

ERNESTO VASCONCELLOS' *ASTRONOMIA PHOTOGRAPHICA*: THE EARLIEST POPULAR BOOK ON ASTRONOMICAL PHOTOGRAPHY?

Vitor Bonifácio, Isabel Malaquias

*Departamento de Física, Universidade de Aveiro
Campus Universitário de Santiago*

3810-193 Aveiro, Portugal.

E-mail: vitor.bonifacio@ua.pt, imalaquias@ua.pt

and

João Fernandes

Departamento de Matemática, Universidade de Coimbra

Largo D. Dinis, 3000 Coimbra, Portugal.

E-mail: jmfernan@mat.uc.pt

Abstract: Portugal, albeit with its own cultural distinctiveness, was not immune to the ideologies permeating nineteenth-century European society, in particular those concerning the social advantages of science and science popularisation. The country's high illiteracy rate hampered but did not prevent several popularisation efforts, which were usually led by professors and armed forces officers. In 1886 *Astronomia Photographica* (*Astronomical Photography*) a book popularising astrophotography, was published in Lisbon as part of a collection entitled *People and Schools Library*. The book seems an odd editorial choice given that, at the time, Portugal's major astronomical institutions pursued astrometric research and there was a virtual absence in the country of amateur astronomers. International astronomical developments, the author's interest in the scientific applications of photography and even the editorial timing are likely explanations for the publication of *Astronomia Photographica*, but we believe a definitive answer is still not available. The style of *Astronomia Photographica* is historical and informative, without being technical; clearly it is not a 'hands-on guide'. The contents of the book show that the author, Ernesto Júlio de Carvalho e Vasconcellos, a naval officer, contacted several experts and was aware of the latest developments in astronomical photography. What makes this a unique book is its content, and its inclusion in a popularisation collection with an exceptionally high circulation at such an early time.

Keywords: popularisation of science, astronomical photography, Ernesto de Vasconcellos

1 INTRODUCTION

Different motivations for the nineteenth-century trend of science popularisation have been proposed: a means to maintain social stability; a way of caring for the needs of literate, leisured and well-to-do social groups; or a process to provide 'useful knowledge' for the workshop and the home (Sheets-Pyenson, 1985). Conferences, periodicals and books played a complementary role in this effort. In particular there was the publication of low-price volumes dealing with a wide range of subjects. Sometimes these came in the form of collections, which every so often were called 'libraries' (Béguet, 1994). In Portugal during the nineteenth century

... there was faith in this instruction. It was forcefully mentioned that ignorance makes man perverse and that education and instruction are the bases of the social edifice. Sometimes, in more practical reflections, the benefits for economic development were also considered. (Torgal, 1993).

In 1870, D. António da Costa, the first Portuguese Minister of Education, wrote that

The universalisation of instruction multiplies the wealth of the nation ... since popular instruction creates a large financial capital in the development of the spirit. With increasing knowledge workers and labourers are more capable and as a consequence industrial and agricultural goods will be more profitable.

Following international trend during the late 1830's, societies aiming to popularise scientific knowledge started to appear in Portugal. The high illiteracy rate

threatened the sustainability of popularisation projects, but cheaper publications resulting from developments in printing techniques helped the sales, even if the illiteracy levels did not change significantly (Matos, 2000). *Popular Almanacs* (*Almanques Populares*, 1848), *Books for the People* (*Livros para o Povo*, 1859), *Popular Education* (*Educação Popular*, 1870) and *Popular Library or Instruction for all the Classes* (*Bibliotheca Popular ou Instrução para todas as Classes*, 1870) are all examples of serial 'libraries' that were published in Portugal during the nineteenth century (Torgal and Vargas, 1993). In this popularisation endeavour, university and polytechnic professors as well as armed forces officers played a fundamental role (Malaquias and Gomes, 2006).

