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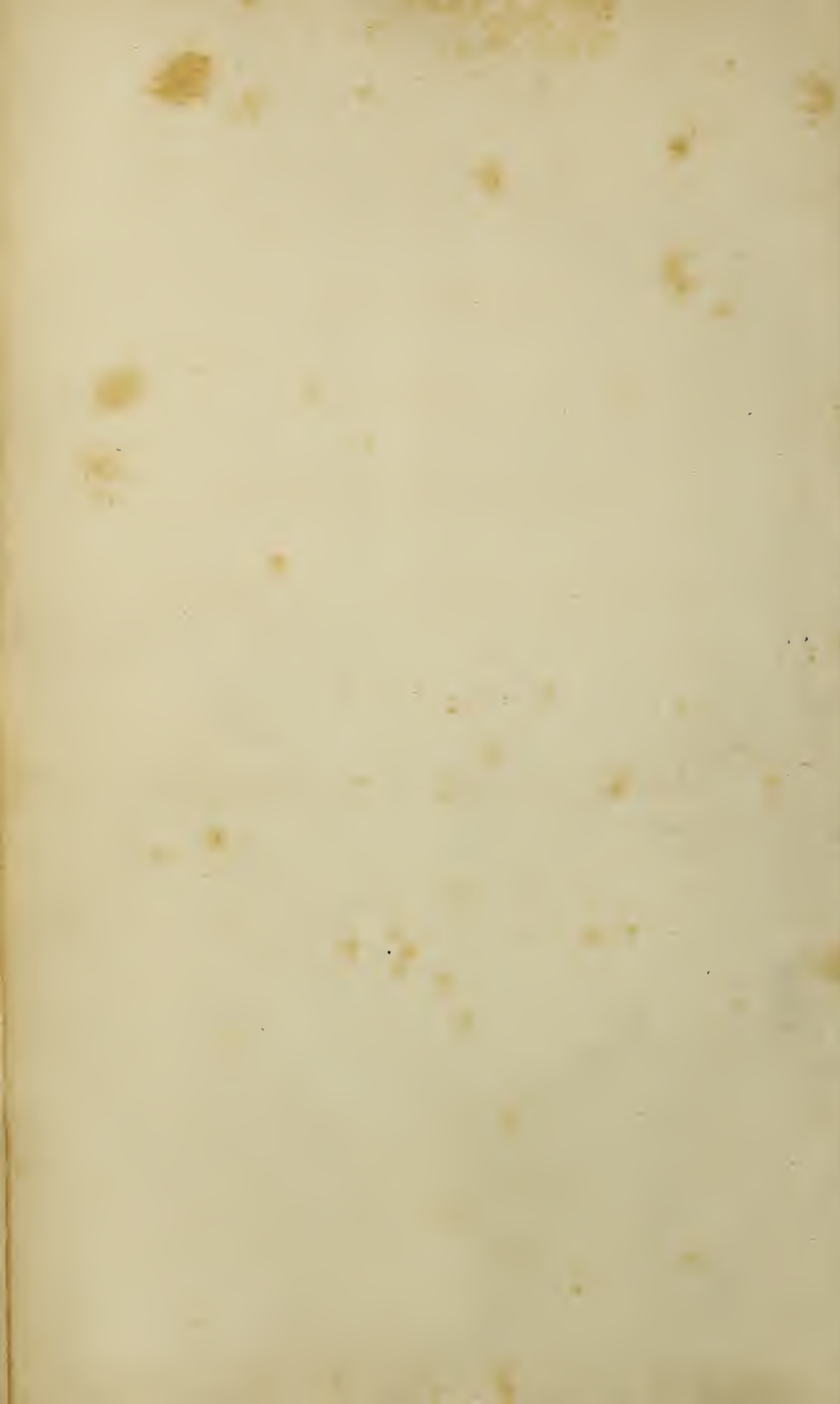
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KATHARINE E. COMAN









L. H. ...
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LECTURE,

DELIVERED APRIL 2d, 1845,

BEFORE THE MEMBERS OF THE

ALBANY FEMALE ACADEMY,

AT THE CLOSE OF THE

ANNUAL COURSE ON ASTRONOMY.

BY ALEXANDER WATSON,

PROFESSOR OF MATHEMATICS AND NATURAL SCIENCE.



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ALBANY, FEMALE ACADEMY, }
April 2, 1845. }

The ladies of the Astronomy class present their best thanks to Professor Watson for his beautiful and appropriate address at the close of the course, and respectfully request a copy of it for publication.

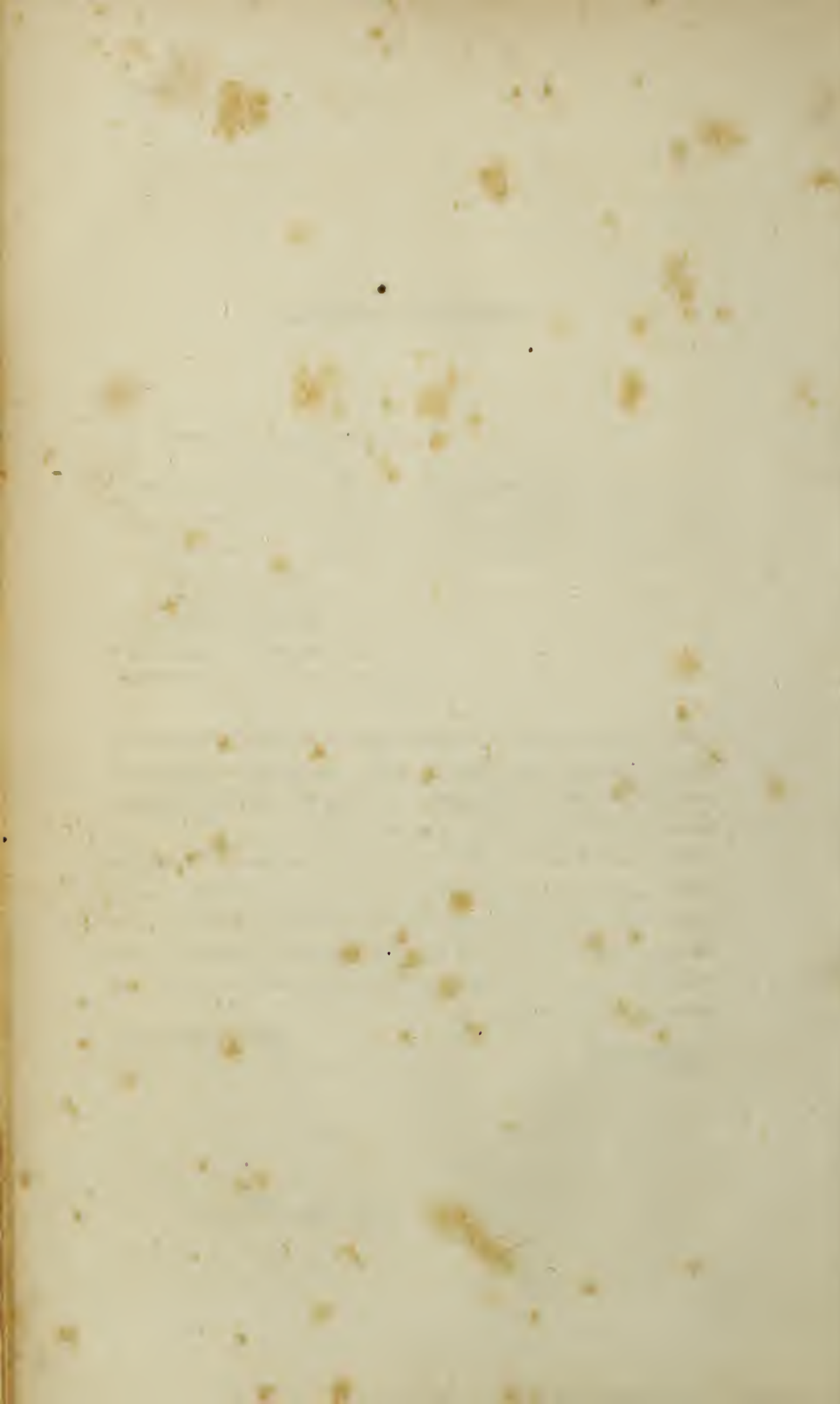
MARY MATHER,
MARY POHLMAN,
JEANNIE MOORE,
MARY P. CASTLE,
Committee.

