

THE "FACE ON MARS" - FOUR DECADES LATER

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Abstract

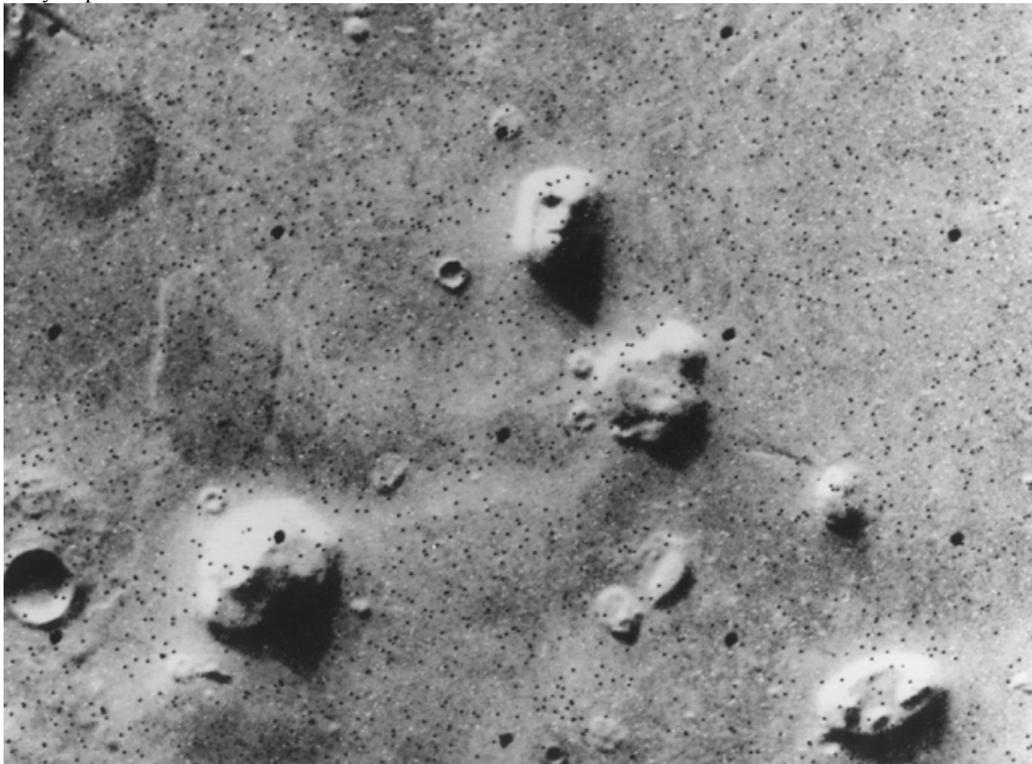
The anomalous characteristics of the so-called "Face on Mars" feature, as seen in the 1976 Viking image, were debunked 20 years ago by reference to a 1998 image taken by the Mars Global surveyor. However ten years later, in 2008, a far superior image was obtained that shows details consistent with the original of 1976. By means of side-by-side comparisons, we show how this 2008 image gives an improvement in identification of the allegedly anomalous details.

Introduction

It is over 40 years since the Viking orbiters photographed an unusual formation in a region of northern Mars known as Cydonia. When an image published in 1998, processed by MSSS (Malin Space Science Systems) effectively gave the 'kiss-of-death' to further study of the feature known as the "Face on Mars", many researchers decided to leave the matter alone. However, in 2008, two MRO (Mars Reconnaissance Orbiter) context camera (CTX) photographs were released but apparently not seriously studied until now. This is a discussion about the facial features within one of the CTX images of 2008.

On the 31st July 1976, the National Aeronautics and Space Administration (NASA) issued a Press Release which stated the following: "NASA VIKING NEWS CENTER, PASADENA, CALIFORNIA PHOTO CAPTION Viking 1-61, P-17384 (35A72)

This picture is one of many taken in the northern latitude of Mars by the Viking 1 Orbiter in search of a landing site for Viking 2. The picture shows eroded mesa-like landforms. The huge rock formation in the center, which resembles a human head, is formed by shadows giving the illusion of eyes, nose and mouth. The feature is 1.5 kilometres (one mile) across, with the sun angle at approximately 20 degrees. The speckled appearance of the image (including the nostril) is due to bit errors, emphasized by enlargement of the photo. The picture was taken on July 25 from a range of 1873 kilometers (1162 miles). Viking 2 will arrive in Mars Orbit next Saturday (7 August 1976) with a landing scheduled for early September."



[Figure 1 - Frame 35A72 - "HEAD". Taken from nearly overhead with a low afternoon Sun angle, indicated by the long shadows.]

