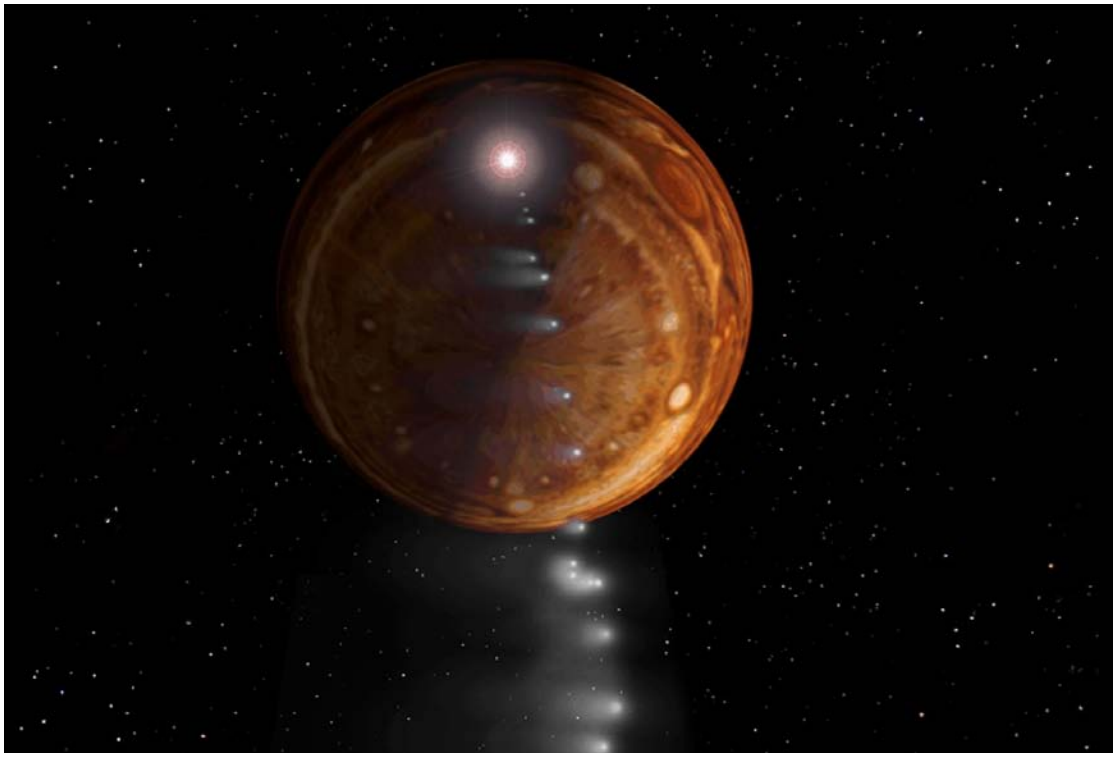

Figure 6 Artist's Rendition of Fragments of Comet Shoemaker levy's Impact on Jupiter

The plural term is deliberately used here, because some comets, like Shoemaker-Levy 9, which encountered Jupiter in 1994, are composed of many fragments and possess no obvious dominant nucleus. .

Until the development of the infra-red detectors and advance optics, astronomers could only speculate on the issue of comets as creators of boulder-sized debris. Loath to sacrifice their expensive space craft, investigators kept away from comets that were overly active. In 2006, however, Japanese astronomers utilizing an advanced camera, observed the fragmentation of Comet 73P/Schwassmann-Wachmann 3b.

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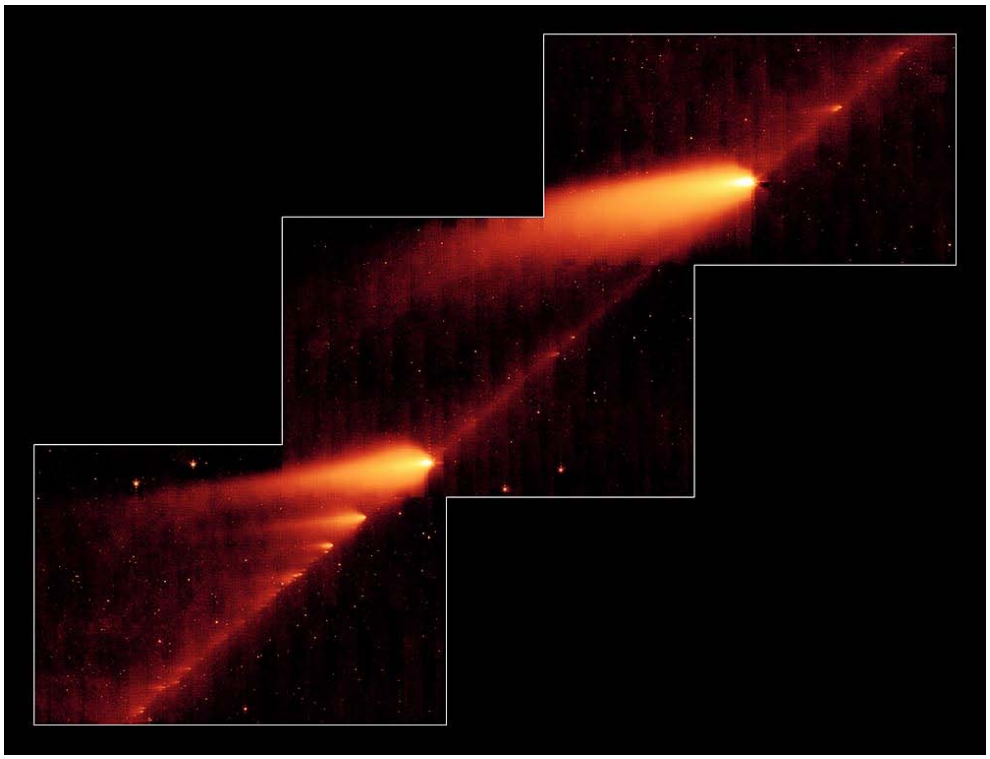

Figure 7. Infrared image of Comet 73P/Schwassmann-Wachmann 3

The following is taken from their report [18]:

> "73P/Schwassmann-Wachmann 3 (hereafter 73P/S-W3) is a member of the Jupiter-family comets (JFCs), orbiting the Sun with a 5.4-year period. During the apparition of 1995, 73P/S-W3 showed a huge outburst in activity. Afterward, four separate nuclei were confirmed and labeled A, B, C, and D. Of the four, fragment C was the largest and the presumed principal remnant of the original nucleus. The size of the nucleus was studied … the pre-breakup radius was 1.1 km and the radius of fragment C was 0.68 -0.04 km. (HST)(Hubble Space Telescope) observations "

After painstakingly masking out background noise and smeared star images, the investigators reported that they had culled from 211 candidates and "(mbz Xxmx01i), they could state that " … at least 154 mini-comets were detected by our data analysis methods." It is now established that comets not only produce boulders in profusion, they are in effect the sub-nucleii from which Donnelly's accumulations of tills are born.

Lest their readers were lacking in imagination, the authors also underscored this planet's potential security concerns:

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Boehnardt and the Maruts

The improved observations of the splitting and breakdown of comets have provided a clearer understanding of the great meteoric storms our ancestors must have witnessed. H Boehnhardt, a member of the *Max-Planck-Institut for Astronomy, Heidelberg* has divided the comet splitting phenomenon into two distinct categories. . These quotations are taken from this ground- breaking article on splitting. The first excerpt is from the abstract: [15]

"More than 40 split comets have been observed over the past 150 years. Two of the split comets have disappeared completely; another one was destroyed during its impact on Jupiter.The analysis of the postsplitting dynamics of fragments suggests that nucleus splitting can occur at large heliocentric distances (certainly beyond 50 AU) for long-period and new comets and all along the orbit for short-period comets. … The two basic types of comet splitting (few fragments and many fragments) may require different model interpretations. Disappearing comets may represent rare cases of complete nucleus dissolution as suggested by the prototype case, Comet C/1999 S4 (LINEAR). …
. Comet splitting seems to be an efficient process of mass loss of the nucleus and thus can play an important role in the evolution of comets toward their terminal state. The secondary nuclei behave as comets of their own (with activity, coma, and tail) exhibiting a wide range of lifetimes. However, at present it is now known whether the fragments' terminal state is "completely dissolved" or "exhausted and inactive."

1. THE PHENOMENON
Split comets appear as multiple comets with two or more components arising from the same parent and initially moving in very similar orbits. When active, the components usually display well-defined individual comae and tails that can overlap each other when the ensemble is close (see Fig. 1). (please insert, if possible mbz)Most of the components of a split comet "disappear" sooner or later; i.e., within time spans of hours to years the components become too faint to be detected even by the largest telescopes, and only one main component "survives" for a longer period of time. … the ultimate proof of comet splitting is provided through the detection of at least one secondary component (also called a fragment or companion) to the primary nucleus. The scientific interest in split comets reaches beyond the obvious questions "Why do comets split?" and "What is the

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sequence of events?" and focuses on the understanding of the internal structure and chemistry of the cometary nucleus as well as its overall evolution with time. The answers obtained from split comets may even provide information on the formation scenario of the solar system (for instance, the size distribution of the cometesimals, the original ice chemistry, and even the "birth place" of cometary nuclei).

