

The Giant impact theory explains the formation of our Moon. What happened after that cataclysmic event? Using NASA data, the author uncovers the hidden order of the Solar System that has been overlooked since the beginning of the Scientific Revolution 400 years ago. Discover a secret that allowed Earth to develop life after the Dawn of the Solar System.

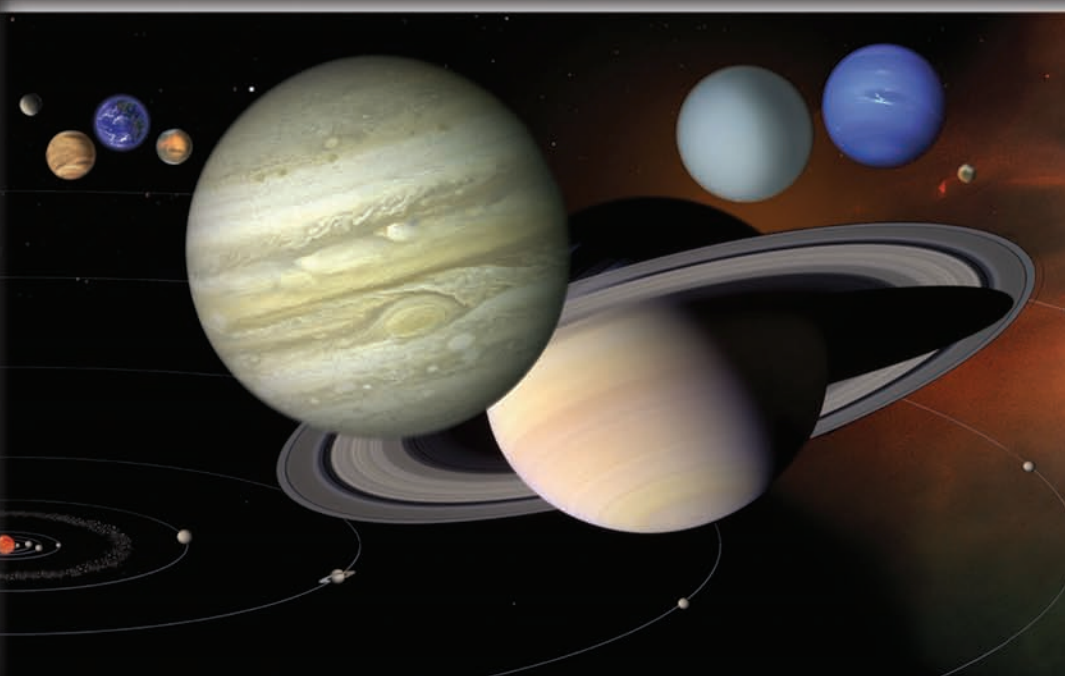
Dawn of the Solar System

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Dawn of the Solar System



David Harbaugh

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First Edition

Front cover NASA - An artist's impression of our solar system with separate representations of scale and size.
<http://solarsystem.nasa.gov/planets/profile.cfm?Object=SolarSys>

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Chapter 1

The Giant Impact Theory

“The most incomprehensible thing about the universe is that it is comprehensible.” - Albert Einstein

How was the Earth made? How did we get here? These questions have crossed every man's mind when he marvels at a starry moonlit night. A major step in Earth's formation is the widely accepted *Giant Impact Theory*. Formulated in 1975 by William Hartman and Donald Davis it is theorized that not long after the Earth formed, a Mars sized planet, Theia, collided with the young Earth - The Giant Impact. The collision shattered Theia and fragmented Earth's crust sending large chunks orbiting into space. Theia's core melded with Earth's core, increasing the young Earth's mass. The impact debris from the crust formed a ring around the Earth and quickly gathered to form the Moon, some scientists estimate in 100 years or less. This theory explains the lack of a large iron core in the Moon and also explains the common oxygen-isotope abundances the Earth and Moon have in common, the Moon came from the same radius in the solar nebula.¹ The Moon differs from moons of other planets, in that the diameter of Earth's moon is large in comparison to the Earth. The diameter of the Moon is one-quarter the diameter of the Earth. By comparison, Ganymede the largest moon in the Solar System has a diameter less than 4% of its mother planet, Jupiter. Our moon differs also in that its orbit is close to the plane of Earth's orbit and not to the equatorial plane of the Earth. The lunar orbit is inclined to the ecliptic (Earth's orbital plane) by 5.1° , and the Moon's spin axis is inclined by only 1.5° . Computer simulations of this event indicate that the collision was of moderate velocity at an oblique angle. The impactor probably formed at the same time as the Earth at one of Earth's Lagrangian points, probably L5, in the same orbit as the Earth at 60° in front of Earth, see Figure 1. This orbit is at exactly the same radius in the solar nebula as that of the Earth so the oxygen-isotope abundances