The number 35A72 was a reference to Viking 1 image 35A72, the seventy-second photo taken by the 'A' camera during orbit 35, captured on the 25th July 1976 (Figure 2). The feature, "which resembles a human head" was discovered by Dr. Tobias Owen and became famous as "The Face on Mars". It's discovery is well documented in the book, *"The Search For Life In The Universe"*, by Donald A. Goldsmith and Tobias Owen. (Ref. 1) In the ensuing years, the feature - captioned 'human head' and related anomalies have received detailed study by several authors and have been referenced in various publications. [Ref. 2 - 16]. A later image of the same facial feature was found on Viking 1 Frame 70A13, taken on 30th August, 1976 during orbit 70. See figures 2 and 3 below.



The Face on Mars from Viking frame 35A72 processed by Mark Carlotto, showing teeth in the mouth area. This was published in 1988 in Applied Optics (Ref. 7)

[Figure 2]

The images, upon enhancement, appeared to show teeth-like features in the mouth (see Fig. 2 above). In other words the formation, upon enhancement of two distinct images, appeared to look more artificial. It would be twenty-two years before the feature was re-examined at higher resolution.



The Face from Viking frame 70A13 processed by Mark Carlotto. This was also published in 1988 in the journal Applied Optics (Ref. 7)

[Figure 3]

Events in 1995

In the meantime the question of the 'teeth' in the Face was addressed in more detail by NASA itself. In 1995, Malin Space Science Systems, responsible for the Mars Global Surveyor (MGS) Orbiter Camera (MOC), published an online article called "The Face on Mars", which discussed the results of image enhancements, such as bit-error correction, contrast and brightness adjustment, resampling and sharpening of digital images using bicubic interpolation, *including a cautionary tale about 'teeth in the mouth'* which had been reported earlier in conjunction with the 35A72 and 70A13 images.

These statements can be read at the following links :

<http://www.msss.com/education/facepage/vikingproc.html>

http://www.msss.com/mars_images/moc/4_9_histo_release/index.html

Events in 1998

In 1998 an image was acquired by the Mars Global Surveyor (MGS) that made the issue of facial features more or less moot. On 6th April 1998, amidst a fanfare of publicity, NASA and Malin Space Science systems released an image of the face taken by the MGS Mars Orbiter Camera (MOC). The result was later posted here:

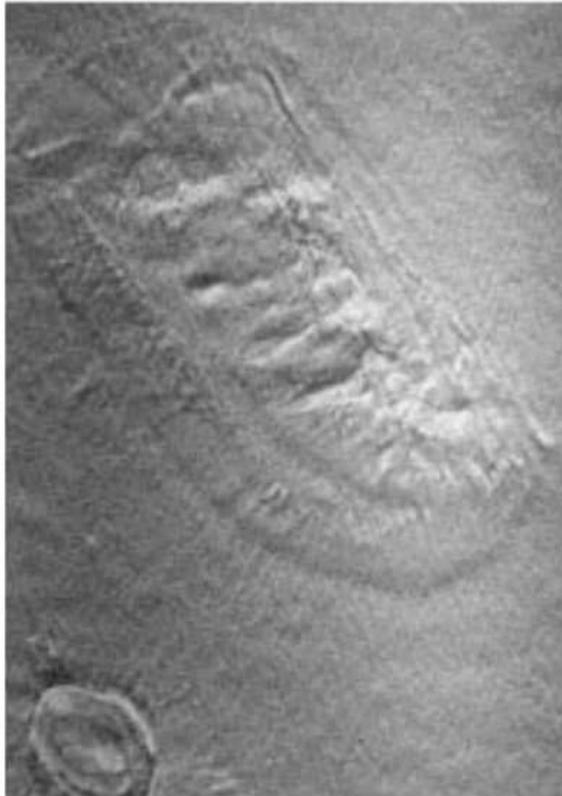
http://www.msss.com/mars_images/moc/4_6_98_face_release/index.html

MSSS stated in 1995:

"First, given the interest in the general public about the "Face," it is appropriate to acquire such images for public relations purposes, especially since the public interest has been generated in no small way by the people who claim there is a conspiracy at NASA to withhold information from the public. Second, there are valid scientific reasons to examine landforms in the area (which, after all, is why the Viking spacecraft were photographing the area in the first place)."

MSSS stated: in 1998

"As can be seen, fortuitously, the area imaged was relatively clear, although the lack of surface definition in many nearby areas, and the low contrast of the raw MOC high resolution image, suggests haze or fog over much of the area."



[Figure 4 - NASA release of 5th April 1998 image. Low contrast made this feature look flat, featureless and without three-dimensional depth. The lack of tonal detail is surprising.]