The following is Boehnhardt's division of splitting comet type:

"Two types of split comets are known from observations: *Type A:* The split comet has a few (usually two) components. The primary fragment is the one that remains "per-manent"; the secondary can be minor, short-lived, or per-sistent for a longer time (years to centuries). The primaryis considered to be identical to the original nucleus (theparent body), while the secondary represents a smaller piece that is broken off the nucleus (typica lly 10–100 m in size). Type A splitting events can recur in the same object.
…
Type B: The split comet has many (more than 10) components that could arise from a single or a short sequence of fragmentation events. The fragments are short-lived (possibly of small size), and no primary component can be identified. Tertiary fragmentation of secondaries is occasionally observed. Type B events are believed to represent cases of dissolution and/or disruption of the comet and the parent body may become completely destroyed. Known cases are Comet D/1993 F2 (Shoemaker-Levy 9) and Comet C/1999 S4 (LINEAR)."

The Companion

Boehnhardt`s cometary characterizations has helped in clarifying a problem this writer has had ever since reading the 1927 work of Franz Xaver Kugler, a Jesuit scholar with an international reputation for his abilities in archeoastronomy, mathamatics and cuneiform philology . Writing in chapter 4 of 'The Velikovsky Affair', [5] *Livio C. Stecchini* wrote of his 1927 monograph entitled "The Sibylline Starwars and Phaethon In the Light of Natural History."

`... The reality behind the myth, is that the earth was enveloped by a stream of meteorites, a stream of 'enormous width' and containing meteorites of such 'giant' size that they could cause great fires and violent flood waves." This was par for the catastrophist course, but the

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event that began the star wars, according to this version of the great legend, was not Velikovsky`s Venus, (although she participated, as did the entire celestial assembly , but two giant meteors.

Malcolm Lowery, Kugler`s translator, wrote:

> *"Kugler recognises in lines 512, 513 and 515 a description of the arrival of "two enormous meteors of the apparent size and form of the sun and the moon . . . with their characteristic accompanying features", but is happy to leave them out of the further action, accepting them, presumably, as no more than the excuse the ancients needed to write a poem about the events following."*

Kugler`s detection of mismatched meteors, immediately brought Boehnhardts Type A split comet to mind, and to a category of mythic partners I had filed away under the heading of `Little brother `phenomena.

Figure 8. War shirt worn by the Morning Star Pawnee

Little Brother was the mysterious companion of the Pawnee Morning Star, this remarkable tribes principal cosmic deity. When Morning Star went out to conquer Evening Star - explicitly known by the Pawnee as Venus-Morning Star made use of Little Brother`s `ball of fire`which he rolled towards their enemies. What struck me at the time was the similarity of this character to Thor`s mischevious companion, Loki, who would disappear

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on occasion with Thorès hammer. This weapon, Asgard`s greatest treasure, often compared to the thunderbolt of Zeus, like Little Brother` ball of fire, conveniently returned to its owner. Velikovsky, in his attempt to unravel the complex Star war battles considered the great cosmic conflict between Zeus and Typhon , an ancestral interpretation of the electrical discharges between the head and tail of the great comet. It is now necessary to consider Kugler`s two meteors as a type A comet with their tail's detached or obscured.

The Lost Sister

In Degrazia`s `Chaos and Creation Ginzberg reports a legendconcerning the trigger of the Noachian deluge: "the upper water rushed through the space left when god removed two stars out of the constellation Pleiades. [6]

The Pleiades –also known as the Seven Sisters- is an unremarkable group of stars, that happen to be the constellation most mentioned in mythology. My favourite Pleiades story is that of Electra, the missing sister.

This excerpt is taken from alcyone.com [7].

> Electra`, although for at least two or three centuries the title of a clearly visible star, has been regarded as the Lostsister, from the legend that she withdrew her light in sorrow at witnessing the destruction of Ilium, which was founded by her son Dardanos, -- as witness Ovid in the *Fasti*:
> ... or, as Hyginus wrote, left her place to be present at its fal, thence wandering off as a hair-star, or comet; or, reduced in brilliancy, settled down close to Mizar as *Alophx*, the Fox, the Arabs' Al Suha, and our Alcor..

Were the famous northern companion constellations of the Great and Little Bear , Wain and Dipper, and other partnered stars memorials to a Boehnhardt type A splitting event and comet. , In other words, were the Pleiades the point in the night sky from which Electra, our type A comet appeared, and finally disappeared.

If the two stars the Hebrew lord of heaven removed to bring forth the deluge was a classic type A event, then the bright meteors that preceded Kugler`s Starwars, not directly

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implicated in the war, could be a type B event. Type A splitting events can recur, according to Boehnhardt, and that could account for a relatively major meteoric storm such as the deluge . The destructive twins could appear a number of times as atype B event, in which the smaller companion would begin to disintegrate completely. In the balance of this paper we will be utilizing this model in our search for a more definitive resolution to the source of erratics.

The Marutes, a perfect meteoric storm

In one of the more vivid chapters of World`s in Collission, Velikovsky claimed that a post-deluvial encounter between Mars and Venus ,in fading cometary form,turned Mars into the leader of a band of mini-comets. When his controversial claim of an inter-planetary clash is put aside, his portrayal of the night sky of this turbulent period of ancient history provides compelling eye witness reports of a comet-splitting event:

The Terrible Ones

According to Velikovsky [3], … Meteorites and gases, … began a semi-independent existence, some following the orbit of Mars, some other paths.

These swarms of meteorites with their gaseous appendages were newborn comets; flying in bands and taking various shapes, they made an uncanny impression. Those which followed Mars closely looked like a troop following their leader. They also ran along different orbits, grew quickly from small to giant size, and terrorized the peoples of the earth. the new comets, … running very close to the earth, added to the terror,… .
Similarly, the Babylonians saw the planet Mars-Nergal in the company of demons, and wrote in their hymns to Nergal: 2 "Great giants, raging demons, with awesome members, run at his right and at his left." These "raging demons" are pictured also in the Nergal-Eriskigal poem; 3 they bring pestilence and cause earthquakes.

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It appears that the mythological figures of the Furies of the Latins or the Erinyes of the Greeks, with serpents winding about their heads…

The Erinyes traveled in a group, like huntresses or like a "pack of savage hounds,"

To these comets, traveling in bands with Mars or Indra, are dedicated many Vedic hymns, indeed a great part of them. They are called Maruts "shining like snakes," "blazing in their strength," "brilliant like fires."

O Indra, O strong hero, grant thou glory to us with the Maruts, terrible with the terrible ones, And then there are the stones again.

> " Stones were hurled by these comets.You the powerful, who shine with your spears, shaking even what is unshakable by strength . . .
> Hurling the stone in the flight! . . .
> All beings are afraid of the Maruts.
> May your march be brilliant, O Maruts . . .
> Shining like snakes.
> May that straightforward shaft of yours, O Maruts,
> bounteous givers, be far from us,
> and far the stone which you hurl!

... The earth groaned, the meteorites—the host of the Lord—filled the sky with a battle cry "over the whole space of the Earth," and "men reeled forward."

These were, in Joel's words, the "wonders in the heavens and in the earth, blood, and fire, and pillars of smoke," when the "sun is turned into darkness, and the moon into blood."
The clouds, the fire, the terrifying din, the darkness in the middle of the day; the fantastic figures on the sky of speeding chariots, running horses, marching warriors; the trembling of the earth, the reeling of the firmament, were visualized, felt, and feared on the shores of both the Mediterranean Sea and the Indian Ocean, for they were not local disturbances, but displays of cosmic forces in cosmic dimensions.

In more than this one instance it is possible to show that peoples, separated even by broad oceans, have described some spectacle in similar terms. These were pageants, projected against the celestial screen, that, a few hours after they were seen in India, appeared over Nineveh, Jerusalem, and Athens, shortly thereafter over Rome and Scandinavia, and a few hours later over the lands of the Mayas and Incas.

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The dreadful figures scattered a hail of meteorites that bombarded walls with hot gravel and flew into windows; simultaneously cities were turned into heaps by the leaping ground.

> "The multitude of the terrible ones" is "like small dust," their invasion "shall be at an instant suddenly," says Isaiah.25 The Lord shall send his host "with thunder, and with earthquake, and great noise, with storm and tempest, and the flame of devouring fire."

These Maruts are men brilliant with lightning, they shoot with thunderbolts, they blaze with the wind, they shake the mountains.

Isaiah (25 : 4) says that

> "the blast of the terrible ones is as a storm against the wall."

The Maruts are often called "the terrible ones," the same term Isaiah used. "The terrible ones" of the Vedas were not common storm clouds, nor were the "terrible ones" of Joel and Isaiah human beings. Certainly only by chance did the similarity of names and pictures in the Vedas and the Prophets escape the attention of students of religion.

The Maruts are understood here as comets which in great numbers started to whirl in the sky on short orbits, after the impact of Mars and Venus. They followed and preceded the planet Mars.

The name Mars (genitive, Martis) would be of the same origin as Marut. It is therefore gratifying to read that the philological relation has already been established. It is even more satisfactory that this philological equation was made without knowledge of the actual relation between the planet Mars and "the terrible ones."

