

INTRODUCTION

THE Science of Astronomy is sublime and beautiful. Noble, elevating, consoling, divine, it gives us wings, and bears us through Infinitude. In these ethereal regions all is pure, luminous, and splendid. Dreams of the Ideal, even of the Inaccessible, weave their subtle spells upon us. The imagination soars aloft, and aspires to the sources of Eternal Beauty.

What greater delight can be conceived, on a fine spring evening, at the hour when the crescent moon is shining in the West amid the last glimmer of twilight, than the contemplation of that grand and silent spectacle of the stars stepping forth in sequence in the vast Heavens? All sounds of life die out upon the earth, the last notes of the sleepy birds have sunk away, the Angelus of the church hard by has rung the close of day. But if life is arrested around us, we may seek it in the Heavens. These incandescing orbs are so many points of interrogation suspended above our heads in the inaccessible depths of space. . . . Gradually they multiply. There is Venus, the white star of the shepherd. There Mars, the little celestial world so near our own.

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There the giant Jupiter. The seven stars of the Great Bear seem to point out the pole, while they slowly revolve around it. . . . What is this nebulous light that blanches the darkness of the heavens, and traverses the constellations like a celestial path? It is the Galaxy, the Milky Way, composed of millions on millions of suns! . . . The darkness is profound, the abyss immense. . . . See! Yonder a shooting star glides silently across the sky, and disappears! . . .

Who can remain insensible to this magic spectacle of the starry Heavens? Where is the mind that is not attracted to these enigmas? The intelligence of the amateur, the feminine, no less than the more material and prosaic masculine mind, is well adapted to the consideration of astronomical problems. Women, indeed, are naturally predisposed to these contemplative studies. And the part they are called to play in the education of our children is so vast, and so important, that the elements of Astronomy might well be taught by the young mother herself to the budding minds that are curious about every issue—whose first impressions are so keen and so enduring.

Throughout the ages women have occupied themselves successfully with Astronomy, not merely in its contemplative and descriptive, but also in its mathematical aspects. Of such, the most illustrious was the

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beautiful and learned Hypatia of Alexandria, born in the year 375 of our era, public lecturer on geometry, algebra, and astronomy, and author of three works of great importance. Then, in that age of ignorance and fanaticism, she fell a victim to human stupidity and malice, was dragged from her chariot while crossing the Cathedral Square, in March, 415, stripped of her garments, stoned to death, and burned as a dishonored witch!

*Martyred by the
Christians*

Among the women inspired with a passion for the Heavens may be cited St. Catherine of Alexandria, admired for her learning, her beauty and her virtue. She was martyred in the reign of Maximinus Daza, about the year 312, and has given her name to one of the lunar rings.

Another celebrated female mathematician was Madame Hortense Lepaute, born in 1723, who collaborated with Clairaut in the immense calculations by which he predicted the return of Halley's Comet. "Madame Lepaute," wrote Lalande, "gave us such immense assistance that, without her, we should never have ventured to undertake this enormous labor, in which it was necessary to calculate for every degree, and for a hundred and fifty years, the distances and forces of the planets acting by their attraction on the comet. During more than six months, we calculated from morning

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to night, sometimes even at table, and as the result of this forced labor I contracted an illness that has changed my constitution for life; but it was important to publish the result before the arrival of the comet."

This extract will suffice for the appreciation of the scientific ardor of Madame Lepaute. We are indebted to her for some considerable works. Her husband was clock-maker to the King. "To her intellectual talents," says one of her biographers, "were joined all the qualities of the heart. She was charming to a degree, with an elegant figure, a dainty foot, and such a beautiful hand that Voiriot, the King's painter, who had made a portrait of her, asked permission to copy it, in order to preserve a model of the best in Nature." And then we are told that learned women can not be good-looking! . . .

The Marquise du Châtelet was no less renowned. She was predestined to her career, if the following anecdote be credible. Gabrielle-Émilie de Breteuil, born in 1706 (who, in 1725, was to marry the Marquis du Châtelet, becoming, in 1733, the most celebrated friend of Voltaire), was four or five years old when she was given an old compass, dressed up as a doll, for a plaything. After examining this object for some time, the child began angrily and impatiently to strip off the silly draperies the toy was wrapped in, and after turning

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it over several times in her little hands, she divined its uses, and traced a circle with it on a sheet of paper. To her, among other things, we owe a precious, and indeed the only French, translation of Newton's great work on universal gravitation, the famous *Principia*, and she was, with Voltaire, an eloquent propagator of the theory of attraction, rejected at that time by the Académie des Sciences.

