Mem. S.A.It. Vol. 82, 240

Memorie della

The Diary of Schiaparelli in Berlin (26 October 1857-10 May 1859): a guide for his future scientific activity

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Abstract. In February 1857, three years after his degree in Turin, Giovanni Virginio Schiaparelli moved to Berlin with a scholarship from the Sardinian government. There he lived for over two years and from October he attended the University.
Berlin was an important astronomical center at the time and the young Schiaparelli had the opportunity to study with some of the most distinguished astronomers of his epoch and to be in one of the best equipped observatory in the world.
During his staying in Berlin Schiaparelli regularly wrote a diary which runs from Monday, October 26, 1857 to Tuesday, May 10, 1859. The Diary is very important for the reconstruction of Schiaparelli's training as an astronomer.
In this communication I'll give some information about the sections of the Diary which deal more strictly with astronomy. In the Diary all astronomical trainings of the mature Schiaparelli are outlined.
But there is an exception: Mars and the inhabitability of other worlds. This rises an interesting historiographical problem which pushes historians to find elsewhere the origins of a research which is inextricably linked to Schiaparelli and that allowed him to found the planetology as a new astronomical discipline.

1. Introduction

Giovanni Virginio Schiaparelli (1835 -1910; for a scientific biography of Schiaparelli see Tucci 2005; Buffoni, Manara, Tucci 1990, 1991; Tucci, Mandrino, Testa 1998) was introduced to the astronomy by the priest of Santa Maria della Pieve, Paolo Dovo (1810-1890) who possessed, besides a library well furnished with books of astronomy, a telescope for observing celestial bodies from the bell tower of the church.

When Giovanni Virginio finished his high school studies in July 1850 he enrolled in the Turin University, where he graduated with honors in the summer 1854 in hydraulic engineering and civil architecture. During the university period he followed the lessons, among others, of Giovanni Antonio Amedeo Plana (1781-1864) and of Quintino Sella (1827-1884). It was Q. Sella who helped Giovanni Virginio, just graduated, to get a scholarship from the Sardinian government to continue his education abroad. In February 1857 he moved to Berlin, where he lived for over two years and where, from October, he attended the University.

In those years Giovanni Virginio followed several courses: the main were those of J. F. Encke (1791-1865) (Theoretical Astronomy), G. A. Erman (1806-1877) (Terrestrial Magnetism and Optics), K. L. Michelet (1801-1893) (Logic and Encyclopedia of Philosophical Sciences), J. Ch. Poggendorff (1801-1893) (History of Physics), R. z Franz (1827-1902) (Radiant heat) and H. W. Dove (1803-1879) (Meteorology).

In the meantime he visited assiduously the new Observatory in Berlin, designed by Karl Friedrich Schinkel (1781-1841), inaugurated in 1835. Encke had been a promoter of the revitalization of the old Observatory, with the support of Alexander von Humboldt. Encke had equipped it with instruments of highest quality. The main tool was a Fraunhofer refractor of 228.6 mm aperture and 4.4 m focal length with German equatorial mount made by Merz & Mahler. With this telescope, Johann Gottfried Galle, a student of Encke, discovered the planet Neptune in 1846.

The instrument was quite identical to that of Dorpat. When Schiaparelli came to Brera ordered, in 1862, an instrument almost identical to the one used in Berlin. With this instrument Schiaparelli began to observe Mars in 1877 (for the history of the Brera Astronomical Observatory and its instruments see Tucci 2007; Miotto et al. 1989; Tagliaferri et al. 1983; Tucci 2000)

But the young Giovanni Virginio had a broad spectrum of interests: from studies of German literature to the history of religions. He studied Indology on the books of Albrecht Friedrich Weber (1825-1901) and Christian Lassen (1800-1876) and, since July 1858, he had begun learning Arabic and Sanskrit. Just a glance at the Diary is sufficient to be astonished by the variety of interests of the young astronomer. Here are some examples of the readings and studies made in 1857.

