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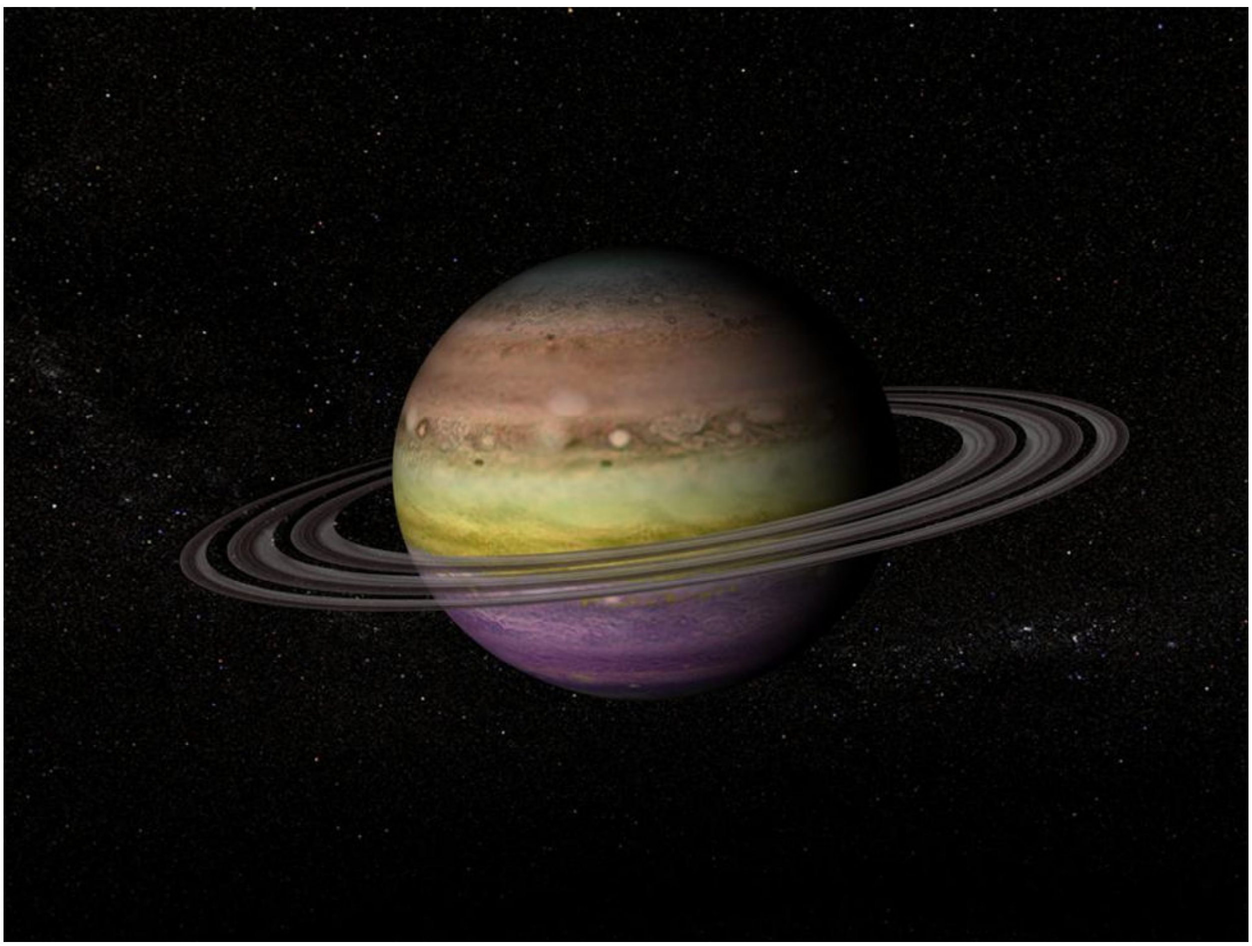

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ℵ IN THIS ISSUE ℵ

- ⊕ The cover image is "Planet V" from the 4-minute video accompanying our lead article. The cover and video artist is John Bejko <johnbejko@comcast.net>.
- ⊕ Our new editor for the print edition is Blaine Pugsley. It will be obvious by inspection of print and internet editions of this issue why we made the switch to internet for our primary publication. For one obvious example, the video has no print counterpart, yet illustrates in pictures the material that looks rather technical and can only be imagined by readers of the print edition. However, thanks to Blaine, we will still have a print edition for those without convenient internet access. The downside is that the greater number of pages and the smaller print runs have increased the cost of the print edition substantially.
- ⊕ Our feature article is more about the exploded planet hypothesis. In previous issues, we summarized evidence for the basic hypothesis, for its success in making genuine predictions that distinguish it from the many mainstream hypotheses it would replace, for possible mechanisms for explosions, and for aiding our understanding of the solar system. Put into context with fission theory for the origin of planets and moons and tidal theory, a picture of a dynamic, often changing solar system emerges. It now appears the original system had 12 major planets of which six remain. Six major planets and many major moons have since exploded. Tidal stresses appear to be the trigger for these events. The piece of this puzzle we examine in this issue is the violent history of Mars as a former moon of now-exploded Planet V, then as a companion of twin moon "Body C" until the latter exploded too. The article converts that scenario from general inferences to hard dynamics and gets specific about whether, how, and under what conditions it is possible. A few surprises turn up along the way – some of which have the potential to be the substance of astronomy texts of the future. If you look at nothing else, don't fail to download and view the 4-minute video linked just before the Appendices.
- ⊕ In this premier open access issue, we review how Meta Science came about, what distinguishes it from mainstream science, and how it maintains such an excellent record of predictions.
- ⊕ *Meta Science in the News* begins with a note about a quasar so old and loaded with iron that only rather ludicrous ad hoc patches can save the Big Bang's interpretation. Next is a short overview of fission theory from a 2000 paper. The third note is about why resistance to new ideas is seemingly inevitable even while slowing scientific progress to a crawl on the pretense of keeping out erroneous theories. And the fourth links to a new YouTube video of our 2001 press conference in New York City about the Mars anomalies.

The Violent History of Mars

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Abstract. With overwhelming evidence now available for the basic correctness of the exploded planet hypothesis, questions arise about the details of the most recent such explosions responsible for shaping Mars and its orbit as we know them today. This study shows that the basic scenario suggested by the evidence and described previously stands up under rigorous scrutiny despite the improbability of passing these new tests by chance. And it allows us to derive specific information about the properties and history of the bodies involved that could only be guessed at heretofore. The solution we adopt is not unique, but satisfies all previous constraints and leads to the present day orbit and rotation period of Mars. "Planet V", the original parent of Mars, was apparently of "helium class", a proposed new class of planets. It had an estimated mass of 2.4 Earth masses, a circular solar orbit at about 1.5 au from the Sun, and two "twin" moons. The inner moon, which later became today's planet Mars, originally had a circular satellite orbit with a period of 20 hours. Tidal locking made that its spin period as well. Outer moon "Body C" originally had a circular satellite orbit with a period of 40 hours and a mass of 86% of that of Mars. Following the explosion of Planet V 65 million years ago, Body C and Mars were left in a mutual, highly eccentric, prograde satellite orbit while continuing to orbit the Sun on an altered solar orbit. Tidal evolution continued until the explosion of Body C 3.2 million years ago, leaving Mars alone in its present solar orbit with relatively high eccentricity for a planet and a prograde rotation period of 1.026 days. Mars today shows the many scars that exhibit this violent history, seen dramatically in the accompanying video.

Overview

A recent review article showed that evidence for the exploded planet hypothesis (EPH) scenario is pervasive and deep. [1] Especially telling are the many successful predictions of the hypothesis against all odds: satellites of asteroids; satellites of comets; salt water in meteorites; "roll marks" leading to boulders on asteroids; the time and peak rate of the 1999 Leonid meteor storm; explosion signatures for asteroids; strongly spiked energy parameter for new comets; distribution of black material on slowly rotating airless bodies; splitting velocities of comets; the asteroid-like nature of *Deep Impact* target Comet Tempel 1; and the presence of high-formation-temperature minerals in the *Stardust* comet dust sample return. This research report assumes the basic EPH is established and seeks to find out more about the now-exploded bodies involved in the two most recent events that have left behind the most surviving evidence.

The table below, taken from the preceding reference, summarizes much of the evidence that Mars is a former moon of its now-exploded parent "Planet V". This body should not be confused with hypothetical "Planet K" that exploded 250 million years ago in the outer main asteroid belt. In both cases, the outer (C-type) and inner (S-type) asteroids themselves probably came from the subsequent explosion of smaller, solid moons rather than these larger, probably gaseous parent bodies.

Evidence that Mars is a former moon
Much less massive than any planet not itself suspected of being a former moon
Orbit has eccentricity of near 10%, as would be expected for an escaped moon.

Spin is slower than larger planets, except where a massive moon has intervened (Mercury escaped from Venus; Moon robbed Earth of original 2-4 hour spin rate.)
Large offset of center of figure from center of mass – common for moons, not for planets
Shape not in equilibrium with spin, indicating reshaping by some cataclysm
South hemisphere is saturated with craters, the north has sparse cratering – indicates either a removal mechanism in the north or a massive cratering event in the south
The crustal dichotomy boundary is nearly a great circle – indicates that something nearby but external to Mars and short-lived devastated half the planet
North hemisphere has smooth, 1-km-thick crust; rough southern crust is up to 20-km thick – suggests massive bombardment of the south half from a planet-sized source
Crustal thickness in south decreases gradually toward hemisphere edges – consistent with external event, but not a local one
Lobate scarps occur near hemisphere divide, compressed perpendicular to boundary – indicates that impacts near the hemisphere boundary were extreme grazers
Huge volcanoes arose where uplift pressure from mass redistribution following pole change is maximal – consistent with present shape not being in equilibrium
Sudden 90° geographic pole shift occurred – as would happen if a great mass were added to one hemisphere centered on Mars equator, causing planet to tip over
Much of original atmosphere has been lost – as would result from a major cataclysm
A sudden, massive flood with no obvious source occurred – cataclysm may have brought the water from oceans on the source body
Xe^{129}, a fission product of massive explosions, has an excess abundance on Mars
Crustal magnetization in southern highlands is weak to absent in northern lowlands

Table I

The specific goal of this treatise is to test the dynamical feasibility of the scenario for the history of Mars strongly indicated by many other lines of physical and circumstantial evidence; and while doing so, to perhaps learn some additional details about that history. The tests rest on three pillars with strong theoretical and observational foundations: fission theory, tidal theory, and the exploded planet hypothesis, in that order of applicability.

- Fission theory for the origin of planets and moons indicates that, as forming bodies condense and heat up (stars) or cool (planets), their spin increases to conserve angular momentum. Each time that spin reaches an overspin condition, *solid* bodies fission to form singlet moons; whereas *liquid or gaseous* bodies (such as the Sun or gas giant planets) fission to form twin companions. [2] Examples of the former are (1) Earth's Moon, and (2) Mercury as an escaped moon of Venus. Simple examples of the latter are (1) Venus and Earth, (2) Uranus and Neptune, (3) the four major moons of Jupiter, and (4) the four major moons of Uranus. Such twin pairs then evolve under the influence of tidal forces into or near to synchronous orbits with a 2-to-1 period ratio.
- Tidal theory indicates that orbits and rotation periods evolve when bodies interact. [3] Although small for planets in today's solar system, the strength of tidal forces between a primary and secondary body is inversely proportional to the cube of their mutual distance in units of the primary body's diameter. And the effect on an orbit varies roughly with the inverse seventh power of the same ratio. These tidal forces are primarily longitudinal

when acting on Earth-like bodies with liquid oceans and solid land; but are primarily latitudinal or radial when acting on gaseous bodies with differential rotation. So tidal forces were of major importance in the early solar system when both Sun and planets were much larger during their formative stages, with correspondingly much larger tides. Moreover, when tidal stresses reach a maximum and internal conditions are otherwise suitable, they can act as a trigger for a sudden planetary core collapse, blocking a planet's normal heat flow and leading directly to an explosion.

- The exploded planet hypothesis (as originally developed) indicates that six of the solar system's original planets and several more of its moons have since exploded into asteroidal fragments and comets. [4] In particular, hypothetical "Planet V", the former parent of its moons Mars and "Body C", exploded 65 million years ago, leaving Mars and Body C in mutual orbit. Then almost 62 million years later, Body C exploded 3.2 million years ago, leaving Mars as the sole major body at that distance from the Sun. It is this history we intend to test using dynamical constraints in this report.