Numbers of other women astronomers might be cited, all showing how accessible this highly abstract science is to the feminine intellect. President des Brosses, in his charming *Voyage en Italie*, tells of the visit he paid in Milan to the young Italian, Marie Agnesi, who delivered harangues in Latin, and was acquainted with seven languages, and for whom mathematics held no secrets. She was devoted to algebra and geometry, which, she said, "are the only provinces of thought wherein peace reigns." Madame de Charrière expressed herself in an aphorism of the same order: "An hour or two of mathematics sets my mind at liberty, and puts me in good spirits: I feel that I can eat and sleep better when I have seen obvious and indisputable truths. This consoles me for the obscurities of religion and metaphysics, or rather makes me forget them; I am thankful there is something positive in this world." And did not Madame de Blocqueville, last surviving

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daughter of Marshal Davout, who died in 1892, exclaim in her turn: "Astronomy, science of sciences! by which I am attracted, and terrified, and which I adore! By it my soul is detached from the things of this world, for it draws me to those unknown spheres that evoked from Newton the triumphant cry: '*Cæli enarrant gloriam Dei!*' "

Nor must we omit Miss Caroline Herschel, sister of the greatest observer of the Heavens, the grandest discoverer of the stars, that has ever lived. Astronomy gave her a long career; she discovered no less than seven comets herself, and her patient labors preserved her to the age of ninety-eight.—And Mrs. Somerville, to whom we owe the English translation of Laplace's *Mécanique céleste*, of whom Humboldt said, "In pure mathematics, Mrs. Somerville is absolutely superior." Like Caroline Herschel, she was almost a centenarian, appearing always much younger than her years: she died at Naples, in 1872, at the age of ninety-two.—So, too, the Russian Sophie Kovalevsky, descendant of Mathias Corvinus, King of Hungary, who, an accomplished mathematician at sixteen, married at eighteen, in order to follow the curriculum at the University (then forbidden to unmarried women); arranging with her young husband to live as brother and sister until their studies should be completed. In 1888

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At the present time, Astronomy is proud to reckon among its most famous workers Miss Agnes Clerke, the learned Irishwoman, to whom we owe, *inter alia*, an excellent History of Astronomy in the Nineteenth Century;—Mrs. Isaac Roberts, who, under the familiar name of Miss Klumpke, sat on the Council of the Astronomical Society of France, and is D. Sc. of the Faculty of Paris and head of the Bureau for measuring star photographs at the Observatory of Paris (an American who became English by her marriage with the astronomer Roberts, but is not forgotten in France);—Mrs. Fleming, one of the astronomers of the Observatory at Harvard College, U. S. A., to whom we owe the discovery of a great number of variable stars by the examination of photographic records, and by spectral photography;—

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CHAPTER I

THE CONTEMPLATION OF THE HEAVENS

THE crimson disk of the Sun has plunged beneath the Ocean. The sea has decked itself with the burning colors of the orb, reflected from the Heavens in a mirror of turquoise and emerald. The rolling waves are gold and silver, and break noisily on a shore already darkened by the disappearance of the celestial luminary.

We gaze regretfully after the star of day, that poured its cheerful rays anon so generously over many who were intoxicated with gaiety and happiness. We dream, contemplating the magnificent spectacle, and in dreaming forget the moments that are rapidly flying by. Yet the darkness gradually increases, and twilight gives way to night.

The most indifferent spectator of the setting Sun as it descends beneath the waves at the far horizon, could hardly be unmoved by the pageant of Nature at such an impressive moment.

The light of the Crescent Moon, like some fairy boat suspended in the sky, is bright enough to cast changing and dancing sparkles of silver upon the ocean. The

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Evening Star declines slowly in its turn toward the western horizon. Our gaze is held by a shining world that dominates the whole of the occidental heavens. This is the "Shepherd's Star," Venus of rays translucent.

Little by little, one by one, the more brilliant stars shine out. Here are the white Vega of the Lyre, the burning Arcturus, the seven stars of the Great Bear, a whole sidereal population catching fire, like innumerable eyes that open on the Infinite. It is a new life that is revealed to our imagination, inviting us to soar into these mysterious regions.

O Night, diapered with fires innumerable! hast thou not written in flaming letters on these Constellations the syllables of the great enigma of Eternity? The contemplation of thee is a wonder and a charm. How rapidly canst thou efface the regrets we suffered on the departure of our beloved Sun! What wealth, what beauty hast thou not reserved for our enraptured souls! Where is the man that can remain blind to such a pageant and deaf to its language!

To whatever quarter of the Heavens we look, the splendors of the night are revealed to our astonished gaze. These celestial eyes seem in their turn to gaze at, and to question us. Thus indeed have they questioned every thinking soul, so long as Humanity has existed on our Earth. Homer saw and sung these