He studied Gauss' *Theoria motus*, a part of Brünnow's *Lehrbuch der sphärischen Astronomie*[1], Struve's *Études d'Astronomie stellaire*[2], Encke's Memoirs on the determination of the orbits of double stars, on the determination of the orbit of comets and on the determination of the orbit of planets, Olbers's Book on the calculation of cometary orbits, Gauss' *Summarische übersicht* on the calculations of orbits, Bessel's *Fundamenta Astronomiæ* (1818), John Fry Heather's *Treatise on mathematical Instruments*, the first part of Mossotti's *Mechanics*. He read Bessel-Olbers correspondence, the first theorems of Newton's *Principia*, the *Mysterium Cosmographicum* and the *Apologia Tychonis* of Kepler, Humboldt's *Vues des Cordillières*.

He calculated the Ephemeris of Vesta for 1860 and the Ephemeris of the opposition for January 1861; he calculated the orbit of the comet 1857 V. He "had only a browse" at a Cauchy's Memoir on vol. I of *Exercices de Mathematiques*.

But he didn't limit himself to scientific studies and readings. He read the *Geschichte der Assyrier und Iranier* (Frankfurt, 1856) of Jakob Kruger, the *Drei Tage in Menphis* (Göttingen, 1856) of Max Uhlemann, the novel *Carriere eines Herzens* of Hans Wachenhusen[3], *Germaine* of Edmond About, *La maison de Penarvan* of Julien Sandeau[4], *L'Orlando Innamorato* of Francesco Berni[5], *L'Orlando Furioso* of Ludovico Ariosto, *Il Poema Tartaro* of Gian Battista Casti[6], all dramatic works of Schiller except fragments. He read two times *Études d'histoire réligieuse* of Ernesto Renan commented by S. René

[1] BRÜNNOW, Frank Friedrich Ernst (1821-1891). *Lehrbuch der sphärischen Astronomie* (Berlin 1851).

[2] STRUVE, Friedrich Georg Wilhelm (1793-1864). *Études d'Astronomie stellaire sur la voie lactée et sur la distance des étoiles fixes* (St. Petersbourg 1847).

[3] WACHENHUSEN, Hans (1823-1898). *Carriere eines Herzens* (Berlin 1857).

[4] SANDEAU, Léonard Sylvain Julien (1811-1883). French novelist. *La maison de Penarvan* (New York, Boston 1858).

[5] BERNI, Francesco (ca 1497-1535). Florentine poet.

[6] CASTI, Gian Battista (1724-1803). Poet. He published the *Poema tartaro* (1787), a twelve sections satiric poem whose main character is Catherine II the Great.

Taillandier[7] in the *Revue des 2 Mondes*, some biographies of Corniani[8], some chapters of the History of Italian Literature of Paolo Emiliani-Giudici. He read quite completely *Terre et Ciel* (1854) of the philosopher Jean Ernest Reynaud (1806-1863), *Les Ruines, ou Méditations sur les révolutions des empires* of Constantin-François Chasesboeuf de La Giraudais, comte Volney, the *Critique générale. Premier essai. Analyse générale de la connaissance. Bornes de la connaissance*, *Essai sur la connaissance* of Charles Renouvier. And, in conclusion, he read also a bit of Hegel's *Encyclopädie*.

Finally, about what he had done in 1857, he wrote: "This year was notable not only for my trip to Berlin, but also for many interesting acquaintances. In Paris Porro and Antoine d'Abbadie[9], besides having seen a session at the Institute, Elia di Beaumont, Cauchy, Movin, Poncelet & c. In Bruxelles Liagre[10] and Quételet[11] father & son; in Berlin Encke, Bremiker[12], Förster, Bruhns, Schönfeld[13], Erman, Michelet, Kummer[14], Bolzani, Baeyer and c. Of the 365 days of the year I lived 45 in Torino, 2 in Savigliano, 1 in Savoja, 1 in Lione, 8 in Parigi, 3 in Bruxelles, 1 in Colonia, 1 in Potsdam, 303 in Berlino." But he notes: " ... the amount of work done does not fully comply with my desire and does not correspond entirely to the opportunities."