Malin Space Science Systems (MSSS) stated that image processing had been applied to the image in order to improve the visibility of features. This processing included the following steps:

- 1) The image was processed to remove the sensitivity differences between adjacent picture elements. This removed the vertical streaking.
- 2) The contrast and brightness of the image was adjusted, and "filters" were applied to enhance detail at several scales.
- 3) The image was then geometrically warped to meet the computed position information for a mercator-type map. This corrected for the left-right flip, and the non-vertical viewing angle (about 45° from vertical), but also introduced some vertical "elongation" of the image - for the same reason that Greenland looks larger than Africa on a mercator map of the Earth.
- 4) A section of the image, containing the "Face" and a couple of nearby impact craters and hills, was "cut" out of the full image and reproduced separately, as seen above and below.



1976 Viking image at 47 m/pixel | 1998 MOC image at 4.3 m/pixel
Distance to camera - 1500 km | Distance to camera - 444 km

[Figure 5 - Viking Frame 35A72 alongside the MOC image acquired on 5th April 1998]

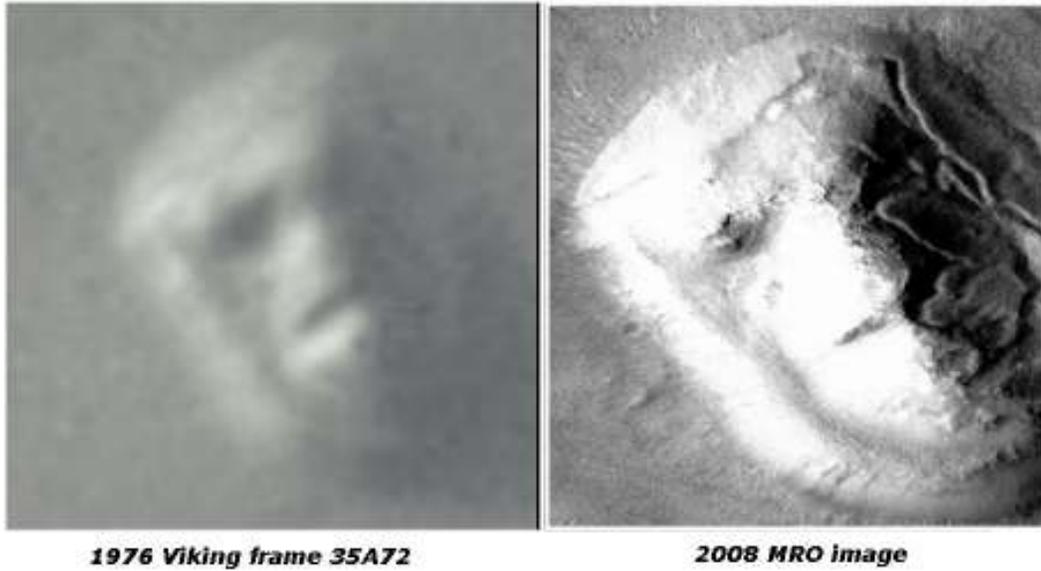
Notice how much more detail appears to be implied in the older, lower resolution image of 1976, compared to the 1998 release issued by MSSS.

Image taken in 2008

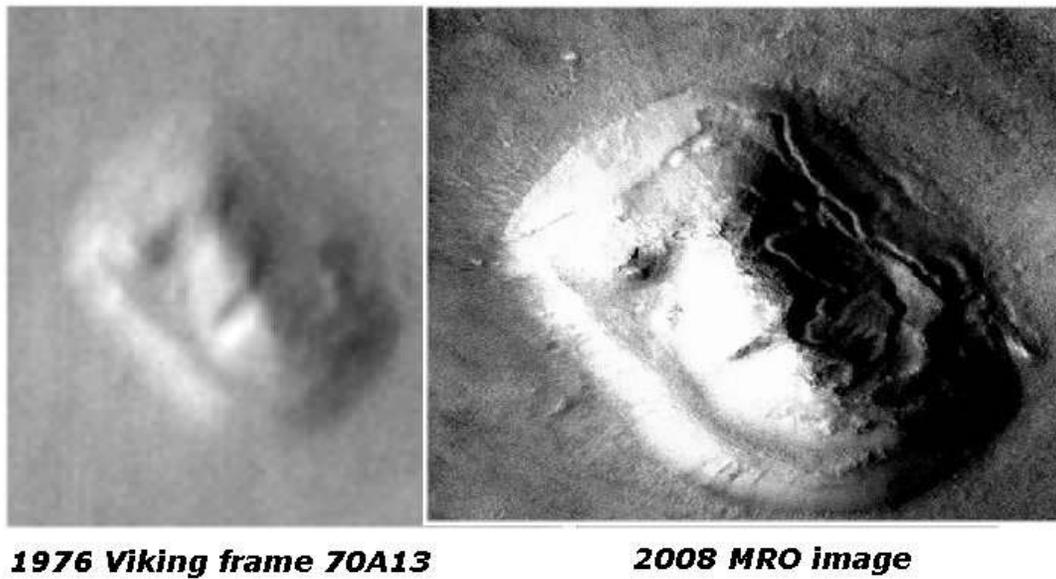
Shown below, is the MRO CTX image: B01_010143_2216, acquired on 24th September 2008, from a distance of just over 311 km. This image has not been processed and is presented here as obtained from the MRO HiRise website. (The incidence and emission angles are shown in Table 1.) It shows clearly an 'eyeball' in the eye cavity and 'teeth' in the mouth area.

