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Mars in the Schiaparelli–Lowell letters

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Abstract. Mars and its canals were the subject of attentive study by Schiaparelli, and also the main subject discussed in many letters between him and P. Lowell, founder of the Flagstaff Observatory. We briefly summarize the issue and the content of the letters.

Key words. History and philosophy of astronomy - Publications, bibliography - Planets and satellites: individual: Mars

1. Introduction

The scientific life of Giovanni Virginio Schiaparelli has been very intense and many discoveries were made by him. Here we concentrate on possibly the most widely known and recognized study, that of the Mars canals. Schiaparelli began his work on Mars in 1877, almost by chance. But subsequently he spent many nights observing the planet. Schiaparelli's studies on Mars have paved the way to the modern science of the planet. For instance, we still use for the main structures on the surface of Mars the same nomenclature that Schiaparelli used in his maps. At his times, however, the most exciting discovery was that the surface was covered by a number of straight markings that Schiaparelli interpreted as canals. Not everyone was convinced of the reality of the canals, but many researchers found the same structures as seen by Schiaparelli and therefore reinforced his findings. One of the most active of them was Percival Lowell, of which we will describe briefly the life and work, which had with Schiaparelli a short but intense correspondence, mainly on the Mars canals. Possibly, their mutual support in the description of canals and their modification ("gemination") was also the prompt to consider Mars inhabited. At the end of his life Schiaparelli's eyesight was becoming more and more feeble and his ability in drawing less and less. The constant help of Lowell was fundamental for him.

2. The canals

Why did Schiaparelli and Lowell see canals on the surface of Mars? There are a few explanations about optical effects and visual mechanisms, some of them neatly presented at this conference (Berlucchi 2011), but maybe the most driving one was the search for life outside Earth. Mankind is often divided between the anxiety of being the only "intelligent" creature in the whole Universe and the desire of finding someone similar to their self. Many philosophers and scientists have looked for other civilizations, one for all Giordano Bruno: for instance "È dunque l'universo uno, infinito, immobile; una è la possibilità assoluta, uno l'atto, una la forma o anima, una la materia o

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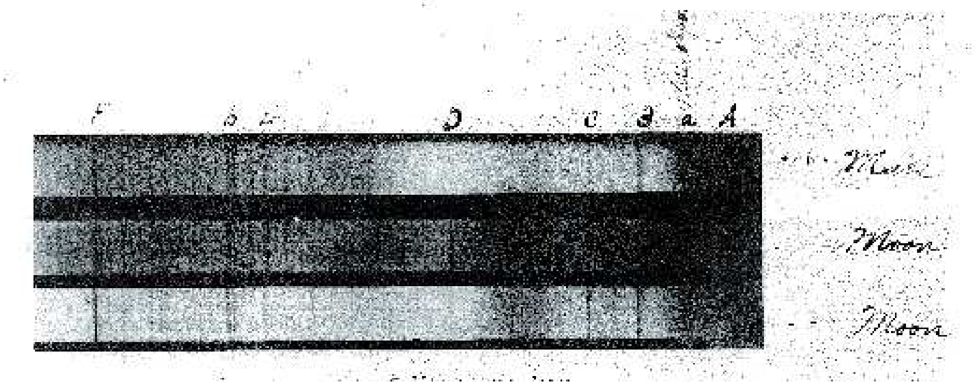

Fig. 1. The postcard sent on March 16th, 1909 by Lowell to Schiaparelli as a present for his birthday, representing a spectrum of Mars taken by Slipher. The spectrum apparently shows the presence of water vapor on Mars: the “a” absorption band is much darker than on the Moon.

corpo, una la cosa, uno lo ente, uno il massimo et ottimo”[1]. and “perchè è impossibile ch’un razionale ed alquanto svegliato ingegno possa imaginarsi, che sieno privi di simili e megliori abitanti mondi innumerabili, che si mostrano o cossì o più magnifici di questo”[2].