In Berlin, Giovanni Virginio planned, through Radloff, one of his best friends, "... a trip ... to Petersburg, along which I would see all the major observatories in the north." The project came about: Giovanni Virginio stayed in Berlin until late spring of 1859, then spent a short time at the Observatory of Potsdam and, at the end of June, he sailed to St. Petersburg, settling at the Pulkovo Observatory until the end of May 1860.

In Pulkovo Giovanni Virginio met the astronomer Friedrich Georg Wilhelm Struve (1793-1864), founder of the Observatory, and had his astronomical training under the guidance of his son Otto Wilhelm (1819-1905) and of Friedrich August Theodor Winnecke (1835-1897). In memory of this activity, a oil portrait of Schiaparelli was relocated in the central gallery of the observatory, completely rebuilt on the ruins of World War II.

2. Archival information about the Diary

During his stay in Berlin, Giovanni Virginio Schiaparelli regularly wrote a diary on a bound notebook: it runs from Monday, October 26, 1857 to Tuesday, May 10, 1859. The manuscript of the Diary, unpublished, is preserved in the Archives of the Brera Astronomical Observatory. In the transcript, the number of characters is more than half a million (about 100.000 words). In the same folder a manuscript copy of part of the Diary of unknown hand is kept, and there is also a typed copy that reproduces part of the Diary.

In the Archives several mathematical writings of the period preceding that one in Berlin and in particular the years 1850-'53 are also preserved.

Relative to the history of mathematics that Giovanni Virginio had in mind to write, and whose tracks can be found in the Diary, there is a notebook entitled "News about the history of mathematics collected by G. V. Schiaparelli. 1855-1875-1880".

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7 TAILLANDIER, René (1817-1879). He published on the *Revue des deux Mondes* several reviews on modern literature, especially Russian and German.

8 CORNIANI, Giovanni Battista (1742 1813). He wrote *I secoli della letteratura italiana dopo il Risorgimento* (Brescia 1808 1813, 9 voll.) (The centuries of Italian Literature after the Risorgimento).

9 ABBADIE, Antoine Thompson d' (1810-1897). French explorer, astronomer and geographer.

10 LIAGRE, Jean Baptiste Joseph (1815-1891). Belgian mathematician and astronomer.

11 QUÉTELET, Adolphe Jacques Lambert (1796-1874). Belgian astronomer and statistician.

12 BREMIKER, Carl (1804-1877). He contributed to *Berliner Astronomisches Jahrbuch* and, from 1850 to 1877, he published the *Nautische Jahrbuch.*

13 SCHÖNFELD, Eduard (1828-1891). Astronomer.

14 KUMMER, Ernst Eduard (1810-1893). Mathematician.

The Diary is written in a nice calligraphy, especially the section on the lectures of the winter semester 1857-'58.

The Diary contains a wealth of relevant information on the training of the young scientist and the emergence of the wide spectrum of interests. The first part is basically focused on a detailed account of the first semester of the academic year 1857-'58. Almost every lesson is told with great details and the writing is probably a transcript of notes taken during the lesson.

Over the months, however, more space is gradually won over by the tale of personal stories and unfolding of episodes of common everyday life, all at the expense of the University lectures.

3. The study of Astronomy in the Diary

Now I'll mention those parts of the Diary that have more to do with astronomy and will provide research topics on which Schiaparelli will later give original contributions.

Among the courses Schiaparelli decided to follow I'll focus on that on astronomy given by Encke.

The course of theoretical astronomy began on Oct. 29, 1857. Encke's aim is to deal with astronomy in its three aspects: spherical, theoretical and physical astronomy. A classical division, at least for the time. Interesting the way in which Encke introduces theoretical astronomy. Schiaparelli writes:

"[Encke] ... means to lead his hearers to the doctrines of theoretical astronomy, and in particular to those relating to planetary motion, step by step following the path of the inventors.

As a result of this methodological choice, Encke shows how the first uniform system for calculating the time from observations of the movements of the Sun and the Moon was achieved. Since the periods of these celestial objects don't have simple relationships between them, once a period was set, long enough series of observations could demonstrate its inaccuracy. It was necessary, according to Encke, to imagine a complex of heavens which have for a long time formed almost exclusively all the astronomy of the Chaldeans and Egyptians.