<p>Center Lat 41.68; Center Lon 350.77 Local time 15.31 Incidence angle 47.95; Emission angle 18.08 Image Skew Angle 90.2; Phase Angle 65.97 Slant Distance 311.29 km Image Acquisition Time 2008-09-24 T20:34:48.242 Scaled Pixel Width 6.53 m Image ID: B01_010143_2216_XN_41N009W</p>
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[Table 1 - Ancillary data for CTX image acquired on 24th September 2008 by MRO]

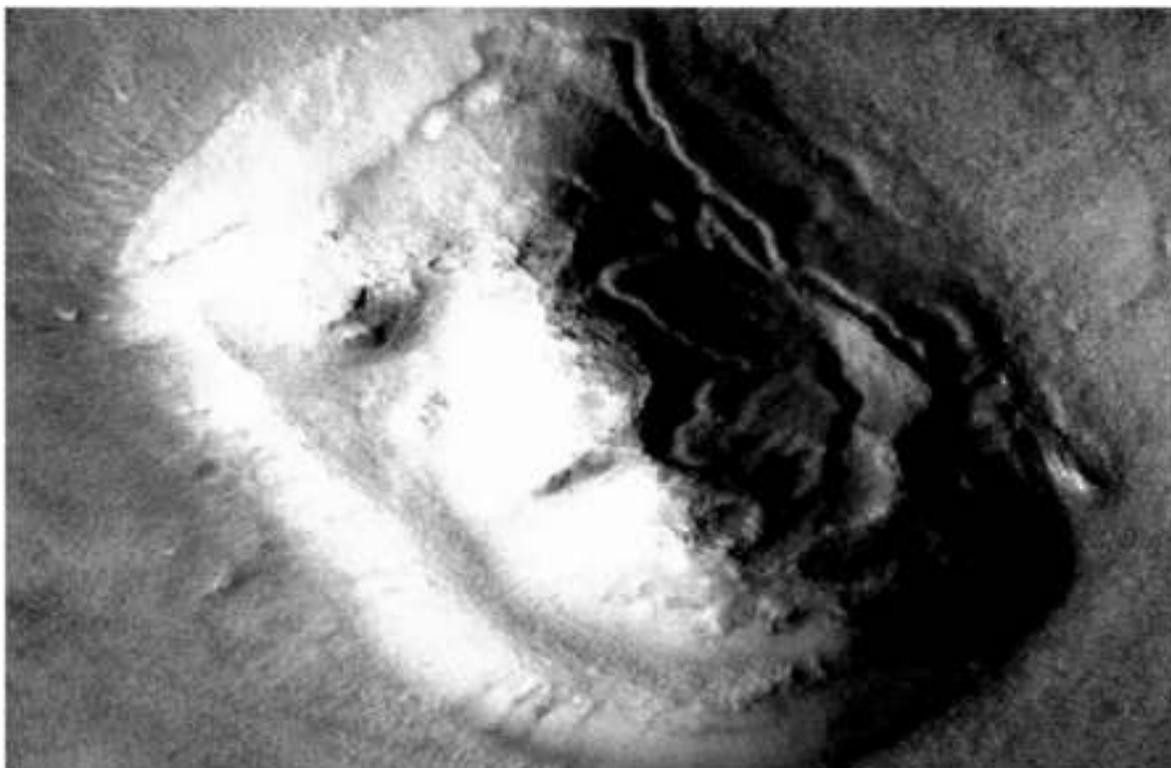


[Figure 6 - Comparison of 1976 Viking frame 35A72 with 2008 MRO CTX image B01_010143_2216]



[Figure 7 - Comparison of 1976 Viking frame 70A13 with 2008 MRO CTX image B01_010143_2216]

[All images courtesy of : NASA/MSSS (Malin Space Science Systems)/JPL (Jet Propulsion Lab)]

