

## The Origin of Sunspots - A New Hypothesis (SH42B-0546)

John Ackerman ([angiras@firmament-chaos.com](mailto:angiras@firmament-chaos.com)) © John Ackerman 2003

### Abstract (revised 12/14/03)

Recent observations of sunspots, the high temperature of the corona and CMEs strongly suggest that they are all caused by highly energetic solid bodies (asteroids) falling into the Sun. This hypothesis is consistent with the rapid (3000 mph) downward flow of gases in sunspot interiors observed by SOHO, their lower temperatures, and the presence of large quantities of water in their spectra. The high velocity of the incoming body entrains the surface gases, carrying them rapidly downward. The vaporization of the bodies cools the local gases and the water released from the bodies produces the observed spectra. Solar flares and CMEs comprise the material splashed from the impact perimeter. The paired sunspots and the multiple secondary spots are the result of the partial breaking up of the incoming body in the solar atmosphere before it reaches the surface. The persistence of the sunspots is due to a quasi-stable toroidal circulation induced in the surface layer, similar to a smoke-ring or an inverse Hadley cell. An impact was recently captured in a sequence of ultraviolet images by the TRACE spacecraft. In the clip, the initial dark scene is suddenly illuminated by the splash or flare due to the primary impactor, which is not seen because it is dark. The resulting illumination makes it possible to observe the associated secondary bodies, which leave dark trails of gases as they vaporize and cool their surroundings. These were described as 'tadpoles' because they each leave undulating dark tails in contrast to the bright background. Their downward motion has created great difficulty for the current hypothesis, that sunspots are generated from within the sun, implying that all material should be moving outward. The estimated velocity of the 'tadpoles,' 400 miles/sec implies that they fell from the vicinity of Jupiter's orbit. Interestingly, the average sunspot cycle is close to the period of Jupiter, not the period of a body falling from Jupiter in a Sun grazing orbit. I suggest that the modulation of sunspot activity, illustrated by the well-known butterfly diagram, is due to millions of bodies which have been ejected from Jupiter's Great Red Spot (-20 latitude) in recent millennia. The 'tail end' of angular momentum loss from the Jovian system was recorded up to 1930 in the form of a monotonic westward 'drift' of the GRS, which actually shows the increasing of the period of Jupiter's rotation. The differences in the asteroid orbits result in the consequent modulation of the resulting impacts on the Sun are likely due to the inclination, obliquity, and eccentricity, which follow Jupiter's period. The difference between Jupiter's period (11.8 earth years) and the average sunspot cycle (11.3) years, during a cycle, are due primarily to a reduction of the asteroids aphelions by drag in the solar corona on a number of orbits prior to their impacts on the Sun. This is consistent with the localized, non-thermal heating of the corona to millions of degrees. Yohkoh images and SOHO's ultraviolet spectra of these regions have provided clear evidence for their non-thermal nature, strongly implying heat deposition by fast moving bodies. The implication of the 'Maunder Minimum' and recent studies of the sunspot cycle on temperature over century and decadal scales, is that powerful bursts of energetic charged particles from the Sun are a significant factor in maintaining the temperature of the Earth at its current level. In addition to showing the 11 year sunspot cycle, the butterfly diagram implies a long term increase in solar activity and therefore in heating of the Earth that should be taken into account in any 'global warming' investigations.

## The Origin of Sunspots - A New Hypothesis

AGU Fall Meeting paper SH42B-0546

by John Ackerman [angiras@firmament-chaos.com](mailto:angiras@firmament-chaos.com) © John Ackerman 2003

Sunspots are only one of the pantheon of currently unexplained solar system phenomena. They appear spontaneously, often in pairs, and their numbers increase and decrease with a period of about eleven years. They are dark relative to the 'normal' solar surface (10,000 F or 5300 K), but are still very hot (typically 3200 Kelvins), often attain sizes as large as the Earth and typically last a few weeks. (The Sun's rotation period is approximately 28 days.) Interest of scientists has been tweaked in recent decades with the realization that they constitute sources of great solar flares producing waves of high energy particles which strike the Earth, disrupting communications and power grids, and threatening the lives of astronauts exposed in space.