Background

In this study, we wish to focus our attention on hypothetical original Planet V, which occupied the position in the solar system now held by Mars; and on its original twin-moon companions, Mars and Body C. The evidence that Mars was a moon of an exploded planet is extensive and summarized in Table I. The existence of a "twin" is required by fission theory if the parent body was liquid or gaseous, and by evidence suggestive of a second explosion affecting Mars. [5] This twin is the body most likely to have held life, as suggested by findings of water and organic molecules and evidence for weathering in meteorites dated close to Body C's indicated explosion date of 3.2 million years ago. (See also remarks in Appendix VII.)

Of those two moons of Planet V, Mars was apparently closer to Planet V than Body C was. This is because Body C most likely took less damage than Mars did when Planet V exploded 65 million years ago. Had it been the other way around, life of any kind might not have survived or evolved to an advanced stage on Body C. [6] However, we tried developing the dynamical tests in this article assuming the opposite order (Body C as the innermost moon) and found no solutions compatible with the applicable theories and available evidence, Of course, both moons would have been badly damaged by the Planet V explosion. But both managed to survive for the next 62 million years in mutual orbit around each other, which indicates that damage done by the Planet V explosion was not the sole cause of the much later Body C explosion, or of its timing.

Following the explosion of their parent, the two moons of Planet V are initially captured into elongated mutual elliptical orbits around each other. Tidal forces rob a little angular momentum from these mutual orbits, and take away all their spin angular momentum. As this happened, tidal stresses on each body would have risen progressively. But because the original inner moon (Mars) must be the more massive of the two bodies, the tidal stresses would be greater on Body C. This explains why Body C, rather than Mars, was the next to explode after surviving for 62 million years and taking less damage than Mars. The mutual tidal forces finally produced too much tidal pumping and stress on Body C's interior. Formulas for the effect of tidal friction on orbits are available [7], but will not be used directly in this analysis because they require knowledge of the strength of materials in each body, which determines the strength of tidal forces.

The end result of tidal evolution was the explosion of Body C at 3.2 Mya, leaving Mars in its present solar orbit. Free from tidal stresses, Mars then cooled and relaxed, ceasing volcanism and returning to internal stability. There is therefore no longer a reason to expect that Mars is in danger of exploding.*

Our goal here is to determine if we can go from plausible initial conditions through a dynamical and tidal analysis, setting constraints as we go for what can work and what cannot work, and still arrive at the spin and orbit of the Mars we see today. Finally, we will adopt the following symbols and formulas for our initial calculations. Programmers are encouraged to develop code of their own to test the solution shown here and to look for any flaws in the development or analysis.

Symbols and notation: Subscripts restrict a symbol to a single body or point with subscript zero indicating the center of mass. a = radius for a circular orbit, or mean distance (also called semi-major axis) for an elliptical orbit, of a satellite relative to its primary; P = orbital period (sometimes equal to rotational period); m = total mass (primary + satellite); w = speed for a circular orbit, or speed at mean distance for an ellipse; q = apsidal axis distance (pericenter or apocenter) for an ellipse; e = eccentricity for an ellipse (negative values indicate q is apocenter); r = distance and v = orbital speed relative to primary for an arbitrary point on an ellipse; h = angular momentum. A bold symbol with an arrow over it, as in $\vec{\boldsymbol{r}}$, represents a vector with (x, y, z) components along the three unit vectors $\left(\hat{\boldsymbol{i}}, \hat{\boldsymbol{j}}, \hat{\boldsymbol{k}}\right)$, respectively. (This scenario is planar, so the z-component is mostly not used.) The same symbol without bold and arrow, as in r, is the magnitude of that vector; i.e., $r = |\vec{\boldsymbol{r}}|$. x and $\bullet$ are cross-product and dot-product for vectors, respectively.†

Equations [Constants are set for units of km for a, q, r (except for solar orbits, where they are astronomical units (au); days for P; Earth masses (⊕) for m; km/s for w and v; km^3/s^2 for $\mu_\oplus$; and ⊕km^2/s for h.] "Parameter" in the formula column of Table II indicates a quantity tested with a variety of values to determine what values lead to acceptable end conditions for Mars. The "Value" column contains the particular value in the final solution adopted here.

$$\text{Kelper's law: } \left(\frac{a}{42241}\right)^3 = P^2 m \qquad [1]$$

$$\text{virial law (for circle): } w = 631.35\sqrt{m/a} \qquad [2]$$

$$\text{distance = velocity * time formula: } a = 13751 Pw \qquad [3]$$

* This tidal stress scenario also suggests that, of all the bodies remaining in our solar system, Jupiter's moon Io is the best candidate for a future explosion because it is undergoing the greatest internal tidal stresses now. Moreover, the *radial* tidal forces [[3]] raised by Io on Jupiter are continuing to bring Io closer to Jupiter; and Jupiter is continuing to accrete asteroids and comets, slowly increasing its mass. The combined effect might lead to the eventual explosion of Io on a presumed time scale of many millions of years.

† The cross-product of vectors $a_1\hat{\boldsymbol{i}} + a_2\hat{\boldsymbol{j}}$ and $b_1\hat{\boldsymbol{i}} + b_2\hat{\boldsymbol{j}}$ is $\left(a_1 b_2 - a_2 b_1\right)\hat{\boldsymbol{k}}$. The dot product is $a_1 b_2 + a_2 b_1$.

$$\text{combining [1] and [3]: } w^3 P = 28.987\, m \qquad [4]$$

$$\text{escape speed} = 1.41421 * \text{circular speed } w \qquad [5]$$

$$\text{virial law (for ellipse): } v^2 = \mu_{\oplus} m \left(2/r - 1/a\right) \qquad [6]$$

$$\text{center-of-mass speed: } \vec{\boldsymbol{v}}_{\boldsymbol{0}} = \left(m_m \vec{\boldsymbol{v}}_{\boldsymbol{m}} + m_c \vec{\boldsymbol{v}}_{\boldsymbol{c}}\right) / \left(m_m + m_c\right) \qquad [7]$$

$$\text{angular momentum: } \begin{array}{l} \text{rotational} \sim h_r = 2.9089\text{x}10^{-5} m r^2 / P \\ \text{orbital} \sim h_o = m r v \end{array} \qquad [8]$$

$$\text{orbital angular momentum parameter: } \vec{\boldsymbol{h}} = \vec{\boldsymbol{r}} \text{ x } \vec{\boldsymbol{v}}\boldsymbol{;}\ h^2 = \mu_{\oplus} m\, a \left(1 - e^2\right) \qquad [9]$$

$$\text{pericenter distance: } q = a\left(1 - e\right) \qquad [10]$$

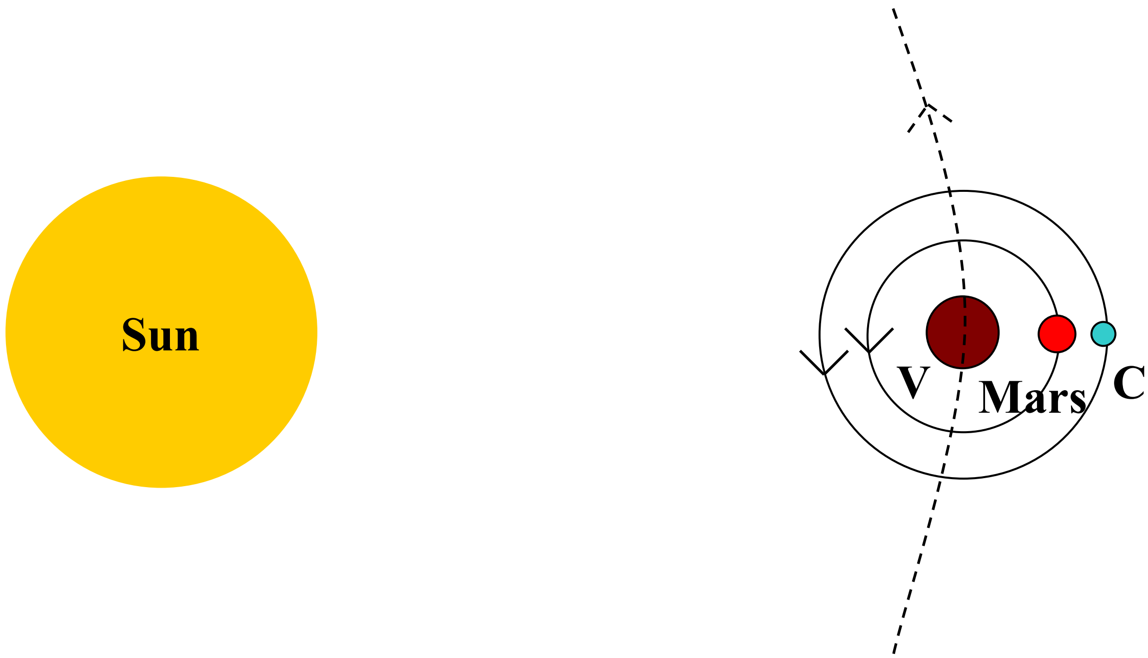

Figure 1. Configuration of Sun, Planet V, Mars, and Body C, respectively, when tidal stresses on Planet V are a maximum. This is the most probable configuration for tidally triggering the explosion of Planet V at 65 Mya.

First Stage: Mars & Body C orbiting Planet V

In what follows, we will follow the scenario just outlined and use the same theme, that bodies are most vulnerable to explosion (from whatever cause) when tidal stresses are at a maximum, with the tidal stresses serving as the final "spark" to ignite the blast. We can then make some inferences about orbital conditions under which the two explosions considered here occurred. Recall that the nature of tidal forces is to cause a body to become prolate (American football or rugby ball shaped), bulging in both directions along the line of forces. Correspondingly, tides have two maxima and two minima for every rotation of the affected body relative to the tide-raising body.

The maximum tidal stress on Planet V would have occurred when the Sun, Planet V, Mars, and Body C, in that sequence, were all aligned. See Figure 1. This configuration has slightly more stress than the alignment Sun-Body C-Mars-Planet V because solar perturbations on satellite orbits cause satellites to be slightly closer to their primary body, on average, when they are opposite the Sun than when they are closer to the Sun. This configuration also places the primary itself closer to the Sun than at any other time.

According to fission theory, the outer moon of any pair of twin moons should have less mass than the inner moon. See Appendix I for the derivation of the particular percentage adopted here. From the known mass of Mars, that relation determines the likely mass of Body C as 86% of the mass of Mars. See Table II, lines 6-8.[‡] We will use this table to record all parameters in this scenario and their adopted final values after many trials.

Lines 1-2 in Table II are the important gravitational constants for the Sun and Earth, the latter because masses in the V-C-Mars system are expressed in Earth-masses. Lines 3-5 are the adopted starting solar orbit parameters for Planet V, where the Sun is the central mass and distance units are in au.

Table II. Relationships and values (See text.)

Line	Symbol	Formula	Value	Description
Mars & Body C as moons of Planet V				
1	$\mu_{\oplus}$	observed	398600 km^3/s^2	gravitational constant for Earth
2	$\mu_{\odot}$	observed	887.128 au km^2/s^2	gravitational constant for Sun
3	e_{VMC}	fission theory	0.000	Planet V original solar eccentricity
4	a_{VMC}	estimate	1.5 au	Planet V original solar mean distance
5	w_{VMC}	$\sqrt{\mu_{\odot} / a_{VMC}}$	24.319 km/s	Planet V original circular orbit speed
6	f_p	Appendix I	0.86	mass ratio for twins in fission theory
7	m_m	observed	0.1074 ⊕	mass, Mars
8	m_c	$f_p m_m$	0.0924 ⊕	mass, Body C
9	m_{mc}	$m_m + m_c$	0.1998 ⊕	combined mass of two moons
10	m_v	parameter	2.353 ⊕	mass of Planet V
11	m_{vm}	$m_v + m_m$	2.4604 ⊕	system mass out to Mars orbit
12	m_{vmc}	$m_v + m_m + m_c$	2.5528 ⊕	system mass out to Body C orbit
13	P_m	parameter	0.836 days	period, Mars around Planet V
14	P_c	$2P_m$	1.672 days	period, Body C around Planet V
15	r_M	observed	3386 km	Mars radius
16	r_C	$f_p^{1/3} r_M$	3220 km	C radius
17	h_{r-m}	[8]	43 ⊕km^2/s	Mars rotational angular momentum
18	h_{r-c}	[8]	17 ⊕km^2/s	Body C rotational angular momentum

[‡] Many non-significant figures are carried in this table to test program coding and to avoid loss of precision through round-off errors when many different scenarios are tried.

