# ASTEROIDAL IMPACTS AND THE FLOOD-JUDGMENT

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**Abstract**

*Scientists developing Earth models within the framework of the global Flood-Judgment should consider a role for asteroidal impacts. There is evidence that the Earth, indeed the Solar System, was exposed to massive encounters with meteorites, asteroids and comets. This article surveys some of the evidence and possible consequences.*

## Evidence of Asteroidal Impacts

Earth-orbiting satellites have contributed to the identification of previously unrecognized impact features on the Earth's surface.[1] Exploration of the Moon and planets has challenged scientific opinion about the magnitude and significance of asteroidal impacts. Even so, very few geodynamic models consider a role for asteroidal impacts. Until 1950 only twelve geological structures were identified as meteorite impact craters. Today, increased interest in these structures has enlarged the list to 110. Not only the number of identified impact craters has grown, but also the range in the size of craters has increased: For example, the Ishim impact crater in Kazakhstan has a diameter estimated from 350 to 720 km; the Reitz in South Africa is 350 to 500 km diameter. Both impact craters are at the large end of the scale. At the smaller end is Australia's Boxhole crater with a diameter of 0.17 km.[2]

Opinions are also changing concerning the frequency of encounters between Earth and asteroidal bodies. Meteorites, asteroids, planetesimals and comets are known to exist in orbits about the Sun. Some 40 asteroidal bodies are known to cross Earth's orbital path. Earth orbit-crossing asteroids are called Apollos after the name given to the first identified orbit-crossing asteroid. Some astronomers estimate the number of Apollos may be closer to a thousand.[3] In addition to material orbiting within the Solar System, the Solar System is also in orbit within the Milky Way Galaxy. Encounters with bodies outside the Solar System are therefore possible. Radioastronomers have observed large, dense (dark) clouds in space. One theory recently put forward is that these clouds may contain comets. It is estimated that the enormity of a cloud is sufficient to hide as many as 100 thousand million comets.[4] Current belief is that comets are conglomerates of ice and rock debris—a "dirty snowball."[5] It has also been suggested that some asteroids and meteorites may actually be fragments of larger comets.[6] Clube and Napier of the Royal Observatory in Edinburgh believe that when the Solar System passes through or near one of these clouds, the Sun's gravity dominates and a portion of the cloud is captured. Such captures would flood the planetary region with asteroidal material which could lead to a catastrophic bombardment of Earth, Moon and the planets. Because these speculations are set against the backdrop of evolution-biased time, they are postulated to recur at intervals of hundreds of thousands of years.[7]

Another view, based on a Bible chronology, is that the Earth has encountered at least one swarm of large asteroidal impacts in the past. One such event was the Flood-Judgment of Scripture.

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## Solar System

Evidence of massive and numerous encounters with asteroidal bodies in the Solar System is seen in surface features of the planets and their moons.[8] The circular Caloris Basin of Mercury is 1300 km in diameter and is ringed by mountains. This basin is thought to be the result of a large asteroid hitting the planet.[9] Voyager 2 photographed a 400 km diameter crater on Tethys (a moon of Saturn) which is only 1050 km in diameter.[10]

Remnants of a Flood-Judgment asteroidal swarm may still be identifiable in the Solar System. Phobos, a moon of Mars, and Amalthea, a moon of Jupiter, are examples of asteroid-like bodies captured in planetary orbit. Phobos has a diameter of 20 km and Amalthea is a rock 155 km by 270 km.[11, 12] Ceres is an asteroid 1000 km in diameter. Ceres is part of the giant asteroid belt between Mars and Jupiter.[13] It had long been thought that this asteroid belt was the remnant of an exploded planet, but this view has changed.[14] It is now thought that this orbital position about the sun is stable, holding captive asteroids between the gravitational pull of the Sun and Jupiter.