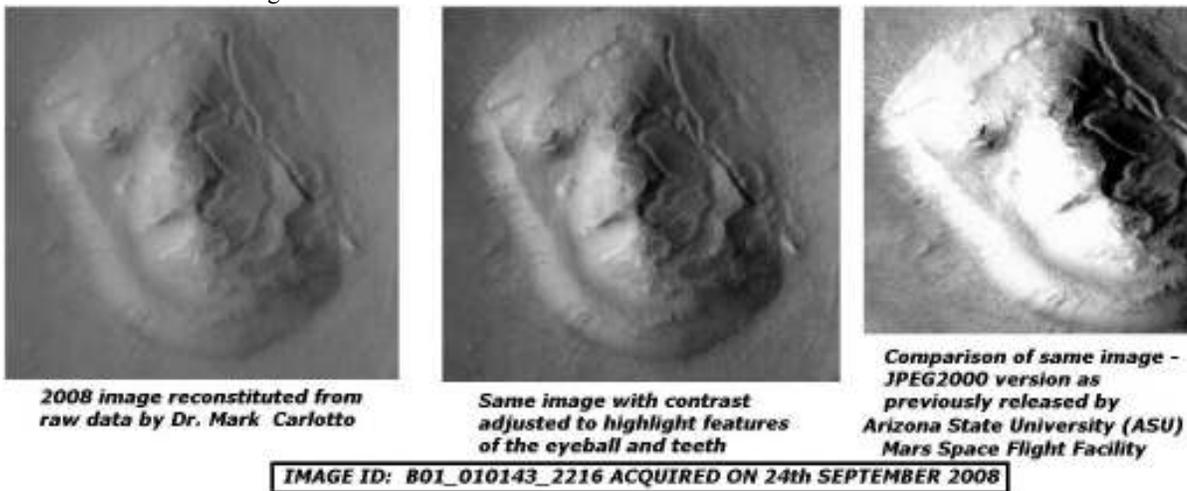


[Figure 8 - An enlargement of 2008 image B01_010143_2216]

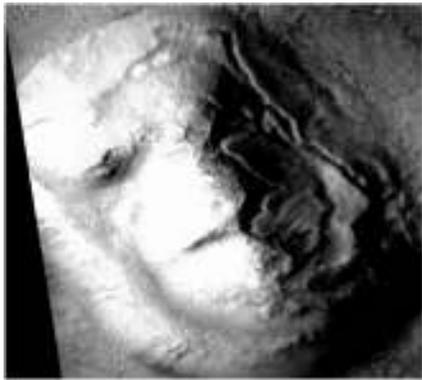
Reconstruction of the Face on Mars by Mark Carlotto

A 3-D reconstruction of the feature was performed using a technique known as shape-from-shading. <https://intelligentgadgets.us/docX/sfsx.shtml>

A 3-D reconstruction of the face allows one to view it at different angles and orientations. Furthermore it allows one to construct time-dependent orientations so that one can imagine how the face would look to a viewer flying around the face at various positions. Shape-from-shading (also known as photoclinometry) is a method for estimating the shape of an illuminated surface from its image. For a surface of constant albedo, the brightness at a point is related to the gradients at that point by the bi-directional reflectance function. An elevation map can be estimated by integrating gradient information in the direction of the sun. The elevation map is used to re-project the original image so that it can be viewed from other look angles.



[Figure 9 - Comparison of raw data with contrast adjusted image for September 2008 picture]



**Image taken on 16 August 2008
at 15.35 local time by MRO CTX
Image No: P22_009642_2216**



**Image taken on 24 Septembert 2008
at 15.31 local time by MRO CTX
Image No: B01_010143_2216**

BOTH IMAGES SHOW EYE DETAIL AND TEETH IN THE MOUTH AREA

[Figure 10 - Comparison of two images taken in 2008 by the MRO CTX camera.]

	1976 VIKING 1 frame 35A72	1976 VIKING 2 frame 70A13	1998 MGS MOC 5 April 1998 image 22003	2008 MRO CTX frame 24 Sept. 2008 B01_010143_2216
SUNAZ degrees	294.28	277.04	Not available	174.91
INA degrees	79.93	62.59	25	47.95
S/C AZ degrees	169.05	139.54	Not available	Not given
EMA degrees	10.58	12.42	Not available	18.08
SCM m/pixel	51.73	48.13	4.3	6.53
RANGE km	1873	1725	444	311

[Table 2]

NOTES for Table 2:

- 1) SUNAZ - Azimuth of sub-solar point. Azimuth of (direction to) North, measured clockwise from zero line defined by a horizontal line drawn from the center of the image perpendicular to the right edge.
- 2) INA - Incidence angle, angle between surface normal and direction to sun, measured at the center of the image. (Sun zenith angle).
- 3) S/C AZ -Azimuth of sub-spacecraft point. Azimuth of (direction to) North, measured clockwise from zero line defined by a horizontal line drawn from the center of the image perpendicular to the right edge
- 4) EMA - Emission angle, angle between surface normal and direction to spacecraft, measured at the center of the image. (Spacecraft zenith angle).
- 5) SCM - Image scale; resolution in metres per pixel
- 6) RANGE - Space craft to frame center, distance in km
- 7) MGS MOC - Mars Global Surveyor Mars Observer Camera
- 8) MRO CTX - Mars Reconnaissance Orbiter Context Camera
- 9) JPEG2000 - format for digital images specified by the Joint Photographic Experts Group