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Mars and Venus

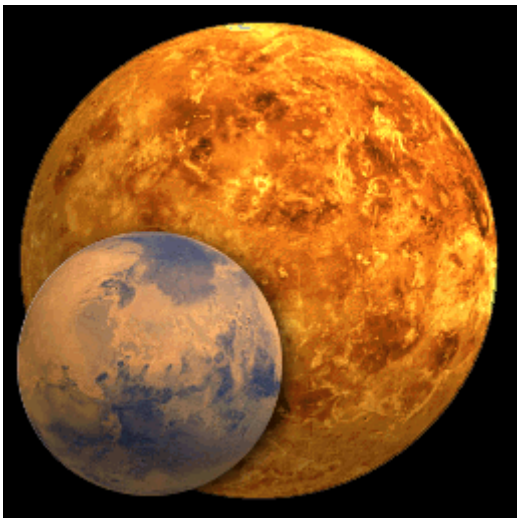

Figure 9. Mars and Venus in profile

Much as I would like, moving on without commenting on Velikovsky's association of the Maruts due to an impact between the planet Mars and the protoplanet Venus cannot be avoided. Without going into a book-length analysis, which would bring us no nearer certainty, Velikovksy's contention that present sun-orbiting planets were dislocated and their orbits shuffled in the last 3.000 years, is still uncertain, but becoming less and less improbable. We have observed Chiron [28], a object in the 200 kilometre diameter range grow a coma and tail, and much larger objects, orbiting nearby stars, with highly elliptical orbits, are being reported in growing numbers.

The Pawnee, who were inveterate meteorite hunters, pictured their chief deity morning Star proclaimed in tribal literature as Mars, riding on a bed of Meteorites. Despite these uncanny associations, we are still far from indicting our present planets as direct contributors of our erratics. As pointed out by Oltean [19] the present group of Jovian comets are more than adequate as suppliers of rocky debris. A single one kilometre fragment from a Jovian comet, would be sufficient to cover a large swath of Ontario and the northern United States with stony debris.

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The Smoking Gun

On most clear nights, we are likely to witness the vestiges of a comet's tail streak across the night sky, and it is not difficult to believe, after observing more than 150 mini-comets emerge from a comet in outburst mode, that the earth could eventually capture and land its broken remains. But in addition to the peculiar condition and location of the drift, we can provide more convincing evidence of its passage through the earth's atmosphere and final resting place. Tracing the path of a comet's boulders, from tail to trail would not only demonstrate the source of erratic, it would also establish the origin of the rest of a comet's debris. For example there is a growing consensus, reported by Degrazzia, that the soils of the late Pleistocene, revealed by the retreating ice sheet in Eurasia and North America, were not endogenous.

"Over several decades there has been a growing recognition that much of the mantle of soil is allochtonous." [7] But where does it come from? Few are the regions where soil can be shown to have aggregated as humus from the vegetation above. The large areas of Europe and Asia covered with loess are now considered all or in part by Russian scientists as non-Aeolian. This is conveyed forcefully to their minds by the presence in the loess of numbers of angular stones. Promptly we are recalled to the pages of Donnelly's old book where he insists on the extraterrestrial origin of the angular stone typical of "glacial till" and of loess.

There are two essential facts about comets that were not available to either our protagonists or their ancestral informants. This is the surprising and poorly understood structure and dynamics of comet tails. Firstly, they are two-dimensional, and secondly, during outbursts, comets dust tails propagate individual bands (called stria), within which their particulates spread and fragment into progressively reducing particles in. A typical tail display is shown in illustration x.

I first became aware of a comet's virtually invisible curtain of rocky debris in a collection of astronomical anomalies, to, edited by William Corliss. Corliss cited Richard E. McCrosky, in the McGraw-Hill Encyclopaedia of Science and Technology,

> "In all cases the tail material is closely confined to the plane of the orbit. In comets that show more than one type of tail or which show Type 1 streamers,

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the various structures disappear when Earth passes through the plane of the comet orbit. It is as though one were looking at a sheet of paper edgewise."

I read this entry with great excitement, for it solved a major problem I encountered in searching for evidence of cometary depositions in the late Holocene. I had given up looking for so-called impact craters. Their empty interiors and suspiciously uniform rim heights did not seem to be related to Donnelly's sky-born drift. I then turn my attention to an intriguing phenomenon composed wholly of glacial tills.

Super Swarms

The region I live in, southern Ontario is located within the cross-over of two great assemblages of eskers and drumlins, which, along with Agassiz's boulders are the leading artefacts encountered in ice age controversy. They are essentially long narrow ridges composed of fossil-free gravel, sand, cobbles and, of course, boulders, of which, more later. There are thousands of these ridges, averaging a kilometre in length and 5 metres in height the esker is a ridge formation's basic stripped down model, its triangulated cross-section displaying only the larger particulates (sand, gravel, cobbles and boulders)

Figure 10. An excavated Esker

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Drumlins, the most common variety, are essentially eskers covered with a streamlined cap of soil. Both types display versions that are partly or wholly converted into concrete. They are known by other designations such as ruches moutons, craig and tails, rock drumlins, flutes etc. They are all jumped up versions of the basic esker and are usually found trending in the same direction. In Canada, they inhabit two of the earth's three major systems normally called swarms or fields. I have chosen to use the novel term super swarm which applies to the radiating collectivity of all varieties of these distinctive ridge forms along with related drift phenomena such as moraines and kettles which will be discussed later. The super swarm radiating from the Canadian north-east is known as the new Quebec formation) and radiating from the northwest, is the Keewatin formation. (see illustrations [8]) Geologists recognize them to be products of late Holocene ice sheets, which is sensible. But the rest of the explanations have suffered from much the same problems as those exposed by Donnelly. They are made up of till, and its glacial origin is still disputed.

To compound the problem, there are no mountains, necessary for creating the height-dependant ice-grinding glaciers near the swarm radiants. Geologist also claims that eskers have been observed appearing from today's glaciers, but this is disputed as well [27]. Eskers and drumlins are carried over hills and cross streams with the same gravity-defying insouciance as erratic boulders. I became convinced that these formations were cometary debris. I was already a convert to Donnelly's view on the cometary origin of till. Both esker-drumlin swarms and their raw materials displayed too many anomalies to be creatures of continent-spanning ice sheets. Eskers, for instance, were explained as the product of rivers running atop or beneath retreating ice sheets, but their fossil-free discontinuous cores and sharp edged sands and gravels showed little trace of alluvial transport.

The largest component, its boulders, uniformly worn, appeared to be embedded near or on the ridge crest, an almost laughable location for the most massive of all the presumed water-born elements. Moreover the esker's semi-parallel paths- in some places the ridges actually pressed in and rode up each other's sides - resembled no river system ever seen on this or any other planet. The two super swarms actually crossed each other's path without one converging ice sheet smearing out the ridges of the other. Though I was finally convinced that these ridges were derived from the 'jets' observed spewing debris from Halley's peanut-shaped nucleus (see illustration),

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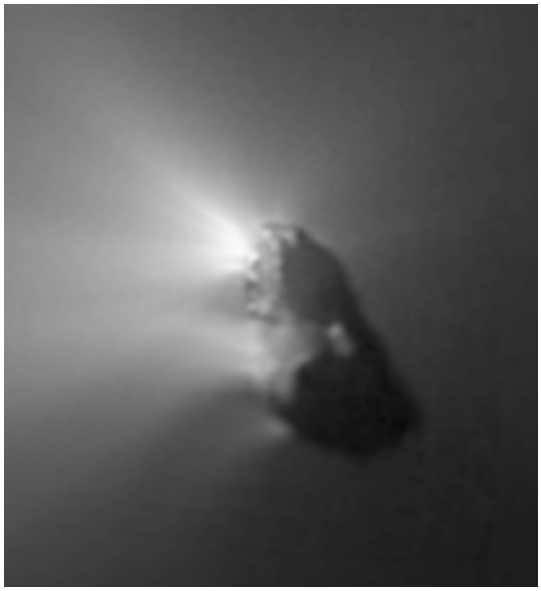

Figure 11. Picture of Halley's Comet taken during the Giotto Project

Still, some aspects of the proportions of eskers and drumlins and their lay down pattern troubled me. I could not account for the narrow base of eskers which seldom were more than 10 metres wide - the jets on Halley were a lot wider. The ability of ridges to touch each other also seemed to violate my assumption, shared by many astronomers, that cometary debris radiated out in a three dimensional pattern from the comet's nucleus like the feathers of a badminton birdie. I found this tail pattern difficult to match to these closely, semi-parallel swarm tracks