In addition to numerous impact features, Mars gives witness to other catastrophic events. The Chryse plain of Mars shows evidence of flash flooding. Water cannot be detected in this region today, but at one time in the planet's history, water may have obliterated all surface features except the highest rimmed craters (Figure 1). It is possible that asteroidal impacts at the polar ice cap may have resulted in melting and subsequent flooding of the Chryse plain.[15] Another possi-


**Figure 1. The Chryse plain of Mars shows features of possible ancient flash flooding in areas where surface water is not detectable today. Only the highest meteorite crater rims avoided the possible on-rushing flood waters. (Kaufmann, 1979, p. 126: drawn from NASA photograph.)**

bility is that Martian polar ice and the Chryse flash-flooding features resulted from extraplanetary ice at the same time as Earth's Flood-Judgment.

### The Moon

Closer to the Earth, the Moon bears visual testimony to numerous possible asteroidal impacts. Earth-based telescopes can count over 30,000 impact features greater than one kilometer in diameter (Figure 2). The largest impact-features, the maria, are believed caused by large impacts that broke through the Moon's surface allowing molten lava to flow over large areas.[16]

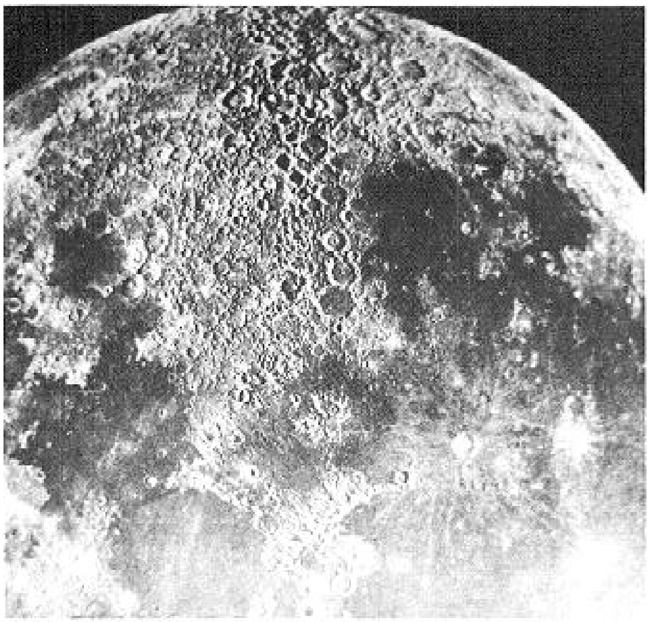

**Figure 2. The surface of the Moon testifies to possible massive bombardment by asteroidal material in the geologic past.**

### The Earth

Large impact craters are identifiable on the Earth's surface. However, the number of terranean impact structures is less than expected. Shoemaker, et al., has estimated the cratering rate from earth-crossing asteroids as approximately twice the observed rate.[17] This calculated rate is based on evolution-biased time. Dachille calculated asteroidal impacts based on the observed number of lunar maria. Proportionately there should be 400 to 500 such impact scars on Earth. The largest Earth impact craters can be compared to lunar maria and would be in the class of the Marc Orientale (900 km in diameter) shown in Figure 3.[18] Figure 4 represents the relative diameters of this class of large spheroids to the Earth's diameter. Small meteorites frequently burn on entering the Earth's atmosphere whereas large maria-producing asteroids and large comets would not. It has been suggested that large asteroid impacts have weakened the Earth's crust. For example, the 720 km Ishim Meteorite crater in the Teniz basin of central Kazakhstan dominates the Asian orogenic as observed from surface topographical maps.[19] Still the number of large impact structures falls considerably short of the predicted 400 to 500. Why is this so? Why would the smaller Moon, which was created after the Earth, show greater asteroidal impact damage than Earth? The relatively small number of large asteroidal impact features on the Earth's surface could be indirect evidence of the Flood. For