The true modern astronomy, which, according to Encke, deduces the laws from pure observation of phenomena, begins with Hipparchus of Nicæa, about a century and a half before Christ.

"Spherical astronomy can be conside-red as preliminary to the rest, since it teaches how to make and to reduce the observations, i.e. to prepare the data on which theoretical astronomy, which considers celestial movements and their appearance, deduces reality. All data on which astronomical theories are based are just observations of directions, obtained by means of some devices applied to certain instruments. Spherical astronomy teaches how to reduce directions into numbers, referring to some coordinate planes, which are mostly the ecliptic or the equator.

Other observational datum is time corresponding to a given direction: it is usual therefore sometimes to use sidereal time, which is given by the stars with whole uniformity, or the average time which is also counted for uniform periods (average solar days) that have the advantage of preserving the agreement between the civil and astronomical calculations of years and days; agreement necessary to avoid many uncomfortable reductions."

I have exposed the introductory part of the lessons of Encke, as told by Schiaparelli, to give an idea of Enke's method of explaining and teaching: he gave an historical character to his lessons, so much so that in the second one he retraced the evolution of astronomy, from geocentric to heliocentric theory.

The reference to the history of this discipline will be a steady distinction of Schiaparelli. His history of ancient astronomy is still a reference book for scholars.

With the arrival of December, Giovanni Virginio become more synthetic and you can only know a little of the general theme of the lectures, which mainly concerns the *Theoria motus* of Gauss.

Encke lessons continued during the winter semester 1858-'59 and looked, among other topics, at the problem of planetary perturbations.

The study and practice of astronomy occupied a large part of the time Giovanni Virginio spent in Berlin and this emerges from the first pages of the Diary.

Giovanni Virginio had very closed ties with Encke, which weren't limited to the time spent at the University, but extended into extra-time school, at the Observatory, at home of the professor, walking together on the road or reading memoirs written by Encke.

In this last regard a first hint can be find on Wednesday, October 28, 1857, when Giovanni Virginio wrote: "I finished to translate from German the memoir of Encke on the calculation of the double stars contained in the *Berliner Astronomische Jahrbuch* for 1832 and I learned the way to calculate the site of a double star from given data, which really doesn't differ from what is usually done for the calculation of heliocentric place of the planets with reference to the equator or the ecliptic. I saw again how you can refer the plane of the orbits of double stars to a fixed plane, i. e. the equator ...". Other considerations on the subject follow.

The theme of the double stars is recurrent in the Diary. It can be found, for example, in a letter sent to Don Paolo Dovo on November 2, 1857.

Saturday, November 7, 1857 Giovanni Virginio began reading Bessel's *Fundamenta astronomiæ* and, as he himself writes, in the first lesson of his book he discusses about some instruments used by the astronomer Bradley. Again speaking of double stars, in the seventh letter to Don Dovo of January 16, 1858, Giovanni Virginio ended with the catalogue of remarkable double stars, gave the elements of the Hugenian satellite of Saturn and told about the progress made in astronomy due the perfection of the instruments and methods of observation.

Giovanni Virginio's attention, however, was mostly captured by the study and observation of comets. The first evidence is found in the summary of the "astronomical work" performed in the month of October 1857, "the determination of the orbit of comet 1857 V". Others had appeared particularly since September 1858, although on 5-6-7 April 1858 there's already a passage relating to comets. Giovanni Virginio in fact in those days went to the home of Encke who "showed the first determination of the orbit of 1819 comet, later known as Encke Comet."

Giovanni Virginio spoke on the 1857 V comet again on Wednesday, October 13, 1858. On that day he " worked hard for the calculations on the final orbit." He applied himself to it the current and following weeks, but unfortunately all hours spent to achieve a satisfactory result were completely useless: Thursday, October 21, in fact, he found that "the eight days of work done recently on the comet 1857 V are useless for at least three quarters. Oh shame! All this for not having paid attention to a sign from the first day. Could it be worse?"

After a break of about a month and a half, comets come back in the days between Thursday, December 16 and Tuesday 21.