The idea that Mars was inhabited was also probably fostered by the, although controversial, finding of water vapor in the Mars spectra. Spectroscopy at its beginning was a very complex activity, the first spectra where collected by eye and compared to a reference spectrum, e.g. that of the Moon, maybe hours later. When photographic plates become available they were not very sensitive in the most interesting region of the spectrum, and bathing of different dyes were used to sensitize them, as e.g. V.M. Slipher explains in his report of the comparison of Mars and Moon spectra (Slipher 1908). The finding of a stronger absorption band in Mars than in the Moon, especially when the air-mass is less over the observatory, lead Slipher to conclude that the “spectrograph has revealed the presence of water in the atmosphere of Mars”, although he himself cautions that the amount of water vapor in the Martian atmosphere is far from being measurable. Lowell sends a copy of one of these spectra to Schiaparelli on March 16th, 1909 (see Figure 1). The presence of water vapor in the Mars spectra is heavily questioned, especially by W.W. Campbell. The question is still open in 1918 when Campbell publishes “The problem of Mars” (Campbell 1918), presenting, side to side, the opinions of Lowell and Pickering, the first strenuously convinced that the canals are the great opus of a dying civilization, the second explaining for instance the doubling of the canals as an optical effect of a dark line on a bright background, which makes its interior less dark.

3. Percival Lowell

Percival L. Lowell (1855-1916) is the descendant of a wealthy Boston family. After reading the book “La planète Mars” by C. Flammarion, he became interested in astronomy and the observations of planets. By using his influence and wealth he founded the Observatory which still bears his name, in Flagstaff, Arizona.

His works include a detailed description of what he termed the ‘non-natural features’ of the planet’s surface, including especially a

[1] “The Universe is then one, infinite and fixed; one is the absolute possibility, one the act, one the form or soul, one the matter or body, one the thing, one the entity, one the maximum and one the optimum” (De la causa, principio et uno)

[2] “.. because it is impossible for a rational and sharp intelligence to imagine that the innumerable worlds, which appear as magnificent or even more than ours, be empty of similar inhabitants or best than ourselves.” (De l’infinito, universo e mondi)

full account of the 'canals', the 'oases,' as he termed the dark spots at their intersections; and the varying visibility of both, depending partly on the Martian seasons. He theorized that an advanced but desperate culture had built the canals to tap Mars' polar ice caps, the last source of water on an inexorably drying planet (Guthke 1990). While this idea excited the public, the astronomical community was skeptical. Many astronomers could not see these markings, and few believed that they were as extensive as Lowell claimed. Lowell is convinced that previous observations were affected by technical difficulties: ".. the instrumental inability at the time these researches were made to examine the spectrum sufficiently far into the red, for it is in the "a" band that the greatest absorption of water vapor occurs, and this was not only beyond the possibility of photography at the time, but beyond even that of visual detection." (Lowell 1908).

Although the consensus was that some actual features did exist which would account for these markings, in 1909 the sixty-inch Mount Wilson Observatory telescope in Southern California allowed closer observation of the structures Lowell had interpreted as canals, and revealed irregular geological features, probably the result of natural erosion. It is likely that looking at a series of dark spots the eyes interpret them as lines. Now we know that profound erosion markings are present on Mars, as shown by the first images of Mariner 4 in July 1965, but those are not visible with the instruments of the early 1900's.

4. On the letters

The letters still in hand are very few: 16 by Lowell to Schiaparelli and 19 from Schiaparelli to Lowell, covering the period 1896 to 1910. They are important because they deal with the relationship between the two men, one considering the other his master, until the end of the life of Schiaparelli. They are mainly in French, the common language at that time, except one which is written in English. The correspondence about Mars begins in 1896, exactly when the scientific community starts debating hotly about the reality of the structure of Mars surface as Schiaparelli had proposed and Lowell was confirming. For instance, in 1894 Campbell shows that the martian atmosphere cannot contain water vapor, although the matter remains controversial even a few decades later as mentioned above: this fact undermines the construction of the two scientists about life and canal works on Mars, but they seem not to care too much. They keep informing each other about the new discoveries on Mars. Schiaparelli observes Mars until 1899, but his failing eyesight makes him question his own interpretation of the surface appearance and therefore he publishes drawings and results only up to 1890.