Mr. Watson presents his compliments to the Ladies of the Astronomy class; and although the address, of which they unexpectedly request a copy, was written without the idea of publication—yet he does not feel justified in refusing to comply with their wishes.

The Ladies may be assured that Mr. Watson values deeply their communication; not so much for the compliment implied in their request, as for their generous appreciation of his efforts to discharge the duties of a teacher—duties at all times responsible, occasionally irksome, and which meet, in such appreciation, the *richest*, and, perhaps, the *rarest* of their rewards.

ALEX. WATSON.

April 3, 1845.



LECTURE.

The course of Astronomy, as you are aware, closes with the present lecture ; and I have resolved, for various reasons, to deviate on this occasion from our common practice. I shall first present you with a brief summary of the subjects—including some of the leading facts and principles—which have been considered. As we have adhered to no particular text-book, this summary, though unavoidably imperfect, may yet be useful and convenient for your future reference. I shall then offer, at greater length, some remarks of a more general kind, on the nature and objects of education—on the legitimate influence of the acquisition of all real knowledge—and on the reflections which the study of Astronomy especially, is calculated to inspire.

In every department of knowledge, and generally in proportion to the thoroughness with which it is investigated, there is ultimately discovered a simplicity that is often in striking contrast with the complexity at first apparent. The simplicity generally consists in the fact that all, or nearly all, the phenomena and operations in question, are found to be explained by a few general principles.

Thus the most elementary of the sciences—arithmetic—may be virtually reduced to the two processes of increase and diminution ; grammar, to the consideration of the two elements of language, the noun and the verb ; logic, to the operations of comparing objects in respect of some common attribute, and of deducing from such comparison, an inference or con-

clusion; while the endless phenomena of magnetism, electricity, and even chemistry, may probably be referred to the simple principles of attraction and repulsion.

In like manner the phenomena of Astronomy—at first sight the most complicated—would seem almost wholly dependent on the two opposite principles of gravitation and impulse. In reviewing this, or any other study, it is useful to keep before the mind these guiding principles, and to mark, as they occur, the various illustrations of their influence.

Beginning with the earth, as the most natural starting point, and the basis of all ultimate observations, we considered in detail its figure, dimensions, and motions. Man had long regarded the earth as a vast plain, immovably fixed on foundations mysteriously laid by Omnipotence—the symbol of stability—the centre and chief object in the universe—for whose service not only the sun and moon, but all the hosts of heaven were created, and performed their majestic rounds. This belief, no less consonant with human pride and consequence, than with the apparent evidence of the senses, seemed directly supported by the scriptures themselves; and we cannot wonder that for thousands of years it met with universal assent. Man however has learned that the senses are occasionally illusory, or rather, that their perceptions are liable to be misinterpreted; that of a curved surface of enormous dimensions, a very limited extent must appear to be a plain; that motion may exist without being necessarily perceived by those who unconsciously participate it; that apparent motion may be actual rest, and apparent rest, actual motion; that in the scheme of the universe, human pride has been but little consulted; that the objects of revelation are moral and spiritual, rather than physical, and therefore there are to be expected “more wonders in heaven and earth,” than are breathed in inspiration, not to say “dreamed of” even “in philosophy.”

The discovery or recognition of a great physical truth is commonly followed by easy and ample corroboration. Such was the case in respect of the earth's sphericity. Among many well known proofs may be here named the phenomena

of lunar eclipses—the analogy of the other planets—the earth's circumnavigation—the appearance of distant elevated objects at sea—the measurement of meridional arcs—the dip of the horizon—the elevation or depression of celestial bodies, caused by motion in any direction on the earth's surface.

Its figure having been proved, it was not difficult to admit its motion. Indeed the old and only alternative left, of supposing the earth at rest, while all the heavenly bodies revolve around it in equal times, involves conditions which, besides being physically impossible and self contradictory—are so complicated—so monstrous—so much at variance with the symmetry and wisdom, the admirable adaptation of means to ends, conspicuous in every thing that bears the impress of the creator, as to be utterly indefensible. The earth's motion on its axis being admitted, all difficulty disappears, while sublime simplicity takes its place.

Here, again, observation confirms what philosophy had ventured to pronounce. The trade winds, for instance, may be named as a constant and familiar result of rotation. It has been asserted indeed that if the earth revolve, a body dropped from the top of a tower or steeple, must fall west of the base, because the earth during the descent, moves towards the east. The objection is nothing more than ignorant assumption. The most careful experiments show the fact to be just the reverse—the body falling exactly at the base, or being deflected towards the east. This accords with the theory, and the established laws of motion. Every body on its surface, whether at rest or not, partakes of the earth's motion, so that to human observation, in ordinary cases at least, the action of gravity on falling bodies must be the same as if the earth were at rest; yet as the motion increases with the distance from the centre—being less, for instance, at the bottom of a mine, than at the top—so the motion of the summit of a tower, (and of course of any body placed there) being somewhat greater than at its base, the body should, as it actually does, fall towards the east, in the direction of the earth's motion.

