CHAPTER TWENTY TWO
The Remarkable Moons of Mars

In order to ensure the celestial context of his Flying Saucer, Swift was given information that would make any thoughtful person reflect seriously on the significance of his revelation.

The occupants of that seraphic craft told him about two peculiar moons orbiting the planet Mars. As Swift put it:

> They have likewise discovered two lesser stars, or satellites, which revolve about Mars, whereof the innermost is distant from the center of the primary planet exactly three of his diameters, and the outermost five; the former revolves in the space of ten hours, and the latter in twenty-one and an half; so that the squares of their periodical times are very near in the same proportion with the cubes of their distance from the center of Mars, which evidently shows them to be governed by the same law of gravitation, that influences the other heavenly bodies.
>
> From the *Voyage to Laputa*,

This is one of the most famous, curious, and precise predictions in the annals of science.

The amazing nature of the prediction is contained in the fact that the two satellites of Mars were not known to the world for another one hundred and fifty years. They were not discovered until Asaph Hall saw them through the 26-inch refracting telescope at the Naval Observatory in Washington, DC in 1877.

Because of their very small size no earth-bound telescopes large enough to see them existed until 1848, when the 26-inch was built. It had sufficient light gathering power, and magnification to make such discovery.

Swift's prediction of the two Martian moons is so startling the scholarly and scientific worlds sought ways to deny its significance.

The unique nature of the satellites is found in the words of William Sheehan in *The Planet Mars*, the University of Arizona Press, Tucson, 1996.

> Swift's prediction is surprising in that he not only had the number of moons right, but he also placed them close to the planet - the distances of the actual Martian moons are 1.4 and 3.5 diameters (2.8 and 7.0 radii) of Mars, compared with 3 and 5 as given by Swift. One would almost be tempted to think that Swift obtained an actual glimpse of the

> moons through a telescope, were it not for the fact that there was no telescope at the time anywhere close to being powerful enough to show them.
>
> . . . After the proper discovery of the satellites by Asaph Hall in August 1877, it was immediately apparent that they were highly unusual objects. Phobos lies at a distance of 9,400 kilometers from the center of Mars, or only 6,000 kilometers from the Martian surface. (Mars as seen from Phobos would be an astounding sight; its disk would subtend an angle of 43°, and it would fill nearly half the sky from horizon to zenith!) The present period of revolution of Phobos around Mars is only seven hours and thirty-nine minutes. Thus it completes three full revolutions in the time that Mars takes to rotate once on its axis - a state of affairs so surprising that Hall at first thought there must be two or three inner moons! Owing to its rapid motion, Phobos rises in the west and sets in the east, and it remains above the horizon for only four and a half hours at a time.
>
> Because its orbital inclination is only about 1°, Phobos, for all practical purposes, lies in the equatorial plane of the planet. It is eclipsed by the planet's shadow 1,330 times every Martian year, managing to escape only for brief periods around the times of the summer and winter solstice. Observers on the Martian surface above 70° north and south latitude would never catch sight of it at all, since it would never clear the horizon.

Note that Sheehan makes the remark "after the proper discovery." Most likely, he felt that Swift's prediction was not "proper."

Due to the lack of telescopes powerful enough to permit discovery prior to Hall's observation, the world concluded that Swift was devising a pure fiction, even though his orbital parameters were so uncanny. The Travels were satire; few believed Swift's stories were more than that. When Hall discovered the satellites many astronomers quickly realized Swift's remarkable prediction. One believed Swift had been divinely inspired. Others, like Camille Flammarion, the eminent French astronomer, referred to it as "second sight," and asserted that the prophets of many religions had been far less accurate. But for most the prediction was shrugged off as a lucky guess.

In order to understand the attitude of the scientific and scholarly community it is necessary to review the background of the Martian satellites.

Their astronomical names, assigned by Asaph Hall, are Phobos for the inner satellite and Deimos for the outer. Curiously, Hall obtained the names from Greek myths for the two steeds pulling the chariot of Aries, the Greek name for the planet Mars. Literally they mean "Fear" and "Terror." Our word "phobia" comes from the Greek root which provides Phobos, and our word "demon" comes from a Greek root which also provides Deimos.

Why did the Greeks believe the planet Mars had two steeds? Did they have knowledge handed down from ancient times but lost to historic record? We do not know. In seeking names for the satellites Hall advertised his discovery and asked for suggestions. A female correspondent, who knew the Greek myths, pointed out this fact, and Hall thereupon gave the two satellites their current names.