should be identical (as was verified by Apollo missions). These Lagrangian points are fixed positions equidistant from both the Sun and the Earth and are considered gravity neutral.² Theia and Earth grew; at a critical size Theia and Earth came under the influence of another planet's gravity. Like a car stuck in the snow, the pull began to rock their stable orbital positions. On each subsequent orbit Theia move further out of its Lagrangian position, oscillating closer and closer to Earth. Reaching instability, Theia came under the influence of Earth's gravitational pull. The resulting collision we call the Giant-Impact.

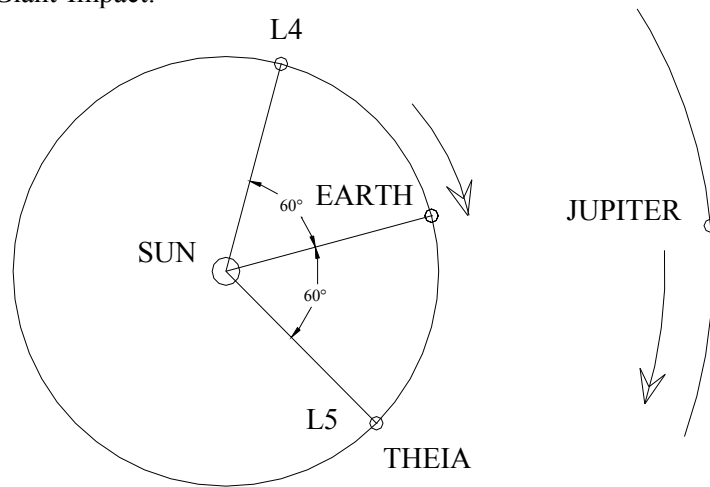


FIGURE 1

The questions I have not seen addressed are; “Where did this collision occur?” and “Why should Earth have such a circular orbit after this catastrophic event?”

The answers to these questions were the foundation of my hypothesis. Long ago it was suspected that a planet should have formed in the region of the Asteroid Belt. Some scientists believe Jupiter prevented this formation; others believe a potential 9th planet was ejected from

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the Solar System. My hypothesis will show that this planet did develop and we are living on it now. This deduction, hereafter referred to as the Harbaugh Hypothesis, displays a sequential methodical development of our Solar System. This may not be a typical development of all solar systems, but the evidence fits ours. All data used in tables and graphs is from the NASA- Planetary Fact Sheet shown in Table 1.

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Table 1 - Planetary Fact Sheet

	<u>MERCURY</u>	<u>VENUS</u>	<u>EARTH</u>	<u>MOON</u>	<u>MARS</u>
Mass (10^{21} tons)	0.364	5.37	6.58	0.08	0.708
Diameter (miles)	3032	7521	7926	2159	4221
Density (lbs/ft ³)	339	327	344	209	246
Gravity (ft/s ²)	12.1	29.1	32.1	5.3	12.1
Escape Vel (mi/s)	2.7	6.4	7.0	1.5	3.1
Rotation Prd (hrs)	1407.6	-5832	23.9	655.7	24.6
Length of Day (hrs)	4222.6	2802.	24.0	708.7	24.7
Dist to Sun (10^6 mi)	36.0	67.2	93.0	0.24*	141.6
Perihelion (10^6 mi)	28.6	66.8	91.4	0.23*	128.4
Aphelion (10^6 mi)	43.4	67.7	94.5	0.25*	154.9
Orbit Period (days)	88.0	224.7	365.2	27.3	687.0
Orbit Velocity (mi/s)	29.7	21.8	18.5	0.64	15.0
Orbit Incline (°deg)	7.0	3.4	0.0	5.1	1.9
Orbital Eccentricity	0.205	0.007	0.017	0.06	0.094
Axial Tilt (°degree)	0.01	177.4	23.5	6.7	25.2
Mean Temp (F)	333	867	59	-4	-85
Surf Pres (atmos)	0	91	1	0	0.01
Number of Moons	0	0	1	0	2
Ring System?	No	No	No	No	No
Magnetic Field?	Yes	No	Yes	N	No

* - See the Fact Sheet Notes.



