WILLIAM H. PICKERING PHOTOGRAPHIC ATLAS OF THE MOON

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William Henry Pickering (1858-1938), was born in Boston Massachusetts. His older brother, Edward Charles Pickering (1846-1919), was director of the Harvard College Observatory for more than 30 years. W.H. Pickering obtained a degree at the Massachusetts Institute of Technology (MIT) in 1879 and later became a physics instructor from 1880 to 1887. Although William started his astronomical work in the field of stellar photography, most of his research, especially in later years, was concerned with visual observations of the Moon and planets. In the pursuit of his investigations of the Sun, Moon, and planets, William travelled extensively to southern and western United States, the Azores, Hawaii, Europe, Chile, and Peru, and the West Indies. He was also responsible for establishment of the Harvard observatory at Arequipa (Peru) where the planets Venus and Mars were studied under excellent seeing conditions.

In 1899, W.H. Pickering discovered the ninth satellite of Saturn (Phoebe) from photographs taken at Harvard observatory, that unlike most satellites has a retrograde orbit.

Pickering was also very interested in building a telescope suitable for lunar photography. This telescope should be of twelve to fifteen inches aperture and of very long focal length. In 1899, thanks to two anonymous benefactors, funds became available. An expedition was organized to find a location for the telescope in Jamaica[1].

An expedition to the island of Jamaica in 1899, during which a five-inch telescope was used at five different stations upon the island, had shown that the atmospheric conditions were extremely favourable to astronomical work during the summer season, and it was hoped that they would be equally so during the winter, which is the time of the greatest freedom from clouds. Later investigations showed that while the seeing in winter is good, yet it is decidedly inferior to that in the summer season.

The observatory was located near the town of Mandeville. Pickering rented an Estate called Woodlawn, 2100 feet above sea level. By the end of December 1900, the telescope and observatory were completed and ready to image the Moon. The mount and telescope were described by Pickering:

The latitude of the island, which is about 18° N., permitted the mounting of the telescope with the axis of the lens parallel to that of the Earth, the tube being placed upon the side of a hill, with the mirror and lens at the lower end. The mirror was supported in a steel fork, which was also placed with its axis parallel to that of the Earth. The mirror could be clamped at different angles with regard to the fork. The fork was caused to revolve about its axis once in twenty-four hours in the opposite direction to that in which it was turned by the Earth. It therefore had no angular motion with regard to the heavenly bodies. A similar rotation was given to the photographic plate. This form of mounting does not permit the portion of the sky in the immediate vicinity of the Pole to be examined, but as the instrument was devised for use on the members of the solar system, this objection was of little consequence. The mirror was of silver on glass, eighteen inches in diameter and about four inches thick. Owing to the length of

[1] Pickering, W.H. (1903). *The Moon – A Summary of the Existing Knowledge of our Satellite with a Complete Photographic Atlas.* New York, Doubleday, Page & Company: 103pp 100 plates.

the instrument, it was decided to drive it by electric motors capable of control from the eye end of the tube, instead of by clockwork actuated by gravity, as has heretofore always been done. The plan proved very successful. The long-inclined tube of the telescope consisted of a wooden frame covered with wire netting and supported on posts driven into the ground. The netting was covered at first with builder's paper, and later with cotton cloth. In the bottom of the tube were strung twelve insulated copper wires, permitting the operator at the upper end of the tube to control the motions of the mirror at the lower end. The small building at the upper end contained the observing room, the laboratory, the computing and dark rooms. The building at the lower end had a movable roof, divided in the middle. This could be slid apart, exposing the mirror and lens to the sky. The light of the Moon was reflected from the mirror up through the lens to the observer at the upper end of the tube. By turning the mirror, the observer could see the Moon, no matter in what part of the sky it chanced to be, and it always appeared below him, and in the same direction. This was an important advantage, as when observing with an ordinary telescope it is very difficult to do good work when the Moon is directly overhead. This is a position that it frequently assumes to an observer located in the tropics.

Figure 1- William H. Pickering and the Lunar telescope at Woodlawn, Mandeville, Jamaica.