The idea that Swift made a lucky guess is based on the arrangement of the planetary satellites in the solar system. Galileo had discovered four satellites around Jupiter in 1610. Cassini had discovered five satellites around Saturn in the period from 1671 to 1684. Except for the Earth moon no other satellites were known in Swift's day. Therefore, as one proceeds outward from the sun, Mercury and Venus had no satellites; earth had one; Jupiter, next in line beyond Mars, was known to have four; Saturn was known to have five. If one takes this sequence and interpolates a number for Mars one should choose two or three. Astronomers believed Swift selected two and thus made his lucky guess.

But Swift was not the first to assign two satellites to Mars. Kepler, the famous astronomer, suggested it in a letter to Galileo in the year 1610, shortly after Galileo made announcement of his discovery of the satellites of Jupiter.

> I am so far from disbelieving the four circumjovial planets, that I long for a telescope to anticipate you, if possible, in discovering two round Mars, as the proportion seems to require, six or eight round Saturn, and perhaps one each round Mercury and Venus.

(For sources see Marjorie Nicolson's paper on *"The Telescope and Imagination,"* in *"Science and Imagination,"* Great Seal Books, Cornell University, Ithaca, 1956.)

Obviously, Swift was not original in assigning two satellites to the planet Mars. He easily could have borrowed the idea from Kepler or from other sources.

Superficially the assignment of guess-work to Swift seems reasonable. But closer examination of his description reveals a number of factors which give serious pause.

1) He is scientifically precise in his statement. Why would a clergyman and writer, a layman in scientific circles, use such exact phrasing in a work of fiction? Even if we grant that his account is a satire on science, he could have satirized in a far less precise manner.

2) He gives explicit values for the orbital periods. Why would he expose himself to ridicule by providing exact numbers?

3) He also gives explicit values for orbital radii. Why would he double his jeopardy in making such assignments?

4) He expresses the Keplerian law of planetary motions to indicate their behavior. No informed scientific reader could easily miss that precision. It seems as though he is inviting close examination of his numbers. Why would he invite scientific scrutiny?

5) The orbital periods given by Swift are considerably below the periods for satellites known in his day. His numbers of 10 and 21.5 hours are far below the 42.5 and 45.5 hours measured by Galileo and Cassini for the most rapid periods then known. Since he was so obviously familiar with the Keplerian laws, and therefore not ignorant of the satellite periods measured by Galileo and Cassini, why would he give numbers strikingly below the range of known values if this were a fiction out of his brain?

6) Hall's measurements of the satellite periods showed that Swift was uncomfortably close to the actual values. This fact, coupled with the previous fact, created a disturbing realization that Swift was doing more than inventing numbers.

The remarkable nature of the satellite prediction has continued to bother the modern scientific and scholarly community, but always their response has been one of disbelief. Carl Sagan, the famous modern astronomer, remarked that Swift's prediction was uncanny. Nicolson and Mohler in *The Scientific Background of Swift's Voyage to Laputa*, also were struck by this uncanny prediction.

> They (the Laputans) have made important discoveries with their telescopes, none more remarkable than that of the two satellites of Mars - which actually remained hidden from all eyes but those of the Laputans until 1877!

Emile Pons, a French authority on Swift and editor of a Paris edition of *Gulliver's Travels*, paid particular attention to this remarkable prediction, pointing out not only the agreement in the number of satellites but also the close agreement with the orbital periods measured by Hall. Nicolson and Mohler included a note in their paper remarking that Pons' also believed Swift had second sight. However, they seemed unperturbed by the remarkable coincidence, maintaining that it was merely a "happy guess."

> It was inevitable that many writers, scientists and laymen, should have raised the question of the satellites of Mars. Our own planet was known to have one satellite; Galileo had discovered four about Jupiter; in Swift's time Cassini had published his conclusion in regard to the five satellites of Saturn. Swift, using no telescope but his imagination, chose two for Mars, the smallest number by which he could easily indicate their obedience to Kepler's laws, a necessity clearly shown him by Cassini; this number fits neatly between the one satellite of the earth and the four of Jupiter. To indicate the Keplerian ratio, he has made one of the simplest assumptions concerning distances and period, that of 3:5 for the distances, and 10 for the period of the inner satellite. It was not a difficult computation, even for a Swift, who was no mathematician, to work out the necessary period of the outer satellite, (3 cubed : 5 cubed = 10 squared : X squared). His trick proved approximately correct — though it might easily have been incorrect.