19	a_{vm}	[1]	50607 km	mean distance, Planet V - Mars
20	a_{vc}	[1]	81326 km	mean distance, Planet V - Body C
21	w_m	[4]	4.402 km/s	velocity, Mars
22	w_c	[4]	3.537 km/s	velocity, Body C
23	h_{o-mc}	[8]	5308 ⊕km^2/s	Mars-C orbital angular momentum
Explosion of Planet V				
24	s	parameter	3.37 km/s	explosion debris speed parameter
25	dt_m	a_{vm}/s	4.171 hours	fragment time to Mars orbit
26	dt_c	a_{vc}/s	6.703 hours	fragment time to Body C orbit
27	θ_m	Figure 2	74.84°	M azimuth when debris wave at M
28	θ_c	Figure 2	60.14°	C azimuth when debris wave at C
29	$\vec{\boldsymbol{M}}_1$	Figure 2	(13231, 48847)	M at debris arrival
30	$\vec{\boldsymbol{v}}_{m1}$	Figure 2	(-4.249, 1.151)	M velocity at debris arrival
31	$\vec{\boldsymbol{C}}_2$	Figure 2	(40493, 70528)	C at debris arrival
32	$\vec{\boldsymbol{v}}_{c2}$	Figure 2	(-3.068, 1.761)	C velocity at debris arrival
33	dt_{mc}	Figure 2	2.532 hours	debris travel time, M orbit to C orbit
34	$\vec{\boldsymbol{r}}_{mc1.5}$	Figure 2	(60610, 8409)	average M-C vector
35	$\vec{\boldsymbol{\alpha}}_m$	Figure 2	(9.74, 1.35)x10^{-6}	M acceleration during dt_{mc}
36	$\vec{\boldsymbol{v}}_{m2}$	Figure 2	(-4.160, 1.163)	M velocity when debris arrives at C
37	$\vec{\boldsymbol{M}}_2$	Figure 2	(-25097, 59394)	M position when debris arrives at C
38	$\vec{\boldsymbol{r}}_{mc2}$	Figure 2	(65590, 11135)	C vector from M
39	r_{mc2}	Figure 2	66529 km	C-M separation
40	$\vec{\boldsymbol{v}}_{mc2}$	Figure 2	(1.093, 0.598)	C vel. Relative to M at debris arrival
41	v_{mc2}	Figure 2	1.246 km/s	C-M relative speed
42	u_{mc2}	Figure 2	1.547 km/s	escape speed from C&M
43	pr_2	Figure 2	0.326	prograde/retrograde indicator
44	$\vec{\boldsymbol{v}}_{ms2}$	[7]; Figure 3	(-3.655, 1.440)	C-M center-of-mass velocity
45	$\vec{\boldsymbol{v}}_{m\odot 2}$	Figure 3	(-3.655, 25.759)	C-M center-of-mass velocity wrt Sun
46	$v_{m\odot 2}$	Figure 3	26.017 km/s	C-M center-of-mass speed wrt Sun
47	$a_{m\odot 2}$	Figure 3	1.753 au	C-M mean distance change wrt Sun
48	$h_{m\odot 2}$	[9]; Figure 3	38.64 km^2/s	C-M angular momentum wrt Sun
49	$e_{m\odot 2}$	Figure 3	0.2005	C-M eccentricity wrt Sun
50	$q_{m\odot 2}$	[10]	1.402 au	C-M pericenter distance wrt Sun
51	$v_{qm\odot 2}$	[6]	27.564 km/s	C-M speed wrt Sun

Orbit of Body C around Mars				
52	f	parameter	`0.72`	M-C tidal evolution parameter
53	f_a	parameter	`1.00`	solar tidal evolution parameter
54	a_{mc2}	[6]	`94555 km`	initial mean distance
55	e_{mc2}	[9]	`0.950`	initial eccentricity
56	Δa_{mc}	$(f_a - 1)\,a_{mc2}$	`0.0`	correction to initial mean distance
57	Δe_{mc}	$(f_a \quad 1)(1 - e_{mc2})$	`0.0`	correction to initial eccentricity
58	a_{mc}	[6]	`99555 km`	evolved mean distance
59	e_{mc}	[9] * f	`0.684`	evolved eccentricity
60	P_{mc}	[1]	`7.49 days`	orbital period
61	q_{mc}	[10]	`29869 km`	pericenter distance
62	ξ_{mc}	[6] with $r = q$	`2.119 km/s`	speed at pericenter
63	ω_{mc}	$86400\,\xi_{mc}/q_{mc}$	`6.129 rad/day`	angular velocity at pericenter
64	Π_m	$2\pi/\omega_{mc}$	`1.025 days`	final tidal lock rotation period of Mars
Explosion of Body C and final orbit of Mars				
65	f_x	parameter	`0.58`	debris wave speed scale factor
66	s_c	Appendix V	`1.955 km/s`	debris wave speed for Body C
67	q_m	Appendix V	`13810 km`	Mars-only pericenter distance
68	f_{c3}	Appendix V	`0.5907`	3rd coefficient in F
69	ζ	Appendix V	`0.6730`	½ true anomaly parameter
70	f_{vc}	Appendix V	`2.3090`	velocity coefficient
71	$\vec{v}_{ms3}$	Appendix V	`( 1.125, -1.412)`	residual Mars velocity wrt Sun
72	$\vec{v}_{m\square 3}$	Appendix V	`( 1.125, 26.152)`	residual Mars speed wrt Sun
73	$v_{m\square 3}$	Appendix V	`26.176 km/s`	Mars-only speed at pericenter wrt Sun
74	$a_{m\square 3}$	Appendix V	`1.528 au`	final mean distance of Mars
75	$e_{m\square 3}$	Appendix V	`0.0931`	final eccentricity of Mars
76	e_M	observed	`0.0934`	Mars eccentricity today
77	a_M	observed	`1.524 au`	Mars mean distance today
78	P_M	observed	`1.026 days`	Mars rotation period today

The entry “parameter” in the Table under the heading “Formula” means the value is determined by trial-and-error trying all values (using some small interval) in the range that produces viable solutions. The value shown is the one that led to the “best” solution. “Parameter” differs from “estimate” on line 4, the adopted initial mean distance of Planet V from the Sun. An estimate has a more limited choice of possible values. In particular, for line 4, we first noted that the mean distance of hypothetical “Planet K”, the parent of the C-type asteroids in the outer main asteroid belt, was measured as 2.82 au based on the explosion signature it produced in asteroid orbital elements. The same technique applied to Planet V suggests a mean distance of ~1.5 au, but with so few asteroids defining it as to generate little confidence in the estimate. The competing choice would be the 2-to-1 period resonance orbit with Planet K, which occurs at 1.78 au. Fortunately, the choice of this parameter, the starting mean distance for Planet V, has relatively little effect on the rest of the solution except for the final value of the mean distance of Mars. Because of that insensitivity, because only one of the twin-planet pairs in the solar system has retained its presumed original 2-to-1 period ratio today, and because the "explosion signature" test is distinctly more consistent with ~ 1.5 au than ~ 1.8 au, we will skip the choice of 1.78 au and stick with the 1.5 au starting value here. Pleasantly, the end of the scenario happens to evolve that initial choice into excellent agreement with today's observed value of 1.524 au. That agreement with today's value would be difficult to achieve with any starting value over ~1.6 au without including solutions with questionable physical plausibility on other grounds.

This tendency for the solutions to "home in" on values supportable by other theoretical and observational considerations was manifest in several places as the analysis developed. It is a type of positive feedback that, when experienced, is grounds to gain confidence in the underlying assumptions, including the entire scenario. The opportunities for the analysis to fail or reach an impasse were numerous; and the fact that it succeeded stands as a source of amazement to this author in a way that is best appreciated by coding the algorithms and trying all the possible adjustments for oneself.

For example, I initially made the "obvious"-but-wrong assumption that the tidal forces on Planet V would be a maximum when Sun, Mars, and Body C were all aligned on the same side. That led to a failed scenario with too high an eccentricity for the final orbit of Mars around the Sun after the Body C explosion because the residual speed of Mars was in the same direction for both explosions, contradicting the present status of Mars. So I re-examined all assumptions and found this one to be in error for the reason stated: The tidal forces depend most strongly on distances, and the distances of the two moons from their parent planet are a minimum when they are in alignment on the opposite side from the Sun. Surprisingly, this necessary correction of a mistaken assumption led to a successful scenario.

To continue the scenario, we next assume (as expected from fission theory) that the relevant initial orbits are approximately circular and in the ecliptic plane. Specifically, this applies to Planet V's orbit around the Sun and the satellite orbits of Mars and Body C around Planet V. Moreover, the original Mars and Body C orbits around Planet V are assumed to have had a 2-to-1 period resonance. This resonance exists for many solar system pairs, but especially the major moons. And fission theory indicates this is the most probable configuration.[§]

To the preceding conditions we can add a few tentative assumptions (parameters) that will be adjusted as needed later. We adopt our guess for the mass of Planet V on line 10 in the table using a value appropriate for a predominantly gaseous or liquid planet from which much of

[§] There is no good reason why Planet V might not have had a significant tilt of its rotation axis. Then the plane of the moons would have been Planet V's equatorial plane, not the ecliptic plane. This would have ultimately caused the present fairly large orbital inclination of Mars's solar orbit, a new constraint with a new parameter to accommodate it. But other than for allowing us to infer the tilt of the rotation axis of Planet V, this complication seemed to contribute little to the scenario being tested here because the inclination calculations have minimal interaction with the planar calculations. So we ignore the third dimension here.

its original hydrogen has escaped. See Appendix II. (If Planet V were not liquid or gaseous, it would fission a singlet moon, not a twin pair.) We will also guess the initial orbital period of Mars around Planet V (table line 13), using a value comparable to the rotation periods of the innermost major moons of the solar system's other gaseous planets. The values in the Table for both of these guesses were refined by trial-and-error to be consistent with constraints that arise deeper in the scenario. We then note that tidal forces would have synchronized the rotation of Mars to be the same as its orbital period around Planet V so that it keeps the same face toward its parent, just as Earth's Moon and all major satellites in the solar system do. Fission theory then fixes the orbital and rotational periods of Body C at double that value. With these preliminary estimates, we use the standard orbital equations [1]-[10] (for circular orbits, modified here to accommodate the physical units we are using). The "Formula" column in the Table indicates which equation is used for each step in deriving the quantities in Table II lines 17-23.

Second Stage: Explosion of Planet V, leaving Body C orbiting Mars

This leads us to examining the orbital conditions of Mars and Body C relative to each other at the time of the Planet V explosion, when the twin moons transition from satellite orbits around Planet V to mutual orbits around each other. This explosion is triggered when tidal stresses are a maximum, which occurs when the Sun, Planet V, Mars, and Body C are lined up in that sequence. Given the parameters already set, the two moons have a known separation and relative transverse speed with zero relative radial and normal speeds. That makes the motions of the two moons parallel when they are first freed, which would seem to place the initial post-explosion locations of Mars and Body C on or near the line of apsides of their new mutual orbit, either at its pericenter (closest) or its apocenter (farthest) separation depending on their relative speed. The standard orbit equations and known masses and initial separation (Table II lines 19-20) should then allow us to derive the initial Mars-Body C mean distance, orbital period, and eccentricity.

However, at this point we encounter a major problem that potentially falsifies the whole scenario. If the two moons are set free at a time when their relative motion is entirely perpendicular to the line between them, then the faster motion of Mars will assure that the new mutual orbital motion is in the opposite direction from the pre-explosion orbits. For example, if the moons started out prograde around Planet V, they would end up orbiting retrograde relative to one another. But in most scenarios, the tidal forces between the two bodies would then induce retrograde rotation for both bodies, which is contrary to the state that Mars is in today.