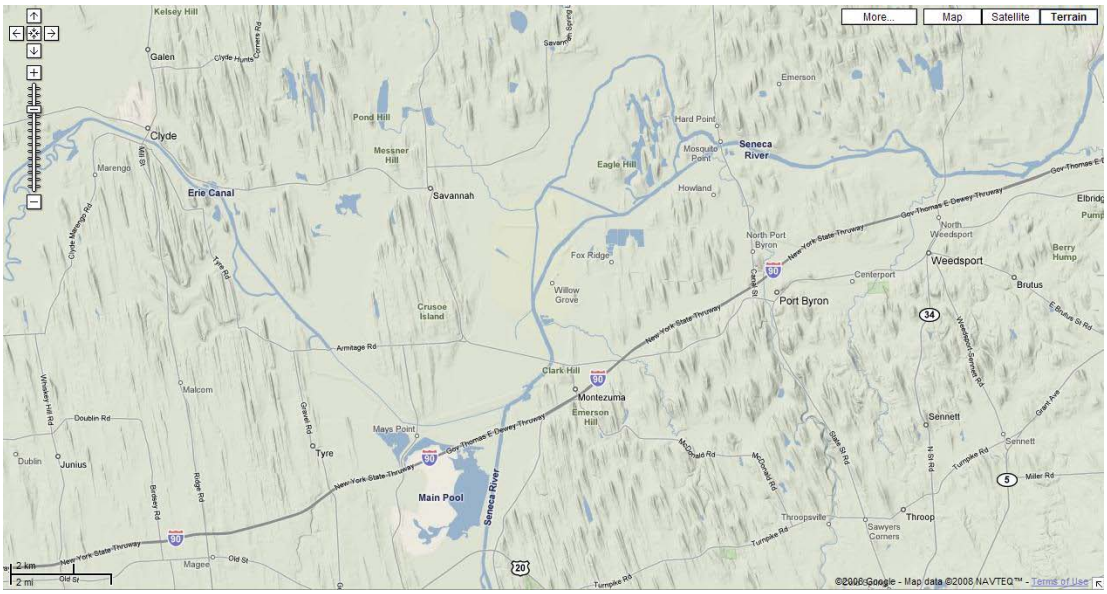

Figure 12. Radiating Pattern of Eskers near lake Erie from Google Terrain View

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My faulty image of a flaring three-dimensional tube of debris immediately disappeared on reading of the sheet-like structure of a comet's debris tail and a new image began to assemble- that of a vertically stacked series of debris ribbons, landing like a falling curtain perpendicular to the earth.

I became convinced that this descending curtain provided an unmistakable imprint, like a shoe in wet concrete. In my mind's eye, a fan of discontinuous narrow ridges appeared, cushioned and preserved by its own supply of ice. This two-dimensional tail seemed to magically solve many of the nagging problems inherent in both the ice age and deluge models.

Order of Particulate Arrival

The second part of the esker/drumlin puzzle, the anomalous position of the boulders found in these ridges, came from relatively recent observations of the comet's type 2 dust tail. The astronomer Kimihiko Nishioka [20], wrote in Icarus:

> "Some big comets showed type II tails with many narrow striae called `synchronic bands,' the formation mechanism of which is still unknown. A dynamic model for the formation mechanism of synchronic bands, which is based on the following process, is proposed.
>
> The complex particles of the aggregates of the unit particles are ejected from the nucleus of the comet and disintegrate repeatedly into individual unit particles at various disintegration speeds. Then, these unit particles break up and their fragments are observed as synchronic bands. These fragments continue to disintegrate or sublimate into smaller pieces and finally they become too small to be seen at a certain normalized lifetime.
>
> The structures calculated with this theory fit well the observed shape and orientation of the synchronic bands of Comet West and Comet Seki-Lines."[i]

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A second article by Sekinina [21] captured the discrete nature of the bands:

> "...the striae [synchronic bands] emanating from comet Hale-Bopp, from early March to Mid-April 1998, a series of photographs captured the birth of striae over a 40-day period.
>
> ... At that time they appeared very weak and confined on the young side of the dust tail. During 8th to 18th March 1998, 17 prominent and well defined as well as at least 9 weak to marginal striae could be identified and measured in the processed images. ...(the)striae became very broad and diffuse in early April 1998 [ii]"

Pushing the Envelope

I quickly realized that these separate thin ribbons of progressively fragmenting rock matched the peculiar order observed in each discontinuous esker. I was convinced that I had found the final piece in the super swarm puzzle. Unfortunately, in my excitement, I had overlooked the fact that debris tails were virtually invisible.

The reported observations were not of the debris trails but the type 2 dust tail that moves in the anti-solar direction (se illustration)

Figure 13.Comet Tempel's Debris Tail observed through infrared

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In 'Tails of a Recent Comet' [8], a paper I co-authored with Frank Wallace, The following were my erroneous findings:

> " (Not only do the striae develop laterally, presumably towards the sun, but (they)also broaden and eventually take on the quality of the 'gossamer' webs extending from planetary ring systems) "

As of this writing, there is no direct evidence of individual ribbons of spreading debris similar to the anti-solar dust tails observed emanating from comets West, Seki-Lines and Hale bop. Nevertheless, astronomers have verified the two-dimensional structure of cometary debris tails and have also noted the propensity of the boulder elements to eject from the nucleus more slowly than the lighter debris [8]. But they have yet to observe this activity taking place within an evolving group of individual ribbons.

This discovery would be a vital link in the required chain of evidence. It would join the outbursts of boulder-rich mini-comets ejected from a mother fragment to ridge crests of esker/drumlin swarms.

Until we are able to closely observe comets in outburst mode, tracing the source of boulders must rely on the examination of the hypothetical downed ribbons. Fortunately, their preservation in the ice and snow contributed by the comet and local snowfalls of the Late Holocene, have helped build and preserve the swarms.

Boulders as Final Arbiters

The boulders we are about to discuss, are not the monsters Agassiz described in the valleys and peaks of the Alps, they are the smaller variety found in Esker/drumlin swarms. But it is no mere coincidence that, aside from scale, they are both found embedded or perched near their respective ridge tops or strewn adjacent to their steeper sides.

This positioning is a direct consequence of the structure and dynamics of comet splitting. The position of boulders in the trailing edge of hypothetical debris ribbons, gives them a definitive presence in the final disposition of cometary debris.

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Passage through the Earth's Atmosphere

As each ribbon passes through the earth's atmosphere, the result is eventually observed in the surface condition of each particle in the esker core. Paradoxically the finest particles show the least wear. This is explained by the local density of the ribbon and the relative surface area of each particle. The clay, silt and sand particles forming the outer skin of the ribbon perform like the ablation shields designed to protect the pioneer mercury astronauts during their re-entry through the earth's atmosphere. The shields were made of a special sand laminate, which peeled off, layer by layer as the capsule made its fiery descent through the atmosphere, keeping the astronauts safe within.

The smaller particles are also effective insulators due to their higher surface to volume ratio which quickly absorbed the extreme heat of atmospheric friction, before its gases penetrated the ribbon's interior. This is not the case with the larger particles-the gravel, cobbles and Boulders. They gain more and more space separating their surfaces as they grow in size, and so become progressively more eroded by the intruding atmosphere. It is this geometry and the earth's relative motion that effectively excludes many boulders from the ridge interior. One must picture a series of debris-filled ribbons stacked so that they form a patchwork curtain, falling perpendicular to the earth's surface. Had the earth completely ceased its rotation, or had the ribbons landed parallel to the equator the debris would accumulate along a single path. The lay down would begin with sand, for the lighter soils, normally prior in line and in time, would be blown off course by atmospheric winds.

The peaked ridge profile of an esker would rise as the particulates, exceeding their angle of repose, would skitter down the vertically rising size. This random deposition normally prevents the development of a clear stratigraphy, giving the interior an unstratified appearance, except for the boulders. By arriving last, they either embed themselves in the upper section of the esker or, like their smaller predecessors, tumble down the side. The important issue of particle velocity will be discussed below, but it seems clear that the presence of cushioning snow and ice, whether provided by the descending ribbons or local winter snowfall, contributed significantly to the excellent condition of these super swarms.

The presence of concentric arcs of drift, called moraines, their concave sides delineating the yearly accumulation of outwash from the retreating ice sheets makes it easier to understand why geologist still persist in their belief that the super swarm is the product of

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a ghostly glacier. (see fig. 4). A more complete description of swarm architecture and mainstream data are found

(http://books.google.ca/books?id=f93Gjbp6JoYC&lpg=PP1&ots=0zWFpdIRjJ&dq=milton%20zysman&pg=PP1#v=onepage&q=&f=false)

Figure 14.taken from DVD(In November of this year Gunnar Heinsohn and I laboriously climbed up the side of an 8 metre high partially mined esker in a Norwood Ontario quarry and pitched some of the boulders we found on the ridge-top down the sides.

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Figure 15.Photo of a boulders which were too large to go into the grinder.

Figure 16.Longitudinal cutaway of a southern Ontario Esker (Norwood) with large boulder approximately 1/3rd from the ridge top. In mining eskers, the quarry is not allowed to remove the gravel and sand down to the bedrock.

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A boulder survey

In 2003, Jessica Leigh McEachern, Presented her Masters thesis in geological Sciences. The subject was 'The boulder Distribution in the Vicinity of Wildwood State Park, Wading River, New York State". She had concluded that the boulders in the park were not randomly distributed, but appeared to follow, in clumps and trains, the path of the Laurentian ice sheet. In addition to conventional visual mapping, the investigator used ground penetrating radar (GPR) to pierce the bluffs overlooking Long Island. McEachern chose this area because:

> "We noticed that most of the boulders in this area, which were exposed in the cliffs, were located approximately two-thirds to 90% of the way up the cliff. Since the height of the cliff is 50 feet, this indicates that we should probably look to a depth of around 5 meters." (pgs 34-35)"

Her GPR data

> " ... yielded a presence of boulders within a restricted layer near the surface."