As the centrifugal force increases with the height, it is curi-

ous to reflect that a limit is thus placed to human efforts in that direction. Independently of other insuperable obstacles, the aspiring architects on the plains of Shinar, who began to build "a tower that should reach to heaven," must eventually have attained an elevation at which—gravity being overbalanced by centrifugal force—mortar, bricks, and builders, would have alike been swept from their "bad præeminence."

The fact that a pendulum which, in any latitude, keeps time, loses a number of vibrations per day when carried to the equator, is an instance of the same force which thus diminishes the action of gravity. And so rigid is the analysis applied to such phenomena, that the effect was found by calculation greater than could be accounted for, by centrifugal force alone. It was not till the detection of another element, not previously recognized, viz, the spheroidal form of the Earth—which was determined by actual measurement, and is itself a consequence of the rotation in question—that the discrepancy was entirely removed.

The force of gravity *below* the Earth's surface being directly as the distance from the centre, *above*, inversely as the square of that distance, it is easy to calculate the weight of a body in any given position. At the depth of 1000 miles it would lose $\frac{1}{4}$ of its weight; at the depth of 2000 miles, $\frac{1}{2}$; at the depth of 3000 miles, $\frac{3}{4}$; and at the centre, being equally attracted on all sides, it would weigh nothing. Yet were the Earth perforated through the centre, and a body let fall into the opening, it would not, as one might at first suppose, stop at the centre. The motion of a pendulum stops not, when its direction becomes vertical, although the entire action of gravity tends to retain it; inertia causes it to ascend to the same elevation from which it fell. In like manner the descending body would be carried by its acquired momentum beyond the Earth's centre, up to the opposite surface, and if left to act freely, would thus continue its vibrations for ever. The time of descent to the centre would be 21 minutes, and as the ascent would occupy the same time, the whole vibration from surface to surface would be 42 minutes. A body elevated above the Earth's surface 618 miles would lose $\frac{1}{4}$ of

its weight; 1656 miles, $\frac{1}{2}$; 4000 miles, $\frac{3}{4}$; and at an elevation of 210,000 miles, the attraction of the Earth and Moon—which is inversely as the squares of their distances, and directly as their masses—would be exactly balanced, and the body, as at the Earth's centre, would weigh nothing.

The mode of ascertaining the Earth's density and dimensions—the nature and proofs of its motion round the Sun—the consequences of this motion, in giving rise to the year, the seasons, and other interesting phenomena, were then described.

We next considered the Sun, that most glorious spectacle that ever greeted mortal eyes, which, in “unapproachable divinity,” pours on so many worlds a ceaseless tide of light and life, beauty and joy—

“ Which was a worship ere
The mystery of its making was revealed;
The earliest minister of the Almighty,
Which gladdened, on their mountain tops, the hearts
Of the Chaldean shepherds, till they poured
Themselves in orisons. Which makes our Earth
Endurable, and tempereth the hues
And hearts of all who walk within its rays !”

Who can wonder at the altars reared, and the adoration offered, by so many children of the Sun to this “material God?” What created object seems so fit a symbol of the Creator? Its worship compared with that of stocks and stones, the “work of *man's* hands,” appears almost rational and sublime—in view of the idol we are half disposed to pardon the idolatry—to pity rather than condemn those who thus mistook the effect for the cause—the visible but glorious Shadow for the invisible Substance.

Like the Earth, the Sun has a rotatory motion, and of course a spheroidal form; its density is only one-fourth of that of the Earth, yet from its vast magnitude, gravity being 28 times greater than with us, will cause a falling body near its surface to descend 450 feet in one second. Of its distance and dimensions, our ideas, inadequate at best, must be based on terrestrial calculations. The former, deduced from the Sun's parallax, is such that, at railroad speed, 30 miles per

hour, no less than 360 years would be required to traverse the mighty void. Its magnitude, deduced from its apparent diameter, is such, that 112 bodies, each as large as our world, placed continuously across its centre, would just span its diameter, and be seen on the Earth as a dark line across its disc.

The Sun's physical structure, atmosphere, and spots, having been considered, we proceeded to the subject of the Moon, whose varied and most interesting phenomena occupied much attention, but cannot here be detailed.

The subjects of Parallax, Twilight, and Refraction; Time and the Calendar; the Equation of Time; the Precession of the Equinoxes; the phenomena of the Tides, occasioned by the conjoined but unequal action of the Sun and Moon; those of Solar and Lunar Eclipses—once so formidable, now so harmless, to human apprehension; the mode of calculating the dimensions of the shadows of the Earth and Moon; the circumstances under which eclipses can take place, and which determine their magnitude and duration; were all examined in minute detail.

Having lingered thus long upon the Earth, and the objects most intimately allied to it, we next considered the planets, in their order of succession from the Sun—their orbits, and periods of revolution—their rotation on their axes—their distances from the Sun, absolute and relative—their dimensions, what, and how ascertained—their satellites—the transits of Venus and Mercury, their importance—and many other collateral topics that need not be enumerated.

The last, and most mysterious members of the Solar system are the Comets; if, in reality, bodies so anomalous in appearance and physical structure, the nature and direction of their orbits, the ends they probably serve, and other essential particulars, can be legitimately ranked among the planetary family. It was shown that the motions of these singular bodies, during the short visits they make, are found to agree with the figures of the three conic sections—the Ellipse, Parabola, and Hyperbola—either of which, as the orbit of a Comet, will answer the conditions of Solar attraction. Of

many hundreds of Comets seen since the commencement of the Christian era, but very few have been recognized, or known to return. Of these few, the orbits must be ellipses, since neither of the other figures is a curve that returns into itself, and a Comet whose orbit is not an ellipse can be witnessed on Earth but once. The nature of their nuclei, envelopes, and trains—the variety in their brightness, magnitudes, distances, and calculated periods (the latter varying from three to three thousand years)—the inconceivably small quantity of matter of which some of them are composed—all formed interesting materials for investigation. Perhaps the most striking circumstance connected with the subject, is the strong presumption, afforded by the acceleration of Encke's Comet, of a resisting medium—a hypothesis which suggests reflections most important and sublime—discountenances the idea of the eternity of the Universe, and points to a period, however remote, when, as it had a beginning, it will have an end.

