

# CHARLES LE MORVAN'S CARTE PHOTOGRAPHIQUE ET SYSTÉMATIQUE DE LA LUNE (PHOTOGRAPHIC AND SYSTEMATIC CHART OF THE MOON)

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The Paris observatory took many lunar photographs between 1894 and 1909. Less than 60 years after F. Arago's speech before the French Academy, Moritz Loewy (1833-1907) and Pierre Henri Puisseux (1855-1928), assisted by Charles Le Morvan (1865-1933), began extensive photographic work (*ca.* 14 years) that will culminate in the first photographic Atlas of our satellite. This atlas was used until 1960, when the images obtained by space probes made it obsolete (Figure 1 and 2).

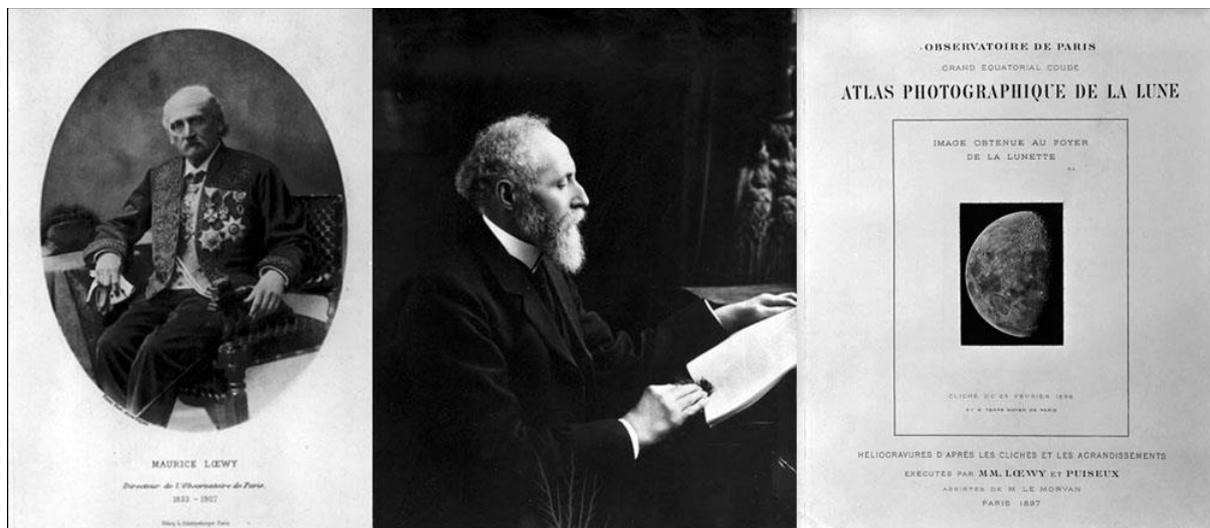


Figure 1- Moritz Loewy (1833-1907) (left) and Pierre-Henri Puisseux (1855-1928) (centre). *Atlas photographique de la Lune, héliogravures*, Paris, 1896-1910, Collections of the Observatoire de Paris (right).

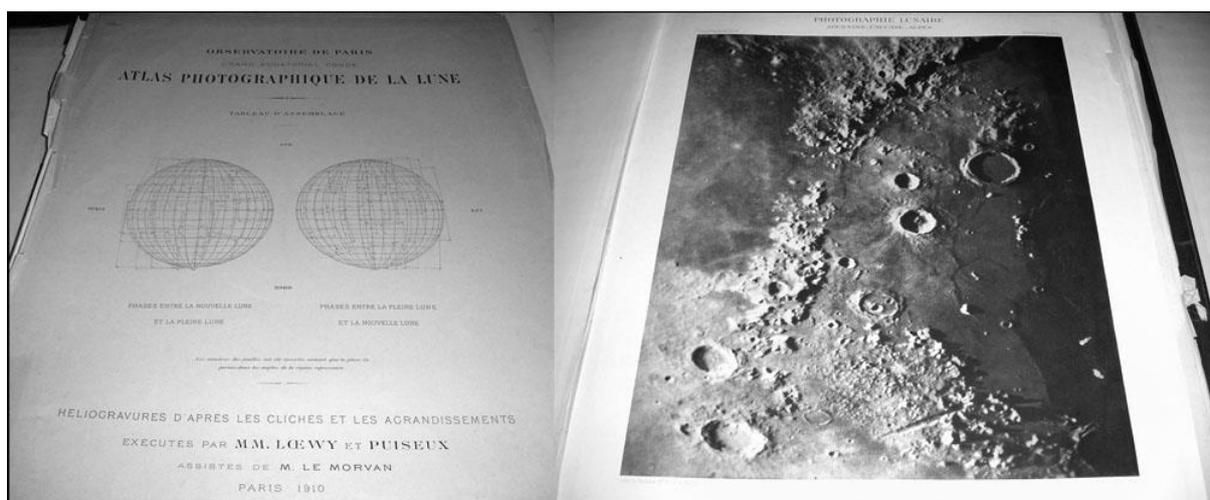


Figure 2- *Atlas photographique de la Lune, héliogravures*, Paris, 1896-1910. Copy in the library of the Lisbon Astronomical Observatory (OAL).