Giovanni Virginio went to the library often and had the opportunity to consult other books; thus he read "what Humboldt says about comets in vol. III of the *Cosmos* and what is said by Herschel, Littrow, Mädler, Klöden, Francoeur and Jahn." In addition, he borrowed Pingré *Cometographie*, which he devoured immediately. Wednesday, 22 he continued reading *Cosmos* of Humboldt.

Studies of comets intensified more and more, so that reports can be traced almost every day ("I studied comets continuously" Thursday, December 23).

Between Thursday, December 23 and Monday 27 Giovanni Virginio managed to borrow the *Monatliche Correspondenz* from Förster while he was at the Observatory and from this he copied the drawings of the 1811 comet. Moreover, he read and transcribed a Memoir of Olbers and another one of Brandes " ... very badly done on the theory of comet tails". Tuesday 28, Wednesday 29, Thursday 30 he developed a "horrible job around the 1680 comet"; for this he felt bad. "I had to acknowledge the inevitable resistance of the ether in space. Newton's observations show this in a undisputed way." And again Friday, 31 he continued "to study comets."

During the first week of the new year, he was "very busy around comets". In particular, Giovanni Virginio examined "Herschel's description of the 1811 comet, as well as the first half of Schröter's work on the comet of 1807". He also found in the second volume of *Memoirs of the Royal Astronomical Society* " ... a Memoir by Mossotti on the delay produced from the ether on comet Encke" and he copied "... the picture of 1825 II comet given by Herschel II". Again, he borrowed from the Observatory the *Monatliche Correspondenz*, from which he copied "some Harding pictures of the 1811 Comet" (January 7, 1859).

In one of the following two days, Giovanni Virginio went to meet Encke at his house and entertained him in a long conversation about the existence of the ether in space. And the distinguished professor said that, knowing the causes of the phenomena "in their form, never in their true essence, ... when it'll be proved that in space there is a cause of delay of motion of comets and it'll be found the law which regulates the consequences of this cause, the goal of the Naturforscher is reached." It matters little that the cause should be sought "... in an ether-resistant, or any equivalent in its effect: Our care must be to study the same cause on other comets, which will lead to shape further discoveries ... ."

During the meeting, Encke also proposed a formula that, according to his theory, "... expresses the ratio of the resistance of the so challenged ether to the sum of universal attraction and repulsion that the Sun exerts on the material that forms the tail of the comet, in terms of known quantities ... ."

Encke lent him the nineteenth volume of his Miscellanies, where several Memoirs were bound together, including one of Leopoldo Del Re (*Short News of the two periodic comets that will appear during the year 1832 (Encke and Biela)*) and a second by J. W. H. Lehmann (*Disquisitiones nonnullae de origine caudarum cometarum*).

During the same weekend Giovanni Virginio finished copying the pictures of Harding on the 1811 comet and began those of Mathieu. He also finished reading Schröter's work on the comet of 1807. Tuesday, January 11 Giovanni Virginio finished the transcription "... of the Memoir of Lehmann on the tail of the comets, ... " while Wednesday 12 copied "... other pictures of the 1811 comet from volume XXVII of the *Monatliche Correspondenz.*"

Friday 14 he developed calculations on the 1680 comet, which he completed Saturday 15: "... the result is not conclusive as hoped, but it is good enough." Also the page of Monday 17 is entirely focused on the study of comets: Giovanni Virginio transcribed Herschel's observations on the 1811 comet and he borrowed from Encke "Heinsius's book on the comet of 1744, a memoir and drawings of Secchi on Donati Comet, Moigno *Cosmos*, where there is a memoir of Faye on Encke Comet, and the delay in question." The focus, in particular, is placed on the latter, since in this context a discussion followed between Giovanni Virginio and Encke, in which the professor rushed into a bitter attack against the French, accusing them "... to do general considerations" without "working and calculating".

