

## OBSERVING MARS WITH SCHIAPARELLI'S TELESCOPE

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### Abstract

We have taken the occasion of the 2003 Mars's opposition to carry out observations of the red planet with the 218 mm Merz refractor, built in the 1863-1865, recently restored, used by Giovanni Virginio Schiaparelli to observe Mars from the opposition of August 1877 until that one of the 1883-'84.

In the occasion we launched a 5 days initiative of dissemination of scientific culture addressed to students and public at large.

We organized direct observations and adapted a webcam to the ancient instrument. The images were sent to Milanese Planetarium where about 300 people, every night, could participate to the manifestation.

Moreover a big screen was arranged in the garden around the Planetarium in order to allow other people to participate. The projection of the images was part of a 2 hours program of short lectures on the historical and current aspects of Mars.

This initiative was successful: but what about scientific culture? What kind of scientific information did the public perceive?

1. In 1862 the first Italian Government funded the Observatory of Milan for purchasing a 218 mm Merz refractor which was ordered in November 1862 by the astronomer Giovanni Virginio Schiaparelli (from now on: S.) and put in place in 1874. S. began to observe Mars starting from the 1877 opposition.

The instrument has been recently restored under the direction of the History of Physics Section of the Physics Institute of the University of Milan.

The objective - a doublet of 218 mm, focal length of 3.15 m ( $f/14.5$ ) - is still very well preserved. It has a light green stain, already present at S.'s times. It is well-corrected, fairly free from coma and aplanatic.

The chromatic aberration is slightly over-corrected, so the objective is achromatic in the red-green region of the spectrum, but produces an excess of blue. S. corrected this effect using a bright yellow or orange filter so the telescope was considered especially suitable for observations of Mars planet, due to his peculiar reddish colour.

The telescope was also equipped with an excellent filar micrometer, a ring micrometer, and 13 eyepieces with magnification between 67 and 690.

The tube is composed, in the inner part, of fir strips and covered by a polished mahogany veneer.

An equatorial German mounting, excellent for large telescope tubes, supports the instrument.

The hourly movement was, and is again regulated, with some problems, by a weight drop clock device similar to that designed by Fraunhofer.

The telescope is completed by a finder and illumination device for the field and micrometer wires.

At one end of the declination axis there is a brass cradle which carries the telescope tube; at the other end there is the declination divided circle and a counterpoise.

To facilitate finding sky objects the polar axis also terminates in a right ascension circle, and carried an adjustable counterpoise.

Apart from the screws and iron axes, the other metal elements of the telescope are made in brass, but with different composition and then different resistance and colour according to the corresponding mechanical function. The cradle for the tube is a melting piece whereas the other parts are forged.

The mounting is placed on a pyramid-shaped cast-iron basement which rests on a reinforced concrete cylinder all around isolated from the floor of the dome by a circular slot.

The observer can manually operate the instrument by means of two long rods driving both the declination and right ascension movements.

Due to several vicissitudes, the telescope has suffered transfers, thefts and damages.

The instrument, and the dome in which the refractor has been reinstalled, has been restored: the working and movements has been reestablished. The wooden circular dome, with a diameter of about 6 meters, is coated with iron. The original furnishing of the dome has been restored as well.

From the results in the measurement of binary stars, made by S., we can deduce that the effective resolution of the objective was reasonably close to the theoretical one which, according to Rayleigh's criteria, is 0.6" (for a wave length of 560 nanometers).

Finally the original micrometers of the Merz telescope are available.

2. During the night of 23 August 1877, with the purpose of testing the optical properties of the refractor, S. observed Mars and noticed the good quality of the telescope. So, in a relatively casual way, he began to use it for a long series of planetary observations that was to make him famous among his colleagues and among the public in general.

S. observed Mars during seven oppositions starting from the 1877 up to the 1890; the first four oppositions were observed with the 218 mm refractor used in our initiative. The other ones were carried out with a new 488 mm Merz-Repsold refractor. The objective of this last one has been broken in fifties of the twentieth century and the instrument has been dismantled and considered by us unworthy to be restored.