The eleven year cycle involves some intriguing structure. One form in which it is presented is by a plot of daily sunspot area versus solar latitude over a number of eleven year cycles, known as a butterfly diagram shown in Figure 1. In the early part of each cycle the sunspots usually appear at north and south latitudes as high as 30 degrees but then move closer to the solar equator as the cycle continues. Then after a short period of almost no activity, the cycle begins again. They often occur in pairs or clusters.

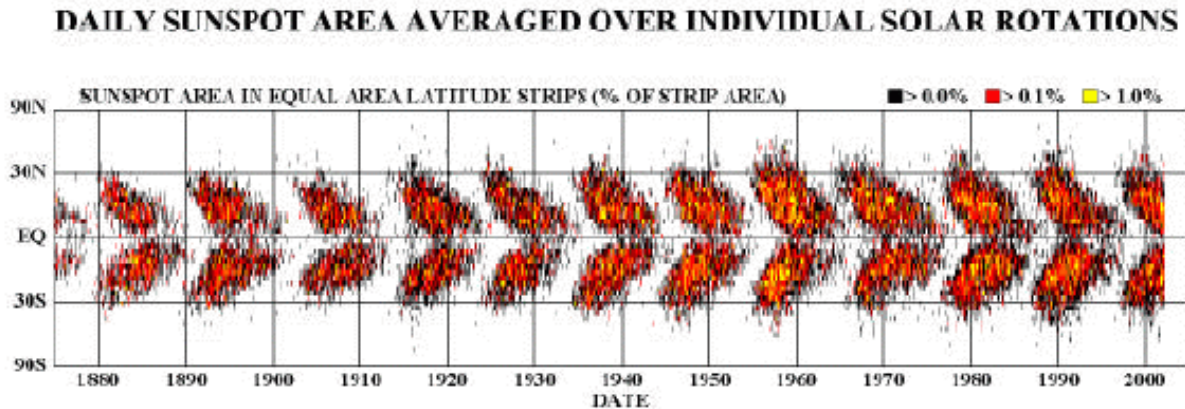


Figure 1. The butterfly diagram illustrating sunspot activity from 1875 to the present.

Surprisingly, large amounts of water have been reported *inside* sunspots by several research groups. Water should be completely dissociated into H and OH radicals and ultimately to O and H atoms at the surface temperature of the Sun (5800 Kelvins). In one paper, (Water on the Sun: Molecules Everywhere, by Takeshi Oka, Science, **277**, 18 July 1997) the spectrum of water was unequivocally measured in a sunspot at a temperature of 3200 degrees Fahrenheit. Although initially surprised at the finding, the author tries to explain the finding within the current paradigm. That is, when the temperature is reduced to 3200 K, we should not be surprised that the atoms quickly go out and find mates to form massive numbers of water molecules - difficult to believe. Measurements by chemist Peter Bernath and his colleagues at the University of

Waterloo indicated that there were enough water molecules in one 12,000 mile-wide sunspot to fill a lake four square miles in area and 300 feet deep.

Another unsolved mystery of the Sun, not directly linked to sunspots, is the fact that its 'atmosphere' attains temperatures above 1,000,000 degrees while the visible surface is only at 5800 Kelvins. This 'corona' is thought to supply the energy which powers the solar wind. It is also thought to be associated with the magnetic field of the Sun, because the corona attains its highest temperatures in areas surrounding sunspots, where the magnetic field is distorted. However, the coronal regions with the strongest magnetic fields are directly above the sunspots where the corona is coolest.

### **New Data and Current Hypotheses**

An article (Inside Sunspots: New View Solves Old Puzzle by Robert Roy Britt) in the Nov. 6, 2002 edition of Space.com gives some results of the most recent sunspot measurements, made by the SOHO satellite and explanations of the observations by a few of the involved scientists.