Why this would be a "trick" Nicolson and Mohler do not explain when it is a simple mathematical calculation. The "trick," of course, is in the uncanny nature of the prediction, but they attempted to reduce it to mere luck. They were unconsciously responding to the impossible chance that Swift would have actual knowledge of the satellites. Thus they could slough off Swift's precise scientific wording, Swift's unusual orbital periods much below the range of known values, and his striking proximity to the values measured by Hall. They saw that his numbers were simple 3, 5 and 10, and hence appeared to be mere "happy guesses."

The following figure illustrates the unusual nature of Swift's prediction.

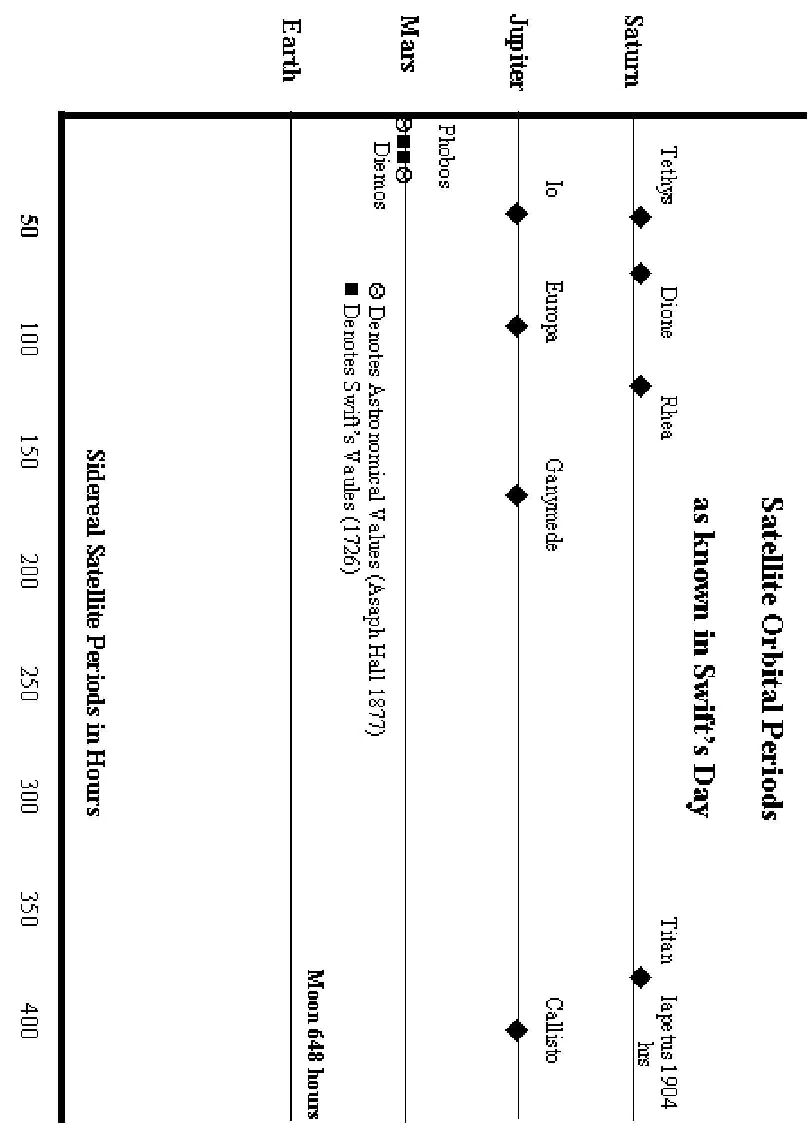
The satellites of Earth, Mars, Jupiter and Saturn are shown with the orbital periods known in Swift's day, except for Mars. For the last I show the periods given by Swift together with the periods later measured by Hall. None of the planetary satellites known to astronomers at that time had orbits faster than the rotation period of the respective planets. Jupiter rotates in 9.8 hours; Saturn in 10.2 hours. Jupiter's Io orbits in 42.5 hours, and Saturn's Tethys in 45.3 hours. Not only did Swift make both satellite periods much shorter than the satellites of the other planets; he had the audacity to make both periods shorter than the rotation period of Mars! This violated all scientific understanding of satellite revolution periods. Men like Newton, who was still alive when Swift published the Travels, would have rejected such inane proposal. This unusual feature, later confirmed by Hall's discovery, is the reason Swift's prediction was so surprising and so disturbing.