When we pass beyond the verge of the Solar system—the plain prose of Astronomy—and approach the fixed stars, the poetry of the heavens, we encounter an impassable gulf that seems to forbid our further progress, to intimate that we must leave those sparkling orbs to the mystery which has so long invested them, and confine our researches within the narrow sphere to which destiny has bound us. The discovery of the telescope, indeed, opened to human contemplation a new scene, unimagined before. By revealing in the depths of space, where the eye could discern nought but darkness, myriads of stars, crowding upon the sight, or, rather, coming up from their unseen abodes at the command of the astronomical enchanter, as new powers were successively applied to it, the telescope has shown that not only the “globe itself, and all that it inherit,” but the whole Solar system, compared with the infinitude of creation, is but as a mote in the sun-beam to the aerial ocean in which it floats.

Yet until very recently the distance of the nearest star was too great for human reckoning; mathematical calculus could not grasp it, although aided by the almost super-human perfec-

tion to which optical instruments had been brought. The amount of parallax—that is, the change caused in the apparent place of a star, by its being viewed from the extremities of a base line so enormous as 190,000,000 miles, which is the diameter of the Earth's orbit—was too small to be appreciated. At last, however, the parallax of one or two stars has been determined, and has shown the distance to be 300,000 times the length of the base line named. It is easy to see, and to say, that at railroad speed it would require 216,000,000 years to pass through such an interval—a period of which all the past generations of ephemeral man form but $\frac{1}{360000}$ part—but in truth, of such vast numbers and distances, we can form scarcely more just conceptions, than we can of the extent of infinity, or the duration of eternity. Yet such, be it remembered, is the distance of probably the nearest stars. When we pursue our enquiries, and find that the stars are fixed, in obvious gradations, deeper and deeper in the abysses of space—a fact evident from the higher magnifying powers necessary to evoke them from invisibility—so that the astronomer descries, in the long retiring lines that form the celestial perspective, the dazzling vista, of stellar worlds, stars that are thousands of times more remote than the nearest—to all attempts to master the conception of such distances “expressive silence” is the meetest, the only response.

Nor is this all. It has been satisfactorily ascertained that our firmament, viz, the entire mass of stars presented to our view in a clear evening, forms but one group, out of innumerable others, separated from each other by fathomless intervals. These starry groups, chiefly undiscernible by the unaided eye, and which appear, even through common telescopes, as vague and hazy patches of light, were resolved into countless stars by Herschel's gigantic telescope—the great medium of communication between Earth and the out-posts of creation. It is an astounding achievement, that by means of this instrument the heavens have been actually sounded, and the form of our firmament, or the cluster of stars of which our Sun is an humble member, and whose blended light forms the outline of the Milky way, been determined and delineated.

Thousands of such firmaments have been enumerated and their positions marked. In form and aspect, in brilliancy and structure, there is observed every imaginable *variety*—so that the vast in nature, seems no less subject to that pervading law than the minute. Of their distance from our firmament and from each other, some faint idea may be gathered from the fact, that Herschel with mathematical certainty, computed the distance of the most remote groups from our system, at 35,000 times that of Sirius. The light that reveals them to us must therefore have taken hundreds of thousands of years to perform its journey, even though it travels 200,000 miles a second; and though they themselves were effaced from creation, *so long* would they still appear to shine with unabated splendor, and continue to dazzle, with their distant glories, the astronomers of after ages.

The last subject of the course to which I would recall your attention, is the existence of nebulous bodies—forms, distinct from those starry masses—composed of a filmy, attenuated substance, holding, as it were, an intermediate place between the ethereal and material. The distinction between these bodies and the masses just alluded to, is, that the dim light of the latter is resolved by the telescope into stars, while that of the former, under the same action, appears more diffuse and indistinct. It were out of place to go into the detail of the nebular hypothesis which has been founded with so much plausibility, and by which the formation of firmaments, systems, suns, and planets, is traced through every stage and degree, in the existing records of the sky. It is most striking to be assured, by actual observation, that the law of gravitation is indeed *universal*, and holds, no less in those far off shadowy forms, than in the descending rain-drop. We are assured that in the first gradation beyond the rudest nebula, there is observable a tendency to condensation and structure—a faint, or rather incipient operation of gravitation towards a common centre; while in the more advanced forms, the spherical outlines, the central intensity of light, and other indications of the law in question, cannot be mistaken. The exquisite lines of Rogers—

“ That very law which moulds a tear,
 And bids it trickle from its source,
 That law preserves the earth a sphere
 And guides the planets in their course’—

thus acquire additional beauty, and the truth they express receives a stronger, sublimer illustration, than even their gifted author ever contemplated.

Having thus presented a brief outline of the Astronomical course, suffer me to direct your attention to the subject of education in general. Among many reasons for bringing this subject before you, may be mentioned the erroneous and defective views still prevalent regarding its nature, its value, its objects and results; the probability that such views, to some extent, may find a place even among yourselves; and the conviction that no occasion could be found more propitious for their removal and the imparting of others more just, than the close of a course on the noble science of astronomy.

The most striking of the peculiarities that stamp the character of the age, is the prominence conceded to the cause of education. Whether we look to the rising republics of the new world, or the venerable monarchies of the old; to the wilds of Russia, where the rigors of climate and of despotism seem to have paralyzed so long the passive millions; or, to the sunny skies of Italy, where the plenary indulgences of nature, if not of creed, appear to have induced an enervation of mind and body equally injurious;—wherever we turn our eyes, we find the cause of education already absorbing, or beginning to awaken, public attention. It matters not what may be the differences of national governments, or the jealousies of individual states; what the distinctions of political opinions, or the varieties of religious belief; the judge and the magistrate,—the minister in the pulpit, and the statesman in the cabinet,—the popular representative in the national council, and the hereditary aristocrat in the House of Peers—President—King—Emperor—Sultan—all, seem inspired with one pervading spirit, and their voices unite in one harmonious cry, “ educate, educate the people.”

Never before was heard so auspicious a cry. Its effect is to

disclose a new scene in the grand drama of humanity ; to present the human family in a new aspect ; to invest with a feature unknown before, the relation of the favored few who rule, to the millionary masses whom they rule. Man, if we may be allowed to individualize the race, is but awaking from the slumber of ages, but beginning to look around him, but preparing to act his part. For thousands of years has he been living in darkness, holding in his own hand his hereditary title, without knowing what it was. The light has begun to break upon him, he sees in his hand this title, he knows not its import fully yet ; but he is learning to read. Yes! *man is learning to read his birthright*: he is claiming, or will soon claim, and enforce too, its generous provisions. Listen to the impassioned strains that are even now uttered by the once passive sons of toil, and ignorance, and oppression.