The new view inside sunspots, provided by instruments onboard the Solar and Heliospheric Observatory (SOHO), shows a previously unseen process. The Michaelson Doppler Interferometer shows plasma in sunspots zooming toward the center of the Sun at 3,000 mph, creating a siphon of sorts that reins in the magnetic fields. Members of the research team offered the following hypotheses:

Magnetic fields in sunspots are known to prevent the heat that's generated deep within the Sun from rising to the surface. So the plasma in a sunspot is cooler than plasma on the surrounding surface of the Sun. Since the sunspot plasma is cooler, it is heavier, and it plunges downward. That draws the surrounding plasma and magnetic field inward toward the sunspot's center ... The concentrated field promotes further cooling and sinking flow and draws in still more material. This sets up a self-maintaining cycle of material circulation.

But the roots of sunspots are still a mystery. And it's not clear whether or how the downward flow of plasma might trigger solar flares. Flares usually occur when strong magnetic fields of two opposite polarities come close to each other and reconnect. The flows beneath the sunspots may have something to do with bringing these opposite polarities together, but that is still being investigated. Though sunspots typically appear in clusters, the new study applies only to how individual sunspots are held together.

The study involved about a dozen sunspots but most of the data was collected on a single 1998 sunspot. NASA scientists have used the data to make a 3-D animation of a typical sunspot that shows a cluster of 'magnetic flux tubes' held together by the downflows. About 3,000 miles down, the mechanism gives way and the tubes spread out.

The descending flow is readily able to extract the heat that accumulates beneath the spot. It then spreads the heat away from the sunspot and eventually brings it to the surface of the Sun far from the spot, from where it is radiated into space.

More recently additional evidence has been provided by the Transition Region And Coronal

Explorer (TRACE) spacecraft. It is in the form of a video clip showing several waving shadows approaching the Sun after the eruption of a Coronal Mass Expulsion (CME) event. Quoting Edward Deluca of the Harvard-Smithsonian Astrophysical Observatory and co-author of an upcoming Astrophysical Journal report on TRACE's observations:

... other instruments have previously spotted the curious, dark globules, which were first noticed in January 1999. After the initial discovery, researchers scrutinized old data, finding about 40 other events dating back to 1991. But TRACE's detection of the tadpoles marks the first ever for a high-resolution satellite. This is the best view yet of these enigmatic shapes, TRACE's close-up ultraviolet view of the tadpoles occurred on April 21, 2002, during a coronal mass ejection (CME). Tadpoles have been seen in association with about 20 percent of CMEs.

The tadpole feature has perplexed astronomers, because such gigantic explosions should be propelling material outward, yet these black blobs are retreating toward the sun at up to 400 miles a second. But the TRACE data, which observes in ultraviolet light at 1.5 million and 10 million degrees Celsius, have helped scientists unravel the mystery behind these formerly enigmatic features.

The tadpoles appear to be superheated magnetic regions devoid of plasma, which is why TRACE's ultraviolet eyes detect them as black. When broken magnetic field lines make new connections to generate the outward-propelled CMEs, lines still attached to the sun's surface also reconnect and snap downward, pulling the tadpole-like pockets down with them. Magnetic pressure momentarily keeps the hot plasma out of these spaces, preserving their dark appearance. As the tadpoles swim downward, the empty space eventually fills with hot plasma from below until the features disappear.