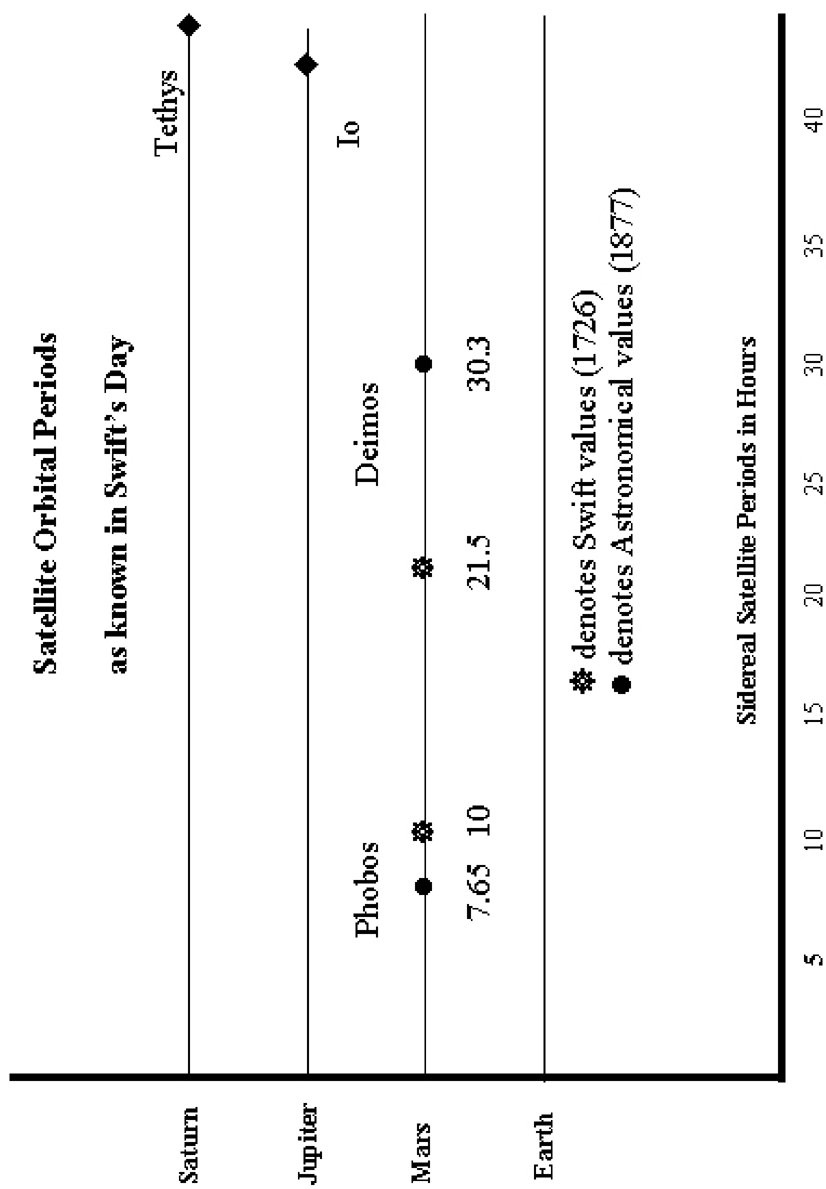
The second figure shows these relationships with the scale expanded to exhibit Swift's periods more clearly.

The fact of these fast orbital periods continued to plague the scientific community. Other scientists were dissatisfied with the cursory treatment given by Nicolson and Mohler. S. H. Gould, in the *Journal of the History of Ideas*, Vol 6 for 1945, pages 91-101, discussed *Gulliver and the Moons of Mars*. He emphasized that Swift's orbital periods were much shorter than we would expect if merely from Swift's imagination. But to show that Swift was merely guessing he looked elsewhere for denial.

Gould investigated the planetary mass and calculated the value necessary for Swift to provide such orbits. He concluded that Swift was in great error on the mass and density for Mars, and therefore did, indeed, merely make a lucky guess. He thus wrote Swift off. Unfortunately, Gould also made a surprising blunder.

In order to understand Gould's approach we must examine the history of the development of satellite equations, and Sir Isaac Newton's contribution to our understanding of the laws of planetary motion. Kepler, using the wealth of accumulated observations he had inherited from Tycho Brahe, devised the relationship between the square of the orbital periods and the cube of the distance from the center of the planetary body. This explained how planets move around the sun, and satellites around the planets, but it did not provide information on the densities or the masses of the respective bodies. Mathematically it is written as follows:


Satellite Orbital Periods
as known in Swift's Day
Saturn
Jupiter
Mars
Earth
Tethys
Dione
Rhea
Titan
Iapetus 1904 hrs
Io
Europa
Ganymede
Callisto
Phobos
Diemos
⊗ Denotes Astronomical Values (Asaph Hall 1877)
■ Denotes Swift's Vaules (1726)
Moon 648 hours
50
100
150
200
250
300
350
400
Sidereal Satellite Periods in Hours


Satellite Orbital Periods
as known in Swift's Day
Tethys
Io
Phobos
Deimos
7.65
10
21.5
30.3
denotes Swift values (1726)
denotes Astronomical values (1877)
Sidereal Satellite Periods in Hours
5
10
15
20
25
30
35
40
Saturn
Jupiter
Mars
Earth

$$p^2 = 1/k \quad r^3$$

where “p” is the orbital period, “k” is the Keplerian ratio, and “r” is the distance of the satellite from the center of the planet in planetary radii (normalized radii).

For reader convenience, the table shows the planet and satellite values for the Moon, and two satellites each of Mars, Jupiter and Saturn.

Planet	Satellite Distance From Planet (km)	Ratio of Satellite Distance to Planet Radius (r)	Period in Hours (p)	$(r)^3$	$(p)^2$	Kepler's Ratio** (1/k)
EARTH						6,378 km radius
Moon	384,400	60.27	655.00	218,929.14	429,025.00	1.96
MARS						3,398 km radius
Phobos	9,380	2.76	7.65	21.02	58.52	2.78
Deimos	23,500	6.92	30.30	331.37	918.09	2.77
SWIFT MARS						
Phobos		3.00	10.00	27.00	100.00	3.70
Deimos		5.00	21.50	125.00	462.25	3.70
JUPITER						71,398 km radius
Io	422,600	5.92	42.50	207.47	1,806.25	8.71
Europa	670,900	9.40	85.20	830.58	7,259.04	8.74
SATURN						60,330 km radius
Tethys	294,670	4.88	45.30	116.21	2,052.09	17.66
Dione	377,420	6.26	65.70	245.31	4,316.49	17.60

Note that I converted Swift's “diameters” into “radii.” I shall explain in a moment.

From Galileo's and Cassini's measurements Kepler's ratio was known to be constant for each planet, but different from planet to planet. This may be seen in the Table. Clearly the “1/k” ratio increases with increasing planetary distance from the sun.

Calculation of the "1/k" ratio for Mars from Swift's numbers was simple. If Swift meant radii instead of diameters, the value was 3.7. If he meant diameters instead of radii the value was 29.6.

Note that 29.6 far exceeds all other values for Kepler's ratio.

Newton reasoned that "k" contained a value for the planetary mass, or was a measure of how much the planet pulled on the respective satellites to keep them in orbit around the parent body. Newton also reasoned that when the Solar System was being formed a primeval solar mass went into circular rotation, spewing out fragments of matter into a spiral pattern which later condensed into the several planets, thus providing a mechanism which keeps them moving in the ecliptic plane yet today. Newton reasoned further that the heavier elements would fly away from the sun less than the lighter elements, and therefore, that planets closer to the sun would be more dense. From this line of reasoning Newton then developed his concept of a universal gravitational constant, and a more rigorous equation for the satellite motions, involving the mathematical constant "Pi," the density of the planet, "m," and the gravitational constant, "G." This refined equation is written as follows:

$$\mathbf{p^2 = (4\ Pi^2 / G\ m)\ r^3}$$

Newton had proposed that Mars should be about three times more dense than Jupiter, based on distances from the sun. Swift should have been well aware of the mass proposed by Newton, since he demonstrated excellent knowledge of the satellite equations, an indicator that he was well informed scientifically. Gould reasoned that if Swift were attempting to stay within the range specified from Newton's theory he would have provided suitable numbers. Swift should have given ratios that would fit with Newton's scheme of successively smaller densities as we proceed outward from the sun.

Immediately apparent is the fact that if Swift meant radii instead of diameters the value of 3.7 would fit the sequence for the "k" values as one proceeds outward from the sun. If Swift meant diameters the "k" value is completely awry, being much larger than even the value for Saturn.

We know that Swift associated with some of the best scientific minds of the day. He was a close friend to John Arbuthnot, physician to Queen Anne, and a member of the Royal Society. Swift could easily have checked with experts on the mathematical elements to make his statements precise. Since he was well informed scientifically, and certainly knew the "k" values for the Earth, Jupiter and Saturn, why did he use numbers which would be so extraordinarily out of increasing sequence, if he meant diameters instead of radii?