“ What! shall the immortal sons of God
 Be senseless, as the untrodden clod,
 And darker than the tomb?
 No! by the mind of man!
 By the swart artizan!
 By God, our Sire!
 Our souls have holy light within,
 And every form of grief, and sin,
 Shall see, and feel, its fire.
 By earth, and hell, and heaven!
 The shroud of souls is riven;
 Mind, mind, alone,
 Is light, and hope, and life, and power,
 Earth's deepest night—from this blest hour—
 The night of mind, is gone.”*

The diffusion of this light, and the cause of education, are synonymous. The importance given to that cause, even in quarters where it might have been least expected, is referable to various influences. It is not, indeed, that human nature has parted with any of its repulsive features—that the paltry pride of conventional castes, the apathy of ambition, the

* Elliot, the English corn-law rhymer.

sordid selfishness of power, in short, that "man's inhumanity to man" has ceased to exist, and that so many potentates, hitherto so indifferent to the wants and wishes of their people, are now fostering education from motives of pure philanthropy. This may in part be true. Some, perhaps the most, of these potentates, are humane and enlightened, and knowledge, in its spirit, and influence, is generous and diffusive. But there are those who espouse the cause of education, although despots, not more by the accident of birth, than in heart and soul—those who would gladly perpetuate the darkness congenial to their empire. This they cannot, dare not, attempt. That their people may keep pace with those of other nations, education is indispensable; and besides, if not granted, the people would themselves speedily demand or acquire it. And thus the hand of power discreetly surrenders what it were impolitic, if not impossible, to retain. Need I say how different is the case in this favored land; how every man holds in his hand, for his own behoof, the blessings which in most other lands must be wrung piece-meal, and ungraciously from the grasp of authority?

The importance of education is seen directly, and only, through a proper understanding and appreciation of the nature of man, and the object of his earthly existence. When it is considered that these are subjects whose bearing is mainly on the unseen and the future, and therefore apt to be lost sight of, or undervalued in the predominance of the sensible and the present—subjects upon which the mass of mankind have had neither the inclination nor the means, of forming proper opinions—we cannot wonder that their value has never been practically recognized till our own times.

Of all the mysteries with which we are beset on every hand; of all the mysteries in revelation, that test our faith, and elude our comprehension; of all the mysteries in the material universe, that baffle the analysis, and mock the pride of reason—man himself is the greatest mystery of all. The mystery, of course, lies in the nature of that which constitutes man—the mind—the essence of each of us—and which even to ourselves is as invisible—almost as inscrutable,

as is the Deity. The very little we do know however, is sufficient to inspire us with admiration, if not with awe, of that which baffles our scrutiny. We know that it is susceptible of wonderful improvement even now, and that it is destined to live for ever, with capacities boundless as its being. What is the gorgeous apparatus of the skies we have been contemplating, upon which is inscribed in characters of light, *decay*—what are all those passive inert masses, those sparks of fire, those transient meteors—compared with the undying sparks of intellect “immortal as their Sire,” that can mark and measure their revolutions—for whose service doubtless they were called into being, and which must constitute all that is truly valuable in the universe?

Education then is nothing else than the drawing forth of mind, the development of its latent powers. It is the fountain whence must be drawn those streams that form the aliment of intellectual life, and without which, the soul is impoverished and starved. Education in its only true import—preparation for another state of being—is obviously the object of man’s existence on earth. Next to religion itself which forms, of course, the highest part of education, is the cultivation of the intellectual powers, in which sense alone, the term is generally employed.

Is it any wonder then, that to the furtherance of this God-like cause, which tends so directly to elevate the race to the dignity and enjoyment of their nobler nature, the purest, and best, and brightest, spirits, of every land, are now devoting their energies? Is it any wonder, that by those best able to estimate its value, it is regarded so sacred in its character, so truly the property of our common humanity, that personal enemies, and political opponents, can approach the subject, divested of every feeling of hostility, and, with generous rivalry, emulate each other in earnest and eloquent appeals in its behalf?

Is it any wonder, that in its support, private generosity has vied with public munificence, and there has been exerted a philanthropy as genuine, a patriotism as pure, as ever was put forth in our world’s history? To such philanthropy, and

such patriotism, are we indebted for the splendid edifice in which it has been the privilege of so many, as it now is ours, and will no doubt be of many hereafter, to secure the priceless blessings of knowledge. Yes! the cause of education may be termed, and should be viewed, as a moral table-land, elevated above the conflicting elements of party strife, in a purer atmosphere—a neutral ground, to which, even in the heat of contest, combatants from both sides may ascend awhile for rest and respite, forget their animosities, concert measures, wish each other God speed, as far as *it* is concerned, and again resume their hostile position.

There still exists, to a humiliating extent, a practical and popular error, vastly inimical to human improvement, and which nothing but correct views on this subject can ever dissipate. The error is, that with the great majority, money is the only recognized symbol of *value*. Education costs money; the father—possibly the daughter—“sees nothing tangible in return for it,” (it is otherwise in most *other* cases of exchange,) and “not knowing that the real service education does, is often like a bank cheque payable some years after date,” thinks it thrown away. Surely it is useless formally to refute so grovelling and ignoble an idea, or to cite any of the obvious instances in which it were ridiculous, and impossible, to make money the standard of value. That man, essentially a spiritual being, placed in a temporary tabernacle of clay for the purpose of preparing for his destined immortality, who alone is formed with head erect, and “heaven directed eye,” should bend his neck, and fix his wistful gaze, his most ardent desires, on the dust he treads, is as marvellous, as it is melancholy. Such aspirations befit only him who was

‘ The least erected spirit that fell
From heaven. For even in heaven his looks and thoughts
Were always downward bent; admiring more
The riches of heaven’s pavement, trodden gold,
Than aught divine, or holy, else enjoyed
In vision beatific.”

Who knows not—feels not—that wealth, so prized and worshipped, is the most perishable and uncertain of all possessions? Thieves may steal it, the fire may devour it, the flood or the tempest may sweep it away, and death infallibly relieves us of the load with which we have vainly encumbered life's fleeting hour. Education is not only intrinsically valuable, but, once conferred, can never be lost, never abstracted, never destroyed. It is part of the being who possesses it; it is the expansion of that being's nature; it continues to expand even beyond death and the grave—how much, who can tell? It is said that a cubic inch of air, of the density existing at the earth's surface, would, if carried beyond the limits of the atmosphere, be so expanded, as to fill the entire space of the solar system. Who knows but the soul, now fettered to earth, confined and compressed by that spiritual gravitation which clogs all its energies, may, when transferred to the pure atmosphere to which it is encouraged to aspire, receive an increase of power and capacity of which we can form but a feeble conception?