Our aim, in restoring the 218 mm Merz refractor - whose objective was in perfect conditions - and its dome, was to recreate the site and the atmosphere experienced by S. when observed Mars and discovered the existence, on the planet, of various dark, straight lines,

forming a complex network named "canali" (canals or channels). These structures gave rise to the debate of the possibility of life on Mars.

So in the August 2003 the original first refractor used by S. for observing Mars was available for observing again the red planet more than a century afterwards. In the last times we had open the dome to public for visit and for observations. In August 2003 we have observed Mars in a opposition very similar to that one of the 1887, the first observed by S.

3. Mars's images taken by a webcam connected with the 218 Merz refractor were projected on the screens of the Planetarium and put on the WEB as well. The Planetarium had organized, together with our Institute, the Brera Astronomical Observatory and the Italian Amateur Astronomers Union, a program of conferences dealing with historical and modern aspects of Mars's exploration, included the ESA and NASA missions. In the Planetarium a reconstruction of the sky in different epochs was shown to the public.

Due to the dimensions of the dome only 40 people per night could observe Mars with the original Merz refractor.

Our aim was:

- a) to show that the researches of the life in the Universe have a very strong cultural appeal at the intersection of several scientific disciplines;
- b) to diffuse among students and public at large some elements of astronomical education;
- c) to give information about S. as the founder of the modern planetology and about his pioneeristic studies of Mars.

d) to make known that the original instrument used by S. was available and that its restoration was part of a programme of safeguard of the historical-scientific heritage aimed to the diffusion of scientific culture.

As we have forecasted the event of Mars's opposition was widely covered by newspapers, magazines, television, radio and WEB. We too collaborated in several ways with the media for informing general public about the phenomenon and about our programmes.

4. The initiative was very successful: more than 5000 people participated to Planetarium manifestation and some hundred thousands of people visited the WEB site. We monitored the results through informal discussions with the few tens of people who had the possibility to carry out direct observations at the Merz refractor.

The general feeling about the initiative was very positive: people were very interested to know about the story of the researches of life on Mars from S. up to the ESA and NASA 2004 missions.

Also the perception of the historical context was very good: people were curious to discover S.'s researches and appreciated that his instrument was restored and able to carry out again observations. The possibility of using an original glorious instrument conveyed emotion and interests.

But as regards to astronomical education we have had the impressions that something was not right.

Here we give an example of bad perception and knowledge of the astronomical side of the phenomenon of the opposition of a planet.

In general people didn't know why the distance of Mars from the Earth and from the Sun isn't constant. Moreover they insisted to observe Mars exactly at the time, known from the media, when the planet was at the shortest distance from the Earth and were disappointed if they could carry out observations some days later, convinced that they would have lost very important information. The well known problem of the perception of the big distances arises also in this case.

Now explanations of the phenomenon given by the media were in general correct and also the presentation through drawings, graphs and simulations was very well done.

But there was an aspect of the phenomenon which drew the attention of the people: its "oneness" in the course of our life and, in this case, even for hundreds or thousands of years after and before. As people have known from the media, Mars had been seen so near to the Earth, before us, only by the Neardenthal man and that only in the year 2287 could have been possible to see it in similar conditions: this aspect of the question - its "oneness" - was so involving that all other ones were completely neglected. Of course it was not unknown to the experts in scientific communication: also for Halley's and Hale-Bop comets the oneness of the event obscured all other things said about it.

But if it is the negative side of the question as regards to astronomical education at the same time gives to scientists tools for better understanding the way in which general public perceives scientific events. And this is an important aspect in a world where a general consensus about scientific researches and activities is necessary for the progress of the scientific knowledge.

Personal involvement is an essential ingredient for communication of scientific culture. General public doesn't want only to be informed of what happens in the field of the science through conferences, articles, news, videos etc. but wants to participate, to be a protagonist.

Of course, often, this request can be foolishly ambitious and it happens not only in the field of the science; but the request of involvement is an aspect of the modern diffused culture which must be considered with the due attention when scientists and science communicators address general public.

## 5. Bibliography

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