In the following days, Giovanni Virginio translated into French for Encke Father the Secchi Memoir he had received, and he extracted " from the book of Heinsius the most interesting things about the great comet of 1744", made some calculations on this and on Donati comet, brought out of the library volumes II and IV of the *Astronomische Nachrichten* "to search for news about comets", even if "... it was impossible to find anything" (18-19-20-21 January), he continued the picture of Donati Comet, he began the calculation of comet 1857 III, he delivered to Encke the translation completed, and Encke showed him "the model of the orbit of Encke Comet, given to him by Bruhns" (26-27-28 January).

Again, he continued to make pictures of comets, to read "... almost entirely Evelio cometography", the Cheseaux Traité de la Comète 1744 and "... the wonderful work on the comet of 1860" by Encke, wrote several summaries by the cometary Volume XIII of the *Astronomische Nachrichten*, thumbed through "... the huge and indigestible work by Lubieniecky on the same matter" and Pingré Cometography (January 29 to March 6).

In the same period, having in mind to work seriously on the comet of 1744, he borrowed from the library Zach tables to calculate the longitudes of the Sun "... which, however, soon proved to be insufficient even for a job provisional ... both for calculation of perturbation and of orbit at first approximation." As a result, Giovanni Virginio had from Bruhns Hansen tables, "... extremely complicated and difficult to handle". Monday, March 7 finished "to calculate the site of the Sun with Hansen's tables (I succeeded beautifully)" and studied at the library the comet of 1744. Finally, from Tuesday, March 30 and Tuesday, May 10 Giovanni Virginio applied to "... Venus perturbations produced on Donati comet", a work he was able to accomplish in that time, just before his departure for Potsdam. This is, in fact, the latest information contained in the Diary ("... I finished to calculate Venus perturbations", May 10).

With the beginning of 1858, Giovanni Virginio began to attend the Berlin Observatory, headed by Encke. It's firstly quoted in Friday, January 8, when he claims: "I went to the Observatory to find Encke, and gave him the reduction of the observations made on last 8 September of which he was very happy". After being in the library, Giovanni Virginio came back again to the Observatory, where he was able to observe "... quite well at the meridian passage of the Sun"; he also took the opportunity "... to see in a very clear way how the Sun is able to change the shape of the instruments." Also Sunday, 17 Giovanni Virginio "... went to the Observatory, first to observe the Sun at noon, then in the evening, where in spite of fresh air I gathered a harvest of at least 24 passages. It's strange that the Observatory was empty, and no one observed except me. Is this a work of slaves?"

The next day he built "... a map of the Pleiades" for the use of his observations and Tuesday 19, for the same purpose he made other observations: "... I built: 1) a table of the Arctic polar regions of the sky ... and 2) a table of Hyadi ... 3) a table to facilitate the use of large Argelander maps."

Thursday 21 and Friday 22 he went on "... the calculation of the tables for the reduction of observations sundials"; then he went to the observatory to take the passage of the Sun, thus losing a lecture of Michelet at the University. He chose that day to be absent to a lesson of optics of Erman, just to get back to the Observatory and observe the North Star.

Saturday 23, Sunday 24 and Monday 25 Giovanni Virginio brought forward the now familiar calculation of tables for the benefit of reducing the observations sundials. He came back to the Observatory on Thursday 28, after a lesson on the calculations of the orbits of Encke comet; that day proved to be particularly fruitful: "I went to the Observatory where I made very good harvest".

In Berlin, Giovanni Virginio became interested in other astronomical themes, such as that of variable stars and asteroids. On March 23, 1858 he wrote: "I described in a table part of the orbits of asteroids" and below, "... instructions for observation of variable stars. *Schumachers Jahrbücher 1844* (Litt. p. 826). Ask Encke". Thursday, 25 instead, he composed "... a catalogue of variable stars" and he hadn't more information till Sunday December 5 of that year, the day when Giovanni Virginio worked "... on variable stars, in which I found the observable fact that to the (proportionally) smaller variations of brightness also matches shorter periods".

About asteroids he wrote instead on Saturday, March 13 ("... work on the geometric conditions of the system of asteroids"), on Tuesday, March 30 ("a Stampfer memoir on how to calculate the brightness of the asteroids and to deduce the diameter, assuming the albedo equals to a very nearly to that of Jupiter and other planets"). He took the mentioned memoir and another of Argelander concerning the same subject and summarized the study carried out in the paragraph of things done in March 1858 ("Work on the geometric conditions of the asteroids")".