2 THE *BIBLIOTHECA DO POVO E DAS ESCOLAS* COLLECTION

In 1870 David Corazzi (1845–1896) started a publishing house in Lisbon, and until 1880 the editorial line of the company, Empresa Horas Românticas (see Figure 1), was essentially characterised by historical, sensational and science fiction novels. Corazzi was, for instance, Jules Verne's first Portuguese publisher (Viana, 1990). In 1881 Corazzi started a new collection of popular books entitled *People and Schools Library* (*Bibliotheca do Povo e das Escolas*, henceforth BPE), which aimed to be "Instructional Propaganda for Portuguese and Brazilians." The BPE books were available in Portugal and Brazil (where Empresa Horas Românticas had an office), as well as

through a wider distribution network (Domingos, 1885; Venâncio, 2004). Concern for the BPE southern hemisphere readers appears, for instance, in Volume 10, *Popular Astronomy (Astronomia Popular)*, where one reads: "Our Brazilian readers will easily find all the stars indicated by taking as a starting point the beautiful constellation of the Southern Cross." (Mello, 1881). Nonetheless, the BPE authors were mainly Portuguese, with only two identified Brazilian contributors, José de Mello—the author of the *Popular Astronomy* book—and Viriato Silva (Nascimento and Santos, 2006). Many of these early authors were former students of the Lisbon Polytechnic School (Escola Politécnica de Lisboa) or members of the armed forces.

A BPE title contained 64 pages of low-quality paper in a 10.0 by 15.5 cm format. Each volume cost 50 reis, which was also the price in 1886 of *Campeão das Províncias*, a 4-page biweekly Aveiro newspaper. The books were illustrated, but the number of figures varied substantially from volume to volume depending upon the subject matter. Eight successive volumes constituted a series. Initially the books were published on the 10th and 25th of each month. The collection continued until 1913, but the bimonthly publication schedule was only maintained until 1885; from 1886 to 1891 volumes appeared, on average, monthly, and from 1892 an irregular pattern developed. In all, a total of 237 volumes was published (Domingos, 1985).

The range of BPE topics covered was rather extensive, and an indication of the variety can be ascertained by examining the titles of the first series: *History of Portugal*, *General Geography*, *Mythology*, *Introduction to the Physical and Natural Sciences*, *Practical Arithmetic*, *Zoology*, *Portuguese Chorography* and *Elementary Physics*. According to Domingo's (1985), the BPE did not have the concern, the necessity or the ability to organise knowledge or share it in a systematic way, but the underlying concept was an encyclopedia, a tree of knowledge in which the basic volumes would be published first, allowing for a later increment in subject matter and complexity, as well as permitting new ramifications to appear following the establishment of connections between different fields of endeavour. The BPE's first editor, Xavier da Cunha (1840–1920), recognised this explicitly while presenting the book *Steam Machines (Máquinas a Vapor*, BPE Number 74), that was inevitably preceded by *Mechanics (Mecânica*, BPE Number 66) and logically followed by *Stoker-machinist Manual (Manual do Fogueiro-machinista*, BPE Number 80). Cunha took as a model "... similar collections published in France, Italy and other countries that march in the vanguard of civilisation." But at the same time he planned to improve upon some of these foreign collections by having a broad editorial approach and publishing only high-quality volumes (Cunha, 1881). The gamble in producing a quality inexpensive project paid off, and the publication had both critical acclaim and popular success. The BPE received several international prizes and the Portuguese Government adopted various early books as textbooks for primary and secondary schools (Nascimento and Santos, 2006; Cunha, 1883).

The number of printed copies of the first two series was indicated in the books. While some discrepancy

exists between circulation numbers quoted by different authors, we have verified that Number 6 and 7 had a print run of 12,000 while 15,000 copies of Number 11 were issued (see Domingos, 1985; Lacerda, 1881; Leitão, 1881; Nascimento and Santos, 2006; Sousa, 1881). We should point out that at the time these high edition numbers were exceptional for Portugal, and quite impressive even for larger countries such as Great Britain (Secord, 2001). A number of the earlier BPE volumes had several editions. For example, Number 10, *Popular Astronomy*, had a first edition of 15,000 copies in May 1881, and a second edition was printed approximately one year later (Mello, 1882; Nascimento and Santos, 2006). Unfortunately information concerning the number of copies printed ceased for the majority of the second and later editions, and from the third series onwards, i.e. above Number 16 in the collection. So it is tantalising to conjecture how many copies of *Astronomia Photographica* were printed, given that no factual information exists and the publisher's records are lost (Domingos, 1985). The copy of *Astronomia Photographica* that we found in the *Portuguese National Library* (Biblioteca Nacional) dates to 1915, and this might point to weaker sales than envisaged since this volume simply looks like a re-packaging of the leftovers from a previous edition (Vasconcellos, 1915). A new unchanged edition of a twenty-nine year old book—even if Vasconcellos was still alive—without any account of new developments that had occurred in astronomical photography, seems to us unlikely.