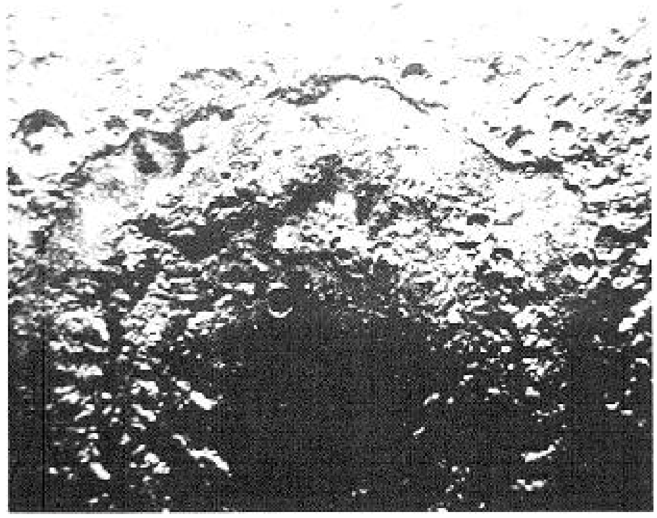

**Figure 3. The diameter of the outer mountain ring of Mare Orientale is 900 km. (NASA Orbiter photograph IV-M-187.)**

example, the global Flood waters destroyed early large impact features or modern continental features were exposed after the initial impacting swarm or both.

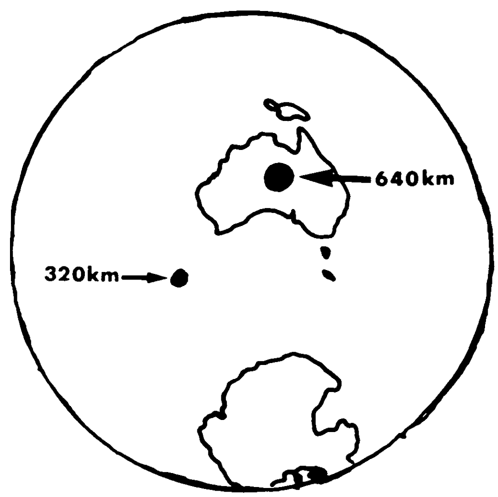


**Figure 4. Relative diameters of "large" spheroids to the diameter of Earth.**

### Iridium Anomaly

In addition to impact features. potential evidence for asteroidal impacts during the Flood Judgment has come from the discovery of noble metals in sediments. Studies have shown that noble metals[20] often occur unfractionated from each other in samples of meteorites[21] In 1979 an unusually high enrichment of noble metals, including iridium, was discovered in a sediment layer. According to evolution-biased geologic time, the sediment layer represented the boundary between the Cretacedus-Tertiary periods.[22] Eocene-Oligocene boundary sediments have also been found to have an enriched iridium layer.[32] The iridium anomaly has been discovered in sediments from Italy, Spain, Denmark, United States (Raton Basin) and New Zealand, as well as in ocean floor sediment cores from the Pacific and Atlantic.[24,25] The wide-spread occurrence of the anomaly is cited as evidence for an asteroidal impact which was of sufficient size to have caused the extinction of plant and animal species preserved in the associated sediments.[26] These sediments are widely held by Creationists to have been deposited toward the end of the Flood-Judgment.

Major criticisms raised against this catastrophe hypothesis are essentially the result of evolution-biased geochronology. Because evolutionists attribute geologic events generated by the Flood-Judgment to processes requiring millions of years, they create problems in sequencing cause-effect relationships. They identify global and regional extinctions of plant and animal species that have no apparent cause. And they identify massive tectonic and catastrophic events in the geologic record unassociated with any evidence for extinction.[27-29] These gaps between cause and effect result because the evolution-biased time frame is grossly expanded. Contracting geochronology into the framework of the Flood-Judgment clarifies many cause-effect relationships evidenced in the catastrophic nature of the fossil record.[30]

The catastrophe hypotheses now being applied by evolutionists to explain global mass extinctions are irreconcilable with the Darwinian evolution model of gradual biological change.[31] The uniformitarian beliefs that brought evolutionary geologists and biologists together appear considerably less cohesive today as increasing numbers of geologists are compelled to return to catastrophe hypotheses.