4. Conclusions

Double stars, comets, asteroids, shooting stars, ancient history of astronomy, hard work in observations. The mature Schiaparelli is all traceable in the astronomical training he had in Berlin. But in his Berlin training there is no indication of his future interest in the physical structure of the surface of planets, especially

Mars. The planets are considered only in terms of their orbit and perturbations to which they are subject.

It must therefore be found elsewhere what led him to study Mars for over thirty years. I have suggested in other studies that his interest in Mars was more terrestrial than astronomical. Where "terrestrial" should be understood in two ways. From observations, Mars was very similar to Earth. And then to look at the red planet was like watching the Earth from outside. This interest guided him to the foundation of a new field of astronomical research which he pioneered: planetology.

But "terrestrial" for historians of science also has a more technical meaning. The term "terrestrial physics" means a scientific approach which focuses on the research, through accurate measurements, of the connection of all forces acting in nature.

If we work around this hypothesis then there is some evidence in his Diary that may be of interest. Schiaparelli repeatedly quotes Alexander von Humboldt (1769-1859), a naturalist and geographer whose lessons Schiaparelli followed.

In this historiographical context it can be useful to refer to S. Cannon who has spoken of "Humboldtian science": a synthetic, empirical, quantitative science very far from preconceived theoretical models and looking for unity of all natural phenomena.

The astronomer is first of all a natural scientist and as such seeks the relationships between different phenomena with accurate measurements. It is plausible that Schiaparelli can be interpreted historiographically not only from the astronomical point of view. In fact, if we look at his scientific work we see that it was quite mixed. In addition to the strictly astronomical work, he analyzed historical series of meteorological or magnetic data to extract general laws, drew up a geometrical model for the theory of biological evolution, was interested in anamorphic geometry.

Acknowledgements. I am grateful to Dr.. Arianna Moro for the excellent work done during her physics degree thesis. And I thank Agnese Mandrino, now working as librarian and archivist at the Brera Astronomical Observatory, and before archivist at the Section of History of Physics of Istituto di Fisica Generale Applicata, Università degli Studi di Milano, where the first Inventory of Archival Historical heritage of the Brera Astronomical Observatory was realized (Mandrino, Tagliaferri, Tucci 1987).

References

Buffoni, L., Manara, A., Tucci, P., "G. V. Schiaparelli and A. Secchi on shooting stars" 1990, Mem. SAIt 61, 935

Buffoni, L., Manara, A., Tucci, P.,(eds) 1991 *G. V. Schiaparelli-A. Secchi: Corrispondenza (1861-1878)* (Milano: Edi.Artes, 1991)

Mandrino, A., Tagliaferri, G., Tucci, P.,*Inventario di Archivio dell'Osservatorio Astronomico di Brera 1726-1917* (Milano: Istituto di Fisica editore, 1987).

Miotto, E., Tagliaferri, G., Tucci, P., (1989), *La strumentazione nella storia dell'Osservatorio astronomico di Brera* (Milano: Unicopli Editore, 1989).

Tagliaferri, G., Tucci, P., Valota, R., Kranjc, A., *Da Brera a Marte. Una storia dell'Osservatorio di Milano* (Novara: De Agostini Editore, 1983).

Tucci, P., "Giovanni Virginio Schiaparelli: an astronomer on Mars" in *Cento Anni di Astronomia in Italia (1860-1960)*. Atti dei Convegni Lincei 217. (Roma: Bardi Editore Commerciale 2005), pp. 173-208

Tucci, P., "Il Museo Astronomico e l'Orto Botanico di Brera in Milano" *Annali di storia delle università italiane* 2007 II: 251-259.

Tucci, P., (ed) (2000). *I cieli di Brera* (Milano: Università degli Studi-Hoepli, 2000).

Tucci, P., Mandrino, A., Testa, A., (eds) *Giovanni Virginio Schiaparelli, La vita sul pianeta Marte* (Milano: Mimesis, 1998).