Perhaps it may occur to some, that many never blest or burdened with education, have succeeded very well in the world, notwithstanding,—better even than those who had reaped all its boasted advantages: and the inference may seem to be natural that there is no necessity for it. Now, apart from the consideration, that worldly success, by which is understood the acquisition and enjoyment of wealth, is a poor criterion by which to estimate the condition of a being whose true happiness and superiority must consist in the possession and exercise of the attributes of *mind*—let me ask whether such individuals even so succeeded in *consequence* of a want of education, or rather in *spite of it*? A man afflicted with a bodily infirmity or defect, is often able, under a kind Providence, to prosper better than some around him who have no such affliction. But does the man himself, does any one, believe that his prosperity is the *effect* of his infirmity, or wish his children to inherit it? And what is the mutilation or paralysis of any of the organs of that feeble frame we are so soon to put off, compared with the mutilation or paralysis of the

soul? What is natural blindness, compared with the blindness of him whose mental eyes have never opened to the light of knowledge, to the dignity of his own nature, to the glories of the universe, on every part of which, vast or minute, near or distant, are imprinted in palpable outlines—

“ The unambitious footsteps of the God
Who gives its lustre to an insect’s wing,
And wheels his throne upon the rolling worlds ?”

He whose intellectual vision is circumscribed within the narrow limits of ignorance, can never be said to be *happy*—can never be said to *live*—in the ennobling sense of the terms: can never be said to realize, on earth, the destiny, the enjoyment, for which his Maker evidently intended him, by bestowing on him such faculties, and surrounding him with such facilities for their improvement and gratification.

The bird in its cage you may say is happy, as it hops from wire to wire, and pecks the hand that feeds it, and warbles its song in its narrow prison. But think you it is happy *because* of its captivity, or would it have been less happy in its natural liberty as an unfettered tenant of the grove, gleaning its food from nature’s store, trimming its plumage by the running brook, bounding in joy from tree to tree, making the woods vocal with its melody, soaring to “Heaven’s gates,” and mingling its orisons with the hymn of praise that ascends from universal nature before the shrine of Omnipotence?

On female education it is not my purpose to dwell particularly. In our day it is happily unnecessary to combat the opinion of those who would deny to woman her claim to education, by depriving her of the possession of intellectual capacity. This false assumption, the offspring of ignorance and arrogance combined, woman herself has practically, and therefore most triumphantly, refuted. She has vindicated her capacity and her right to be educated, by the successful pursuit, not only of those more common and superficial branches that were long supposed exclusively appropriate for the female mind, but also of those higher, sterner studies, requiring close analysis, and severe mental discipline. By those experienced in the instruction of youth of both sexes, it is, I believe, generally ad-

mitted, that the female mind, so far from betraying inferiority of comprehension or acquirement, can well bear comparison with that of the "lords of creation." My own impression and ready testimony have long been to that effect, and I need scarcely say that both have been confirmed and strengthened by the increased opportunities for observation afforded in the institution with which I have the pleasure to be connected.

The opinion of Mrs. Ellis, herself a good illustration of its truth, appears substantially correct. "In her intellectual capacity, woman is equal to man, but in her intellectual power she is greatly his inferior: because from the succession of unavoidable circumstances which occur to interrupt the train of her thoughts, it is seldom she is able to concentrate the forces of her mind, and to continue their operation upon one given point, so as to work out any of those splendid results which ensue from the more fixed and determinate designs of men." During the period of female education, when the causes of distraction from continuous mental effort exist not, there appear to be equal capacity and power. But afterwards, in the appropriate sphere of woman's action, absorbing duties leave little opportunity, even were there inclination, for intellectual pursuits. And yet, within the vast and ever extending circle of knowledge, there is not a portion, however fair or fascinating, however dark or distant, which woman has not explored; there is not a field which she has not enriched and adorned with fruits and flowers.

Such is the undue homage paid to the mere symmetry of form and feature, that she who possesses beauty, is but too apt to consider herself, and be considered by others, possessed of every thing. We practically forget that all that is thus bright and beautiful is only a casket—the jewel is unseen; only a temple, sacred indeed, and not unworthy of the divine Architect, yet but a temple, "the soul's the deity that lodges there." We forget that beauty is a flower not only born to die, but which breathes its momentary sweets and fades when it begins to bud; that even through its hour of pride, it fails to retain the admiration it attracts, if there be found not harmonizing with it, corresponding loveliness of heart and mind;

and thus that the most sparkling eye loses half its charms, when it is discovered to reflect no intelligence from within.

The Fountain of Arethusa was said to have the power of imparting beauty to all who drank of its waters. The boon, though real, would have failed to secure the lasting admiration that renders beauty so desirable. Education is a fountain, however, which can impart such a boon—a beauty more enviable far than fable gave to Arethusa—a beauty which, while it adds lustre to that of the outward form, survives it, and supplies its place—a beauty that withers not with age, but enjoys perennial vigor—a beauty that perishes not with the form that enshrines it, but lives in a more congenial atmosphere, and flourishes with the bloom of immortality.

I have dwelt thus long on the nature and importance of education, in order to impress on you a sense of the value of your present advantages. With you, this is the only season devoted to the culture of your mental powers; and if time always brings with it its duties and responsibilities, with how much force may it be affirmed of the time of youth, the spring and seed-time of humanity. As is the foundation laid in youth, so must be the superstructure of age, is a maxim as applicable to the one sex as to the other. According as you improve or neglect the golden opportunities now presented, are you laying the basis not only of future respectability or insignificance, but of happiness or sorrow. For most assuredly the youngest among you, if spared to years of maturity, will look back upon the time spent here, with feelings of pleasure or pain, just as it shall appear on the retrospect to have been turned to a good or a bad account. Such are our natures that we cannot help frequently dwelling upon the past; and thus the powers of memory and reflection alone, render the improvement or neglect of such opportunities a blessing or a curse, by placing them perpetually before the mind as elements of satisfaction or regret. Whether then you regard your mere worldly interests—the more generous aim of gratifying the wishes and hopes of your friends—your future individual

happiness—or the still higher motives of duty and obligation, you are most powerfully urged to fidelity in the improvement of these precious hours.