This problem is resilient against simple changes in assumptions made up to now. Reversing the initial sequence so that Mars is the outer moon does not change the problem. Letting the explosion happen when the moons are on the sunward side of Planet V does not change it. Letting the explosion happen when Mars and Body C are nowhere near conjunction and are far apart could yield direct post-explosion orbits. However, except for a narrow range of all such possible conditions, the relative velocities would exceed mutual escape velocity, and the two bodies could not end up orbiting one another, leaving no explanation for the second explosion event affecting Mars and dumping major masses of water onto it. (It should also be noted here that moons in similar solar orbits but not orbiting each other cannot collide, but are required by the laws of dynamics to librate and avoid collisions, much like the Trojan asteroids near the orbit of Jupiter do.)

So for a viable scenario, we seem to be left with the improbable coincidence that the moons happened by chance to be in just the right places in their initial orbits at the explosion to end up in mutual orbits, and the conclusion that tidal forces did not trigger the explosion. However, somewhat surprisingly, a satisfactory solution to this apparent scenario flaw exists that is not *ad hoc*. Once again, this solution came out of a careful re-examination of assumptions, and finding one that seemed obvious at first but cannot in fact be correct.

Our intuition readily thinks of explosions as more-or-less instantaneous events, or at least very rapid events, because this is the case for explosions on Earth. However, distances in space are vast, and entire planets are large bodies. For example, if Earth exploded, and the blast wave had a speed of 10 km/s, it would take ~ 11 minutes to travel from Earth's center to its surface. Clearly, a real-time video of such an explosion would appear to us to be in super slow motion. Significantly for our purposes here, it would take the blast wave ~ 11 hours to reach the Moon. Closer artificial satellites would move through an even larger fraction of their orbit during the delay time for the blast to reach them because their orbital speeds are faster. So we cannot neglect to include explosion delay in our scenario because the satellites will move significantly away from conjunction during that delay. Moreover, an inner satellite will move through a greater angle along its orbit during the delay than an outer one because of its faster orbital speed and shorter period.

A further consideration is that it is not the blast wave itself that affects a satellite orbit by impacting the moon, but rather the disappearance of the central planet around which the satellite was orbiting. But that mass does not vanish quickly. It spreads out through space in a roughly spherical manner relative to the explosion site. During the time when most of that expanding mass is still interior to a moon, that moon continues to orbit just as it did before the explosion. The expansion of the mass has virtually no effect on the orbit until the mass starts to pass the moon's orbit. Then as most of that mass becomes exterior to the moon, it is no longer in orbit at all. The net force on a body anywhere inside a uniform spherical shell of matter is exactly zero. So the de-orbiting of the moon occurs rapidly as the bulk of the exploded mass passes its orbit, rather than gradually as the debris wave from the explosion expands.

To model this effect, we need to adopt another parameter and use many trial debris wave expansion speed values to represent explosion delay in reaching the moons. This speed will be the mean speed of the most massive explosion fragments, because in an explosion (just as is true for the real asteroid belt), the mass in the largest pieces exceeds that of all others pieces put together. And the largest fragments (or blobs in the case of a gas giant) are generally the slowest, so we should not be too surprised to see that the adopted value in line 24 of the Table is slower even than escape speed from the surface of Mars (5 km/s), However, with very little mass left interior to the largest fragments, even relatively small debris wave speeds will escape and do so with minimal deceleration of the blast wave on its way out. Lines 25-26 show the calculated mean time delay for Mars and Body C to leave orbit, respectively. And lines 27-28 show the angular arcs for the continued orbits of the two moons before the main effect of the passing debris wave reaches each of them.

Obviously, it was a serious mistake to neglect this continued orbital motion, different for each moon, before each body ceased to orbit around Planet V. The scenario could not have been realistic without taking this delay into account. And amazingly, adding this required element to the model places the moons in or near the parts of their relative orbits where escape from each other is less likely than capture, and where the resulting mutual orbit is more likely to be prograde. In short, making the test model more realistic takes us into the domain of solutions that lead ultimately to the present-day spin and orbit of Mars, something that several of the more naïve models did not allow to happen for any parameter values.

Of course, in the new mutual orbit following the explosion, both bodies actually move on ellipses with their center of mass at the focus. But in Newtonian mechanics, we are free to describe the orbit of Body C relative to Mars as if the latter were fixed in space. So we use the formulas specified in Figure 2 and its accompanying equation box for the quantities in Table lines 29-42 to compute the relative orbit parameters. The fact that the starting values adopted here, appropriate for this analysis for reasons that have nothing to do with the outcome, happen to lead to mutual capture rather than escape and to prograde rotation for Mars rather than retrograde, argues for the general correctness of the scenario because the right end result is difficult to impossible to reach by chance.

The length of the present day rotation period of Mars (line 78) is another constraint on the whole analysis. For Earth's Moon, tidal friction has evolved its orbit from very close to Earth out to its present distance of 60 Earth radii while Earth's spin slowed from a few hours to its present 24 hours. But there is much less spin angular momentum in this scenario. As Mars and Body C assume a mutual elliptical orbit, tidal forces will quickly evolve the rotations of both bodies to eventually be locked facing one another during the pericenter part of their orbits, where tidal forces are by far the strongest. Near pericenter, the heavy side of each body will face the other body. All other original spin angular momentum (lines 17-18) is converted into orbital angular momentum (line 23), which does not change the orbit very much. Later we can use Mars's present rotation period to infer constraints on its previous orbit around Body C.

Another consideration is the motion of the center of mass of this mutually orbiting pair relative to the Sun, which we calculate on lines 44-46. Our goal here is to meet the constraint that, at the end of our analysis when Mars is alone, the calculated orbit of Mars around the Sun (lines 47-51 for this stage of the analysis) should ultimately resemble the orbit we observe today Lines 76-78). (Exact agreement is not critical because of long-term variations; but rough agreement is important.) When Planet V explodes, the motion of both co-orbiting bodies is propelled forward when the exploded parent releases its hold on them (Figure 2). The initial location on the pair's new, elliptical solar orbit is at perihelion, the point on the solar orbit closest to the Sun. That will ultimately be where the next explosion occurs because that is where solar tidal forces are a maximum. Solar perturbations on the mutual eccentricity may change the orbit significantly over the next 62 million years until the Body C explosion at 3.2 million years ago.

But those effects should be periodic, not cumulative, and have amplitude about 0.1 in eccentricity with maximum eccentricity at a Sun-Mars-C-pericenter alignment.

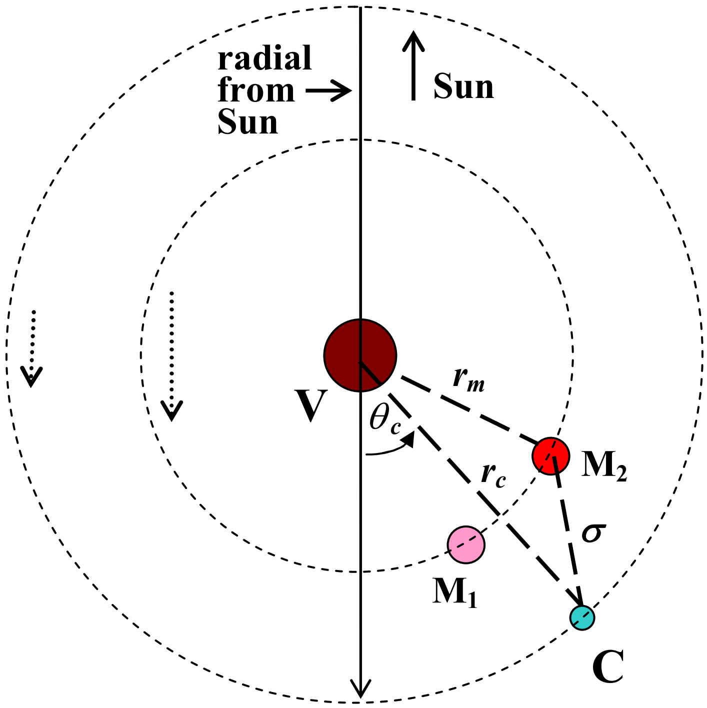

Figure 2. Mars pseudo-orbit relative to "fixed" Body C.

$\theta_m = w_m dt_m / a_m$ [M angle from V radial at debris arrival]

$\theta_c = w_c dt_c / a_c$ [C angle from V radial at debris arrival]

$\vec{\boldsymbol{M}}_1 = \left(a_m \cos\theta_m\right)\hat{\boldsymbol{i}} + \left(a_m \sin\theta_m\right)\hat{\boldsymbol{j}}$ [M at debris arrival]

$\vec{\boldsymbol{v}}_{\boldsymbol{m}1} = -\left(w_m \sin\theta_m\right)\boldsymbol{i} + \left(w_m \cos\theta_m\right)\boldsymbol{j}$ [M vel., debris arrival]

$\vec{\boldsymbol{C}}_2 = \left(a_c \cos\theta_c\right)\hat{\boldsymbol{i}} + \left(a_c \sin\theta_c\right)\hat{\boldsymbol{j}}$ [C at debris arrival]

$\vec{\boldsymbol{v}}_{\boldsymbol{c}2} = -\left(w_c \sin\theta_c\right)\boldsymbol{i} + \left(w_c \cos\theta_c\right)\boldsymbol{j}$ [C vel., debris arrival]

$dt_{mc} = dt_c - dt_m$ [debris travel time, M orbit to C orbit]

$\vec{\boldsymbol{r}}_{\boldsymbol{mc}1.5} = \vec{\boldsymbol{C}}_2 - \vec{\boldsymbol{M}}_1 - 0.5\,dt_{mc}\left(\vec{\boldsymbol{v}}_{\boldsymbol{m}1} + \vec{\boldsymbol{v}}_{\boldsymbol{c}2}\right)$ [average M-C vector]

$\vec{\boldsymbol{\alpha}}_{\boldsymbol{m}} = \mu_{\oplus} m_c \vec{\boldsymbol{r}}_{\boldsymbol{mc}1.5} \Big/ \left|\vec{\boldsymbol{r}}_{\boldsymbol{mc}1.5}\right|^3$ [M acceleration during dt_{mc}]

$\vec{\boldsymbol{v}}_{\boldsymbol{m}2} = \vec{\boldsymbol{v}}_{\boldsymbol{m}1} + \vec{\boldsymbol{\alpha}}_{\boldsymbol{m}} dt_{mc}$ [M velocity, debris arrives at C]

$\vec{\boldsymbol{M}}_2 = \vec{\boldsymbol{M}}_1 + \vec{\boldsymbol{v}}_{\boldsymbol{m}1} dt_{mc} + 0.5\,\vec{\boldsymbol{\alpha}}_{\boldsymbol{m}} dt_{mc}^{\ 2}$ [M position, debris at C]

$\vec{\boldsymbol{r}}_{\boldsymbol{mc}2} = \vec{\boldsymbol{C}}_2 - \vec{\boldsymbol{M}}_2$ [C vector from M]

$\vec{\boldsymbol{v}}_{\boldsymbol{mc}2} = \vec{\boldsymbol{v}}_{\boldsymbol{c}2} - \vec{\boldsymbol{v}}_{\boldsymbol{m}2}$ [C velocity relative to M at debris arrival]

$r_{mc2} = \left|\vec{\boldsymbol{r}}_{\boldsymbol{mc}2}\right|;\ v_{mc2} = \left|\vec{\boldsymbol{v}}_{\boldsymbol{mc}2}\right|$ [C-M separation & relative speed]

$u_{mc2} = \sqrt{2\mu_{\oplus}\left(m_m + m_c\right)/r_{mc2}}$ [escape speed from C&M]

$pr_2 = \left[\left(\vec{\boldsymbol{r}}_{\boldsymbol{mc}2} \times \vec{\boldsymbol{v}}_{\boldsymbol{mc}2}\right) \bullet \hat{\boldsymbol{k}}\right] \Big/ \left(r_{mc2} v_{mc2}\right)$ [pro/retro-grade index]

$$\left\{\frac{v_{mc2} > u_{mc2} \rightarrow \text{escape}}{v_{mc2} < u_{mc2} \rightarrow \quad \text{orbit}}\right\}\left\{\frac{pr_2 > 0 \rightarrow \quad \text{prograde motion}}{pr_2 < 0 \rightarrow \text{retrograde motion}}\right\}$$

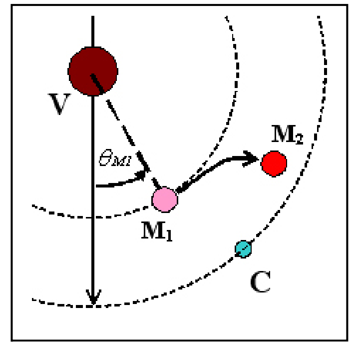

Figure 3. Mars and Body C continue to orbit Planet V after it explodes until the debris wave passes the orbit of Mars (M_1). Then Mars continues linearly (except for the attraction of Body C) to M_2, and Body C still orbits Planet V until the debris wave reaches its own orbit. Thereafter, both former moons orbit each other.