### **The V/A Hypothesis**

Long before the latest SOHO finding, it seemed logical to me that sunspots were caused by the impacts of large bodies into the Sun's surface. Naively, one can imagine a stream of large bodies in a Sun-grazing orbit with a period of 11.3 years, and an inclination that would result in their striking the Sun between 30 degrees north and south latitude. Some of their orbits would decay on each pass and cause them to impact the Sun. Also they would be expected to break up on approach, creating pairs or clusters of sunspots. The new findings, that the gas at the surface of the Sun is diving down into the Sun at 3,000 mph, strongly reinforces this notion. But there are two problems with this hypothesis. First, although the velocity of the 'tadpoles' (400 miles/sec) is consistent with an origin at Jupiter's orbit, the period of such bodies would only be about five years, far from the sunspot period. Second, it is difficult to imagine the enormous number of bodies in similar orbits that could produce the myriads of sunspots recorded over the last century. However, we suggest that the close correspondence of Jupiter's period of revolution around the Sun and the sunspot periodicity cannot be mere coincidence.

There is a facet of the Velikovsky/Ackerman scenario which suggests a solution to this mystery - one which could never be imagined under the current uniformitarian paradigm. It originates from the suggestion in several myths, e.g. that Pallas Athene (proto-Venus) was born out of Jupiter 'fully armored with a spear,' implying an incandescent linear feature was seen at that

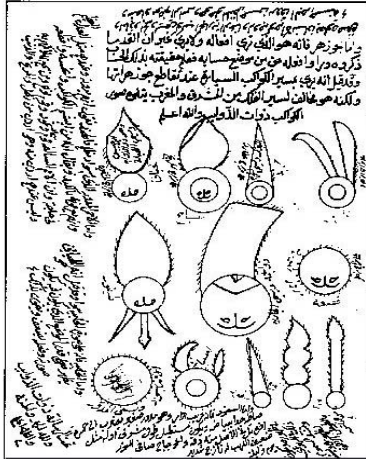


Figure 2 A 9<sup>th</sup> century A.D. arabic document showing an enormous jet shooting out of Jupiter (upper left drawing). (Translation courtesy of Everett K. Rowson, Director, The Middle East Center, The University of Pennsylvania, Philadelphia PA)

time (4,000 BC.) This, combined with a drawing of a large jet shooting out of Jupiter in a ninth century AD arabic document, in Figure 2, suggests that the impact on Jupiter, out of which proto-Venus was born, continued to produce a highly directed jet of hot gases for more than four millennia. I maintain that this is manifested today by the most prominent feature on Jupiter, the Great Red Spot. The jet, which originally extended hundreds of thousands of kilometers from Jupiter, encompassing all four Galilean moons, gradually diminished to the point that it could no longer eject mass from Jupiter, only recently.

Investigators from Oxford University, studying data returned by the NASA Galileo NIMS instrument, have recently detected the remnant of the jet at the center of the GRS. This is described at <http://www.planetary.org/html/news/articlearchive/headlines/1998/headln-033198.html>, as follows:

Jupiter has high winds, and a large number of very large, very long-lived storm systems can be seen on the planet at any one time. The most famous of these is the Great Red Spot (GRS), which is revealed as having a most remarkable structure in the new data.

Most astronomers believed GRS was a deep mass of cloud. Instead, it has a spiral arm structure of clouds, with gaps between which enable NIMS to see through the GRS into the deep, relatively clear atmosphere below. Furthermore, the cloud structure is higher in the center by more than 10 kilometers and tilted toward one side, something like a crooked spiral staircase.

What seems to be happening is that wet air from the deep atmosphere is rising rapidly in a relatively narrow region in the center of the GRS, and then spraying out above the tops of the ammonia clouds while rotating, rather like a giant garden sprinkler. In some ways this is similar to what happens in a terrestrial hurricane, but the Jovian storm is much bigger than the entire Earth.

The gun-barrel-like crater implied by the highly directional jet, was due to the impact of a planet-sized body of interstellar origin or possibly one comprised of nuclear matter, combined with the unique, low density gas hydrate makeup of the bulk of Jupiter. In *Chaos*, I detail a number of major contributions which the jet has made to the solar system we observe today: (1) It supplied the outer layer of the four Galilean moons, in the millennia after the proto-moons formed from material ejected into Jovian orbits at the time of the great impact, 6,000 years ago. (2) The great heat of the jet gases combined with the strong radiation field surrounding Jupiter after the impact, accounts for the great differences in the makeup of the four Galilean moons. (3) The hot gases still rising from the crater are responsible for the Jovian temperature excess.