Scholars proposed that this simple test against Kepler's equation should be enough to show that Swift did not know what he was doing. He certainly knew that satellite equations were stated in radii, and not in diameters. But how could he make such an elementary blunder, and ruin his mathematical precision, when he was so amazingly close to every other element in this astonishing prediction? No wonder astronomers questioned Swift's values.

Gould went further.

If he used Newton's equation containing an expression for the mass of the planet, and assuming that Swift meant diameters and not radii, he could compare the values of "m" for Jupiter and Saturn against Swift's "m" value for Mars. If Swift had really made a valid prediction the mass of Mars should be about three times that of Jupiter, as Newton had predicted. In Gould's words:

> We may illustrate from the tables of Jupiter at the beginning of the second book of the *Principia*. Adopting Swift's phraseology we have: "the innermost satellite is distant from the center of Jupiter two and five-sixths of his diameters and the second four and a half; the former revolves in the space of forty-two and a half hours, and the latter in eighty-five and a quarter." For the first moon we therefore divide the cube of two and five-sixth by the square of forty-two and a half. The result is almost exactly equal to one-eightieth. For the second moon we divide the cube of four and a half by the square of eighty-five and a quarter; this again, as expected, gives one-eightieth . . . Thus Kepler's ratio for Jupiter, which we may call the Jupiter-ratio, is equal to one-eightieth.

Gould was being fair with Swift by using the numbers known to Swift from Newton's *Principia*, which differ somewhat, but not much, from the values we know today. The above Table shows "k" values calculated from current knowledge. Compare Gould's numbers with the Table.

Gould was attempting to put the values for Jupiter on the same footing with Swift's numbers, by changing everything over to diameters, and not radii.

If we follow this line of thought, Kepler's ratio for Mars is 29.6. The ratio for Jupiter from Gould's reasoning is 79.4. The ratio of these two numbers is 2.68, very near the value of 3.0 predicted by Newton.

So what was Gould's problem?

He made two elementary blunders. He was tricked by Swift's verbal method of description. He took that method and applied it to the satellites of Jupiter and Saturn. The trick was in Swift's use of the word diameters rather than radii.

To calculate Kepler's ratio, using diameters rather than radii, Gould divided the orbital radii of the satellites of Jupiter and Saturn by two. (He supposedly used Swift's diameters directly.) Thus he changed Newton's 5 2/3 for Io to 2 5/6, and Newton's 9 for Europa to 4 1/2. This gave him a ratio eight times the true value. ($1/2^3$ =1/ 8.) That is how he obtained his value of 1/80. But he went in the wrong direction. He should have doubled the radii to obtain the diameters, not cut them in half. That was the first blunder.

Secondly, he compared the mistaken calculations for Jupiter against the values for Mars, where he used radii instead of diameters. That was the second blunder. Therefore, when he calculated the value for Mars he obtained 3.7, as I show in the tabulation, based on radii. When he then compared the two values, the 1/3.7 for Mars using the radii instead of the diameters, and the 1/80 he obtained from ½ the radii for Jupiter, he found the mass of Mars to be twenty-two times as great as that of Jupiter. (3.7/80 = 1/22.) This was so far beyond Newton's theorized values Gould concluded that Swift's numbers had to be wild speculation.

I truly do not understand why Gould went to so much trouble, only to confound himself. If he had used diameters for Jupiter he would have obtained 1/1.25. Then if he had taken the diameters for Mars to obtain 1/29.6, and compared the ratio of the two, he would have obtained a ratio of 1/23.7, nearly the same as his 1/22. He would have reached the same conclusion, without making these elementary blunders.

If Gould had calculated using radii for both planets instead of diameters, he would have obtained (3.7/8.72 = 1/2.36) showing again that Swift was close to the mass ratio proposed by Newton.

Clearly, Gould was deeply bothered, so much that he could not keep his thinking straight. He was determined to show that Swift did not know what he was doing.