General discussion

Astonishing detail in the above images (Fig. 9), including what appear to be teeth in the mouth area, suggest continued study of the "Face on Mars" is essential. If there is a chance that it represents a hominid-type face, then the implications in the SETI are profound. All objects cast shadows. To say that shadows create an "illusion" of eyes and mouth would be incorrect for this image. It is clear though that one side of the facial feature is damaged. At 6.53 meters per pixel, this HiRise image, compared to the near 50 meters per pixel of the 1976 Viking images, portrays a high-resolution photo which shows the true shape of the "Face On Mars". We see an eyeball and teeth without any bicubic interpolation enhancement. This study is as much about facial recognition - as it might be about recognition of an alien artefact on Mars. What does one need to depict a face? An eye, a line for a nose and a mouth would be sufficient - as many advertisers for consumer products have shown.

Previous findings of 'teeth' in the mouth of the face on Mars, by Carlotto and others cannot be dismissed out of hand (Ref. 7). Ananda Sirisena also found teeth in the mouth area during enhancements done to the Viking image 35A72 in the 1990's although the findings were not published at the time. The effect of the 1998 image of the facial feature, released by MSSS, has been to draw mainstream attention away from a feature on Mars that could be of great cultural value to humanity and to our future search for extraterrestrial intelligence. SETI will have to expand away from only a radio-signal search to searching for planetary artefacts as a standard procedure. Perhaps our discovery of ETI may be closer to home than we ever thought possible.

A comprehensive epistemological study was written in 1986 by Randolph Pozos in his book, *"The Face On Mars - Evidence for a Lost Civilization?"* (Ref. 3). The question mark in his question asked - and left it open for future research to provide an answer. Pozos states, "Is the "Face" on Mars a creation of wishful thinking or is it actually our intelligent recognition of something very important?" He reported, "One scientist had an immediate negative reaction to seeing the "Face" on Mars....nothing more should be done on this topic....since it might prove the truth of religion which was, according to his belief system, not possible."

In his book, *Planetary Mysteries* (Ref. 4), Richard Grossinger stated, about an extraterrestrial message, "Actually a face is perfect. Compared to it, the Pioneer plaque is a lot of talk, a rather showy song and dance. Arthur C. Clarke thought of a monolith and that was a good idea. But a face is even better. A face says: if you are smart enough to find me, then you are smart enough to know that I don't belong here.....There couldn't be any more clear statement of: come and see me." The idea of the Face on Mars being a calling card, or even an invitation to take a closer look at the whole region was taken up by other writers. Former astronaut and lecturer at Cornell University, Dr. Brian O'Leary, in his book *"Mars 1999"* (Ref. 5) summarised it thus, "Some scientists argue that intelligent intervention could not have done anything as bizarre as creating a humanoid face on Mars, as this would violate our operating paradigms in the SETI. I believe that such a view is overly narrow and that all reasonable inquiries into possible manifestations of extraterrestrial intelligence are worth pursuing."

Visceral reactions to the face on Mars exist even today, forty years after the discovery by Tobias Owen. When Viking project scientist Gerald Soffen had shown the print of the Face in 1976, to the press corp assembled at JPL, he had said, "Isn't it peculiar what tricks lighting and shadow can do. When we took a picture a few hours later it all went away; it was just a trick, just the way the light fell on it." The truth of the matter was that a few hours after frame 35A72 was taken, Cydonia would have been in total darkness. Richard Hoagland recalls, in his book, *"The Monuments of Mars - A City On The Edge of Forever"* (Ref. 6), "That afternoon so many years ago at JPL, as a group of press passed around copies of the "head" photograph and laughed, someone had jokingly remarked that "the head is to tell us where to land."

Where to land on Mars? Strangely enough, one of the places initially chosen for one of the Viking landers to settle on the Martian surface was Cydonia - but it was not to be. The Viking 1 Lander touched down in western Chryse Planitia. Viking 2 landed about 200 km west of the crater Mie in Utopia Planitia. Both landers conducted three experiments each, in the search for microbial life, Pyrolytic Release (PR), Gas Exchange (GEX) and Labelled Release (LR). Each carried a Gas Chromatograph/Mass Spectrometer (GCMS). The results were surprising and interesting: Viking 1: the GCMS gave a negative result; the PR gave a negative result, the GEX gave a negative result, and the LR gave a positive result.. Viking 2: the results were both surprising and perplexing: the GCMS gave a negative result; the PR gave a positive result, the GEX gave a negative result, and the LR gave a

positive result. The end results were three positive signals for life across the two sites. The GCMS has been deemed not sensitive enough to detect organic compounds; a reinterpretation of the results now suggests the samples did contain organics but the results were not understood because of the strong oxidation effects of perchlorate, a salt now known to be found in Martian soils. This fact was reported in *Journal of Geophysical Research*, 115, E12010, in 2010.