It affords me unfeigned pleasure to bear testimony, in common with the Principal, not only to the talents, but the industry and conscientiousness, which the great majority of you manifest in your studies. These indications justify the hope that, through you, the Institution will be able to sustain its well earned, and acknowledged reputation; that your teachers will receive in your improvement, that reward of their anxieties and toils for which no mere emolument ever is—ever can be—an equivalent; and, what is far more important, that there is thus secured, as far as human agency can secure whatever is future, your own happiness and your salutary influence, in the spheres in which you are destined to move. I have alluded to the gratification of your teachers at your improvement. To every generous mind this must form some motive to exertion. But what are teachers in comparison with knowledge, the great end secured by education? From what has been advanced on the nature of mind, and the proper province of education, it is evident that the knowledge you may acquire, and which your teachers are but instrumental in imparting, is neither yours, nor ours; it is something sacred—something divine—it is light from heaven, it points to heaven, and thitherward helps to guide the way.

Among the most beautiful and harmless of the fictions and rites of ancient mythology, was the worship of Vesta the goddess of fire. In her temple was an altar, on which the eternal fire unceasingly burnt. This fire, originally kindled at the Sun, was kept alive and watched, night and day, with reverential awe, by priestesses appointed to the sacred office. To this holy service these priestesses devoted their lives; and even when their lamp of life was extinguished, the flame they cherished died not with them. For as each successively disappeared from the altar, another was appointed to fill the vacant place, and thus from year to year, and from age to age, the fire continued to burn.

Even so with teachers and the light of knowledge at whose

altar they are the humble ministers. A few brief suns, and we and all beside, who occupy similar trusts, shall have resigned our places to others, and have left the scene. Alas! I need not remind you how affecting an example of this truth we ourselves so lately witnessed, in the sudden dispensation whose effects are yet visible around us.* But the light of knowledge—the celestial flame—which we are privileged to fan and foster, shall never be extinguished. It is quenchless, undying, immortal as the soul, stable as the throne of the Most High. Cherish then—Oh cherish, for your own sake, for its own—this sacred fire, this fire from heaven, itself imperishable, though its priests are but for a day.

Among so large a number as I have the privilege of addressing there is, and must be, great diversity of general attainments. And in viewing, at any time, the result of your studies, there is danger of falling into one of two extremes. The one is of being dispirited with the little advancement you have made, compared with that of others; and of feeling a consciousness of inferiority. The other is an opposite emotion of pride, at having achieved so much, and a self complacent disposition to look down on those of inferior attainments. Let me assure you that the difference in your attainments is attributable far more to the different opportunities enjoyed and improved by each, than to any disparity of original capacity. Let me caution you against the common error of erecting a false standard in such estimations. The proper estimate of your individual progress is to be made, not by contrasting your position with that of others, but simply by reckoning from the point from which you set out, to that at which you have arrived. True, the hill of science must be climbed, but it is not necessarily the one highest in the ascent that merits most applause. The palm is justly due to her, who, whatever be her position—whether still struggling near the base, or proudly nearing the apparent summit—has, within a given time, by well directed labor, surmounted the greatest difficulties.

The path of knowledge, like the journey of life itself, is

* Alluding to the sudden death of Miss Dwight, one of the teachers in the academy.

ever crowded with travellers ; on the right hand and on the left, behind and before, they are pressing on. And if the mere accident of our individual position forms legitimate ground either of exultation or despondency, we may experience both feelings almost at the same moment. By looking behind, we perceive ourselves in advance, and enjoy the former feeling ; by looking in advance, we perceive ourselves in the rear, and that feeling is converted into the other. So true is it, that all human knowledge is merely relative, that is, great or little, only in a comparative sense.

Let such considerations cheer those whose progress is somewhat limited. Let them look at those behind them—for many such they are sure to discover. Let them reflect how many as worthy in the sight of Heaven as themselves, have never been blest with their privileges, and be grateful to the Providence by whom they are favored. Above all, let the prospect of those before them, instead of being ground for dejection, be a stimulus to active effort, and inspire the conviction, that the same or a less amount of time and toil, will place them in the position they so much admire.

But more especially are such considerations necessary to be kept in view by those, who may be too prone to that pride of intellect to which we are all more or less liable. It has been said indeed that “a little learning is a dangerous thing.” I believe in no such doctrine. I presume to think on the contrary, that a little learning is a *useful* thing, but that the more we can get of it the better.

There is nothing, however excellent, that may not be abused ; and the ostentatious display, or rather the barren affectation of learning, is the abuse, the perversion of knowledge, rather than its legitimate effect. Good sense should ever be esteemed superior to mere learning ; and the man or woman who discards good sense, and exhibits pedantry in its stead, is an object of pity, rather than of admiration. A certain author well remarks that “pedantry crams our heads with learned lumber, and takes out our brains to make room for it.” If such be the case, “leave me my brains” say I, and let pedantry look out for other craniums.

The direct tendency of all knowledge worthy of the name, is to inspire humility

“ The eldest born of Virtue,
That claims the birth-right at the throne of Heaven.”

It may be admitted that in the acquisition of knowledge there is a conscious dignity—a feeling of man’s native nobleness—a species of pride that one may well feel without being ashamed. When we are introduced by general literature to the splendid monuments erected by human genius : when, through the languages of Greece and Rome, we become acquainted, in their pure originals, with those relics of antiquity that do such honor to our common nature : when we contemplate the beautiful creations of Classic Poetry, still exhibiting the freshness and coloring—almost the breathing and pulsation—of a new existence : when we listen to the eloquence of Demosthenes, or stand in the market place of Athens and hear the maxims of morality and piety that drop from the lips of Socrates : or, when Science points with exulting eye to what man has achieved in *her* domains—when she tells us how a fabric so enormous as our earth has been accurately measured and weighed, with scale and compass, by a creature whose physical importance compared to that of itself is infinitely less than that of the smallest particle of dust on this floor to the entire edifice in which we are assembled : when she further tells us how man has subjected to his scrutiny, and converted to his purposes, the invisible and impalpable elements of Nature, analyzed and weighed the air itself, and sounded the depth of that unseen ocean in which we exist : how he has arrested the sun-beam, and decomposed into its primary elements the light of heaven, and made it reveal the story of its incredible velocity : how he has stemmed the tides, and braved the storm, and bridled the winds, and chained the lightning, and tamed the thunder : how he has transformed the almost viewless vapor into a superhuman power, superseding the labor of man and beast, almost repealing Heaven’s statute of human toil, annihilating time and space, and drawing into one familiar brotherhood the most distant and estranged of the hu-