Figure 1: The headquarters of the BPE publisher, Empresa Horas Românticas, in Rua da Atalaya, 40 Lisboa (after *Almanach Illustrado do Ocidente*, 1887).

3 THE AUTHOR OF *ASTRONOMIA PHOTOGRAPHICA*

Ernesto Júlio de Carvalho e Vasconcellos (see Figure 2) was born in Almeirim on 16 September 1852. He entered the Portuguese Navy in 1864, as 'Aspirante a Guarda Marinha', aged 11, and completed the preparatory course at the Lisbon Polytechnic School in 1872 and graduated from the Naval Academy (Escola Naval) in 1874. In 1878, after serving in various naval vessels, he was nominated auxiliary to the Hydrographic Section, a position that he held until 1880. In 1878-1879 he attended classes in 'Astronomy and Geodesy' and 'Mineralogy and Geology' at the Lisbon Polytechnic School, and 'Topography' and 'Practical Geodesy, Rivers and Canals' at the Military School (Escola Militar), all of which formed part of the degree of a hydrographic engineer. In 1880 Vasconcellos was granted approval to complete the degree (Arquivo da

Marinha Portuguesa, Livro Mestre B; C), and by 1883 he had completed the associated apprenticeship.

As early as 1881, Vasconcellos tried to obtain a teaching position in the Naval Academy. In his bid for the second discipline vacancy he wrote a dissertation published in 1884 entitled *A Astronomia Photographica* (*The Astronomical Photography*) (Vasconcellos, 1884). Vasconcellos failed in his objective, but an updated version of his dissertation was published two years later in the BPE collection. On 23 September 1884 the Portuguese Government appointed Vasconcellos to superintend the launch of the telegraphic cable between Dakar (Senegal) and Luanda (Angola), and he left for London on 26 July 1885 and returned to Lisbon on 6 January 1886 after completing the first part of his mission. On 29 May 1886 he embarked again from Lisbon to superintend the second leg of the telegraphic cable, returning to Lisbon on 10 November. The Government commended the successful completion of his mission. Three years later he was again nominated for a similar endeavour, this time to supervise the telegraphic connection between Luanda and Cape Town (South Africa) (Arquivo da Marinha Portuguesa, (b)). It is not surprisingly, therefore, that Vasconcellos' second book, published in 1889, was titled *Submarine Cables* (Cabos Submarinos) (Grande Enciclopédia Portuguesa e Brasileira).



Figure 2: At the time of publication of *Astronomia Photographica*, Ernesto de Vasconcellos was 33 years old, two years younger than shown in this photograph (after Sociedade de Geografia de Lisboa, 1931).

As the years progressed, Vasconcellos carved out a distinguished career as a Navy officer, cartographer and geographer. He published several articles and books in these two fields, and in particular he was an expert on the former Portuguese colonies. He taught at the Naval Academy and at the Colonial School (Escola Colonial), and represented Portugal at several inter-

national geographical congresses (Berne 1890, Berlin 1899, Geneva 1909, Sao Paulo 1910 and Rome 1913). He was twice a member of the Portuguese Legislative Assembly, and he served on several parliamentary commissions (Grande Enciclopédia Portuguesa e Brasileira).

Vasconcellos was accepted as a member of the Lisbon Geographical Society (Sociedade de Geografia de Lisboa, henceforth SGL) in 1878, three years after its foundation, and he was actively involved in Society business right up until his death. He belonged to the SGL committee for more than forty years, and from 1911 onwards he was the Society's Secretary (Sociedade de Geografia, 1881; Grande Enciclopédia Portuguesa e Brasileira). At the time of his death, on 15 November 1930, Ernesto Júlio Carvalho de Vasconcellos was an Admiral in the Portuguese Navy.