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- U.S. Units

<u>JUPITER</u>	<u>SATURN</u>	<u>URANUS</u>	<u>NEPTUNE</u>	<u>PLUTO</u>
2093	627	95.7	113	0.0138
88,846	74,897	31,763	30,775	1485
83	43	79	102	110
75.9	29.4	28.5	36.0	1.9
37.0	22.1	13.2	14.6	0.7
9.9	10.7	-17.2	16.1	-153.3
9.9	10.7	17.2	16.1	153.3
483.8	890.8	1784.8	2793.1	3647.2
460.1	840.4	1703.4	2761.6	2755.8
507.4	941.1	1866.4	2824.5	4538.7
4331	10,747	30,589	59,800	90,588
8.1	6.0	4.2	3.4	2.9
1.3	2.5	0.8	1.8	17.2
0.049	0.057	0.046	0.011	0.244
3.1	26.7	97.8	28.3	122.5
-166	-220	-320	-330	-375
?*	?*	?*	?*	0
63	60	27	13	3
Yes	Yes	Yes	Yes	No
Yes	Yes	Yes	Yes	?

NASA Official: Ed Grayzeck,
 Last Updated: 29 November 2007, DRW
edwin.j.grayzeck@nasa.gov

nssdc.gsfc.nasa.gov/planetary/factsheet/planet_table_british.html -

Chapter 2

2009 International Year of Astronomy

“For it is the duty of an astronomer to compose the history of the celestial motions through careful and expert study.” -
Nicolaus Copernicus

2009 marked the 400th anniversary of Galileo Galilei’s first recorded astronomical observations through a telescope. 2009 also marked the 400th anniversary of Johannes Kepler’s book *Astronomia nova* (*New Astronomy*) in which he records the first two fundamental laws of planetary motion. Kepler’s 650 page book detailed his step-by-step process of investigation and discovery of celestial mechanics; it is considered to be the start of the Scientific Revolution. The Solar System is our home. We have gone from observation and computation to exploration and analysis examining the details of the moon, planets and Sun. For 400 years science has searched for answers, is it possible it has overlooked one?

Chapter 3

Evolution of the Solar System

"All truths are easy to understand once they are discovered; the point is to discover them." - Galileo Galilei

NASA publications and websites were a great source of reference material in research for this book. The following paragraph is the introduction to NASA scientific paper SP-345 *Evolution of the Solar System* (<http://history.nasa.gov/SP-345/ch1.htm>).

How our solar system was formed is a question that today attracts as much interest as the problem of the Creation did in the past. In many theories advocated today, the basic approach to this problem remains remarkably similar to what it was in ancient times: The author hypothetically assumes some specific primordial configuration of matter and then deduces a process from which some significant features of the present state emerge. When the basic assumption is unrelated to actually observed phenomena, chances are that the result will be a model which, by definition, is a myth, although it may be adorned with differential equations in accordance with the requirements of modern times. A realistic attempt to reconstruct the early history of the solar system must choose a procedure which reduces speculation as much as possible and connects the evolutionary models as closely as possible to observation. Because no one can know what happened four to five billion years ago, we must start from the present state of the solar system and, step by step, reconstruct increasingly older periods. *This actualistic principle*, which emphasizes reliance on observed phenomena, is the basis for the modern approach to the geological evolution of the Earth; "the present is the key to the past".

My analysis was not conducted utilizing computer simulations, or even advanced differential calculus computations, rather simple

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geometric evaluations and comparisons of existing NASA data. My findings even if at first considered coincidental deserve further consideration and evaluation.