The two French astronomers obtain about 6000 photographs spread over 500 nights of observation. A large part of these photographs was destroyed because they did not have the necessary quality for the Atlas. At present, around 2000 glass plates are kept in the library of the Paris Observatory. The instrument used was the great coudé equatorial of the Paris Observatory (Figure 3). This telescope was built in 1891 and weighed about 16 tons. Thanks to a system of mirrors, the observer could remain immobile next to the eyepiece. The coudé refractor had a 60 cm lens aperture and a focal length of 18 m (F/30). Besides a visual lens, the refractor also had a photographic lens, both built in the workshops of the Paris Observatory by M.M. Henry. The equatorial mount was built by "Maison Gauthier". Some observatories in France installed similar coudé refractors: Lyon (1887), Alger et Besançon (1890) and Nice (1892).

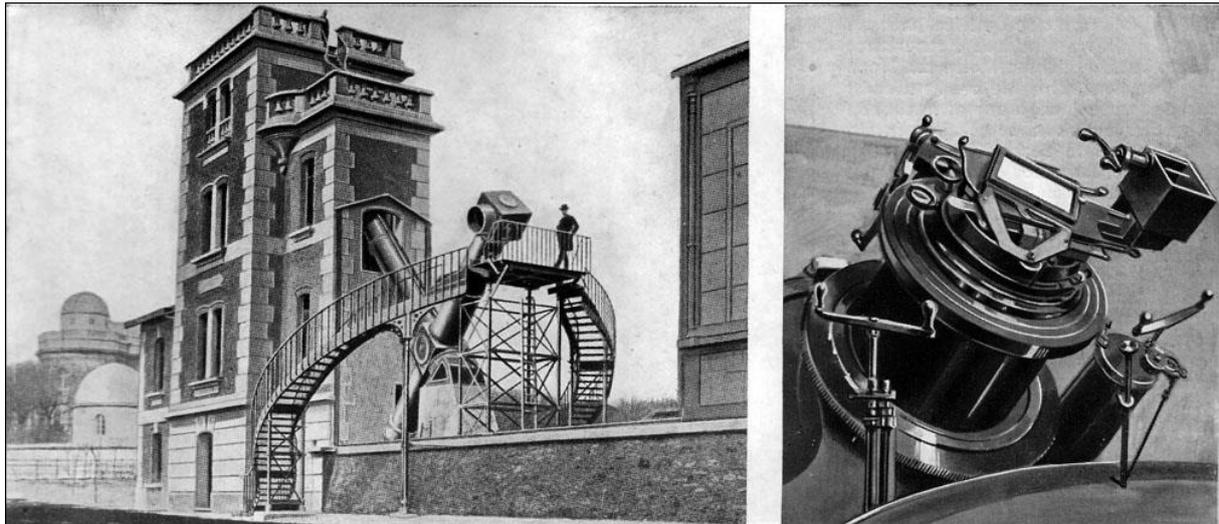


Figure 3- Coudé Equatorial of the Paris observatory: general aspect (left); photographic chassis (right).

The great coudé equatorial had a special photographic chassis the focal plane. This chassis could move by means of a clock mechanism that allowed corrections to be made during exposures (especially in Declination).

The photographic project of M. Loewy and P.H. Puiseaux was divided into three parts:

- (i) Obtaining high-resolution photographic plates that would reveal all the lunar formations that could be observed with the coudé refractor;
- (ii) High quality photographic glass plates of the whole lunar disk that could be studied with the aid of a microscope;
- (iii) Paper photographic enlargements with the same quality as the glass plates to produce the Photographic Atlas.

The images in the Atlas were made from 18X24 cm glass plates (Gelatino-Bromide). These already had a high sensitivity which reduced the exposure times to only a few seconds. The climatic and seeing conditions (turbulence and transparency) were taken into account (the two astronomers used only 1/3 of the photographs obtained for the Atlas).

The best images obtained with the equatorial coudé were the subject of successive publications of the *Atlas Photographique de la Lune* edited between 1896 and 1910 by the Paris Observatory. This Atlas comprises 12 fascicles: (11 prints and 71 enlargements) and texts (descriptions of the most relevant objects of lunar relief, nature and origin). Most of the reproductions on paper were made by M. Fillon.