$\vec{\boldsymbol{v}}_{\boldsymbol{m}\square 2} = \left(m_m \vec{\boldsymbol{v}}_{\boldsymbol{m}2} + m_c \vec{\boldsymbol{v}}_{\boldsymbol{c}2}\right) / \left(m_m + m_c\right)$
[C - M mass ctr. vel. wrt Sun]

$v_{m\square 2} = \left|\vec{\boldsymbol{v}}_{\boldsymbol{m}\square 2}\right|$
[mass center speed wrt Sun]

$e_{m\square 2} = 2\vec{\boldsymbol{v}}_{\boldsymbol{m}\square 2}\square\hat{\boldsymbol{j}} / w_M$
[C - M eccentricity wrt Sun]

$\Delta a_{m\square 2} = a\Delta e_{m\square 2}$
[mean dist. change wrt Sun]

Note in the equations with Figure 2, subscript 1 indicates the time when the debris wave arrives at Mars; subscript 1.5 denotes the mid-time between times 1 and 2; and subscript 2 denotes the time when the debris wave arrives at Body C. The specific results to this stage of calculation depend strongly on the explosion fragment speed parameter in Table line 24. A fuller discussion of that parameter's meaning and significance appears in Appendix III. General equations to go from an initial position vector and velocity vector to the corresponding orbital parameters appear in Appendix IV.

> ***"It is trial that proves one thing weak and another strong. A house built on the sand is in fair weather just as good as if built on a rock. A cobweb is as good as the mightiest cable when there is no strain upon it."*** – Henry Ward Beecher (19^{th} century motivational speaker and author)

Third Stage: Tidal evolution for Body C orbiting Mars

Because the mutual orbit of Mars and Body C is highly elliptical, gravitational interactions cause considerable internal stress from tidal pumping to both bodies. For Mars, this produced massive volcanism, the remnants of which remain in the Tharsis region today following 3.2 million years of cooling. But the stresses would have been greater on Body C because the mass of Mars stressing Body C was greater than the mass of Body C stressing Mars, and the amplitude of the forced librations in the spin of Body C would have been correspondingly larger, too. This is why it is Body C that eventually explodes, allowing Mars to relax, cool, and stabilize.

If either former moon has significant rotational angular momentum, tidal friction would feed that into the mean distance of the moons, which would then evolve just as Earth's Moon is slowly evolving outward. However, that is not the case, so no important change in mean distance or orbital period occurs – a factor aiding the stability of the high-eccentricity mutual orbit. Although the matter of Mars-Body C orbital period was not considered as a hard boundary condition, Appendix VII discusses reasons for preferring solutions near a 7-day orbital period.

Meanwhile, mutual tide-raising forces would tend to gradually lower the eccentricity of the mutual orbit, which would change the rotation period of Mars because it is synchronized with the mutual angular speeds at pericenter. Those speeds would gradually decrease as eccentricity decreased. And solar tide-raising forces might also cause significant evolution. These two parameters are shown on Table lines 52-53. Numerical estimates suggested that solar tides should be pretty small; and indeed, only values very close to unity for line 53 allowed solutions. So this parameter was set at unity and allowed no further influence. Its importance is in showing that adding arbitrary degrees of freedom to the scenario usually does little or nothing to add more acceptable solutions. By contrast, adding the mutual tidal parameter, which numerical estimates suggested was not negligible, allowed solutions with mutual orbital periods near one week because it allowed initially high-eccentricity orbits to relax to lower eccentricity orbits with slower rotation periods for Mars, making the overall solution more attractive.

The tidal theory for lowering the eccentricity is easy to visualize. A bulge on Mars raised by Body C will tend to gravitationally speed up Body C on the inbound leg of its orbit, raising its pericenter distance. The same bulge tends to slow Body C on the outbound leg, lowering its apocenter distance by an equal amount. The effect of the application of this mutual tidal parameter on the mutual orbit is computed in lines 54-64.

Fourth Stage: Explosion of Body C, leaving Mars orbiting Sun

Tidal theory again dictates the orbital configuration at the time of the explosion of Body C. For reasons similar to that determining the configuration when Planet V exploded, the tidal stresses will again be a maximum when the Sun, Mars, and Body C are lined up in that order. And when such an alignment occurs with the pair of former moons at the perihelion of their solar orbit, and with the mutual orbital eccentricity near its maximum from solar perturbations, tidal stresses would be at their all-time peak.

In Sun-Mars-Body C alignments, the post-explosion residual motion of Mars would tend to decrease the eccentricity of the final solar orbit of Mars because Mars's motion around Body C is opposed to its motion around the Sun. Based on our trial parameters, this is just what we need to get a Mars solar orbit close to that observed today. Therefore, the configuration at the Body C explosion would most likely be that shown in Figure 4.

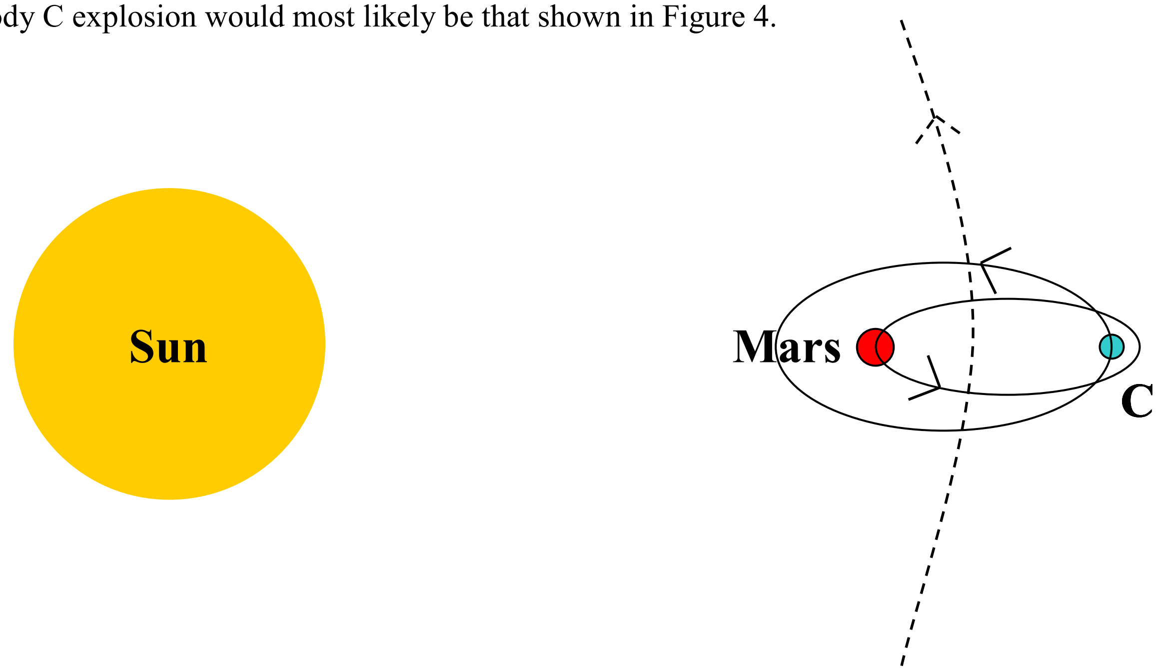

Figure 4. Configuration of Sun-Body C-Mars for maximum tidal stress at moment of Body C explosion. This is the most probable configuration for tidally triggering the explosion of Body C at 3.2 million years ago.

Table lines 65-75 show the corresponding parameters for the Body C explosion and the post-escape solar orbit of Mars for our adopted solution. These may then be compared with the observed values in lines 76-78. The solution shown is not unique, but has only a very narrow corridor of wiggle room. For example, note the main effect of the three main adjustable parameters. Adjusting the Mars initial period/spin affects mainly the escape speed and final Mars orbit. Adjusting Planet V's mass affects the Mars-Body C period, and allows the solution to get close to today's Mars rotation rate at pericenter. Adjusting the mean fragment speed for the largest fragments affects mainly the angular width of the arc leading to non-escape orbits.

Near the high end of solutions, available only if we ignore the ~7-day estimate for the Mars-Body C orbital period, would be the following solution, which we compare here with the adopted solution: If it should turn out that helium planets cannot form with masses below 2.5 Earth masses, then a solution near the sample shown might be more appropriate. Some solutions allow Planet V masses up to roughly 5 Earth masses, but not more.

	P_m -days	m_v -⊕masses	s -km/s	P_{mc} -days
adopted solution	0.836	2.353	3.37	7.49
sample high-end solution	1.670	3.630	4.37	9.08

Generalizing this scenario's methodology, we expect that something similar happened with former "Planet K" in the outer main asteroid belt. This leads to the expectation that Ceres was a former moon, and that its twin moon met the same kind of fate as Body C. So when close-up spacecraft views of Ceres become available, we expect they will show a hemispheric dichotomy and other explosion-related similarities to Mars. The lack of atmosphere would probably mean hard, melting or vaporizing impacts leaving lava-like deposits all over one hemisphere, but with no obvious source volcanoes for that hemisphere.

Appendix VI notes other implications for fission theory's reconstruction of the original solar system that were suggested by this analysis.

Finally, a 4-MINUTE VIDEO illustrates the scenario from start to finish, highlighting some of the points of evidence explained by the scenario, even though that evidence did not form part of the motivation for the scenario. It is 38 MB long and runs in Windows Media Player (for example). See http://metaresearch.org/media%20and%20links/animations/violentmars.wmv.

Appendix I. Mass ratio for twin pairs

Twin pair	mass ratio
Venus/Earth	0.815
(Ve+Me)//(Ea+Mo)	0.860
Uranus/Neptune	0.845
Europa/Io	0.54
Callisto/Ganymede	0.73
Umbriel/Ariel	0.865
Oberon/Titania	0.855

According to fission theory, three pairs of twin planets and four pairs of twin moons remain from the original solar system. Of those, Jupiter and Saturn might be the only major exception to the rule that the members of each pair are similar in mass. However, the Jupiter-Saturn exception has been substantially modified by the explosion of massive gas giants A & B from the early solar system (the cause of the "late heavy bombardment"), and it is not yet certain that Jupiter and Saturn should be paired with one another, or perhaps Jupiter with Planet A and Saturn with Planet B. So for present purposes, we omit these two planets from the comparison table.

It is almost certainly not a coincidence that the four major moons of Jupiter are likewise a modest exception to the mass ratio that applies elsewhere. Indeed, Jupiter is almost certainly accreting mass even today faster than any other planet. So if its original mass was modified substantially by the Planet A & B explosions, it follows that its major moons would likewise accrete extra mass. If so, then the innermost of each moon pair would accrete more because it has faster orbital speed, is more massive to start with, and lies closer to Jupiter. And this is the direction in which the observed discrepancies lie for both Jovian pairs, with the discrepancy being larger for the inner pair as the same idea would predict.

So if we overlook the two Jovian pairs, we find remarkably close agreement for the mass ratio of the remaining four pairs. And even there, we can make an *a priori* mandatory modification because fission theory tells us that our Moon originated as part of Earth's mass, and Mercury originated as a moon of Venus. So if we examine the mass ratio of the two (planet +

moon) pairs, we get a mass ratio that lies within 1% of the average of the other three pairs. This would make the mean of the four pairs 0.856 ± 0.007, which we can round to 0.86 in light of the mean error so as not to overstate its accuracy.

The mere fact that four pairs of adjacent planets or moons in the solar system have mass ratios so similar would by itself be an anomaly crying out for explanation if we did not have fission theory to explain it.

Appendix II. A new class of planets?

Tidal stresses trigger explosions, and the delays for the debris wave to reach the moons enables mutual capture into prograde orbits. But the window for both these things to happen is narrow. These essential post-explosion delays before the moons are free occur in a roughly equivalent way for any adopted initial Mars spin & orbit period. But they set an upper limit to the Planet V mass parameter. The smaller the mass we choose for Planet V, the wider is the window for satisfactory solutions. However, Planet V must be a predominantly liquid or gaseous planet to it can form twin moons in accord with fission theory. And there is a minimum mass for any planet to resist losing all its light volatiles (hydrogen and helium) and becoming a solid, terrestrial-type body such as the Earth and smaller planets and moons. But planetary formation theory is not yet advanced enough to tell us what that mass limit is.