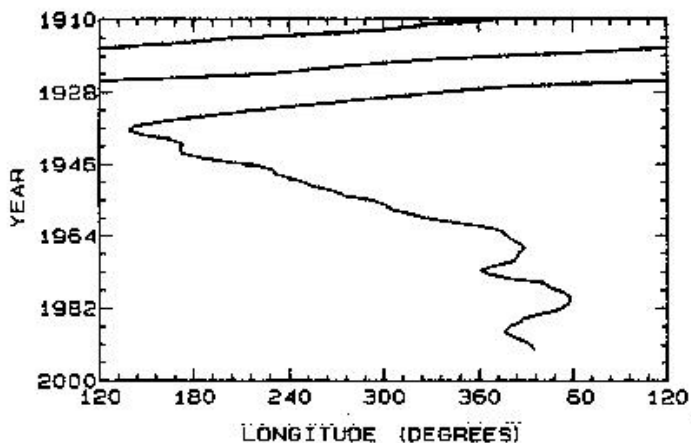


Figure 3 The longitudinal ‘drift’ of the GRS in degrees per year since 1910. The apparent monotonic westward drift is actually a measure of the slowing of Jupiter’s rotation.

(4) The total mass ejected from the Jovian system by the jet, over six millennia, has slowed the rotation of the giant planet from its initial period of about one hour (calculated by Fred Hoyle, *The Cosmogony of the Solar System*) to its current period of almost ten hours. Evidence of the ‘tail end’ of this deceleration is available in the records of the GRS circulation periods, Fig. 3, measured relative to an assumed constant rate. As can be seen in the figure the ejection of mass from Jupiter ended around 1930.

The total energy released at the time of the impact, which was sufficient to eject several Venus-sized masses from the system, was about  $10^{42}$  ergs, but the energy required to slow the rotation of the massive Jupiter is of the order of  $10^{43}$  ergs. I attribute this great longevity of the jet partially to energy being released from the gas hydrates within Jupiter, primarily methane combustion. This is consistent with current thinking that gas hydrates are the next major natural energy source on Earth and recent experiments in recovery of methane.

What happened to all the material ejected with escape velocity as Jupiter whirled, which did not become incorporated into the Galilean satellites? As the hot gases cooled they accreted to form unique solid bodies in the weightlessness of interplanetary space. These were dark, low density, cinder-like bodies comprising the full variety of the elements imbedded in the bulk of Jupiter. This included sufficient iron and nickel that most became magnetized, because they solidified while still within the magnetic field of Jupiter. Those with greater orbital velocities became one class of the main belt asteroids. The low densities ( $1 \text{ gm/cm}^3$ ) and magnetism of several main belt asteroids and also Almathea are consistent with this hypothesis. Scientists attribute the low densities of these bodies to their being loosely bound ‘rubble piles’, i.e. without structural rigidity, but those imaged close-up look quite rigid, like potatoes with convex shapes. Also, the current consensus is that the main belt asteroids are ancient and have been subjected to collisional breakup, but this would result in sharp angled surfaces, which have not been observed. I maintain that at least one entire class (C-type) of main belt asteroids, numbering in the hundreds of thousands, was formed from the Jovian jet in the last 6,000 years. The other class and the 50-some small satellites of Jupiter, probably formed from the debris blasted from Jupiter at the time of the original impact, which failed to become incorporated into proto-Venus. Based on the Sloan Digital Survey data there are estimated to be some 700,000 main belt asteroids with diameters greater than 1 km. They are characterized by low to moderate

inclinations, as would be expected from their ejection in the direction 20 degrees below the equator of Jupiter. The large range of inclinations is also an indication of their relative youth, since their orbital inclinations should have been reduced to zero within 100,000 years, similar to the rings of Saturn.