### Tektites

Tektites are believed to occur when meteorites impact the Earth (some say meteoritic impacts with the Moon). Rock and sand are vaporized by an explosive force that ejects glass-like tektites into ballistic orbits scattering debris over a large area. They are found in both sediments and as surface artifacts (e.g., over central Australia) over a wide geographical area. Microtektites are found in sediment cores from the Indian and Pacific oceans.[32, 33] The global distribution and stratigraphic occurrence of these collision residuals are evidence of asteroidal impacts during times when the sediments were being deposited.

### Rare Meteorites

An exotic class of evidence for large asteroidal impacts comes from the composition of certain rare meteorites. Two types of meteorites known as shergottites and nakhlites originated as fragments of solidified, once molten rock. The fragment known as the Shergotty meteorite is believed to have originally been part of a lava flow. It is postulated that a large meteorite hit the solidified lava and ejected chunks into space.[34] Where was the parent lava flow? Earth, Mars, the inner planets or the Moon become possibilities.

Geochemists at the University of Arizona discovered a predominance of l-form amino acids in a sample of the Murchison meteorite. The discovery of organic compounds is rare in meteorite samples and is usually attributed to contamination of the meteorite after impact. The significance of l-form amino acids is their association with biosynthesis. Laboratory synthesized amino acids are produced in equal proportions of l-form and the mirror-image d-form amino acids.[35] If the identification of l-form amino acids is confirmed for the Murchison meteorite, this could be another example of ejecta thrown into space by the impact of a large asteroid on Earth. In this scenario the ejecta would establish an orbit, eventually returning to Earth. It is also possible that other meteorites conclusively shown to contain organic matter are products of large asteroids impacting Earth during the Flood-Judgment.

### Effects of Asteroidal Impacts

In 1908 an explosive force equivalent to 50 megatons is thought to have destroyed an area of Siberian forest 100 km in diameter. This devastation is now suspected by some astrophysicists to have been caused by a 100-meter fragment of Encke's Comet.[36] As Clube and Napier observe:

> The current over-abundance of interplanetary particles, fireball activity and meteor streams in Apollo orbits all seem to bear witness to a sky that must have been exceedingly active within the past few thousand years. We see today the remnants of what must have been larger and most impressive pieces of cometary debris. Although these facts are 'well known,' astronomers do not seem to have appreciated their general implications.[37]

Table 1 shows the different energies involved in various Earth processes. Impacts of asteroids the size of Ishim and Reitz may have represented a considerable energy input. Although this article suggests that multiple large asteroid impacts occurred over the Earth during the Flood-Judgment, several reports have recently examined the effect of single impact events. These single impact scenarios can be useful in demonstrating the awesome destructive forces released by colliding asteroidal bodies.

**Table I**
**Energy of Various Earth-Related Processes**

| Process | Energy (ergs) |
|---|---|
| Earthquake (Chile, Alaska) | $10^{24}$ |
| Earthquakes, annual total | $10^{25}$ |
| Volcanic explosions | $10^{23}$-$10^{26}$ |
| Annual heat flow from Earth | $8 \times 10^{27}$ |
| Energy represented by formation of Barringer Crater, Arizona (1.2 km dia.) | $10^{24}$ |
| Mountain range raised one km ($1600 \times 480 \times 1$ km$^3$) | $10^{29}$ |
| Kinetic energy of spheroid, (density 3.5 gm/cm$^3$ and velocity 24.5 km/sec.): | |
| **Diameter:** | |
| 32 km | $1.75 \times 10^{32}$ |
| 320 km | $1.75 \times 10^{35}$ |
| 640 km | $1.4 \times 10^{36}$ |
| Rotational energy of Moon | $3 \times 10^{30}$ |
| Rotational energy of Earth | $2 \times 10^{36}$ |
| Orbital energy of Earth about Sun | $2 \times 10^{40}$ |

(After Dachille, 1983, p. 268)