The extraordinary image processing work done by Mark Carlotto in 1988 and published in "*Applied Optics*" (Ref. 7) showed the eye detail and teeth in the mouth as shown above in Figures 2 and 3. The 2008 images captured by the MRO confirm these details, predicted by Carlotto in 1998, ten years earlier.

The Journal of Scientific Exploration, in 1991, published a paper by Vincent DiPietro, Greg Molenaar and John Brandenburg espousing *The Cydonia Hypothesis*. The abstract read, "Evidence suggesting a past humanoid civilization has been found at several sites on Mars. In particular, what appear to be large carved faces, with similar details, have been found at two separate sites. Together with geochemical and geological evidence that suggests Mars was once more Earth-like in climate, the images of the objects support the Cydonia Hypothesis: that Mars once lived as the Earth now lives, and that it was once the home of an indigenous humanoid intelligence."

In 1999, four members of the Society For Planetary SETI Research (SPSR) presented finding ice in craters in Cydonia. Harry Moore, John Brandenburg, Steve Corrick & Ananda Sirisena showed photographic evidence indicating ice within craters at a meeting of the American Geophysical Meeting in the spring of 1999. (Ref. 12) NASA confirmed water ice on Mars on 22nd November 2016, reported by JPL here: <https://www.jpl.nasa.gov/news/news.php?feature=6680>

A book by Laurence Bergreen (2000) - *Voyage To Mars: NASA's Search For Life Beyond Earth* (Ref. 14) adopted a sceptical outlook. He stated, "The Face, as everyone knows, is unworthy of discussion." That is not a correct statement. He continues, "A tenacious little community of conspiracy buffs considers this ordinary rock formation to be evidence - heck, it's *proof!* - of intelligent life on the Red Planet, the handiwork of an ancient, lost civilization, and any new data from NASA concerning the face is sure to attract their unwelcome attention". Despite these harsh words from Bergreen, we show here that the new data from the MRO are indeed worthy of further scrutiny. Unwelcome or not, scientists do follow the evidence, wherever it leads. The authors of this paper feel that the face is worthy of continued study.

One author who has been terribly influenced by the MSSS issue of the flimsy 1998 image is Ben Bova. In his 2004 book, *Faint Echoes, Distant Stars - The Science And Politics Of Finding Life Beyond Earth* (Ref. 18), he writes, "Mars Global Surveyor took up orbit around the red planet on September 12, 1997 and began mapping the surface in unprecedented detail. As far as the public is concerned, however, its biggest achievement was something of a letdown. In 1976, one of the thousands of photos that the Viking orbiters had taken showed a rock formation that looked uncannily like a human face. Some enthusiasts, including many UFO aficionados, leaped to the conclusion that intelligent Martians had carved a monument similar to the carvings on Mount Rushmore. Skeptics wondered how Martians could carve a likeness of a *human* head, but the enthusiasts began to see not only "the face" in Viking photos but pyramids and whole cities, as well. Global Surveyor's sharper cameras showed that "the face" on Mars was actually nothing more than a heavily eroded mesa. The enthusiasts were not pleased." At least, Ben Bova does not deny that the massif *does look uncannily like a face*, unlike many others who have denied that it looks like a face and have suggested that one can "see things" that do not exist. What Bova's opinion will be to the 2008 images should prove to be rather interesting. Notice the statement, "as far as the public is concerned." Is Ben Bova not a member of the public? Is he not a member of the human race?

In 1979, three years after the Viking orbiters and landers, a daring suggestion was made in a paper by Hiromitsu Yokoo & Tairo Hoshima (1979) - "*Is Bacteriophage ϕ X174 DNA A Message From An Extraterrestrial Intelligence?*" *Icarus* 38, 148-153. Here was a forward-looking attempt to consider the galactic effects of panspermia.