The first light of the Woodlawn telescope was on December 31 a few minutes after midnight and eight days later the first photograph was taken.

Our first satisfactory photograph of the Moon was taken on January 29, 1901. Our last photograph was taken August 31, so that the material for the present volume was collected in about seven months.

Pickering's Atlas was the first complete Photographic Atlas of the Moon published. It was first published on 26th August 1903 in the Annals of the Harvard College Observatory and later in a book, Pickering, W.H. (1903). *The Moon – A Summary of the Existing Knowledge of our Satellite with a Complete Photographic Atlas.* New York, Doubleday, Page & Company: 103pp 100 plates.

In planning the work, it was decided to divide the Moon's equatorial diameter into eight equal parts, and erect perpendiculars at the dividing points. It may be well to point out some of the respects in which this atlas differs from the Lunar photographic atlases that have preceded it.

(a) It is the only complete photographic atlas of the Moon in existence. Not only so, but it covers the whole visible surface of the Moon five times.

(b) The plates are all arranged systematically.

(c) The plates are of such a shape that all the objects shown are similarly illuminated. Had fewer, broader plates been used, many objects could not have been shown near the terminator. The similar illumination also permits the most suitable plate and exposure to be used for the whole of the particular region under consideration.

(d) Every region is shown at five different phases, many details being conspicuous at one phase of the Moon that are not seen at all at another. In this way changes in the snow patches and in the vegetation are shown which could not possibly be indicated by any single photograph.

(e) Sometimes the same region contains some very bright and some very dark areas, such as a bright mountain mass and a dark mare. In such cases, both cannot be shown to advantage on the same photograph. By having five photographs, however, the exposures and printing can be so adjusted that every object will be shown with a suitable exposure upon at least one plate.

(f) All the plates are on the same scale, 5" to the millimetre, and while there are some differences in the linear dimensions which are unavoidable by this plan on account of the varying libration and distance, there is no great range of scale such as occurs in some photographic atlases, where one plate may be on more than twice the scale of another.

(g) All the plates are approximately oriented parallel to the lunar axis, with south at the top.

(h) Since all the plates are printed the same size as the original negatives, there has been no enlargement of the grain of the plate, and we have in consequence a much smoother surface than is possible in the case of those pictures enlarged from negatives taken with a lens of shorter focus.

(i) A considerable overlapping of the plates is allowed. This is a great convenience when working near the edge of a region.

(j) The photographs were taken, whenever possible, under favourable libration, and especial attention was paid to this point in the original plan.

(k) No shading of the limb was permitted; therefore, every region appears in its true photographic relations of light and shade.