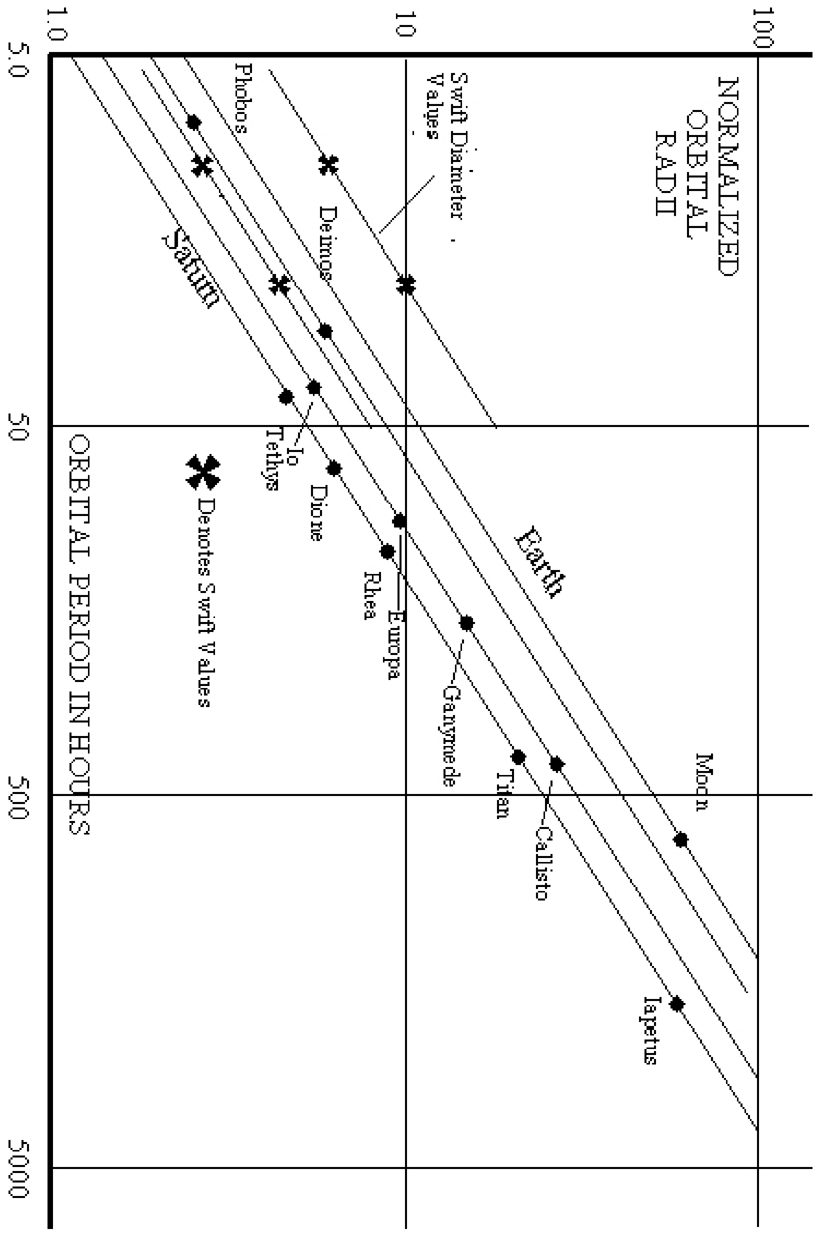
Swift is vindicated. The density for Mars provided by his numbers is 2.36 times the density for Jupiter, not 22 times, if we assume that Swift meant radii when he said diameters.

To show how clever Swift was in his description, I plotted the satellite periods and orbital radii on logarithmic scales. The slope of the lines is 2/3 which, in logarithms, expresses the ratio of a square to a cube. While this is intended for more technical readers it shows how close Swift actually came to the proper density for Mars. The position of the lines on the chart are dependent upon the relative densities, with the Earth to the left, Jupiter to the right and Saturn still further to the right. The astronomically correct line for Mars is shown, together with the line determined by Swift's radii values. It can be seen that Swift was doing far more than dabbling with numbers.

The values based on diameters are shown in the line separated far above the others. Obviously, Swift misled Gould and countless others by his use of the word "diameters," rather than "radii."

At this point the reader is in a position to weigh Swift's prediction. Could Swift have guessed satellite orbits and planetary density so close to the actual values, in violation of, and beyond, knowledge current at the time? In reviewing the history of analysis of Swift's prediction one cannot help but be amazed how the human mind avoids implications it would rather not contemplate. Sagan believed Swift was uncanny in his prediction but did not investigate his context; Nicolson and Mohler avoided a penetrating analysis; Gould entered a deeper analysis but made extraordinary blunders. A most curious chain of circumstances has contributed to a continuing blindness of Swift's prediction.

I am especially surprised that no astronomer has published a similar analysis, with the graphical plot I show. Had they done so, they would have quickly identified Swift's "trick."



SATELLITE ORBITAL PARAMETERS

I shall now examine how Swift may have calculated his numbers. His reason for changing them from radii to diameters is the same as it was for the Flying Saucer. He could not take the risk of exposing himself for his personal safety. The evidence shows that Swift had to know both Kepler's laws of planetary motion and Newton's law of gravitation to provide precise numbers for proper orbital relationships and proper planetary density.