Chapter 4

The Nebular Hypothesis

“Here the skeptic finds chaos and the believer further evidence that the hand that made us is divine.” - Robert Moses

The Nebular Hypothesis developed by Immanuel Kant in 1755 is the most widely accepted model to explain the formation of the Solar System. This hypothesis estimates formation to have begun 4.55 billion years ago with the gravitational collapse of a small part of a giant molecular cloud. According to this hypothesis, most mass collected in the center forming the Sun while the rest flattened out into a protoplanetary disc out of which then formed the planets, asteroids and moons. The Nebular Hypothesis has fallen in and out of favor but currently seems to be the best fit. Is it?

There are unresolved questions with this theory. One potential problem is the angular momentum of the planets vs. the angular momentum of the Sun. The Sun contains over 99% of the mass of the solar system yet has only 2% of the angular momentum. This seems to contradict the Law of Conservation of Angular Momentum but may perhaps be explained by magnetic braking of the Sun or some other unknown phenomena. This model also does not account for the positions of Uranus and Neptune. These giants exist in what should have been a region of reduced density and their long orbital periods make their formations at these distances highly implausible. Computer models necessitate their formations inside the orbit of Jupiter and their migrations to the outer solar system. Another problem with this model is the near circular highly stable orbits of the terrestrial planets as they exist today. The initial orbits of the proto-terrestrial planets would have needed to be highly eccentric in order to collide and grow. How did these orbital paths stabilize? Today some scientists endorse the “*Chaos Theory*”. Randomness and unpredictability are terms used to describe the formation and current

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positions of the planets. Although the chaos theory does not directly contradict determinism (predictability) it does point out the inherent limitations of using scientific laws to predict the future. Determinism gave rise to the metaphor of the clockwork universe, which, when once wound up, will evolve forever in a predetermined manner. In this sense, chaos is more of an anti-theory than a theory; unlike previous theories, it emphasizes the weakness of science rather than its strength.³

The Solar System has evolved considerably since its initial formation. Many moons have formed from circling discs of gas and dust around their parent planets, while other moons are believed to have been bodies captured by their planets, or as in the case of the Earth's Moon, to have resulted from giant collisions. Collisions between bodies have occurred continually up to the present day and have been central to the evolution of the solar system. According to the nebular hypothesis, the positions of the planets often shifted and planets have switched places. This planetary migration now is believed to have been responsible for much of the Solar System's early evolution. Modern astronomers are learning more about the motions they observe and uncovering some astonishing examples of chaotic behavior in the heavens. Nonetheless, the long term stability of the solar system remains a perplexing, unsolved issue.⁴

Chapter 5

The Harbaugh Hypothesis

“The simplest explanation for a phenomenon is likely the correct explanation.” - Occam’s Razor

It is obvious the planets formed in a protoplanetary disc, the planets all revolve in the same direction in the same orbital plane or disc. Another big question is how and when did this disc form? My hypothesis will take a fresh look to explain the Solar System’s formation. Using NASA’s published data; the planets’ positioning can be explained not from a perspective of distance and mass but rather from a perspective of sequencing and time. The formation of our Solar System was systematic with distinct tendencies of planet positioning. The Giant-Impact Theory refined in 1975 by Dr William Hartman explains the formation of the Earth - Moon system. This theory is the beginning chapter of my larger theory explaining the formation of the Solar System. Random and chaotic are used to describe collisions resulting in the birth of planets in our solar system. Chaotic does describe the Earth-Moon formation, and random seems appropriate for other events, but there is an underlining order to the planets’ spacing. These tendencies lead to the long-term stability still evident today, 4.5 billion years later.

The Earth formed with a twin planet, Theia, in what today is known as the Asteroid Belt. Jupiter’s gravity disrupted this system. The Giant-Impact Theory explains the Earth-Moon evolution. Earth’s phase lock with Venus explains Earth’s current stabilized circular orbit.

The Giant impact theory explains the formation of our Moon. What happened after that cataclysmic event? Using NASA data, the author uncovers the hidden order of the Solar System that has been overlooked since the beginning of the Scientific Revolution 400 years ago. Discover a secret that allowed Earth to develop life after the Dawn of the Solar System.

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