There is evidence that Vasconcellos had an early interest in the the scientific applications of photography. An 1881 article published in the SGL bulletin entitled *Phototopography or Photographic Topography* starts by stating that

... one of the most interesting applications of modern science is surely the determination of the constitution of celestial objects by spectral analysis. This technique was first applied by Kirchhoff and later Rutherford, of New York, applied the photography to record the solar spectrum.

The article continues with a short explanation of the phototopography technique and its advantages, in particular in situations where maps must be speedily obtained, namely on expeditions (Vasconcellos, 1881). In *Astronomia Photographica* Vasconcellos (1884) thanks Aimé Laussedat for advice provided concerning photographic matters. Laussedat not only developed the photogrammetry technique in the 1850's (Eder, 1945: 398) but he also pioneered the use of a horizontal telescope for photographing the 18 July 1860 solar eclipse (Laussedat, 1860).

Vasconcellos' contact with astronomy is more difficult to ascertain, the publication of *Astronomia Photographica* being his only known contribution in the field, and we believe it was restricted mainly to his student years. During his hydrographic engineering apprenticeship, Vasconcellos studied at the Lisbon Royal Astronomical Observatory (Real Observatório Astronómico de Lisboa) under the supervision of the institution's Director and Sub-director, Frederico Augusto Oom (1830–1890) and César Augusto de Campo Rodrigues (1836–1919) respectively (Vasconcellos, 1920). Following the 22 December 1870 total solar eclipse, João Carlos de Brito Capello (1831–1901), who worked at the Infante D. Luiz Observatory started a programme of daily solar photography to study possible connections between solar activity and the Earth's magnetic field. The photographs obtained were considered amongst the best available in the early 1870's, and one was published in the second volume of Secchi's *Le Soleil* (1877). However, this program had finished by 1880 (Bonifácio et al., 2007). Unquestionably, Vasconcellos was aware of this program's existence for in *Astronomia Photographica* there is a description of the equipment used and of the results obtained at the Infante D. Luiz Observatory. Vasconcellos (1886b) also thanks Brito Capello for allowing the study of a Jules Janssen solar photograph.

In 1881, as part of his engineer apprenticeship, Vasconcellos was sent to the Infante D. Luiz Observatory in order to practise the taking meteorological and magnetic observations, especially those with hydrographic applications (Moreira, 1881). Outside the Infante D. Luiz Observatory there were also abundant opportunities for Capello and Vasconcellos to meet, as both men were naval officers and members of the Lisbon Geographical Society, Brito Capello being one of the SGL founders.

Curiously, we found that later in life Vasconcellos played a small part in the planning of the famous 29 May 1919 British total solar expedition eclipse, which confirmed Einstein's Theory of General Relativity. Arthur Hinks, who was Secretary of the Royal Geographical Society, studied the possible geographical locations for the British expeditions. As such he wrote to the SGL asking for advice concerning Principe Island in the São Tomé Archipelago. As the Society's Secretary, Vasconcellos replied, and he gave a favourable assessment of Principe's location as described in Hinks' (1917) presentation to the Royal Astronomical Society in November 1917. Vasconcellos (1886a) had a personal knowledge of this island as he was responsible for the map of the island that was published in 1886. At its 10 November 1917 meeting the British Joint Permanent Eclipse Committee decided to send, if possible, expeditions to both Sobral (Brazil) and Principe Island (Dyson et al., 1920).

4 ASTRONOMICAL PHOTOGRAPHY IN THE NINETEENTH CENTURY

From its beginnings the scientific applications of photography and specifically in an astronomical context had been considered (Arago, 1858). Correctly exposed daguerreotypes of the solar surface, the solar spectrum, the partially-eclipsed Sun and the Moon were all obtained in the early 1840's. In the 1850's and 1860's photographs of the Sun, Moon, Donati's Comet and total solar eclipses were secured. Following these early successes and the disappointing 1874 transit of Venus results, the decade 1875-1885 saw a series of new and important achievements in this field. Briefly we should point to the following photographs: the Sun by Janssen in 1877; the spectra of celestial bodies by Draper and Huggins in 1879; the Orion Nebula by Draper and Common in 1880 and 1883 respectively; comets by Janssen in 1881 and Gill in 1882; cometary spectra by Huggins in 1881; the spectrum of the solar corona by Schuster in 1882; and the Andromeda Nebula by Roberts in 1885 (e.g. see Bajac and Saint-Cyr, 2000; de Vaucouleurs, 1961; Lankford, 1984; Mouchez, 1887; Norman, 1938; Rayet, 1887a). In 1885 Perry summarised this trend when he wrote:

The award of the highest distinction in astronomy, the gold medal of the Royal Astronomical Society, two years in succession to those who have been most successful in celestial photography [A. Common in 1884 and William Huggins in 1885] is no doubtful sign of the great value attached to such work.

The possibilities open up by Gill's 1882 comet photograph and the brothers Paul and Prosper Henry's 1884 and 1885 stellar photographs prompted the idea of an all-sky photographic map (see de Vaucouleurs, 1961; Weimer, 1987). This led to the April 1887 International Astrophotographic Congress in Paris,

thanks to the efforts of Admiral Mouchez and the Paris Academy of Sciences (Weimer, 1987).

By 1884 several articles concerning *Astronomical Photography* had been published both in specialist astronomical magazines and in the general non-astronomical literature. For example, see de la Rue's "Report of Celestial Photography in England" (1860), which was presented at the 1859 meeting of the British Association for the Advancement of Science, Brother's 1866 review of celestial photography in the journal *Academy Registry*, and Radau's 1878 article, "Les Applications Scientifiques de la Photographie", in the *Revue des Deux Mondes*. Several photographic books also included chapters dedicated to the topic, including *Les Merveilles de la Science* (Figuier, ca. 1870, 149-160), *Les Merveilles de la Photographie* (Tissandier, 1874, 249-262) and *Die Chemische Wirkung des Lichts und die Photographie in ihrer Anwendung in Kunst, Wissenschaft und Industrie* (Vogel, 1874; this was later issued in the International Scientific Series and published in Great Britain, the United States and France in 1875 and 1878).

In addition, astronomical photographs were often displayed at international photographic and 'world' exhibitions. For example, the impact caused by Whipple's photographs of the Moon at the London Great Exhibition of 1851 is well known (see de Vaucouleurs, 1961; Hearnshaw, 1996). In 1876, the French Photographic Society (Société Française de Photographie) organized, an exhibition at the *Palais de l'Industrie* in Paris, which had the primary objective of

... showing the utility of this Art [photography] by its numerous applications to the Sciences (Astronomy, Geography, Topography, Scientific Missions ...). (Davanne, 1876).

Photographic societies provided a natural forum in which recent developments in equipment and techniques were discussed. Consequently it is not surprising to find articles relating to astronomical photography in journals published by some of these societies. The increased use of photography as an astronomical technique also led to the appearance of photographers, or people with photographic skills, in typical astronomical environments, such as during eclipse and transit expeditions (e.g. see Duerbeck, 2004; Pang, 2002). Two examples of this interplay between photographers and astronomers are Alfred Brothers and Jules Janssen. Brothers, a Manchester photographer—better known today for his pioneering use of flash photography—obtained one of the only two successful photographs of the 22 December 1870 solar eclipse (see Brothers, 1871; Lenman, 2005). Jules Jansen, first Director of the Meudon Observatory in Paris, contributed significantly to the advancement of solar photography. He was also Honorary President of the French Photographic Society from 1891 to 1893 and 1900 to 1902, and the first President of the National Union of the French Photographic Societies (Union Nationale des Sociétés Photographiques de France), when it was created in 1892 (see Launay, 2000).

5 VASCONCELLOS' ASTRONOMIA PHOTOGRAPHICA

It was against this background of growing internation-

al interest in astronomical photography that Vasconcellos' *Astronomia Photographica* was published in 1886 as Number 134 in the BPE series (see Figure 3). Interesting developments were also happening at this time in the Portuguese photographic scene. The publication of a new monthly photographic periodical, *The Photographic Art* (*A Arte Photographica*), started in 1884, and two years later the first Portuguese international photographic exhibition opened in Porto, at the Crystal Palace (see Sena, 1998; Sociedade do Palácio de Cristal, 1886).