In the first issue of the Atlas the authors mention:

*La possibilité de construire, par des procédés photographiques, une carte générale de la Lune, aussi complète et plus exacte que toutes celles qui ont paru jusqu'à ce jour, ne saurait plus faire l'objet d'un doute. Une telle perspective n'intéresse pas seulement a une catégorie restreint d'astronomes, mas tous les savants qu'atti e l'étude du ciel, et même tous ceux qui s'adonnent sous une forme quelconque à l'exploration de la nature.*

Charles Le Morvan (1865-1933) reused the photographs of Loewy and Puiseux that were published between 1896 and 1914 by Paris Observatory under the title *Atlas photographique de la Lune*. He published his own "*Carte photographique et systématique de la lune*" in 1914 and 1926; the first publication consists of a series of 48 plates, enlargements of the 38x49 cm, representing the visible hemisphere of the Moon.

Morvan's Atlas consists of Large folio (505 x 385 mm) 6 fascicles comprising 48 photographic plates in heliogravures by L. Massard after the photographs by the author, taken at the Paris Observatory between 1902 and 1907. The plates are numbered I to XXIV and I-A to XXIV-A. The size of the heliogravure area is 320 x 255 mm. Each of plates I to XXIV with original transparent tissue key overlay with outlines and captions of lunar features, the remaining plates with tissue guards only, partly with outlines drawn by hand in pencil. In his photographic and systematic Map of the Moon, Charles Le Morvan reused the original clichés of the *l'Atlas photographique de la Lune* by Maurice Loewy and Pierre Puiseux. Le Morvan already participated in the production of the Loewy/Puiseux Atlas with own lunar observations and the preparation of glass clichés, especially after the death of Loewy in October 1907. Le Morvan joined the staff of the Paris Observatory in 1890, where he spent his entire working life. In 1914 Morvan edited the *Carte Photographique et Systematique de la Lune* which contained copies of photographs taken from the *Atlas Photographique de la Lune*. The finance for this work had come from a grant of 4000 francs from the Bonaparte Fund of the Paris Academy of Sciences. Complete sets of this work are very rare. Linda Hall Library in Kansas City has the full copy of the 48 sheets, the University of Arizona in Tucson only has the first 24 sheets, the Paris Observatory has the entire book.

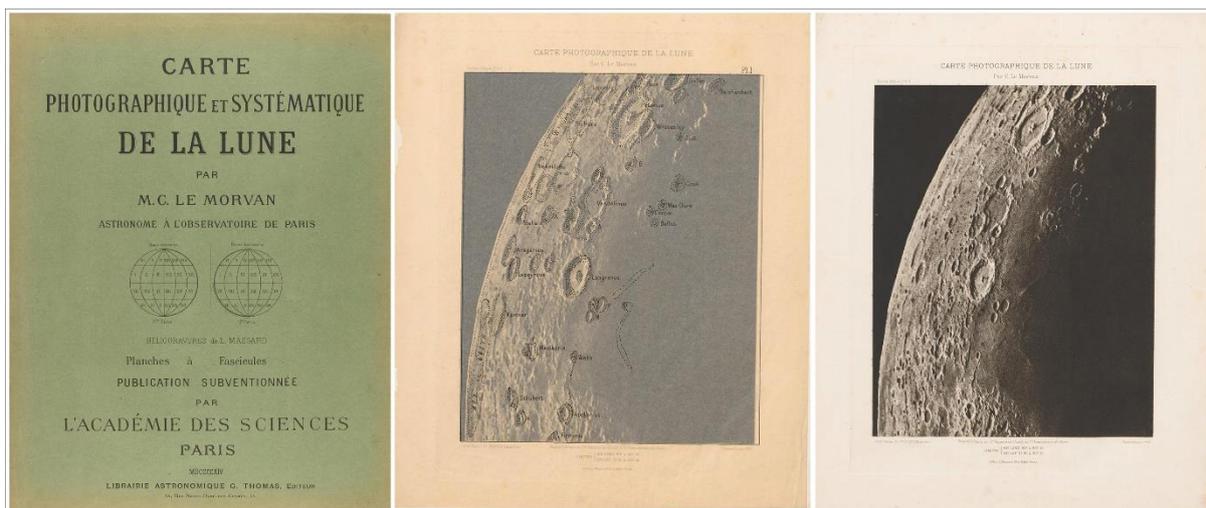


Figure 4 - *Carte Photographique et Systematique de la Lune* by Charles Le Morvan (1914). Author's copy.