The extensive mathematical analyses done by Stanley McDaniel and Horace Crater concerning the mound configuration in Cydonia also need to be factored in, as the mounds are in close proximity of the face. (Ref. 10, 11, 13, 15, 16)

Conclusions

The focus on the search for extraterrestrial intelligence has been almost exclusively in terms of radio SETI. Today pSETI (planetary SETI) investigation is increasingly argued as a subject for scientific study. There have been recent suggestions by scientists in the journal "Nature" that in addition to monitoring for radio signals, SETI should consider the possibility that unmanned robotic probes, sent from distant star systems, might be present (or might have been positioned a long time ago) within the solar system [Ref. 19]. Indeed, in their letter to Nature, Rose and Wright state: "If extraterrestrial civilizations existed within a few tens of light years, radio could be used for two-way communication on timescales comparable to human lifetimes (or at least the longevities of human institutions). Here we show that if haste is unimportant, sending messages inscribed on some material can be strikingly more energy efficient than communicating by electromagnetic waves. Because messages require protection from cosmic radiation and small messages could be difficult to find among the material clutter near a recipient, 'inscribed matter' is most effective for long archival messages (as opposed to potentially short "we exist" announcements). The results suggest that our initial contact with extraterrestrial civilizations may be more likely to occur through physical artefacts—essentially messages in a bottle—than via electromagnetic communication".

The surface of our neighboring planet Mars, should have an equal claim on our attention in this respect. And what better way of 'inscribing matter' than by creating a depiction of a face into rock, as has been done through the ages by numerous cultures on Earth, of which Mt. Rushmore is only one example? A face carving is a sign of the intelligence behind the carving, albeit as an art form. Details within the artwork can reveal more about the civilisation of the creators. Processes of erosion can indicate how ancient the piece might be. At the moment, guessing the age of surface features on Mars has been difficult, as any planetary scientist would admit. Some features have been dated from a million to a billion years. Changes have also been seen lately, occurring within a few years of each other.

A 3-D reconstruction of the "face" from image *B01_010143_2216* was done by Mark Carlotto from the raw data, without any contrast adjustment. [20]. The viewer will notice the clarity of the entire feature and the detail in the eye area. This 3-D reconstruction effectively creates a rapid, two-second flyover of the massif in Cydonia. The technique used, known as photogrammetry, essentially creates a 'shape' from the 'shading' on the massif, using proven and tested algorithms.

A contrast-adjusted rendering of 83 frames from Carlotto's 3-D reconstruction was encapsulated by Ananda Sirisena into a one-and-a-half-minute film. [21] One can clearly distinguish separate 'teeth' in the mouth area as well as striking detail within the eye cavity which could possibly change with time, orientation, Sun angle and spacecraft elevation. There is even a hint, that were it not for the apparent damage to the left side of the face, the mouth continues along the side in darkness, the left side of the face. This short film vindicates the processing results pioneered by Mark Carlotto and published thirty years ago, in 1988. (Ref. 7)

Details within the eye structure of the face on Mars were first reported by Vincent DiPietro and Greg Molenaar in their missive, "Unusual Mars Surface Features" (UMSF), first published in 1982 (Ref. 2). The 'Starburst' pixel interleaving technique described in UMSF delineated an eyeball in the eye cavity and is a tribute to early image enhancement techniques. Whilst image processing techniques have moved on in the last twenty to thirty years, it is correct to say that one cannot extract more information than is present in an image to begin with. Images do contain a wealth of information encased within them and we can extract those fine details with the best of image enhancements, including 3-D reconstruction.

As we discover more and more planets outside of our solar system, the paradoxical question of "Where are all the galactic travellers?" comes back to haunt us since Enrico Fermi raised the query in 1950. Humanity needs to be prepared to study not only microbial life on other planets in our system and their satellites but also the possibility of artefacts left by life-forms which may have evolved from such basic life. There have been no "search-for-life" experiments on Mars since the Viking landers of 1976. The fact that three experiments conducted with Martian soil returned 'signals for life' at both Viking lander locations has been carefully brushed under the carpet of chemical obfuscation. We look forward to the next set of spacecraft flying to Mars *to conduct life experiments*, especially those designed by the European Space Agency (ESA).

If there is one cosmic imperative, it is that life survives and evolves in the darkest of niches. Our solar system may have a rich and varied history going back millions and millions of years. There is also the possibility of extra-solar visitors leaving technical artefacts anywhere within our solar system, together with their 'technosignatures' which we might be able to detect, given time and advances in our technological abilities (Ref. 22). It seems that all of our space exploration is conducted based on the *assumption* that there is no ET nearby. Why not change that mental attitude? Let the countdown to Cydonia begin.

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- 21) The Society for Planetary SETI Research (SPSR), has two films (of a few seconds duration) on its website, links below, (in the Film and Video Archive) - titled : "*Face On Mars 3-D Reconstruction*" by Dr. Mark Carlotto. From MRO CTX camera raw data of Image taken on 24 September 2008" <http://spsr.utsi.edu/video/face.html>
- 22) "*Contrast Enhanced 3-D film of the 2008 image of the Face On Mars*" rendered by Ananda Sirisena <http://spsr.utsi.edu/video/facece.html>
- 23) Jason Wright (2017) - *Prior Indigenous Technological Species* -, Astro-Physics, April 2017

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