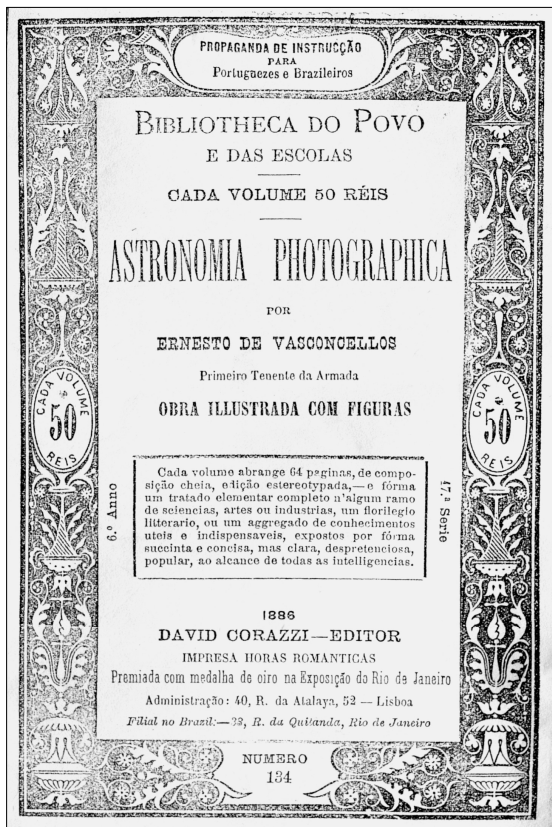


Figure 3: The cover of *Astronomia Photographica*, BPE Number 134, published in 1886 (after Vasconcellos, 1886b).

An explanation for the BPE appearance of *Astronomia Photographica* is provided in the Foreword to the book, which is entitled “Two Introductory Words”. The publication arises, it is claimed, as a natural consequence of the appearance earlier of the BPE volumes on *Popular Astronomy* (BPE, Number 10, 1881) and *Photography* (BPE, Number 78, 1884). Secondly,

A recognition that “Niepce’s art” favours enormously all sciences and arts: in this way the astronomer photographing the celestial bodies, the zoologist and the botanist photographing the specimens of the species they intend to study ... all find in the photography the most powerful and safe auxiliary, because it represents a faithful copy of all the objects needed by their multiple occupations. (Vasconcellos, 1886b).

On the basis of this statement, one is almost led to speculate if more photography books dealing with other specific scientific fields were planned. While none was published, the idea fits the pattern that a collection of this type may pursue.

The Foreword in *Astronomia Photographica* also

included the recognition that “Up until today there has not been any published work on the subject of this book ...” (Vasconcellos, 1886b), something that Vasconcellos (1884) had already referred to in the foreword to his 1884 dissertation. We should point out that the 1884 BPE publication on *Photography* was also “... an unprecedented event in Portuguese photography ...” (Sena, 1998). While these are plausible arguments, we believe that further research is needed to better establish the reasons behind the publication of *Astronomia Photographica*. Was it a consequence of a slowdown of available collection titles? The year 1886 sees the end of the BPE bimonthly publication schedule, and only 19 of the expected 24 volumes (i.e. Numbers 121 to 139) were published in that year. *Astronomia Photographica* is Number 134. Or is there a connection between the book publication and a new effort to push for the implementation of a new astronomical photography research programme in Portugal taking account of the latest international developments? At the time, the main concern of the Portuguese observatories was astrometry, and no contribution was made by amateur astronomers (e.g. see Bonifácio et al., 2006b; Osório, 1986; Silva 1996). The idea of taking advantage of Portugal’s favourable climate is presented in both the 1884 and 1886 editions, while discussing the possibility of photographing the corona outside of eclipse, a ‘hot topic’ at the time (Vasconcellos, 1884; 1886b; Becker, 2000). But the following citation in the BPE volume reveals a new agenda:

If such an idea [Mouchez’s Carte du Ciel] is to be carried out our observatories cannot stay idle especially given that the purity of our atmosphere aids the use of photographic means for the organisation of celestial charts. (Vasconcellos, 1886b).