Answering to one of Lowell's letters, dated March 3rd, 1903, he writes "J'ai composé une partie du septième Memoire 1890, ... ce sera le dernier des mémoires sur Mars... En 1899 j'ai du cesser non seulement les observations de Mars, mais toute observation astronomique [3]." Lowell takes great pleasure in re-observing and confirming what Schiaparelli had identified on the surface, the shapes are called with affection "Vôtre Thot et lacus Moeris[4]" On the other hand Schiaparelli takes every chance to appreciate Lowell studies on Mars. For instance he considers the memory "The cartouches of the canals of Mars", published in the n.12 Bulletin of the Lowell Observatory, as a noteworthy description of a new way of accounting for the Mars canals. It deals with a new method to determine the degree of visibility of a canal in the different seasons of the martian year, in the expectancy to shed new light on Schiaparelli's idea that the canal "geminations" are due three months before and five after the spring equinox. This proposition is nonetheless very controversial in itself. The sequences called "cartouche" did not have any scientific relevance afterward, but we want to underline the need for Lowell to communicate to Schiaparelli, dearest friend and estimated colleague, the "firstlings" of his observations.

[3] "I have composed a part of the seventh Memory... this will be the last of the Mars memories.. In 1899 I had to stop not only the observation of Mars but all astronomical observations altogether."

[4] "Your Thot and Moeris lake".

In 1905 Schiaparelli sees the photographs taken by Lowell, published on Astronomische Nachrichten, and starts comparing the details of the surface as shown by the photographs and those described in the drawings based on visual sightings. For Schiaparelli the reproduction of details allowed by the new photographic plates is so precise that it opens a new phase of the analysis of the planet, both for its topography and for the accuracy of measures of every kind, in particular for the determination of the rotation axis of the planet. He foresees a new and extraordinary future for the technique.

Lowell ask permission to Schiaparelli to dedicate his last book on Mars to him. In the Introduction he compares Schiaparelli to Columbus: one as the discoverer of the New World, the other as the discoverer of the new world of Mars. Schiaparelli defines the book as ".. tout simplement un petit chef d'ouvre[5]." The bottom line of the book, shared by both Schiaparelli and Lowell, is that the first hypothesis of seas and continents as the origin of the different shapes/colors on the surface is superseded by growing of vegetation.

Mars has always fascinated human kind, says Schiaparelli in a letter dated 1907, it was observed by Babylonians and "avec son moyen Kepler a dècouvert ses deux premiers lois: mainentent elle en dévoile le mystère de la vie sur un autre monde[6]." And he concludes "C'est le Mars terrestre, c'est á dir le guerre, qu'il faut abolir[7]." In all the letters of the 1907 the idea that the image seen by the eye and by the photographic plate differ, and one has to take this into account when comparing drawings and photographs, is always present. Schiaparelli urges Lowell to publish his photographs and suggests M. Eugene Antoniadi, then working in France, as a possible help in publication since he had already studied a few of the Lowell's images. In response to one of these letters Lowell sends Schiaparelli, as a present, a copy of the spectrum of Mars mentioned before and shown in Figure 1.

The last letter from Schiaparelli to Lowell, dated April, 23rd, 1910, has a broader span. First Schiaparelli mentions that probability and statistics may help the progress of knowledge beyond experiments and rigorous mathematical theorems. He acknowledges a new wave of skepticism on the Mars' surface description and interpretation and at the same time suffers deeply not to be able to demonstrate their reality with new observations. He has a great faith in the power of photography and foresees in the future pictures so large that the finest detail can be rendered by the grain size of the emulsion. This will put an end to the debate. He concludes confirming and renewing his interest for the day-to-day progress of astronomy.

On June 14th, 1910 Lowell answers, sending positives prints of the Mars opposition, taken in an unfavorable season for the canals. This last letter is probably never read by Schiaparelli, which is hit by a thrombosis on June 22nd, and dies on July 4th.

5. Conclusions

This is a brief summary of the epistolary exchange between two firm believers of the presence of life on Mars, as seen by the effects on the surface appearance. The transcription of the correspondence is published in Manara et al. (2004). Much more has been said by Schiaparelli on the planet but the space is too short here to summarize it all.

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[5] ".. simply a mastership."

[6] "via its motion Kepler discovered his first two laws: now it allows to solve the mystery of life in a new world."

[7] "Is the earthly Mars, that is the war, that has to be banned."