### Collision with Large Comets

Astronomers have calculated that a 10 km diameter comet impacting over land would immediately destroy life over a hemisphere. They estimate the air temperature would increase to about 500 °C and windspeed would be about 2500 km/h at 2000 km from ground zero. Nitric oxides from the fireball would adversely affect atmospheric ozone. Mutagenic ultraviolet light intensity would increase. Turco, *et al.*,[38] have calculated that the average global temperature rise for an impact of $10^{31}$ erg would result in a 15 °C global temperature rise. O'Keefe and Ahrens[39] believe that such global heating, which is primarily due to energy transferred to the ejecta, would be short-lived due to the radiative decay lasting only a matter of days. A localized heat pulse is more probable. Perturbation of the internal currents in the core of the Earth would disturb its magnetic field. Mantle disturbances could also lead to rapid movement of the lithospheric plates. Mass extinctions of life would be expected.[40]

### Changes in Earth's Angle of Rotation

Recently in *Ex Nihilo*, astronomer Dodwell's model of a large asteroid tilting the Earth has been reviewed.[41, 42] The model suggests that a large asteroid generated a 3.5 degree tilt in the Earth's axis of rotation. Because of angular momentum, the Earth has been gradually "righting" itself during the interval between 2345 BC ± 5 until 1850 when the present angle of 23.5 degrees was established again. Astronomical records and architectural evidence from Stonehenge to Karnak have been cited as tracing this shift in the angle of rotation.

The size of a single asteroidal impact sufficient to change the angle of rotation would have to be considerable. It has been calculated that the impact of an asteroid the size of Juno (190 km diameter) would change the Earth's axis only 0.02 degrees.[43] Energy from the impulsive impact with a large asteroid would be almost entirely converted to thermal energy rather than mechanical motion.[44] Dodwell's model suggests the Pacific Ocean Basin is the impact feature left by the collision of asteroid and Earth.[45] The circular appearance of this basin can be explained by other Earth models.[46] However, a more difficult problem is the idea that the Earth's axis has gradually readjusted throughout history without evidence of catastrophic global geodynamic phenomena over the same historical period. By contrast, a permanent tilt resulting from massive impacts during the Flood-Judgment could produce a catastrophic global response.

A shift in the Earth's axis of rotation changes the Earth's figure of rotation. Earth radius measurements and satellite observations have confirmed that the Earth bulges at the equator. Changes in the axis of rotation will cause the bulge to shift to the "new" equatorial position. A sudden change in the axis of rotation, if only by a fraction of degree, could result in very rapid adjustments on a global scale. Tremendous tension (rifting) and compression (mountain building) forces would occur. Sudden pressures would cause the rocks of the ocean floor and the continents to behave inelastically resulting in massive fracturing. After the initial shock, the Earth's outer crust would begin to establish an equilibrium to the new rotational forces.[47]

Sedimentation would be affected on a global scale. Massive episodes of erosion and sedimentation would occur as oceans invade and recede from the continents. Great sedimentary basins would fill and impressive erosion features would rapidly develop where the oceans egressed from land. As land masses adjust to the new rotation, ocean currents would be slower in adjusting. The circulation in the atmosphere would respond to the changing oceanic circulation. Drag effects resulting from changes in geography would also affect atmospheric circulation. Weather patterns would be directed by these adjustments toward global equilibrium. Climates would be severe and wide-ranging until equilibrium was established.[48] If such a scenario is expected from a small shift in the Earth's axis, then these events must have been many times compounded during the Flood-Judgment.

### Effects on the Earth's Magnetic Pole

A shock impulse of 1.5 to 30 seconds has been estimated for the collision of asteroids 32 to 640 km diameter. Only one percent of the kinetic energy of impact would be required to explosively evaporate the asteroid.[49] Dachille has proposed a model in which the Earth is composed of concentric shells. The boundary layer of each shell represents a major zone of discontinuity in physical and chemical properties (Figure 5). The existence of such boundaries is supported by geophysical data on the Earth's interior as interpreted by geophysical theory. The model proposes that when any great impulsive force impacts the Earth, stress will occur on all boundary layers. For example, impact of a 320 km diameter spheroid at 32 km/sec applies an impulsive stress of about $4 \times 10^{10}$ dynes/cm$^2$ on a concentric shell 1000 km below the surface. By comparison, basalts fail in shear stress around $8 \times 10^8$ dynes/cm$^2$.[50]