The Director of the Lisbon Royal Astronomical Observatory, Frederico Augusto Oom, participated in the 1887 International Astrogaphic Congress but, in the end, no Portuguese observatory participated in the *Carte du Ciel* project (Weimer, 1987; Winterhalter, 1891).

The role that personal relations played in the publication of the book is still not clear. On the one hand, David Corazzi, publisher of *Astronomia Photographica*, was also a SGL member (Sociedade de Geografia de Lisboa, 1881). On the other, João Maria Jalles, author of the BPE’s *Photography* and the collection’s most prolific contributor (writing, amongst others, the volumes on *Mineralogy*, *Gravity*, *Optics* and *Mechanics*), married Carolina Amélia de Brito Capello in 1875, thereby becoming João Carlos Brito Capello’s brother-in-law. In *Photography* the application of this technique to astronomy is not discussed, but in the chapter dedicated to Portugal there is a brief reference to the existence of the photographic meteorological instruments at the D. Luiz Observatory and to the fact that in the same observatory “... astronomical photographic work worthy of all appreciation has been done.” (Jalles, 1884).

6 THE TEXT OF *ASTRONOMIA PHOTOGRAPHICA*

Realising that “... astronomical photography appears to be a study almost entirely new among us ...” Vasconcellos presents the subject matter for a non-specialist audience. The text is therefore written

... without formulae and in a way that allows the comprehension of all of the topics treated in the book ... and while it is written summarily and without any pretentiousness we believe it may fulfill the objectives of popular scientific promotion that this library [BPE] aims to diffuse amongst the people and in the school. (Vasconcellos, 1886b).

The language used is colloquial. Interesting items of news and short personal stories are also used to enliven the text. References and mathematical formulae are almost totally avoided. The only formulas present in the text are three that relate to the transits of Venus, and they are simple. The lack of references makes it difficult to access Vasconcellos' sources. We found quotations from several articles published in the *Comptes Rendus* by Janssen (1886) and Mouchez (1885a; 1885b; 1886) and from Vogel's (1878) *La Chimie de la Lumière*. *Astronomia Photographica* is not a technical photographic compendium like Monckhoven's (1865) *Traité Générale de Photographie* or Abney's (1877) *Cours de Photographie*. Instead, *Astronomia Photographica* provides a review of astronomical photographic developments and results, ranging from Daguerre's unsuccessful attempt to obtain an image of the Moon in 1839 to the celestial photography pursued at the Paris Observatory. Within the rigid 64-pages limit—including covers—the book's index reveals the expected topics:

- Photography applied to the study of Astronomy (p. 4)
- Solar Photography (p. 9)
- Lunar Photography (p. 21)
- Stellar Photography (p. 23)
- Nebulae Photography (p. 32)
- Comet Photography (p. 35)
- Eclipses (p. 37)
- Photography applied to the observation of the transits of Venus (p. 48)
- Conclusion (p. 62)

The 1886 edition is basically an update of the 1884 content, but taking account of recent work done at the Paris and Meudon Observatories (as described in several papers published in *Comptes Rendus*, the latest of those dating from 11 January 1886). The update was probably completed by 29 May when Vasconcellos left Lisbon, since *Astronomia Photographica* was published no later than 21 August, (that is, before his November return to the city. Graphically, small changes were also made between editions in order to allow for an easier read: several paragraphs were broken up and extra space was introduced between them. Strangely, both editions contain only three figures, a rather small number for a book of this nature. The earlier BPE volumes *Popular Astronomy* and *Photography* had 15 and 10 figures respectively (Jalles, 1884; Mello, 1881). Drawings of a photoheliograph and a shutter are complemented by a diagram explaining the determination of the Earth-Sun distance via the observation of a transit of Venus. The unavailability of a good photoheliograph engraving is mentioned in both editions, a fact that might point to a hasty publication of this BPE volume (Vasconcellos, 1884; 1886b).