Depending on the direction of the GRS relative to the orbital velocity vector of Jupiter, many bodies would not have become main belt asteroids. Instead, as a result of being ejected in the opposite direction from Jupiter's orbital velocity, many of these asteroids must have been injected into orbits that pass close to the Sun. The combination of -20 degree S. latitude orientation of the GRS with the 1.3 degree inclination of Jupiter's orbit and the 3.1 degree obliquity of its spin axis could result in orbits of the ejected bodies ranging from 24 to 16 degrees relative to the ecliptic. But the range of sunspot latitudes on the Sun is from -30 to +30 degrees. This is because the equator of the Sun is tilted at about 7.5 degrees to the ecliptic. Therefore the maximum solar latitudes of the asteroid impacts would be approximately 31.5. Whether they impact in the northern or southern hemisphere would depend on the direction of their origin relative to the tilt of the Sun and whether they impacted on the 'near' or 'far' side of the Sun. It can also be seen from this (mental) picture, that asteroids passing through the plane of the ecliptic at the time of impact could strike the Sun at or near its equator. This range of latitudes is consistent with the data in the butterfly diagram. Unfortunately, because there are no permanent markings and because of our inability to observe the farside of the Sun, this diagram does not convey the longitude at which the impacts occur.

The systematic variations in impact latitudes on the Sun during each eleven year cycle implied by the butterfly diagram (~11.2 years) are slightly different from the period of Jupiter (11.8 years). We suggest that this is due to general relativistic advance of perihelion which simulates an increased orbital velocity of their origin. These asteroids also experience drag in the solar atmosphere, which reduces their aphelions. A third factor which might influence the sunspot period and its variations, is the motion of the barycenter of the Sun. If this is a factor it would be dominated by the period of Jupiter. It has been pointed out by the late Dr. Rollin Gillespie that the Sun-Jupiter barycenter is displaced 1.068 solar radii from the Sun's center of mass and that this is close to the ratio of the period of Jupiter to the sunspot period. Using his values:  $11.861773 / 11.120412 = 1.066667$ . The relative importance of these factors in influencing the difference in the periods of Jupiter and sunspot activity would be an excellent subject for mathematical modeling.

I maintain that innumerable asteroids have been sprayed in many inclined orbits as Jupiter, and the jet along with it, rotated in the last six millennia. If we assume, with Fred Hoyle, that Jupiter's original rotation period was about one hour, we can attribute the slowing, to the current 10 hour period, to the ejection of this myriad of bodies. This process was extremely intense immediately after the great impact and continued at a slowly diminishing rate for six millennia, still producing a measurable slowing up to 1930. One big question is: "How much longer will these bodies continue impacting the Sun?" If we assume that the butterfly diagram does not contain any bias due to improvements in observation or measurements of sunspots, we must

conclude that the impact area is increasing markedly. This may or may not be a favorable trend for the Earth and its people.

Essential to my entire hypothesis, is the thesis that water, in the form of gas hydrates, is the primary constituent of Jupiter. This is implied by the high concentration of water on Europa, Ganymede and Calypso, as well as the low concentration in the Jovian atmosphere, due to its being frozen in the body of Jupiter. ( The full reasoning is available in the paper entitled “A New Paradigm for the Jovian System,” also available on this website.) This implies that the asteroids impacting the Sun contain plenty of water, thus explaining the strong spectral signal of water measured within sunspots. As these bodies impact the Sun, at some 400 miles/sec, they propel the surface gases downward at the same time they are being vaporized, leaving the surface cooler, darker and full of water molecules. But the great orbital kinetic energy is not merely absorbed by the Sun. The gases at edge of the point of impact are splashed outward similar to the way an impact on a rocky surface ejects material. The approach and impact obviously perturbs the magnetic field in the locality but I maintain that the kinetic energy imparted to the gases at the impact sites produce the CMEs and solar prominences. These gases are initially contained by the magnetic field of the Sun as can be seen in the loops of the prominences, but if their energy is great enough, the gases expanding from the impact site tear away from the constraining field and rush outward into interplanetary space. The impact leaves its mark on the Sun in the form of a relatively stable local circulation pattern, like a smoke-ring or inverted Hadley cell, explaining the lifetime of sunspots, which can be weeks.