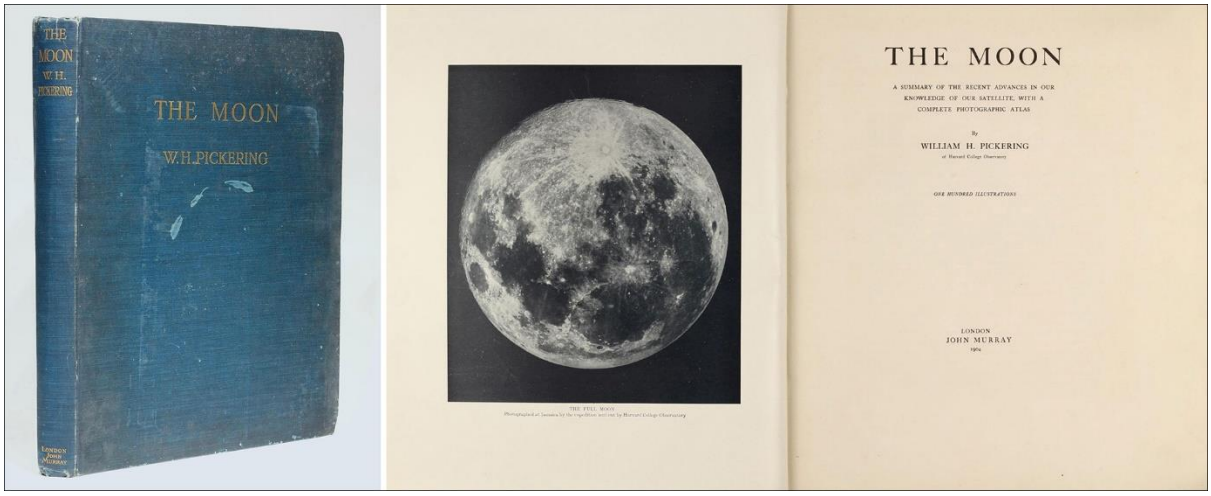

Figure 2- Pickering, W.H. (1903). *The Moon – A Summary of the Existing Knowledge of our Satellite with a Complete Photographic Atlas.*

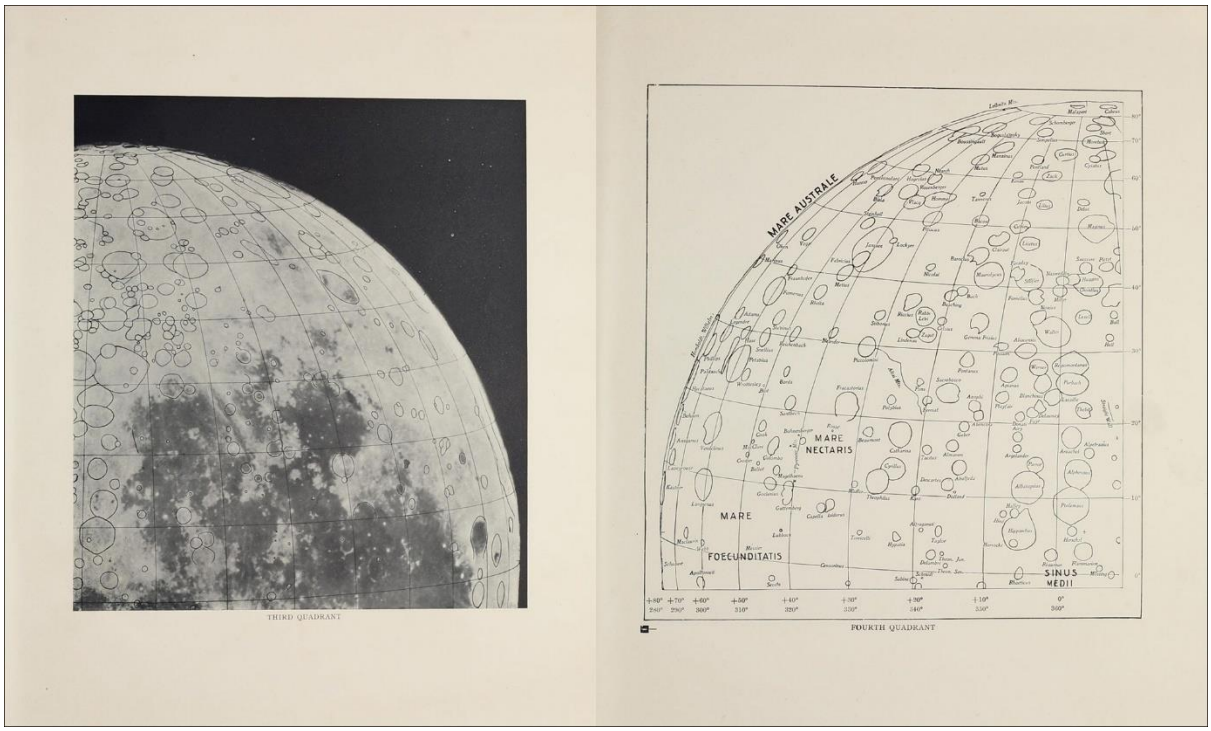

Figure 3- Pickering, W.H. (1903). *The Moon – A Summary of the Existing Knowledge of our Satellite with a Complete Photographic Atlas.*

Figure 4 - Pickering, W.H. (1903). *The Moon – A Summary of the Existing Knowledge of our Satellite with a Complete Photographic Atlas.*