In arriving at his numbers Swift was constrained by something mathematicians call degrees of freedom. Swift obviously was astute enough to obey this constraint. He had to calculate from the following possible assumed data, based on the freedom of choices:

1. Orbital radii from two satellite periods and the "k" factor.
2. Satellite periods from two orbital radii and the "k" factor.
3. Corresponding radius and period from one satellite period, the "k" factor, and the other orbital radius.
4. The "k" factor and one orbital radius from two satellite periods and the other orbital radius.
5. The "k" factor and one orbital period from two orbital radii and the other satellite period. (The condition assumed by Nicolson and Mohler.)

If he chose values for both the orbital period and radius of Phobos, his "k" value became fixed. If he chose another value for the period of Deimos then the orbital radius was determined by the "k" value previously calculated for Phobos.

Let's assume he selected the periods as the easiest place to start his calculation. (Choice #1.) Then he could choose a "k" factor suitable to his plan. From those selections his orbital radii would be determined.

Examination of Swift's numbers shows that the period for Phobos is 30% higher than the astronomical value. 7.65 hours X (1 + 0.3) = 9.95 hours. This value is amazingly close to the period of 10 hours Swift used, within 0.5%. Further examination shows that the period for Deimos is 30% lower than the astronomical value. 30.3 hours X (1 - 0.3) = 21.2 hours. This value again is amazingly close to the period of 21.5 hours Swift used, within 1.5%. Swift had a choice remaining. If we assume he selected the "k" factor we find that his value of 3.7 differs from the astronomical value of 2.78 by 25%: 3.7 X (1 - 0.25) = 2.78.

The remarkable result is seen in the rounded nature of the orbital radii if we assume Swift selected these easy periods and the "k" factor. The cubes of the orbital radii are equal to the product of the square of the periods and the "k" factor: r^3 = k X p^2.

If Swift chose 3.7 for 1/k, and 10 hours for Phobos then r^3 is 1/3.7 X 10^2 = 27. The cube root of 27 is simply 3.

If Swift used 21.5 hours for Deimos then r^3 is 1/3.7 X 21.5^2 = .27 X 462.25 = 124.8 or 125 within less than 0.2%. The cube root of 125 is simply 5.

The amazing aspect is not that Swift manipulated the numbers so easily, but that they rounded off so neatly. We cannot help but wonder how he must have played with the values to find such neat numbers.

Did Swift have the actual orbital data, and some idea of the "k" factor before he started his calculations?

If not, he once again was uncanny in his ability to select such simple numbers. After while, his uncanniness becomes unbelievable.

However, another possibility must be considered. The altered numbers could have been given to him directly by the craft operators, rather than real numbers he later manipulated. They may have been as much concerned for his personal safety as he. Swift may never have known the actual values, but accepted the numbers he was given, probably with the assurance he could publish them safely. Then the calculations were done by his celestial hosts, and not by him.

In all of this uncanny performance we must keep the context properly in mind. We cannot isolate his description of the Martian moons from his account of the Flying Island. When he begins his discussion of the satellites he says *They have likewise discovered . . .* "They" are the occupants of the Flying Island. "They" told Swift about the two Martian satellites. "They" were occupants of a seraphic craft alien to this world, a perfect saucer-shaped object, which could hover in the air, and go into progressive motion as "they" pleased.

From this examination we can better understand why Swift used a satirical context for his story.

We must consider social conditions. Many today reject reports of flying objects, or that they are intelligently controlled by beings who come to this earth from other places in the universe. Most individuals, in order to avoid social condemnation, hesitate to admit that they have seen strange objects in the sky. How then with Swift? Would not a description presented as serious truth have done him irreparable damage? He could not report these experiences as actual fact.

Consider the astronomical response to the history of Swift's prediction. Suppose he gave exact values for the orbits. If they had been discovered during his lifetime it would immediately become known that he knew the exact values. It could not have produced anything but extremely difficulty for him, even to the point of being accused as an agent of the Devil. It was better to obscure the numbers.

On the other hand one might argue that our Visitors were able to perceive social and scientific developments. Then the numbers would reflect some other concern for inadvertent discovery. Perhaps "they" wanted the numbers to remain obscure until a more appropriate time of discovery. Perhaps "they" clouded everyone's mind. Perhaps the numbers were intended to be an integral part of the revelation of the Flying Island. Then the nature of the numbers takes on an altogether different cast.

We should not neglect this possibility. We should take serious regard for the intelligence and foresight of beings who come here from the heavens.