It should be noted that the investigator mentions neither eskers nor drumlins in her report, and it is not clear from her description that she was describing a classic ridge structure. It is my opinion that the feature was probably a number of parallel ridges, their gaps filled in with Loess and clays provided by the retreating ice sheet. The state park is obviously located in swarm territory, and is described:

> " The terrain is somewhat hilly and also features small valleys

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Figure 17.Part of a topographic map, showing the northern edge of Wildwood State Park.

Cliffs, Bluffs and Escarpments

The location of displaced boulders on the steep side of the park's bluff is no coincidence. It is one of the persistent signpost of boulder accumulations. Virtually all ridge systems, independent of scale, both on this and other moons and planets are asymmetrical to some degree.

This is because debris ribbons themselves are asymmetrical. As a ribbon falls, the earth, or any other body for that matter, moves laterally beneath it. The lay down may be imagined by thinking of the falling debris as a solid wedge-shaped body such as a ramp.

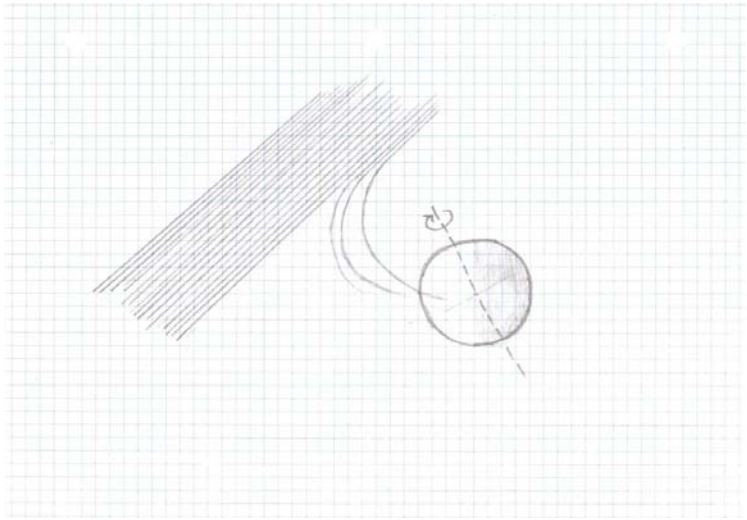

Figure 18. Artist Conception of the accretion of ribbons by the earth

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If the ramp is propped up with its thin edge down and then released, as it lies on the ground, the high end of the ramp forms an escarpment, also called a cliff or bluff.

Because The trailing edge of each ribbon owes its bulk to its increasing store of gravel, cobbles and lastly, the largest rocks, the boulders will therefore be found either embedded within, or perched on top of the escarpment. Some boulders are delayed in arrival long enough to miss the ridge formation entirely and land beside it.

We will return to this issue at the conclusion of this paper.

Swarms in Space

I became fully aware of the ubiquity of ridge systems When NASA, managed to land a space craft on an asteroid. In a November 21st 2001 news release, Andrew Cheng, NASA's NEAR Project Scientist reported on the first intimate look at an asteroid:

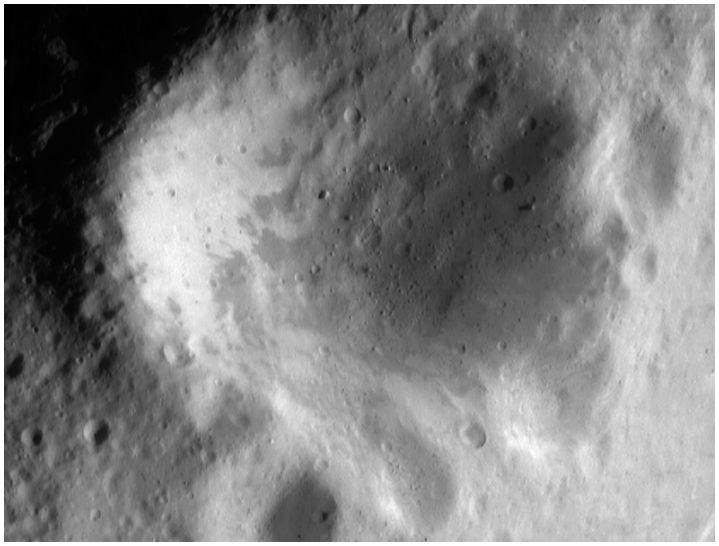

Figure 19.The images were taken as the spacecraft flew directly over the 3.3-mile (5.3 kilometer) wide crater and its smaller sister craters, which align its rim and create a paw-like appearance.

> " … We have made fundamental discoveries about Eros: that it is a primitive, undifferentiated body, and that it is a consolidated body, but having established the basic nature of Eros, we are now trying to make sense of what we see when we get up close...from the beginning of the orbital phase, we saw linear features on Eros - for example in the first mosaic released after orbit injection (February

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> 14th, 2000). We noted the roughly parallel lineaments running generally east west on Eros (October 2nd, March 6).
>
> These lineaments run into the 5-km crater, which we then nicknamed 'the paw', …
>
> We showed in the IOD [image] for March 7 the great ridge in Himeros, formerly the 'saddle', without knowing at the time that this ridge actually continues outside of Himeros to over 15 km away, but we did correctly identify it as a structural feature."

This expedition to Eros reinforced my conviction that ridge systems and their somewhat enigmatic craters were the most common structural features to be found in our solar system.

The Eros team later developed images displaying two large craters joining a major ridge system that wrapped itself one third around this ($10x10x38$) kilometre asteroid.

One of the many thousands of boulders scattered around Eros was so large that a tractor trailer could park under one of its overhangs, and some of the largest were found within the smooth bottom of the craters. Aside from these exotic elements the final report on Eros indicated terrain similar to other solar system bodies: [9]

> "At the 100 meter scale the asteroid morphology is dominated by boulders, slides, streamers, ponds, and other features indicative of regolith accumulation and transport".

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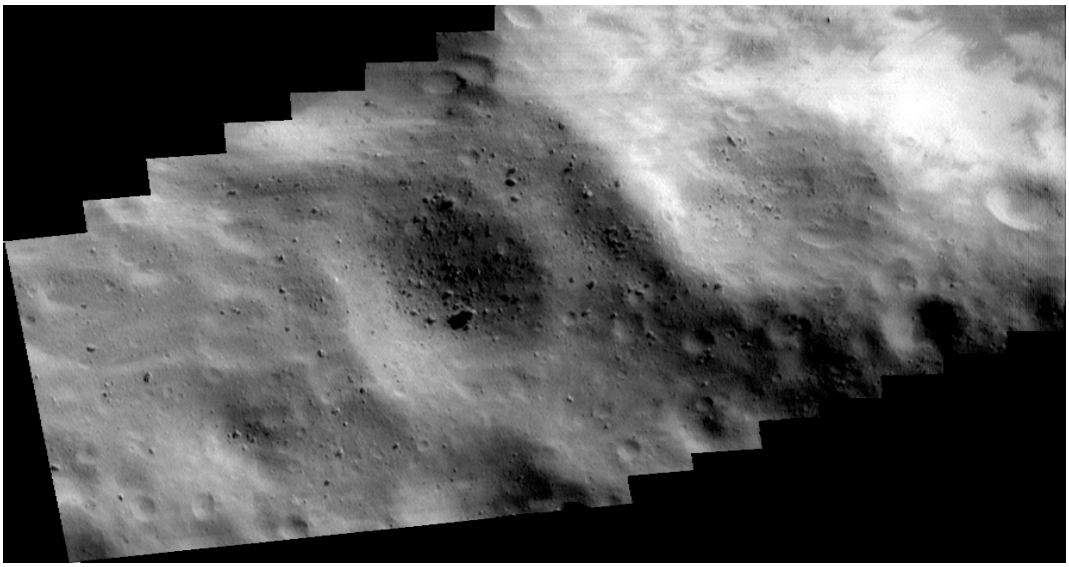

Figure 20. The two large, subdued craters in the center of the mosaic are each about 1 kilometer (0.6 miles) wide .The boulder on the floor of the crater to the left is one of the larger rocks on Eros, more than 90 meters (295 feet) across. The whole scene is about 4 kilometers (2.5 miles) across.

Hybrid Exogeny of Eros

The great boulders sitting within the so-called impact craters presented a problem to the Eros team. There were no obvious glaciers on Eros or any realistic prospect of them developing. Deluge or volcanism is also improbable.

The only viable alternative, it seemed were hypothetical missiles that created the so-called impact craters. These phantom bolides, it is proposed, put the boulders into temporary orbit, from which they eventually returned to nest within the craters. If we subscribe to mainstream theory, these meteors vaporized and blew away due to the violence of the detonation.

An unusual precedent has therefore been established that some eratics can be acquired extraterrestrially, so long as they are the product of external impactors.

It should be noted that large erratics of Eros are described as angular. We cannot fully corroborate this do to image quality. The Martian Rovers cameras, however, show in high

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definition a large erratic located beside a ridge, and it may be seen that this boulder, unlike our own planets have not been eroded by the light Martian atmosphere.