The boundary layers at various levels will respond to an asteroidal impact differently, depending on the energy imposed on the boundary layer and the physical and chemical nature of the layer. Discontinuities would be expected at each boundary layer. At each lower boundary the fracture energy would be less and, therefore, less fracture and relative motion at each lower shell boundary. The relative displacement of each shell could then lead to geographical pole displacements. According to Dachille:

> If the shells down at 1,000, 600 and 400 km levels were to fail in shear sequentially or simultaneously there would appear to be no difficulty in obtaining geographical pole displacements of 20° to 30°.[51]

Pole displacements resulting from an episode of multiple massive impacts suggested for the Flood-Judgment could explain the phenomenon of "pole wandering" described by geophysicists studying magnetic orientations of various rock strata (Figure 5).[52]

What size asteroid could affect shell slippage within the mantle? Dachille calculates that a spheroid 175 km in diameter (density of 3.5 gm/cm$^3$) would provide sufficient impulse energy. Smaller spheroids (15 to 25 km diameters) could provide adequate momentum-energy content to displace sizeable portions of upper mantle shells and crust if off-center impacts are considered.[53]

### Asteroidal Impacts and the Flood-Judgment

The term Flood-Judgment used throughout this article stresses the true reason for the global flood catastrophe. It was *not* an accidental encounter with a swarm of asteroids, meteorites and comets. The Flood-Judgment was ordained and executed by God. It was not an "act of nature," but an act of judgment against human rebellion. The Bible faithfully records the chronological history of this judgment. This historical account provides the framework within which scientists are free to develop Earth models.

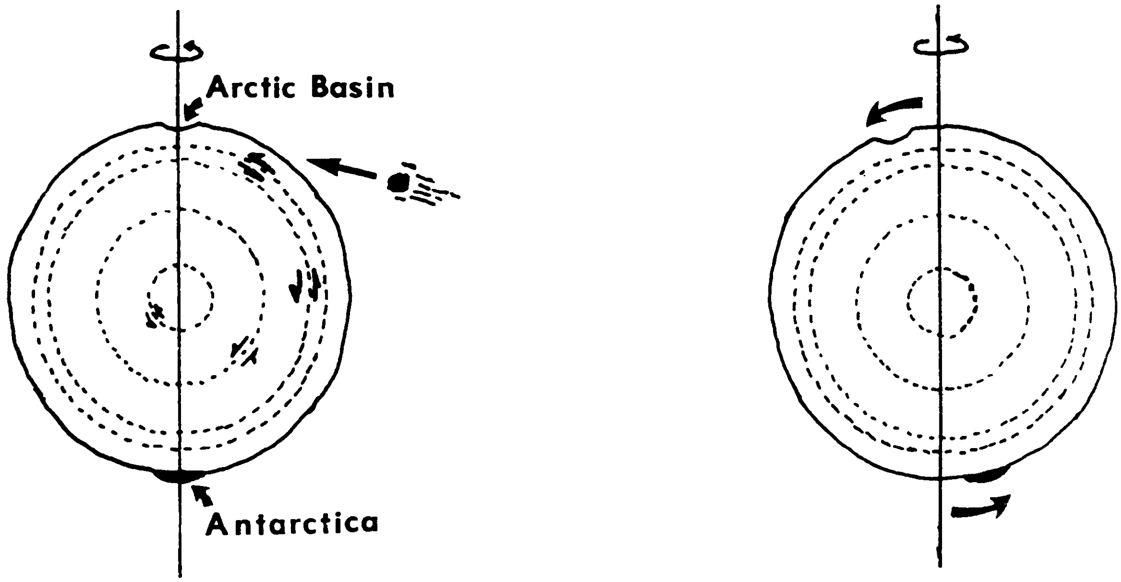


**Figure 5. Representation of Dachille's model for geographical magnetic pole "wandering." The Earth responds to an asteroidal impact as successive layers of shells. Discontinuities in movement at the boundaries result in geographical magnetic pole displacements, although true axial displacement may be small. (Redrawn after Dachille, 1983, p. 274.)**