man family : how he has invented one instrument, by which he discovers in every drop of water, in every bud and blade, and leaf and flower, a world teeming with myriads of a living population, as fearfully and wonderfully made as we ourselves, until the gradations of the descending scale of animated being are lost in the minuteness that eludes the powers of the microscope : how he has invented another instrument, by which he virtually leaves his earthly abode, and, penetrating the measureless depths of space, discovers in every tiny gem that sparkles in the brow of night, a world or a sun ; and how he is forced to conclude that far—far—in the impenetrable, illimitable, void, that neither eye nor telescope has ever pierced, there lie imbedded, numerous as the dew drops of the morning, the stars of firmament within firmament, and system within system, in that outer and wider circle of the dark and unknown, which ever encompasses the illuminated circle of Knowledge :—I repeat, when we are led into such reflections by these and countless other topics that might be suggested, we may well feel a legitimate pride, that we belong to a race of beings, gifted by the benevolent Creator, with faculties capable of observing and appreciating the wonders by which they are surrounded.

I remember my feelings when a boy on first entering the Cathedral of St. Paul's in London. While I gazed on that magnificent structure, I thought that if any thing made with hands were worthy of the Divinity, it was such a temple. And while I surveyed the statues, monuments, and obelisks—those envied emblems of earthly immortality erected to departed worth, and valor, and genius ; and when, high above all, around that lofty dome, I saw displayed the flags and banners of almost every nation on earth—the honored trophies of hard fought contests in flood and field for a thousand years—I confess, boy as I was, I could not repress a feeling of pride, as if part of the honor was shared by me in belonging to the race.

Young Ladies—the temple of knowledge to which education introduces you, is in many respects the counterpart of

that which I have thus faintly described. It is a venerable, an enormous pile; the work of nearly sixty centuries; rude and contracted in its beginning, but enlarged from time to time, through the long succession of generations, as new conquests have been made, and fresh trophies won. As we stand in the vestibule and cast our eyes within, we may well feel awe-struck at the augustness of the scene, disclosing an extent so vast, and objects so innumerable, as to dazzle and bewilder. Contributions from every age and clime, and people and tongue, are there. In the innermost recesses, dim and dark, and almost lost in the obscurity of distance, are discovered memorials of the years before the flood, while close to the vestibule, in bright and bold relief, are deposited the trophies of yesterday.

There, are the labors of the solitary cell, the midnight taper, the over worked brain, the wasting frame, the deathless, quenchless spirit, whose flame was fed by the immortality which, with prophetic foresight, it knew it had already achieved. But why enumerate? There, are the accumulated riches of the race, made up by tributes from every land. There, is all that man has won, and calls his own.

Who does not feel an interest—which of *you* does not feel an interest—may I not say a pride—in this, the common property of the race? Which of you does not wish to contribute something to the common stock—some little relic, that shall outlive her own brief span of being, and tell spectators of a future age, the story of her birth? Who is there in whose bosom there breathes no aspiration, at least, to enter this temple of knowledge, and see before she dies, what man has done.

But there is another temple, to which, in conclusion, I would lead your thoughts; a temple in which there is found not in a single beholder, one emotion of pride, but where every such feeling dies within the breast. It is the temple of the Universe—a temple not made with hands, whose architect is the Eternal—a temple whose dome is immensity, whose lamps are the ever burning stars—a temple of which Earth is but one of ten thousand times ten thousand altars,

and man himself, one of the lowliest of its countless worshippers.

Oh! if there is one species of insanity that towers above all others, surely it is the madness of the "unde-vout astronomer" who can gaze on such a scene as this as this, and, as he turns away from the sight, exclaim, "*there is no God.*" In St. Paul's Cathedral, while the stranger is lost in admiration of the physical grandeur of the structure, his eye is arrested by a lofty and conspicuous inscription in Latin—SI MONUMENTUM QÆRIS, CIRCUMSPICE—"If you seek my monument, look around." This is the epitaph of Sir Christopher Wren, the architect of the work; and as the stranger obeys the injunction, and *looks around*, he pays involuntary homage to the genius and memory of the man. And is there no similar inscription in memorial of the Everlasting, carved in characters of living glory on the walls of the Universal temple, in language understood by savage and by sage, and which finds its interpretation in every heart?

Who is there that surveys in a star-lit night this most imposing spectacle, amid that pervading, almost startling silence, which he knows to be coeval with eternity, and does not feel inclined to stand with uncovered head, and awe-struck spirit, and even suppressed breath, while he feels that the earth on which he stands, is but the vestibule of creation, the porch of the universe, the first step within the portals of that temple of Nature, of which he is thus permitted to discern only the dim, and distant, and shadowy outlines. And while the earth seems to dwindle into a point, and he into an atom, as he looks up into the infinitude of space above, and thinks of the infinitude that equally yawns beneath; and then passes involuntarily to the idea of the Unseen Spirit whose presence pervades that infinitude—now, as it ever did, and ever shall do—oh it is then, that all the boasted treasures of human knowledge, the achievements of science, and the triumphs of reason, that lately seemed so vast, appear what in reality they are, only a few feeble rays, permitted to emanate from the ineffable fountain of Wisdom and Intelligence.

Such thoughts as these are the genuine results of real Knowledge, and above all, of Astronomical knowledge. Such thoughts form an infallible antidote to that vanity and self-esteem which superficial acquirements, a mere smattering of learning, are apt to inspire. They lift the soul above the petty strifes and trifles, the ignoble aims and pursuits, by which so many are engrossed.

One word more and I have done. It seems but yesterday when we met together at the beginning of the term, and the flight of time has already brought us almost to its close. It is an affecting thought also that no two successive terms ever see the same individuals all meet again. A few more winters and we shall all have disappeared from earthly scenes, and have been transferred to another department of the universe, how near, or how distant, none can tell.

“ Like bubbles on the sea of matter borne
We rise, and break, and to that sea return.”

May we all be permitted to cross the vestibule of the great temple, to gain a glimpse even of the shrine of the Uncreated, and with reason unclouded, and spirit unlogged, and eye unscaled, to see, to admire, to adore. But may I be permitted to remind you, that into this temple the only means of entrance are those prescribed in the book of Truth, by Him who is himself the Way—the Truth—the Life—Him who is emphatically the Great Teacher, and who descended from Heaven to earth, to achieve at once the Spiritual Education, and the endless happiness, of his erring children.