Initially, when planets fission from a proto-Sun, they have essentially solar composition and consist mainly of hydrogen, perhaps 20% helium, and much smaller amounts of all other elements. If the protoplanet is massive enough, it retains most of that hydrogen, which assures that the planet will remain a gas giant. If the protoplanet does not have enough mass, most of the light hydrogen and helium will escape into space, leaving behind a relatively small-mass "terrestrial" planet comprised of heavier elements, which may then chemically differentiate. (For example, heavy elements may fall to the core and light elements may rise to the surface; or vice versa if the spin is fast enough.) The dividing line between one fate of the other depends on the planet's size and mass, which determine its surface escape velocity; and the mean molecular speeds of the various elements. For example, the rms speed of N2 (atomic mass 14) at sea level on Earth is ~300m/s, which implies that the rms speed of H molecules would be ~4.2 km/s. That speed would have been higher for a much hotter early Earth. Escape speed from Earth's surface today is 11 km/s, but that would have been much less for the original larger, gaseous proto-Earth. Even today, the Maxwellian tail of the speed distribution of H atoms (presumably from the breakup of water molecules) would be over escape speed, producing Earth's faint hydrogen tail.

To this point, this planetary formation model has much in common with mainstream models. However, it points up a major, neglected area in the transition zone between gas giants and rocky terrestrial planets. There must exist some proto-planet initial mass range allowing most of the hydrogen to escape, but not most of the heavier helium. The result will still be a gaseous planet, but a helium-dominated one, unlike any planets remaining in our solar system today. We know very little about the evolution or stability of such "helium planets". But we do note with interest that, in both places in the solar system where intermediate-mass helium planets might have formed (between Mars and Jupiter, and beyond Neptune), we instead find asteroid belts. This suggests that helium planets might be less stable than other types.

So fission theory suggests that Planet V was a helium planet, somewhere in the mass range between Earth and Uranus (about15 Earth masses). The solutions here suggest masses near the lower end of that range, although solutions with masses up to about 5 Earth masses exist. It is also relevant that helium planets will be denser than hydrogen planets, and therefore tend to form relatively large and relatively close moons through the fission process. So that suggests an explanation for why Mars and Body C are larger than other solar system moons.

Appendix III. About the explosion-fragment-speed parameter

If a planet undergoes a central explosion, most of its mass is vaporized because the blast wave has a speed faster than an intact mass can accommodate. The mechanism of vaporization is heating of all individual molecules, increasing their vibration speeds beyond what the forces of cohesion can resist.

Most of the matter not vaporized lies near the planet's surface, where it is under minimal pressure from the weight of overlaying layers, and where it can be accelerated to high speeds more gradually as the lower layers rise and push outward over the many minutes it takes even a very fast blast wave to travel from the center to the surface of a planet.

The crust of the planet and parts of the upper mantle are then fractured into fragments of varying size and accelerated outward at high speeds. Next, the vaporized interior mass in the form of a blast wave passes that near-surface material, and is followed by additional vaporized or fragmented mass in the form of a debris wave. These produce the final acceleration of the larger fragments, which are the slowest. The passage of most of the interior mass in these two waves also drops the escape velocity to a much lower value. Indeed, escape velocity drops to zero for the largest, and hence slowest, fragment.

One might think that mass speeding away in the opposite direction would still slow the last fragment and require some escape velocity. But that is not the case. The gravitational force outside any uniform, spherical shell of matter is the same as if that shell were concentrated at a single point at its center. And the gravitational force everywhere inside a uniform, spherical shell of matter is zero. The force from the small amount of nearby mass in the shell exactly compensates the larger mass in the far side of the shell. The slowest fragment this finds itself in a region of zero net force and therefore zero escape velocity.

The high-speed blast wave contains only a small fraction of the total mass. The debris wave that follows is then well-sorted by fragment size, with the vaporized debris moving out fastest and the intact fragments moving slowest. Because we cannot model this wave in detail, we will conceptually approximate its action by assuming that the planet's entire mass remains interior to any point in space until half of the mass has passed that point, at which time we assume that the planet's mass is completely outside and the net force from the planet drops to zero.

We do not know the speed of this imaginary expanding shell marking the "half-mass" boundary, and must model it as an adjustable parameter, s. But we expect that s will generally be proportional to the square root of the mass of the exploding planet because escape velocity is. So we will define s_0 as the limiting speed of an expanding half-mass boundary from an exploded one-Earth-mass parent at a distance of infinity. We then assume the speed is distance independent because most of the mass can all be considered as part of an expanding spherical shell that has minimal self-retarding force. That allows us to scale any adopted value for s_0 to any other exploding planet or moon mass m : $s = s_0\sqrt{m}$.

If there were a significant mass m remaining inside a given distance r, then the time for the debris wave to reach r would not be a simple linear function of r. Given s at infinity (which necessarily means a speed above the velocity of escape), to find the total time t (in seconds) for the half-mass boundary to travel from the exploding planet's center, we would need the steps on the left below:

$a = \mu_\oplus m/s^2$ [virtual mean distance]

$\cosh F = 1 + r/a$ [F = eccentric anomaly in radians]

$t = (\sinh F - F)\Big/\sqrt{\mu_\oplus m/a^3}$ [time from center to r]

$\sinh(z) = \left(e^z - e^{-z}\right)/2$

$\cosh(z) = \left(e^z + e^{-z}\right)/2$

$\sinh^{-1}(z) = \ln\left[z + \sqrt{z^2+1}\right]$

$\cosh^{-1}(z) = \ln\left[z + \sqrt{z^2-1}\right]$

Because many programming languages and calculators do not offer hyperbolic functions as part of their standard commands, we might also need to code these in terms of the exponential and natural logarithm functions, as shown in the equation set on the right.

Appendix IV. Size and shape of an orbit derived from a single position and velocity vector

Given a single position vector $\vec{\boldsymbol{r}}$ and its velocity vector $\vec{\boldsymbol{v}}$ of an orbiting body with mass m_2 relative to a central body of mass m_1, we first find the magnitude of each vector: $r = |\vec{\boldsymbol{r}}|; v = |\vec{\boldsymbol{v}}|$. Then equation [6] (with $m = m_1 + m_2$) can be used to solve for the semi-major axis (mean distance) of the elliptical orbit: $a = 1\Big/\left(2/r - v^2/398600m\right)$. And equation [9] can be used to solve for the orbital eccentricity: $e = \sqrt{1 - |\vec{\boldsymbol{r}} \times \vec{\boldsymbol{v}}|^2/398600m\,a}$.

Appendix V. The trajectory of Mars at escape from exploding Body C

We use the same debris wave speed from the explosion of Planet V to model the escape of Mars when Body C explodes. This amounts to assuming the same kind of physical explosion mechanism, which seems reasonable. The main difference here from the Planet V explosion case is that the pre-escape orbit is a high-eccentricity ellipse instead of a circle. Because we are concerned only with a small portion of that ellipse near its pericenter, we will approximate the pre-escape orbit as a parabola (eccentricity = 1). Also, we only need to know the velocity vector of Mars relative to the former center of mass of Mars and Body C at the point when the debris wave passes Mars, because that is the only pre-escape orbit parameter that affects the eccentricity and mean distance of the final solar orbit of Mars.

Here are the governing equations.

$r = q\sec^2\zeta$ [distance from focus; $\zeta = 1/2$ true anomaly]

$(1/3)\tan^3\zeta + \tan\zeta = \sqrt{\mu/2q^3}\,t$ [relates ζ to time]

$t = r/s$ [time for debris wave to pass Mars]

$\sin\zeta - (2/3)\sin^3\zeta = \left(\sqrt{\mu/2q}/s\right)\cos\zeta$ [orbital speed / s]

*** Solution for ζ ***

$F = \sin\zeta - (2/3)\sin^3\zeta - \left(\sqrt{\mu/2q}/s\right)\cos\zeta$ [target is $F = 0$]

$dF/d\zeta = \cos\zeta\cos 2\zeta + \left(\sqrt{\mu/2q}/s\right)\sin\zeta$

[use above to correct ζ iteratively until $F = 0$]

*** End ζ solution ***

$\vec{v} = \sqrt{2\mu/r}\left[(\sin\zeta)\hat{\boldsymbol{i}} - (\cos\zeta)\hat{\boldsymbol{j}}\right]$ [final velocity vector]

$\vec{v} = \sqrt{2\mu/q}\cos\zeta\left[(\sin\zeta)\hat{\boldsymbol{i}} - (\cos\zeta)\hat{\boldsymbol{j}}\right]$ [eliminates r]

Appendix VI. Notes on fission theory

Why are twin planets Earth and Venus so far from the 2-to-1 resonance that fission theory suggests they started with? Fission theory indicates that Mercury escaped from Venus. The present circular orbital speed of Venus is 36 km/s, but needs to be ~38 km/s to place it in the 2-to-1 resonant orbit with Earth (orbital period 6 months). But when Mercury was still a moon of Venus, its tidal escape was through the L1 Lagrange point on the line from Venus to the Sun. As that happens, Mercury's relative satellite orbital momentum is opposite its solar orbital motion. This means its escape causes a forward impulse to Venus, giving that planet more angular momentum but ultimately less orbital speed.

Analogously, as terrestrial planets shed their original H and He light gases, all that mass will likewise preferentially escape through L1. So most escaping mass has spin momentum opposite to orbital momentum, leaving terrestrial planets with a net gain in orbital momentum; i.e., they end up farther from the Sun. The same process, mass loss in Venus, would also have the effect of accelerating the tidal escape of Mercury. Such mass loss may interact with the Sun's tidal forces to push proto-Venus or proto-Earth to faster or slower speeds than the 2-to-1 resonance orbit. But our Moon's fission from Earth must have occurred before Earth shed much of its original gaseous mass.

This means that original Earth should be to present Earth as original Venus is to present Venus, except for the fact that our Moon is 4.5 times less massive than Mercury, and Venus is ~5/6 of Earth's mass. Another factor this analysis has highlighted is that twin pairs will tend to evolve toward 2-to-1 period resonances, but there is no corresponding action pushing one twin pair into 2-to-1 period resonance with any pre-existing twin pair. So resonances are disturbed or never occur between twin pairs and within pairs of terrestrial planets that lost lots of mass and/or large moons.

So we now suggest the following original periods (in years) of the solar system's original 12 major planets. New thinking is that the more massive planet (the outermost) of each pair of large gas giants would produce intense tidal stresses on the smaller (innermost) at times of closest approach shortly after fission from the enlarged proto-Sun. This means these giant twin planets would never get the chance to evolve into a 2-to-1 resonance before the smaller was induced to explode by the larger. It also means the outermost would absorb most of that exploded mass because there would not as yet be any planets further in, and it would be the closest and most massive body available for the purpose. Moreover, most such collisions would decrease the orbital angular momentum of the surviving planet, opposing its outward motion through solar tidal forces. This explains why the two surviving planets, Jupiter and Saturn, are closer in than a smooth sequence would suggest. The table reflects the implied fact that Planets A and B never reached their resonant position or evolved significantly before exploding.

Venus	0.5	V	2.37	A	6	B	15	Uranus	83	T	280
Earth	1.0	K	4.74	Jupiter	12	Saturn	30	Neptune	166	X	560

Appendix VII. Possible tie-in with Martian artifacts

Anomalies suggestive of artifacts are seen in recent high-resolution spacecraft imagery of Mars [[8]]. These have a character more like the kind of things that will be found someday on Earth's Moon as a result of visiting human activities rather than the kind of things expected to be seen on a civilization's primary world. Therefore, if either body was in fact a home world to a species capable of making artifacts, it would more likely have been Body C. Moreover, suggestions exist in the form of a distinctly terrestrial flavor to the possible artifacts, and in the dating "coincidence" of the Body C explosion (3.2 million years ago) and the dating of the oldest definitely hominid fossil found on Earth ("Lucy", also dating to 3.2 million years ago). These suggestions of a connection between the demise of Body C and the rise of hominids on Earth led us to give mild preference to solutions where the orbital period of Body C around Mars was ~7 days, suggesting an origin for the special significance of that particular interval ("the week") to modern humans.