Before leaving the topic of extraterrestrial erratics, it is instructive as well as amusing to quote a NASA expert commenting on a report of alien activity within the lunar ridge tops:

> "... I suggest that object A is a relatively flat face with a locally high albedo. The 'vents', if you adopt my theory that we are looking at the branch of astronomy that deals with the nature and origin of the physical features of the moon (called 'selenology') rather that an alien artefact, would be a row of either ridge-top peaks or rock formations like boulders. Unfortunately I have no idea what the final scale of the picture is, but at that enlargement we are approaching a visual resolution limit. I propose that the 'vents' are shadows of a series of relatively small surface features, which appear circular because of this resolution limit. I'd expect aliens to dig more uniform holes, somehow."

Potholes and Kettles

Figure 21.Kettle (round glacial eye-shaped lake), highlands of Isunngua, Greenland

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Although there has recently been a concentrated and frustrating search for the impact craters corroborating a suspected late Holocene impact event no one has been giving serious consideration to the track of our Drumlin-Esker swarms. They have their own crater-like concentrations which are understood to be glacial features. .. The state park investigator found a few in her Long Island boulder survey:

> "Several kettle holes (depressions which mark where the glacier left behind a large chunk of ice or other detritus after it retreated) have been identified, including a large kettle on the southeast fringe of the campground. "

If we have made the case that ridge systems, both earthly and extraterrestrial are composed of cometary debris, then what are we to make of the chain craters tracking them? For one thing, their interiors, like the kettles adjacent to our own planets eskers, appear to be equally devoid of meteorites.

Great Balls of Fire

It is not within the scope of this article to go into the nature of what current geological thought call impact craters and what the sceptical sometimes call astroblemes. In any event, a number of neo-catastrophists have claimed that these craters are the electrical scars marking the great meteoric showers so vividly portrayed by Donnelly, Velikovsky, and Kugler.

Despite the impressive mathematics backing vaporized bolides as the parents of chain cratering, we have come to a logical standoff. The debris composing ridge systems are captured extraterrestrially or their associated empty chain craters to vaporized bolides; it is highly unlikely that they are both.

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Figure 22.Ridges and Boulders on the moon

The phantom bolide backers have one powerful argument that must be addressed at this point and that is the pristine condition of virtually all tills, Particularly the famous perched boulders, some of which appear to have been carefully placed on their perches by a race of gargantuan piano movers. Degrazia, in his 'Lately Tortured earth' has given some thought to this question:

> A not-well-understood feature of meteor falls is that they can accomplish soft landings as well as hard crashes. In hard crashes, such as at Campo del Cielo (Argentina) where a number of meteoroids fell, "large masses of meteoritic iron and shale have been found in its vicinity." [8] Heide writes, "the 60-ton meteorite from the Hoba farm near Grootfontain, South West Africa, the heaviest of all known meteorites, imbedded itself in friable limestone at a depth of only 1.5 meters. The iron meteorites of Cape York in Greenland, weighing up to 30.875 tons, lay on solid gneiss rock, or were barely imbedded in moraine rubble, without any trace of an impact. Here we may guess that they fell on a thick layer of ice or snow and sank to their final location as the snow or ice melted [9] ...
>
> Much that is meteoritic may not be discovered. On an Antarctic ice field, Japanese explorers found over 1000 meteorites, of which only one was composed of iron [11] . Were the field of stone, instead of ice, the stone meteorites would probably go undetected. Obviously we could not test all the Earth's rocks for exoterrestrial origin, especially since the tests themselves might beg the question.

To Degrazias thoughts should be added the contribution that the water resident in each descending ribbon makes in cushioning the fall of the more massive falling elements.

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Tracking Big Game

We now return to the great boulders that won Agassiz the current ice age paradigm. We have, so far, confined our search for the source of erratics to the boulders found in small scale ridge systems such as esker-drumlin swarms. These rocks do not usually exceed a metre in diameter.

We will now shift to the ridges and valleys of this planet's mountain belts in the search for the largest erratics. A cautionary note must be entered into this part of our investigation. If we find large scale boulders in the same relative position in mountain belts as we do in esker-drumlin swarms, then the equation seems inescapable that, the mountain belt is also composed of cometary debris. This particular issue, which has preoccupied me for the last 12 years, is a subject that requires more than the limited time and space offered by this article. There is a documentary in the works, provisionally entitled 'The Earth Builders'. We have already begun the animation required to re-enact the capture and laydown of a super swarm. Our progress towards a release date will be found on our web site www.unravellinggenesis.com.

Erratics Then and Now

In 1867, Alfred Russel Wallace, *in the January 1867 number of the Quarterly Journal of Science* wrote an article with the modest title of *Ice Marks in North Wales', (With a Sketch of Glacial Theories and Controversies)* Wallace, who is best known for having anticipated Darwins publication of 'Origin of Species' began the article with a prayer to the rock cycle and deep time that would still satisfy the most rigid uniformitarian today.

> " [[p. 33]] One of the most interesting branches of modern geology, and that on which recent researches have thrown most light, is the inquiry into the exact modes by which the present surface of the earth has been produced. When we see a vertical precipice, a deep chasm, or huge masses of shattered rock, our first impression is to impute these effects to some violent convulsions of nature, such as volcanic eruptions, earthquakes, or floods.

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> It is, however, now generally admitted that such causes have had, for the most part, little if any effect in modifying the surface, except when many times repeated during long periods of time; and it is every day becoming more certain that even the grandest and most romantic scenery of mountainous countries has been produced by the slow but long-continued action of those natural causes which we see daily at work, but whose effects during the few years that we can observe them are almost imperceptible.
>
> These causes are, the ocean waves, running water, rain and frost; which, if acting for long periods during which subterranean forces are also at work slowly elevating and depressing large tracts of country and to some extent fracturing and loosening the rocky strata, seem capable of producing all the chief features which the surface of the earth now presents in non-volcanic regions."

Wallace had spent a month revisiting a trip Agassiz had made to Mt. Snowdon in Wales. The article offered the general reader an explanation of the relatively new glacial theory of the evolution of such local major land forms as drift, perched boulders and *roches moutonne*(cemented drumlins). (mbz revise)

> "When the glacier has finally retreated, many of these blocks and boulders will remain in positions where neither simple gravitation nor the action of floods of water, nor the shocks of earthquakes could have placed them. ... Many of them occur on the edge of precipices and ravines, as is particularly the case at the torrent walk near Dolgelly, the sides of which on nearly level ground are thickly strewn with large angular blocks and boulders. One of these is 15 feet square and 9 feet high, and has lower ground all around it.
>
> It is when they stand upon the summit of conspicuous eminences, as they often do about Snowdon and Cader Idris that they attract most attention, while when thickly strewn over level ground or on slight hillocks and ridges they are passed over by the tourist as too common a phenomenon of mountainous countries to deserve attention. Yet it is really as difficult to account for their presence in the one case as in the other..."

There is in this description, the ghost of our Long Island park survey. Wallace seems to be describing the same distribution pattern. The great stones seem, to be located in the top quarter of the ridge or scattered in the valley.

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As for the equal concern for valley and ridge crest erratics, employing the glacial theory to explain their position scattered in the valleys pales in comparison to justifying the profusion of erratic perched on mountain tops. Wallace admits as much in discussing another location:

> "On the very summit of Cader Idris there are several detached eminences formed of large square and polygonal blocks, which in some places stream down the slopes of the undulating surface of the mountain top. Were they lower down we should at once pronounce them to be moraines, but in their present position they are somewhat difficult to account for. I think, however, there can be little doubt but that they are due to the action of the snow and frost during the last portion of the glacial period. As soon as the perpetual snow line reached the top of the mountain, and the permanent glaciers below had all melted away, there must have been a long period during which the rocks on the summit were subjected to the alternate action of ice, snow, and water.
>
> During the winter they would be buried under many feet of snow, which would be forced into every crevice in the form of compact ice. During the short summer the snow would melt from the surface, but the water in the fissures would be probably frozen every night, leading to the further fracture and displacement of the rocks. The pressure of the snow and ice in the succeeding winter would force these always a little downward in the direction of least resistance, and this alternate action, combined with the character of the rock, which is here chiefly basaltic and splits into rude tabular and columnar masses, seems sufficient to have produced that mass of blocks heaped confusedly on the very summit of the mountain, which almost always suggests to the mind of the non-geological visitor some tremendous convulsion of nature, and makes him readily accept the popular theory that the vast hollow of Llyn Cai is a volcanic(pg 41) crater. "

Wallace's explanation is quite rational, for the glacial hypothesis dictates that the glacier should have carried these boulders down to the valley and therefore there must be some other mechanism putting them in this awkward position. Wallace resorts to the well-known method of post-glacial frost heave to explain their tardy appearance. I agree, of course, with Wallace's locating these stones beneath the mountain summit, noting in passing that they did not appear to heave out of the mountain's lower regions, but a glaring question remains, particularly in light of the esker model of boulder emplacement, and that is; why are they heaving exclusively up and out of the ridge tops? Unfortunately, Wallace did not have ground penetrating radar at his disposal, so we must look for more recent investigations.

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One such was done on the North African coastline south of Rabat Morocco. A survey was undertaken to evaluate the ability of tsunamis to displace and propel boulders (69). Though not perched on great mountain heights, both the rock size and ridge heights were substantially greater than those found in esker/drumlin swarms of southern Ontario. The largest boulder was more than 8 metres in length and 100 tons in weight.