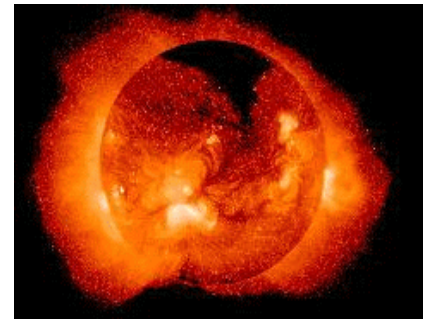


Fig 4. Yohkoh image of solar corona in extreme ultraviolet.

I further suggest that the high temperature of the corona is due to the braking of the Sun grazing asteroids which eventually impact the solar surface or to the vaporization of smaller asteroids. As these bodies encounter the solar atmosphere some of their enormous orbital energy is converted to heat causing the localized, non-thermal heating observed by the Yohkoh (Fig 4) and SOHO probes. In some ways scientists are leaning toward this explanation. Quoting from an article summarizing data on the solar corona (Science, **285**, 6 Aug1999, p.849):

In the Yohkoh images one sees only the hottest part of the corona. SOHO's ultraviolet spectra of these regions have provided clear evidence for nonthermality. *The Yohkoh images thus probably show the approximate locations of heat deposition in the corona.* (My emphasis.)

The study could also lead to clues that might one day explain why the Sun has an 11-year cycle of activity. The asteroid impact hypothesis is strongly corroborated by the SOHO doppler measurements indicating that the *gas in the umbras of sunspots is rushing into the Sun at high velocities (3000 mph)*. In spite of this amazing revelation, no scientist in the field has even suggested that sunspots are caused by impacting asteroids. The failure to consider this explanation probably arises because, at the peak of solar activity, an average of ten large asteroids per day would have to be impacting the Sun. In the current paradigm there is no source



for such an inexhaustible supply of unseen bodies, particularly in light of the fact that they must be massive enough to penetrate the solar atmosphere and impact the surface.

The video clip made from TRACE images, a still photo from which is shown in Figure 5, further corroborates my hypothesis. It can be viewed on the internet at: [www.physlink.com/News/041603SolarTadpoles.cfm](http://www.physlink.com/News/041603SolarTadpoles.cfm). The initial scene shows a quiescent area of the sun's surface.

Because the background is dark it is not possible to see the primary asteroid as it impacts the Sun from the upper right, but the hot gases which rebound from the impact site light up the entire scene. This makes it possible to see the less massive pieces which broke off from the primary asteroid and were retarded in the solar atmosphere. Some of these bodies may also strike the surface, producing smaller sunspots around the primary one, as shown in Figure 6. It appears in the film clip that the same hot plasma produced by the impact of the primary asteroid, which makes the secondaries visible, may also increase the chances that they become vaporized. The heat used to vaporize the less massive secondaries causes the cooler, dark areas, named 'tadpoles,' by the scientists, who voice amazement that they are descending instead of ascending. By the scientists own estimates, they are moving toward the Sun at approximately 400 miles/sec, only slightly slower than the more massive primary, which just impacted the surface.



Fig. 5 TRACE image with tadpoles descending from upper right

The Earth has benefitted from the impact of these bodies on the Sun via the solar flares and the Coronal Mass Ejections (CMEs) produced by each impact. Their heating effect on the Earth is just beginning to be recognized. This is merely one of many advantages that have accrued to the Earth from that great impact on Jupiter.

Further evidence for the origin of these bodies in the Jovian system comes from the TRACE scientific team's estimate of the velocity of the tadpoles, 400 miles/sec. This velocity coincides closely to that which a body originating at Jupiter will attain in falling into the Sun.