[[1]] T. Van Flandern (2007), "The challenge of the exploded planet hypothesis", Int'l.J.Astrobio. (accepted; in process); preprint at http://metaresearch.org/publications/bulletin/2006issues/1215/Mrb06d.asp.
[[2]] T. Van Flandern (1999), *Dark Matter, Missing Planets and New Comets*, North Atlantic Books, Berkeley, chapters 19 & 25; http://metaresearch.org/solar%20system/origins/original-solar-system.asp.
[[3]] T. Van Flandern (1999), *op. cit.*, chapter 6.
[[4]] T. Van Flandern (1999), *op.cit*, chapters 7 & 23;
http://metaresearch.org/solar%20system/eph/ephrevised/ephrevised.asp;
http://metaresearch.org/solar%20system/eph/eph2000.asp.
[[5]] T. Van Flandern, "New evidence for artificiality at Cydonia on Mars",
http://metaresearch.org/solar%20system/cydonia/mrb_cydonia/new-evidence.asp.
[[6]] T. Van Flandern, M. Carlotto, H. Crater, J. Erjavec, L. Fleming, and J.P. Levasseur (2001), "Evidence of planetary artifacts", Infinite Energy 7#40:23-31; also at http://spsr.utsi.edu/, link to "Peer-reviewed journal publications and other recent articles".
[[7]] T.C. Van Flandern, E.F. Tedesco & R.P. Binzel (1979), "Satellites of Asteroids", in *Asteroids*, T. Gehrels, ed., 443-465. Contains the relevant tidal evolution timescale formulas.

[8] http://www.metaresearch.org/solar%20system/cydonia/asom/pressconf_nyc.asp.

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> ***"An important scientific innovation rarely makes its way by gradually winning over and converting its opponents: it rarely happens that Saul becomes Paul. What does happen is that its opponents gradually die out, and that the growing generation is familiarized with the ideas from the beginning."*** – Max Planck

For Our New Readers: An Overview of Meta Science

History leading to Meta Science

In the 1960s and early 1970s, funding sources for astronomy research were still fairly diversified, with government, universities, and industry all major players. But as the space program grew, gradually Big Science elbowed Little Science aside, and funding became more centralized. Today, there is little recourse outside NASA or NSF. The decadal funding review committees would frequently recommend programs for adoption in order of cost, putting in as many big-ticket programs as possible. Ignored were meritorious programs costing very little because all budgeted funds would already be allocated to expensive projects before the little ones came up for consideration.

The long-term effects of these changes were not evident for many years. One such effect was to squeeze out independent researchers in favor of large teams working on grand projects. A more harmful effect grew up in the 1980s when funding became tight. NASA and NSF tended to "adopt" certain theories as "established" and cut funding for research on alternatives. This effectively curtailed the possibility of scientific revolutions. A third side effect is that NASA was forced to adopt political policies inappropriate in science, such as justifying its annual budget by telling the U.S. Congress that their space telescopes would find proof of the Big Bang, "black holes", "dark matter", "dark energy", etc. This led to publicizing the latest evidence favoring each of these ideas as the annual budget consideration approached, and to downplaying or ignoring counter-evidence. A fourth problem is that NASA started citing and urging recipients of its funding to cite other NASA programs and scientists, ignoring credit to non-NASA-funded scientists – again for the nominally "good" purpose of justifying maximum funding for everyone who could be funded, with priority of course to those who helped get the funding by splashy findings using previous funding.

Many younger scientists and researchers have never known a time when things were any other way.

Beginnings of Meta Science

Meta Research was founded in 1991 to deal with the problem that many alternative models worth pursuing by all valid scientific criteria could no longer get funding from the usual sources. Our *Meta Research Bulletin* began publication in March 1992, reporting on such research. But it was soon evident that most alternative models were no better than the mainstream models they hoped to replace. Typically, a replacement model takes exception to some particular aspect of a mainstream model but accepts all the rest. The motivation for that exception is often appreciated only by the originator and at most a few others, but offers little real advantage to understanding nature and introduces a new set of existing or potential problems to replace the ones it "solves". These minor variants on mainstream models are in almost unlimited supply, so they have come to have very low value in the scientific community.

In the book that led to the founding of this organization (Meta Research), *Dark Matter, Missing Planets and New Comets*, we propose a fundamentally different approach to developing and judging scientific theories than that in current use. Virtually all present theories are formed by induction – we observe something and try to figure out its cause. But such an approach is non-unique and literally equivalent to educated guesswork. It commonly leads to hypotheses that must be continually patched or augmented to keep them viable.

The cited book discussed many examples of the new approach of developing theories by deduction. This requires a starting point or starting premises, but with the huge difference that everything follows uniquely from the starting premises through a series of logical syllogisms with little or no room for guessing and little opportunity to stray from a single, inevitable path. Precisely because deductive theorizing is so tightly constrained and has so few degrees of freedom, most starting positions lead quickly to contradictions with observation or experiment and are therefore falsified within a few steps. This explains the lack of popularity of the method because getting the starting position right is hard and can be frustrating. But the reward of the method is that, once a valid starting point is found, the deductive theory will provide deep insight into cause and effect and will have an excellent record at making genuine predictions even against long odds. It has the ability to teach the scientist many things he/she might never have imagined.

There is a second way in which Meta Science and mainstream science have parted ways. Science is about forming and testing hypotheses. But it also recognizes that the biases of the experimenter or observer are formidable and likely to dominate all results if not kept in check. When the results of a test are favorable to a hypothesis, they are rarely scrutinized, challenged, or even verified. When the results are unfavorable, they receive intense inspection. Reasons for discarding the "worst" of the data are easy to imagine. If all else fails, inventive scientists can always imagine an ad hoc helper hypothesis to explain why the data is not applicable, or how the data can be made consistent with the hypothesis anyway.

Scientific method forbids all these bias-reinforcing procedures. Testing is supposed to be performed by setting up a protocol that, once set, cannot be changed as results start to come in. Ideally, both experimenters and observers are isolated from the data, or at least from its implications, until the point when the data and its implications are inevitable and unchangeable. This procedure is called "controls". Without controls, any test of any hypothesis by any scientist (or lay person, for that matter) will inevitably tend to confirm one's starting biases. Falsification of hypotheses becomes as difficult as the biases are deep. Mainstream science has almost complexly forgotten the importance of controls for the pragmatic reason that, if they were used, many favored hypotheses (including some that bring in lots of funding) would immediately fall.

Meta Science insists that controls must be in place for science and knowledge to advance because the most interesting new things to be learned are those that go against our biases and present beliefs.

In summary, conventional science often says that every answer leads to many new questions. Deductive science has the opposite character: One successful starting premise answers many questions, both those already asked and those we did not yet know to ask. Meta Science is about replacement theories using deductive methodology with controls, which limits the field of possibilities to very few options. And those few options have had some excellent successes for aiding true insight and understanding, not being contradicted by later data, and making successful predictions even when the consensus says "no way". To take just one of many examples: The exploded planet hypothesis predicted in 1978 that asteroid satellites exist and are "numerous and commonplace". That was universally considered absurd by the mainstream until the first "official" asteroid satellite discovery in 1993. Now hundreds are known, and it is estimated that 5% of all asteroids have satellites large enough to be discovered by optical means. The percentage with smaller satellites will certainly be larger yet.

Deep reality physics

The ultimate search for a valid starting point occurs in cosmology. Meta Science eschewed all guesses such as "space can be curved" or "there can be any number of dimensions". Only a small number of premises are available from logic alone without benefit of interpretation on the part of not-always-unbiased scientists. Of course, postulating a First Premise would be another type of guess. But it happens that we can do a lot with only a single useful premise – NO MIRACLES ALLOWED – on the grounds that a true miracle would be impossible to explain by definition, and would therefore end further inquiry. (We exclude apparent miracles that do ultimately have an explanation.) So for the very pragmatic reason that we wish to explain, understand, and predict natural phenomena, we don't allow miracles at any stage. And if we are ever forced into a position where no possible explanation exists except a miracle, we would then be forced to conclude that our perception and experience is of an artificial reality, like a Star Trek holodeck reality, behind which is the one true reality inaccessible to us.

Safe premises, that follow from logic alone and are guaranteed to be valid because their opposite would be a true miracle, are developed in "Physics has its principles". Here are some examples:

- Every effect has an antecedent, proximate cause
- No time reversal
- No true action at a distance
- No creation ex nihilo
- No demise ad nihil
- The finite cannot become infinite

Let's look more closely at one of these. It is easy to understand that "creation *ex nihilo*" (from nothing) is a true miracle. It is to be contrasted with creation from the vacuum, whose composition and nature are still beyond the reach of present instrumentation. But the vacuum contains light, gravitation, zero-point energy, and other manifestations of further contents. By contrast, the idea that anything, anywhere, anytime could be brought into existence from truly nothing instead of from pre-existing parts (visible or invisible) is miraculous and could never be explained by physics. It is relevant to note that neither this nor any of the other principles can be expressed in mathematical terms in the equations that try to describe empirical physics.

So the field of physics that excludes miracles and adopts the above premises and their corollaries when explaining natural phenomena is known as "deep reality physics", to contrast with the Copenhagen school in quantum physics that includes some miracles within its premises and has concluded "there is no deep reality to the world around us". Deep reality physics is a specific example of the kind of deductive starting point that Meta Science embraces. It leads to the Meta Model, the only viable cosmology derived deductively from the above starting premises without any inductive help from observations or experiments. It shows us a somewhat different meaning to the "familiar" concepts of space and time than the ones we have been taught. And it indicates that all physical phenomena can be explained by five and only five dimensions: three of space plus time and mass/scale. Amazingly, this allows the Meta Model to easily answer the ultimate question about the origin of the universe. The universe had no beginning and will have no end because that violates no principles of physics; whereas the alternative certainly does. With some thought, we can even come to understand how this makes sense in the same way that Zeno's paradoxes make sense. (See the *Dark Matter, ...* book for details.)

Meta Science today

Meta Science is a methodology for developing theories that have great success in terms of their usefulness. Because Meta Science models do not start from mainstream models and are generally not influenced by them, they often are so different as to be initially unrecognizable as viable theories for familiar phenomena we have always understood in some other way. That characteristic is both a strength and a weakness. Its strength is deeper understanding and better predictions. Its weakness is greater resistance to adoption because the new models often require a complete restart and rethink of everything an expert knows, or thinks he/she knows. Few people whose careers and sense of self importance are tied to a mainstream model are eager to even consider such an alien alternative.

Today, the leading models of Meta Science in the field of astronomy are these:

- Meta Model for the origin and nature of the universe
- Pushing Gravity for the origin and nature of gravitation
- Fission Model for the origin of planets and moons
- Exploded Planet Hypothesis for the demise of planets and moons
- Artificiality Hypothesis for the amazing anomalies on Mars

From these follow numerous corollary hypotheses or models for specific circumstances:

- Lorentzian relativity to explain the relativity of motion
- The speed of gravity: strongly FTL in forward time
- Elysium to explain general relativity effects and electricity & magnetism
- Satellite Model to explain the origin and nature of comets

- Origin of Earth’s Moon
- Origin of Valles Marineris
- Origin of Mercury as a moon of Venus
- Origin of Mars as a moon of now-exploded Planet V
- Origin of Pluto-Charon as moons of Neptune
- Origin of asteroids
- Origin of meteorites
- Mechanism of Panspermia
- Origin and nature of inertia
- Predicting meteor storms and outbursts
- Why we don’t need “dark matter”, “dark energy”, “black holes”, “string theory”, etc.
- Why supernova and microwave radiation data actually contradict the Big Bang
- Explanation of the Allais pendulum effect during eclipses
- Explanation of the “black drop” effect during transits
- Why the Sun may be in a liquid state rather than gaseous
- Possible connections between humans and extraterrestrial artifact builders

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> ***“It is better to have nine of your ideas be completely disproved, and the tenth one spark off a revolution than to have all ten be correct but unimportant discoveries that satisfy the skeptics.”*** – Francis Crick to V.S. Ramachandran

Meta Science in the News

Cosmos could be much older than thought

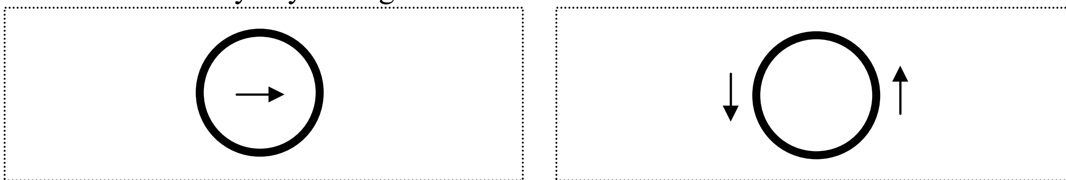
CNN 2002 July 11: Findings from an ESA telescope show that the universe could be much older than previously expected, based on an examination of X-rays from a quasar near the edge of the known cosmos. By current theory, the Big Bang universe began 13.7 billion years ago. But a quasar about 13.5 billion light-years away contains much more iron than it should for its age. Supernovas are supposed to be the source of iron in the universe, which then takes time and many generations to build up to significant levels. But iron in quasar APM 8279+5255 was three times more plentiful than in our solar system. Only two possible explanations are offered: Either undiscovered "iron factories" are sprinkled through the early universe, spitting out the metal through an unknown physical process. Or the universe is much older than presently thought. [Communicated by dean mamas <deanmamas@yahoo.com>.]