Once again the finding is, as in our New York state park, quite explicit:

> " The setting is a) high tide cliff, with large blocks tilted seawards, or fallen at the base of the cliff " and "The Petit Val d'Or shows the most spectacular features. In this lagoon-like beach, the boulders are very numerous and occupy a ridge of ca. 500 m x 60 m = 30,000 m^2 (Maximum weight and displacement of the boulders are respectively 100 tons and 150 m."

and

> "... Most of the boulders derive from the fractured cliff top itself" (pg.12)

The present physical evidence supporting a cometary provenance for Agassiz great boulders is still anecdotal, for it has never occurred to geologists that boulder concentrations within ridge summits had any geo-tectonic significance. It seems unlikely that even an exhaustive survey, revealing the same relative boulder concentrations in mountain ridge tops as those detected in and excavated from eskers, would bring Geologists to consider an exogenous source for the earth's mountain belts. But we might be luckier with astronomers. Perhaps they are buffered by the perspective provided by deep time and outer space, for there has recently been a cautious proposal concerning an exogenous mountain belt for one of Saturn's moons.

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The Bellyband of Iapitus

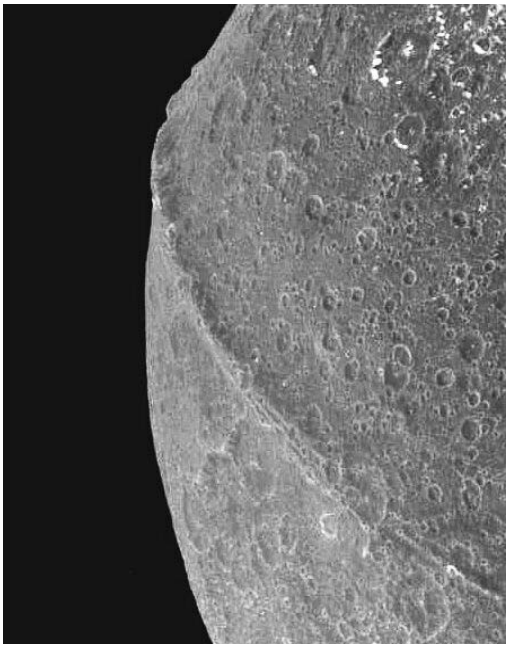

Figure 23.The third largest Saturnian satellite, Iapetus, has a curious 13 km high ridge system exactly aligned with its equator.

The formation in question is quite unusual; It lies along the equator of a moon of Saturn. The following news release of the Planetary Society is instructive [22]:

> "It is the only body in the solar system with a The self-defined equator;(mbz illustration) a startlingly linear ridge of tall mountains (a feature that is casually known as Iapetus' "belly band" exactly girdles its equator). ... (see illustration)judging from the number of huge impact basins and smaller craters covering Iapetus' surface, there has been little in the way of geologic activity. "

The spectacular height (13km) and unusual position naturally invited speculation on its origin, and amongst the punters was Dr Ip, of the Institutes of Astronomy and Space Science, National Central University, Taiwan, who offered what must be the first mainstream proposal for an exogenous mountain belt. [23] With the proviso that

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> "A detailed formulation of the accretion disk formation, ring evolution and mass distribution of the hypothetical ring system is beyond the scope of the present work"

(pg.7), Dr Ip hazarded an alternative to the original suggestion that the mountains were an artefact of nascent plastic deformation a possible alternative is that

> "the observed equatorial ridge system is the result of mass accumulation from the surface impact of a ring system .Could this unique feature have originated from a heavy collision event leading to the formation of an accretion disc?"

One example of the bedrock referred to by flint is probably the hardpan which Donnelly refers to in Ragnarok. He speculated that this material was consolidated by the heat generated by cometary gases:

> " ... but when the mixture of clay, gravel, striated rocks, and earth-sweepings fell and rested on them, they were at once hardened and almost baked; and thus we can account for the fact that the "till," which lies next to the rocks, is so hard and tough, compared with the rest of the Drift, that it is impossible to blast it, and exceedingly difficult even to pick it to pieces; it is more feared by workmen and contractors than any of the true rocks". [10]

" A Penultimate Silicate Froth"

Aggravating the justified scepticism facing our claims of exogenous mountain belts, is insufficient evidence, for this article can only sketch out the basic lines of argument supporting this ambitious claim. The required evidence will be presented in a forthcoming series entitled 'Unravelling Genesis. Nonetheless I would like to leave the reader with some justification for this apparent outrage.

To begin with, current conflicting orogenies are nothing but desperate conjectures. Let us take just one of the most popular of the current crop- inspired by Wegener and the famous Mid-Atlantic Ridge. When plate tectonics was first unveiled, the ridge was pictured as the raised lips of two great slabs of magma forcing their way up and over a fissure in the earth's surface, spreading continents at a pace equivalent to the immeasurable growth of a fingernail. Then it became clear that these slabs were not a vague bulge pictured by 19th century

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investigators in the ocean bottom, but a series of mountain ridges composing a 40,000 kilometre earth-circling mountain belt. Not only did this discovery fail to confuse anybody, according to the Wikipedia, it brought the theory universal acceptance. But how could a mountain belt which takes millions of years to fabricate be effectively immobile, sitting astride two spreading plates, even at fingernail growing rates!

Moreover the Mid-Atlantic Ridge is only a small part of an earth-girdling mountain belt that also should have done some moving. This ridge is not made up of two separating slabs, but a typical mountain belt of at least seven familiar looking discontinuous chains of ridges, filled with sediments and active and extinct volcanoes like those of the Appalachians and the Rockies. The molten rocks that have moved along valleys and poured out through their gaps appear to be the product of the prodigious shearing pressure of the mountain belt rather than the product of the subterranean wells of magma. But even more confusing, is the placidity with which plate tectonists deal with the question of sub-oceanic mountains. Claiming that mountain belts Do they think they are the product of upwelling Magma? If not, how did they get there? Mountains obviously do not spring out of fissures in the earth's crust. IN any event mountains are not made up of igneous materials.

No standard geology text has made this claim. Mountain ridge interiors are, like eskers and drumlins made up of fossil free aggregates of rock, either compacted or concretized.

Normally we should have no direct interest in criticizing plate tectonics, for they are only the agency by which they are carried, compressed or swallowed, but as may be understood from the example given, it can make a terrible mess of attempts to understand orogeny. Until geological theory comes up with a believable model for mountain building, we are free; it seems, to do a little speculation of our own.

There are objective physical reasons for the persistent failure of mountain building theory. For many years we have been informed by objective authorities that the rocks that cover our planet compose an alien crust.

In an article published by Skinner in the American Scientist, the author comments on the physical contrast to be found in the earth's sediments and the magmas that presumably created them.

> "Crustal rocks appear literally to be a penultimate silicate froth of the most uncommon terrestrial elements..." The writer concludes, "Because the earth and oceans and air are extreme distillates and fractionates of the average original earth and very unlike it in composition and origin, it is obviously risky, if not misleading, to infer that superficial studies tell much of what we must know of time in the earth."[11]

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In the 40 years or so since Skinner made this statement, drilling ships such as the Glomar Challenger [Skinner's drill ship] and a variety of indirect techniques primarily seismic, have been employed to probe the depths of our undersea world. In this age of plate tectonics the search is focused on locating the course of circulating magmas responsible for determining the course of descending slabs of old ocean bottom and the slowly emerging slabs of new plates. In a recent international conference, entitled "TRANSPORT OF MATERIALS IN THE DYNAMIC EARTH"

… 2001, more intensive isotopic studies underscored Skinner's Appreciation of the earth's " penultimate silicate froth "

In a leading paper, the authors reported their study comparing the volcanic radioactive elements found in Samoan volcanic rocks with continental [terriginous] rocks.

The investigators believed that

> "… [The mantle plumes] may provide our most direct sampling of the deep mantle., and this distinctive chemistry is conventionally ascribed to recycling of ancient lithosphere containing a terrigenous sediment component."

In other words, the authors were attempting to link sub-crustal magmas with continental [terriginous] rocks.

They reported

> " … No model has as yet satisfactorily accounted for many of the puzzling geochemical characteristics of hotspots." [12]

The authors carefully traced the materials scraped off the overlying terrain in attempting to match magma and continental sediments.

By comparing the geochemical character of basalts from Ta'u Island, Samoa, which are the least enriched [in radioactive isotopes] of Samoan basalts (… With the most-enriched material, from Malumalu Seamount (… We are able to characterize the trace-element patterns of the "enrichment"[the mixed molten materials]; what is noteworthy is the very large negative [Page 23] Ti [titanium] anomaly in the enriched component, indeed suggestive of a terrigenous sediment component." The authors concluded "However, The lack of Pb [lead], Nb [niobium], and Ta [tantalum] anomalies, and the negative Ba [barium] anomaly, are difficult to reconcile with a terrigenous pedigree for the enriched component. One can simply assert that chemical processing during subduction has erased the continental fingerprint. [13]

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It stands to reason, on the basis of these findings, that any attempt to impose an endogenous solution to mountain building is bound to fail.

explaining the evolution of major land forms appear to be built on the basic misapprehension of an assumed physical and chemical connection between the earth`s interior and its major crustal features,

Conclusion

On one level it is understandable that an intense debate arose in the 19th century on the issue of erratics. They are very large objects, located in very strange places and on extremely precarious perches. They should appeal to even the most jaded tourist, and there are a number of initially legitimate earthbound forces that conceivably moved them there. In addition to Velikovsky's waves of translation and Agassiz's glaciers, Charles Lyell, Darwin's mentor proposed icebergs and there was even a precursor of the ejection and re-entry theory proposed by the Eros team. Von Buch, who was considered the foremost geologist of the time,

> "died in 1853, still firm in his early faith that the erratic bowlders found high on the Jura had been hurled there, like cannon-balls, across the valley of Geneva by the sudden upheaval of a neighbouring mountain-range" [14]

Our insistence on an endogenous source for erratics represents much more than mistaken theory. 19th century geologists in rejecting ancestral recollections of exogeny along with the imposition of deep time and the wholesale rejection of works of catastrophists from Whiston to Velikovsky not only threw out precious eye witness testimony , they imposed intellectual constraints that significantly retarded the advance of the earth sciences. .