In the text, 34 out of 62 pages—or 55% of the total—deal with the topics of solar photography, solar eclipse photography and the application of photography to the transit of Venus. This is consistent with Portuguese expertise in this field up to this date,

consisting of the daily solar photography programme carried out at the Infante D. Luiz Observatory in Lisbon, the 1870 solar eclipse expedition and the preparations for the failed transit of Venus expedition to Macao (Bonifácio et al., 2006a; Bonifácio et al., 2007).

Almost coinciding with the publication of *Astronomia Photographica*, two lengthy papers dealing with astronomic photography were printed in France: "La photographie astronomique à l'Observatoire de Paris et la Carte du Ciel" appeared in the *Annuaire du Bureau des Longitudes pour l'an 1887* (Mouchez, 1887) and "Notes sur l'histoire de la photographie astronomique" was serialised in the fourth volume of the *Bulletin Astronomique de l'Observatoire de Paris* (Rayet, 1887b). Both papers also materialised in book form. While Mouchez's effort is clearly focused on stellar photography, the topics covered by Rayet and Vasconcellos are similar. Nevertheless, a comparison of Rayet's and Vasconcellos' books shows two quite different approaches. Doing justice to its title and intended audience, Rayet's book stresses the historical developments of astronomical photography while Vasconcellos pays more attention to the latest research. A good example is provided by the treatment given by both authors to solar eclipse photography. Rayet ends his description with the 1871 eclipse, while Vasconcellos is mainly interested in the 1883 one. In 1886, Stein's second volume of the newer edition of *Das Licht im Dienste wissenschaftlicher Forschung* titled *Die Photographie im Dienste der Astronomie, Meteorologie und Physik* (Stein, 1886), was also published, the first 108 pages of which cover, in a manner more comprehensive than Vasconcellos' volume, the optical and technical aspects of astronomical photography, and present the results thus far obtained. In the following year, a more technical approach to the topic was presented in Konkoly's (1887) *Practische Anleitung zur Himmelsphotographie nebst einer kurzgefassten Anleitung zur modernen photographischen Operation und der Spectralphotographie im Cabinet*.

7 CONCLUSION

The 1886 publication of Vasconcellos' *Astronomia Photographica* in the BPE book collection is somewhat out of character given the interests of the small Portuguese astronomical community. The oldest Portuguese observatory, at Coimbra University, and the Lisbon Royal Astronomical Observatory were both involved in astrometric work and the recently-built Polytechnic School Astronomic Observatory was not fulfilling the research expectations raised at the time of its construction. Yet the preface claims that *Astronomia Photographica* fills a market void and is a natural progression of the BPE collection. The appearance of this book also coincided with an increased interest in astronomical photography, led mainly by recent advances in this field and by Admiral Mouchez's plan for an international collaborative astrophysical sky map. We believe, nevertheless, that several important questions remain open and require further investigation. For instance, is the timing of the publication a tentative attempt to impress upon the general public and the Portuguese Government the need for greater financial support for this type of research, or was it a consequence of an editorial shortage of BPE titles? A

better knowledge of the leading protagonists' personal relations would possibly help answer these questions, but unfortunately the publisher's records were lost. What is certain, however, is that the author, Ernesto de Vasconcellos, had a keen interest in the scientific applications of photography to astronomy and was well informed.

Astronomia Photographica is an up-to-date review of developments that occurred in astronomical photography from its beginnings through to the contemporaneous results obtained by the brothers Prosper and Paul Henry at the Paris Observatory.

The main objective of this paper is to point out to a wider audience the forgotten existence of this 'sui generis' publication, which may very well be the first popular book to be published that was dedicated solely to astronomical photography.

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Vitor Bonifácio is an invited Assistant Professor at Aveiro University, Portugal. He is interested in the History of Astronomy and Physics. Currently he is working on the history of the development of Portuguese astrophysics.

Isabel Malaquias is an Associate Professor at Aveiro University and a member of CIDTFF. She teaches history of science and her research interests are concerned with history of physical sciences, history of instruments and institutions, and science education.

João Manuel de Moraes Barros Fernandes is an Assistant Professor in the Mathematics Department at the University of Coimbra. He received a Ph.D. in Astrophysics from the University of Paris in 1996. His main research interest is stellar evolution. He is also interested in the history of astronomy in Portugal.