It is particularly ironic that the scientists have given animal names to these mysterious phenomena. This was, of course, exactly what our forebears did when they named the heavenly bodies in ancient myth - the same myths on which the V/A theory is based. The irony is that this is the property of the myths, which cause 'conventional' scientists to reject their validity as scientific evidence.

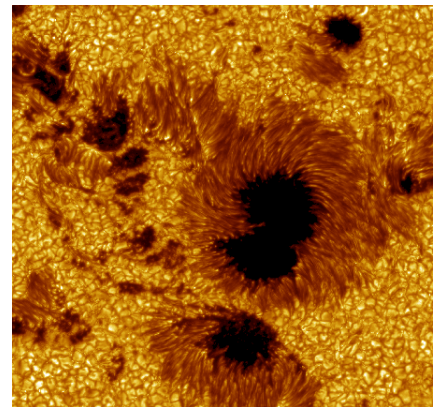


Fig. 6 A group of sunspots, which all form at the same time, are due to fragmentation of the primary asteroid.

The great multitude of asteroids continually being vaporized in the solar atmosphere, from Jupiter and other sources spelled out in the Velikovsky/Ackerman scenario, are the source of what scientists call the solar absorption spectrum. The current belief is that this spectrum represents the elemental composition of the Sun. This leads to a number of derivative misconceptions, namely: the uniqueness of the Sun compared to other stars; and the primordial nature of the carbonaceous chondrite meteorites. Once the recent chaotic events triggered by the impact on Jupiter are understood, these spectra will be seen for what they truly are. Indeed, they may provide clues to planet formation in star systems which are too distant to be resolved telescopically.

Depending on the location of the impact, the CME waves of high velocity charged particles sometimes enter the magnetic field of the Earth, spiraling into the poles and greatly enhancing the Aurora Borealis. The most intense solar flares can incapacitate communication networks and power grids. But I maintain that these electromagnetic impulses perform several functions vital for life on Earth. The obvious effect is in warming the Earth. From historical records and the ingenuity of a number of researchers it has been ascertained that there was a 70-year dearth of sunspots and aurora in the 17<sup>th</sup> century, referred to as the Maunder Minimum. At that same time in history, a severe temperature drop was recorded anecdotally. During that period, so-called “Frost Festivals” were held on the Seine river which was frozen solid in those years. This was the only period that the Seine river froze solidly. Recently, solar activity has been correlated with temperatures on Earth on both century and decadal time scales. If true, the butterfly diagram implies a gradual global warming effect throughout the entire recording period.

The CMEs provide another vital function, one which is currently unimagined by scientists. I maintain that the geomagnetic field is generated by a superconducting current in the solid inner core of the Earth, comprising FeH. The impulses of massive waves of charged particles on the magnetic poles of the Earth ‘pump-up’ the superconducting flow of current in the solid core of the Earth (FeH), by Faraday induction. Positive and negative particles spiral in opposite directions, so that their effects are additive. This is consistent with sudden changes in the derivatives of the geomagnetic field measured in the last century.

The ponderously slow circulation of liquid iron in the outer core, currently thought to act as a ‘dynamo,’ which generates the geomagnetic field, cannot explain these changes because (1) it carries no electrical charge; (2) it takes an estimated 1000 years for one circulation of each of the swirls which span the globe; (3) the slowly swirling masses on opposite sides of the Earth move completely independently of one another. This circulation only serves to distort the pure dipole field from the inner core, causing the very slow regional changes observed at the surface.

The sudden introduction of  $10^{42}$  ergs into the solar system 6,000 years BP has profound implications for ancient history and planetary science. Only a few of them are touched on in this paper. Until the catastrophic scenario is acknowledged, at least as a viable paradigm, making possible the discussion of new ideas instead of their outright dismissal, the potential knowledge of our world and the planets, *already present in the data*, will remain hostage. The longer we

look out into the universe, the more aware we must become that it is a violent and changing place. To assume our system is immune is sheer folly.