Did Earth encounter an asteroidal bombardment at the time of the Flood-Judgment? The possibility of ice and rock debris existing in outer space has been confirmed by exploration of the Solar System.[54] Scripture teaches the existence of waters above the atmosphere (firmament). Genesis records during the second day of Creation, God separated the primordial ocean into two parts. One portion was below the atmosphere and the other above.[55] Both scientists and theologians have considered the possibility that the waters above the atmosphere implied a vapor canopy.[56] This canopy covered the Earth during the time before the Flood-Judgment and provided a "greenhouse" effect. Evidence for a more uniform and moderate global climate is found in the fossil record.[57] Some scientists have suggested that the collapse of this vapor canopy was the source of the Flood rain.[58]

Morton, a geophysicist, has argued that a thick vapor canopy would create a surface temperature profile too high for life to exist. As an alternative, he proposes a pre-Flood Earth with orbiting rings of ice particles.[59] This model receives some empirical support from observing the rings of the outer planets: Jupiter has one ring; Uranus has nine; and Saturn has too many to count.[60] One of Saturn's moons, Enceladus, appears to be a 490 km diameter ball of ice.[61] Recently it has been argued that impact features on the Moon suggest collisions with orbiting material.[62]

Scripture supports the concept of waters above the atmosphere being responsible for the 40 days of continuous rain.[63] However, the nature of the waters above the atmosphere may be more than a vapor canopy and/or ice rings. After separation of the primordial ocean, the composition of the water below the atmosphere was such that dry land appeared.[64] On what exegetical basis would we assume that the waters above the firmament are compositionally different from the waters below? The implication is that the mineralogical potential of the waters above the atmosphere were the same as the ocean from which dry land was formed. This assumes the primordial ocean was a homogenous mixture before division by the atmosphere. The waters above the atmosphere could then be expected to contain mixtures of ice and rock. It is possible that the comets, asteroids, meteorites, and outer planetary moons (and planets?), excluding the uniquely created Earth and Moon, are remnants, a reminder, of the pre-Flood "waters above."

Whatever the origin of asteroidal bodies — dense nursery clouds of comets, collapsing rings of primordial ice, or some other extraplanetary source — the Earth, Moon and planets of the Solar System may have been exposed to a massive bombardment of asteroidal material. Evidence exists which supports the hypothesis that a major episode of impacts was concentrated within the time of the Flood-Judgment. This provides an energy source and a trigger for other geodynamic phenomena. The energy released by the asteroidal impacts of the Flood-Judgment could have contributed to a transformation of Earth's geography.

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## QUOTE

Little wonder that we should at last come to celebrate the imagination as the mind's special prerogative which makes man independent of all creation, of all being, but his mind itself. It would be a mistake, however, to conclude that the alchemy practiced upon being by the emancipated imagination is restricted to poets. Philosophers and theologians and scientists and politicians and social workers—the gamut of "professional" minds within what is left of the polis—are as tempted to illusions as the poets. . . .

Indeed, the imagination has sometimes become a substitute Lord and Giver of Life, not only for the poet but for a range of would-be makers of being; the imagination, liberated from its responsible grounding in reality, creates a variety of coloring books to tempt our happy greens. . . .

Today, from particle physics to astronomy, from the formulae of DNA and the mathematics of genes to the structure of nations into one nation, the order of being is largely presumed not only in the *keep* of human mind, as in the orthodox virtue of stewardship, but resting in the mind as cause—mind as the determinant of order. Now when this assumed position is pressed firmly, its holder will deny the charge sometimes, not always. But from our actions in nature, that supposition of man's power as cause appears dominant of the actions. At the least we must conclude that the modern sense of responsibility to order is changed from what St. Augustine understood it to be when he defined virtue as "rightly ordered love." It has become *rightly ordered power*, the *rightly* justified by man's imagination.

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