Fission Process for Planet Formation

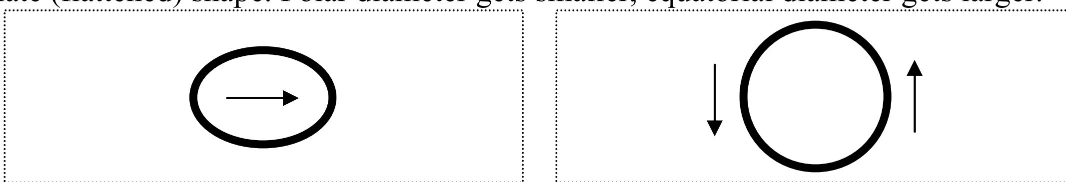
The following diagrams illustrate the stages of the fission process.

Sideview | *Topview*

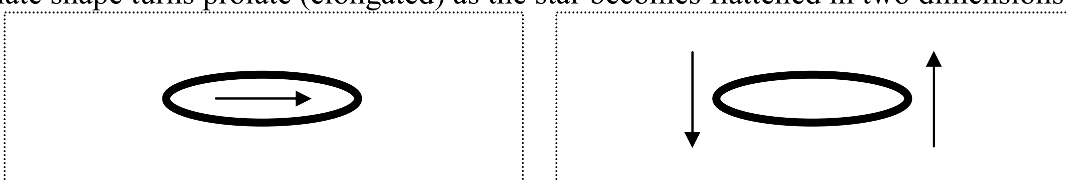
1. Star rotates slowly. Cycle begins.



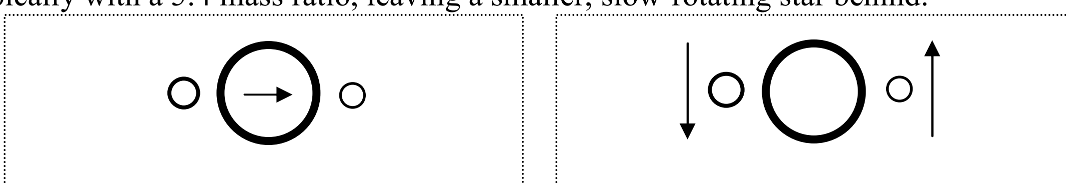
2. Star contracts from accreting and/or cooling, which speeds its rotation, producing an oblate (flattened) shape. Polar diameter gets smaller, equatorial diameter gets larger.



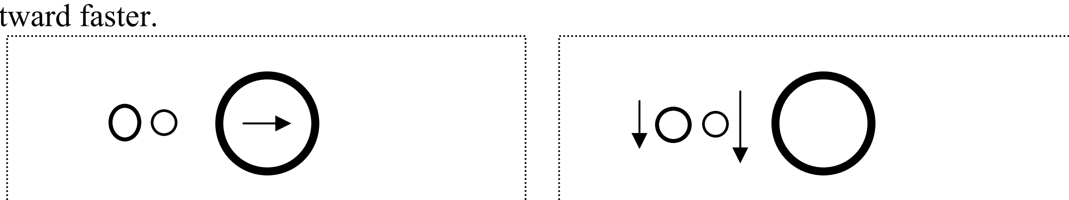
3. As "overspin" is approached (where centrifugal force begins to exceed gravity), the oblate shape turns prolate (elongated) as the star becomes flattened in two dimensions.



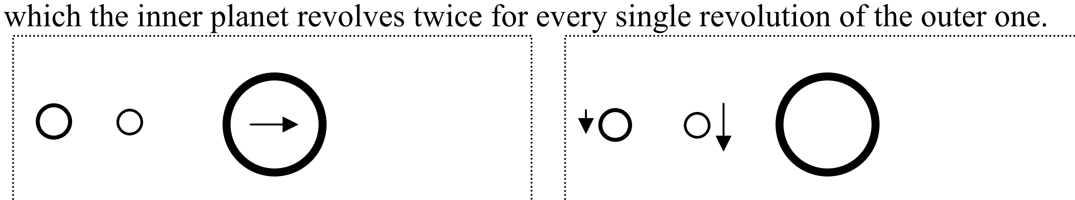
4. As "overspin" is exceeded, the star fissions as the two prolate bulges break off, typically with a 5:4 mass ratio, leaving a smaller, slow-rotating star behind.



5. Tidal forces cause the proto-planet orbits to expand, with the larger one evolving outward faster.



6. Outward evolution continues until a 2:1 period-ratio (1.6:1 distance ratio) is reached, at which the inner planet revolves twice for every single revolution of the outer one.



7. By zooming in, the smaller star will appear larger and the planets will disappear off-scale, recreating the original condition and setting the stage for another cycle.

See animation #3 by John Bejko, showing these steps graphically: http://metaresearch.org/media%20and%20links/animations/animations.asp. The complete fission theory for the origin of the solar system may be found at http://metaresearch.org/solar%20system/origins/original-solar-system.asp. Note the updates for specific fission theory inferences at that link to be found in Appendix VI of the lead article in this issue.

Resistance to new paradigms

[from the Society for Scientific Exploration message board]: "... the fate of Fleischmann and Pons [cold fusion] shows that the destructive defense mechanisms put into place by establishment science to protect itself against radically new ideas has got nothing to do with the inherent implausibility of those ideas, and everything to do with the threat that the ideas might pose to the careers, reputation and income of orthodox scientists. After all, telepathy, PK, precognition, possible survival of death, etc. might well be seen as outrageous, impossible, fraudulent relics of magical thinking – but that's not the main reason they are stomped upon. Even if supported by conclusive statistical evidence, they are rejected because acceptance would require taking a new view of nature itself. Cold fusion does not have any of these links with magic and weirdness – it is just a physical phenomenon for which we do not yet understand the mechanism, although many plausible ideas have been put forward. (Somehow, it is just a matter of some aspect of the catalytic action allowing atoms to become close enough for nuclear interaction to occur.) It is a threat not because it is magic but because acceptance would threaten the entire multibillion dollar hot fusion industry with its thousands of high level scientific and technical jobs, professorships, glitz, prestige and massive research grants. Let's also remember the case of poor old Alfred Wegener, ignored in his own lifetime, whose theory of continental drift took 50 years to be accepted, despite the fact that every southern hemisphere geologist knew full well that Africa and South America could be fitted together perfectly both geometrically and geologically – too many reputations (let alone textbooks) in conventional geology might have been threatened by its acceptance." [Peter Wadhams / Cambridge University / pw11@cam.ac.uk]

Second 2001 Mars anomalies (NYC) press conference now on YouTube

A video of the second of two national press conferences in 2001, in New York City on May 8, was recently placed on YouTube. It shows what was released to the public at that time about the Mars anomalies. Both press conferences and some of the images shown were major news in some open-minded media outlets. But that very open-mindedness sometimes creates doubt about the credibility of any given story. Most major media did not attend either conference. ABC reporters did attend the DC conference, were impressed with the findings, and planned to air them on Good Morning America the next day. However network executives reacted by saying "What does NASA have to say about this?", the answer being "No comment. Let the images speak for themselves." So they decided not to risk the network's credibility, and rejected airing the story and images. [Link communicated by Greg Orme: http://www.youtube.com/watch?v=5u-20g7Bwdw]

> ***"To make certain that crime does not pay, the government should take it over and try to run it."*** – G. Norman Collie

GENERAL INFORMATION

Pertinent articles and discussion of published articles, especially those related to Meta Science, are welcome. The preferred format is Microsoft Word. Appropriateness for this Bulletin is at the discretion of the editor; but if accepted by referees, articles will be published without significant editing of content. A response by the editor or a referee may then also be published. The first author is shown any such response and offered the opportunity to adjust his contribution in the light of the response. If time permits, this process is iterated until all parties are satisfied. Until the publication deadline, authors have the option to defer publication to a later issue to complete this process.

MEMBERSHIPS, SUBSCRIPTIONS, BOOKS, CDS

In 2007, the electronic Bulletin will be open access. None of our research is eligible for government funding, so we rely on Member contributions to support the organization. Memberships (which are primarily contributions to the research) come in three levels: Supporting Member ($25/year), Sustaining Members ($50/yr), and Patron Members (≥$100/yr). Membership and other contributions to Meta Research, a 501(c)(3) organization, are tax deductible in the United States. Members are notified of new Bulletins and other publications by email, and have access to the Members Only area of our Message Board. A printed version of the Bulletin is separately available to anyone via mail on a subscription basis for $24 per year (4 issues) for U.S. and Canada addresses and $29 per year for other countries.

Books and CDs sponsored or recommended by Meta Research:

- Author-signed copies of the 1999 (2nd) edition of the Meta-Research-sponsored book *Dark Matter, Missing Planets and New Comets* by Tom Van Flandern, published by North Atlantic Books in Berkeley. Subject matter is the origin and nature of all things astronomical. $22.50+S&H
- *Pushing Gravity: New Perspectives on Le Sage's Theory of Gravitation*, M. Edwards, ed., published by C. Roy Keys Inc. in Montreal. Subject matter is the fundamental nature of gravitation and its physical mechanism. $25+S&H
- *Gravity*: CD containing presentations and papers on the nature and origin of gravitation. $19+S&H
- *Evolving Mars*: CD containing a collection of photographic anomalies on Mars. $19+S&H
- *A short tour of the universe*: CD containing slides of spacecraft/space telescope photos of planets, moons, asteroids, comets, galaxies, and other exotic objects. Also useful for public lectures. $19+S&H
- *EME Notes Master Volume*: CD containing ~2000 notes with short summaries and pointers to noteworthy papers in the journals, especially those representing puzzles or anomalies or bearing on Meta Science. $25+S&H
- S&H: For each book ordered, add $2.50 for book-rate shipping (USA), $5 for first class (USA and Canada), $9.50 for global priority to other Western Hemisphere or Europe, or $15 for airmail to other countries. Add 20% of the book amount for each CD.
- A CD containing all 15 MRB volumes (60 issues) from 1992-2006 is also planned, and will be announced at a later date.

Payment methods include mailed checks, credit cards (Visa/MasterCard/Discover/American Express, include expiration date and security code); and on-line payments via PayPal.com (to <tomvf@metaresearch.org>). You can also pay for Memberships or make purchases, including back issues of MRB, at our secure on-line store at http://metaresearch.org/home/store/advanced/default.asp.

META RESEARCH

Meta Research, Inc. is a scientific non-profit 501(c)(3) corporation run by a 7-member Board of Directors. It was founded in 1991 in response to the broad problem of getting support to do research on promising but unpopular alternative ideas in astronomy that have trouble getting funded from the usual sources. The organization supports and encourages research or observations in connection with astronomical theories that are in accord with observations and experiment, add insight or understanding, and make testable predictions; but that are not otherwise supported solely because they lie outside of the mainstream of the field of Astronomy.

The name "Meta" (pronounced with a short "e") comes from the dictionary meaning of that prefix: "later or more highly organized or specialized form of; more comprehensive; transcending; used with the name of a discipline to designate a new but related discipline designed to deal critically with the original one."

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Our office hours are 9 a.m. to 6 p.m. Pacific Time. Our expeditions are led by Meta Research astronomers. For eclipses, we go to near the edge of the path of totality, where the view is most spectacular. Plans for future expeditions are on hold. Check the "Expeditions" tab at our web site, or go directly to <http://eclipseedge.org>, to learn of such plans, which may develop on short notice because of the complexities of the present world situation, or because of unexpected astronomical developments.

AUTHOR INFORMATION

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