There is more than the fate of ice age theory at stake here. As Boehnhardt stated (see above).

"The scientific interest in split comets reaches beyond the obvious questions "Why do comets split?" and "What is the sequence of events?" [15]

> `` ... The answers obtained from split comets may even provide information on the formation scenario of the solar system. ... ``

Portentous as this seems, Boehnhardt may have actually understated the role comets play in planetary evolution.

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Figure 24.The Himalayan Mountain Belts

The appearance and spread of new species have been associated with evolving mountain ranges. In examining the explosion of new life in the Palaeozoic era, the authors of a 1996 article in the American Scientist by Droser, Fortey and Li, stated

> "The Ordovician radiation also coincided with a period when mountains were actively being forged throughout the world". [16]

The authors conclude,

> "This suggests that an enriched mosaic of habitats, a possible increase in nutrients and changing substrates associated with mountain-building might have played a part in the evolutionary story."

An exogenetic explanation for the formation of the earth's crust has never been contemplated by the secular western mind. From Aristotle and Plato to Ignatius Donnelly, Immanuel Velikovsky and Carl Sagan, extraterrestrial encounters have focused mainly on the destruction of the physical environment and extirpation of existing species.

Paleontological evidence suggests, however, that our biosphere has not only survived, but has been renewed and diversified through a number of distinct global upheavals.

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The current rationale for this surprising finding is that these catastrophes wiped out so many species, that large environmental gaps became available for new life to evolve. A dark barren planet, however, is scarcely an environment for an explosion of new life.

A more interesting hypothesis might be constructed around a planet that has acquired copious volumes of hydrocarbon-rich materials, concentrated in relatively small, well-defined areas of global surfaces,

The rapid extra-terrestrial acquisition of the Appalachian mountain belt would scarcely be a peaceful event. There would be widespread death and destruction from volcanic eruptions, giant tides and direct impact. Needless to say, these events do not support uniformitarian theory but neither do they support present catastrophist ideas.

Impacting meteors cannot, by themselves, trigger the rapid development of new species, nor explain the origins of mountain belts. The connection between the earth's capture of novel crustal materials and the rapid evolution of its biosphere is not the subject of this particular paper. Nevertheless, rapidly acquired mountain belts appear to provide new approaches to the enigma of macroevolution.

We will give the last word to Niles Eldridge the notion that bolide impacts

> ``Whether it was a comet, whether it was an asteroid, whether it was one or more of these objects -- … They came up with this actually very good ecological theory that involves the occlusion of sunlight, the blockage of photosynthesis… It's a good ecological theory because it deals simultaneously with plant life, and - therefore, the base of the food chain…. {But, it} cannot all have been caused by extraterrestrial impact. There must be something else going on that's causing faunal disruptions, faunal turnovers, episodes of extinction and biogeographic Migration out and immigration in, and subsequent bursts of evolutionary change. It can't all be bolides from outer space." [17]

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References

[1] Corliss, William R. *Unknown Earth: a Handbook of Geological Enigmas*. : 1980, Glen Arm, Md.

[2] Williams, Edward Huntington and Henry Smith. *A History of Science: Modern Development of the Physical Sciences*. New York: Harper & Brothers, 2003.

[3] Velikovsky, Immanuel. *Worlds in Collision*. New York: Doubleday and Company Inc., 1950.

[4] O'Conner, Richard. *The Day the Dam Broke*. Philadelphia: J.B. Lippincott Company, 1957.

[5] Stecchini, Livio C. "Cuneiform Astronomical Records and Celestial Instability". *The Velikovsky Affair*. Ed. de Grazia, Alfred. 1978. 123-151.

[6] de Grazia, Alfred. *Chaos and Creating: An Introduction to Quantaevolution in Human and Natural History*. Princeton: Metro Publication, 1981.

[7] *Alcyone Systems: The Pleiades: Information*. 2009 <http://www.alcyone.com/info.html>

[8] Zysman, Milton, and Frank Wallace. "Tails of a Recent Comet: The Role Cometary Jets Play in Crustal Formation." *The Society for Interdisciplinary Studies Cambridge Conference: Natural Catastrophes during Bronze Age Civilizations, 11-13 July 1997*. <books.google.ca/books?isbn=1895416019>

[9] McCoy, Timothy J., "The Near Earth Asteroid Rendezvous Mission to asteroid 433 Eros: A milestone in the study of asteroids and their relationship to meteorites". *Meteorite & Planetary Science* vol. 37 no. 12 August 2, 2002: pg. 1651-1684.

[10] Donnelly, Ignatius L. *Ragnarok: The Age of Fire and Gravel*. New York: D. Appleton and Company, 1883.

[11] Skinner, Brian J., ed. *Earth's History, Structure and Materials - Readings from American Scientist*. Los Altos: William Kaufmann Inc., 1982.

[12] Hart, Stanley R. *Formation and Evolution of Geochemical Mantle Domains*. October 2001. Transport of Materials in the Dynamic Earth. < http://www.misasa.okayama-u.ac.jp/symposium/sympoFY01/3rdcircular/main.pdf>

[13] Hart, Stanley. *Geochemical Evolution of the Mantle*. 1 Dec. 2001. Science Storm. <http://www.sciencestorm.com/award/0125917.html>

[14] Williams, Henry Smith. A History of Science Part 3. Kessinger Publishing, 2004.

[15] Boehnhardt, H. "Split Comets." <http://www.lpi.usra.edu/books/CometsII/7011.pdf>

[16] Droser, Mary L., Richard A. Fortey, and Xing Li. "The Ordovician Radiation." *American Scientist* 84.2 (1996): 122-131.

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[17] Eldridge, Niles. *Cretaceous Meteor Showers, the Human Ecological "Niche," and the Sixth Extinction*. 1998. The American Museum of Natural History. <http://www.amnh.org/science/biodiversity/extinction/Day1/bytes/EldredgePres.html>

[18] Ishiguro, Masateru, Fumihiko Usui, Yuki Sarugaku, and Munetaka Ueno. "2006 Fragmentation of Comet 73P/Schwassmann-Wachmann 3B Observed with Subaru/Suprime-Cam." arXiv:0904.4733 Apr 2009. <http://arxiv.org/pdf/0904.4733v1>

[19] Oltean, Marius. "On the feasibility of applying presently understood cometary fragmentation processes to the Zysman-Wallace hypothesis." 2009. Comimi Research Inc.

[20] Nishioka, Kimihiko. "Finite Lifetime Fragment Model 2 for Synchronic Band Formation in Dust Tails of Comets." *Icarus* 134.1 (1998): 24-34.

[21] Birkle, K., O. Ryan, H. Boehnhardt, Z. Sekanina, D. Engels, P. Keller, and M. Jaeger. "Dust Tail Striae in Comet Hale-Bopp." Astronomische Gesellschaft Meeting Abstracts, Abstracts of Contributed Talks and Posters presented at the Annual Scientific Meeting of the Astronomische Gesellschaft at Heidelberg, September 14-19, 1998.

[22] Saturn's Moon Iapetus – Explore the Cosmos. The Planetary Society. 17 Aug 2009 <http://www.planetary.org/explore/topics/saturn/iapetus.html>

[23] Ip, Wing-Huen. "On a ring origin of the equatorial ridge of Iapetus." *Geophysical Research Letters* 33.L16203 (2006).

[24] Velikovsky, Immanuel. *Oedipus and Akhnaton: Myth and History*. Pocket Books, 1980.

[25] Velikovsky**,** Immanuel. *Peoples of the Sea*. New York: Doubleday, 1977.

[26] Velikovsky, Immanuel. Ramses the 2nd and His Time. Buccaneer Books, 1993.

[27] Cox, Douglas E. *The Glacial Paradox*. 2001.
< http://vinyl2.sentex.net/~tcc/dload/paradox.pdf>

[28] Groussin, O. P. Lamy, L. Jorda. "Properties of the nuclei of Centaurs Chiron and Chariklo." Astronomy and Astrophysics 413 (2004): 1163-1175. <http://www.aanda.org/index.php?option=article&access=bibcode&bibcode=2004A%2526A...413.1163GPDF>

[29] Cox, Douglas E. "Problems in the Glacial Theory." *Creation Research Society Quarterly*, 13.1 (1976): 25-34. *Unknown Earth: a Handbook of Geological Enigmas*. Ed. Corliss, William R. Glen Arm, Md., 1980. 33-50.

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