

A LECTURE

By REV. W. AITKEN.

(Continued.)

The planets, primary and secondary, connected with our system, numerous as they are, especially since the smaller planets have been so largely augmented, are yet greatly outnumbered in number by the Comets, of which several hundred have been observed, and which, on adequate grounds of probability, are computed to amount to many hundreds or thousands more. Of those which have been made the object of scientific consideration, some, as was formerly mentioned, in their furthest flight from the Sun, keep still within the outermost planetary orbit, and are hence named *exterior* Comets; some, again, moving in hyperbolic curves come to us we know not whence, and depart we know not whither—being, perhaps, as Humboldt has suggested, "Merely wanderers through our Solar system, moving from one Sun to another." (Comet IV, 199.) There are others which, though describing vast orbits of extreme ellipticity, may, nevertheless, in obedience to the power of Solar attraction, be expected back from their longest excursions into the etherial realm; their visits, however being necessarily "few and far between." In older times, Comets were regarded with a superstitious dread—their appearance "with fear of change perplexing monarchs," and being, in general estimation, ominous of terrible disaster, the forerunner of pestilence and war. In our own time, they have inspired alarm of another sort, but scarcely less powerful, the least in their irregular career, sweeping in all directions through space, one or other of them should come into collision with the earth. Such a collision is, no doubt, within the limits of possibility, and in the instance of the Comet called after the Astronomer Bell, as Sir John Herschel has remarked, "Supposing neither its orbit, nor that of the earth to be variable, must, in all likelihood, happen in the lapse of some millions of years." This comet's orbit, "by a remarkable coincidence, very nearly intersecting that of the earth, had the latter, at the time of its passage in 1832, been a month in advance of its actual place, it would have passed through the Comet." (Outlines, Art. 579, 585.) Whether, if a collision had taken place, it would have been followed by the disasters foreboded from such a catastrophe, may, notwithstanding, be reasonably questioned. One Comet which approached the earth to within six or seven times the distance of the Moon, afterwards got astray in the miniature system of Jupiter, but without producing the slightest sensible disturbance of the motions of that planet's satellites. The most substantial clouds "according to the eminent Astronomer just cited, 'which float in the highest regions of our atmosphere, and seem at sunset to be drenched in light, and to glow throughout their whole depth as if in actual ignition, without any shadow or dark side, must be looked upon as dense and massive bodies compared with the filmy and all but spiritual texture of a Comet.' " "Newton," it is subjoined in a note, "has calculated that a globe of air of ordinary density at the earth's surface, of one inch in diameter, if reduced to the density due to the attitude above the surface of one radius of the earth, would occupy a sphere exceeding in radius the orbit of Saturn. The tail of a great Comet then, for aught we can tell, may consist of only a few pounds or even ounces of matter." (Outlines, Art. 558, 560, note.)

It may be enough to convey an idea of the enormous bulk of the largest Comets, to mention that of 1680, at its greatest size, had a length much exceeding the whole interval between the Sun and the Earth—amounting, in fact, to forty-one millions of leagues. This Comet is supposed, though on uncertain data, to accomplish its revolution in a period of eight thousand eight hundred years; and its greatest distance from the Sun is computed to be twenty-eight or twenty-nine times further from him than Neptune. When we add that the nearest fixed Star—that, at any rate, which by the greatness of its parallax would seem to be nearest—a certain Star in the constellation of the Centaur—is two hundred and seventy times more distant still, it may tend to give us some faint notion of the immensity of a domain, the first step towards whose confines from our system, is over an interval whose width arbitrary sign, indeed, may denote, but which utterly baffles our capacity of definite conception.

Besides the celestial bodies to which hitherto we have chiefly been adverting—those, namely, belonging to the Solar System—the Heavens contain an innumerable multitude comprehended under the general classification of Stars, and commonly on account of their greatest apparent permanence, distinguished as *fixed Stars*. And the spectacle which the nocturnal sky, sparkling with these living fires, offers to the eye—irrespective of scientific considerations—is one of those ineffable sublimity few are wholly insensible. A late illustrious poet (Byron), in language characterized by his usual energy and beauty, has embodied the impression which the contemplation of the starry host is adapted to produce on the poetic temperament—

"Who ever gazed upon them shining,
And turned to earth without regret;
Nor wished for wings to soar away,
And mix with their eternal rays;"—*Stanzas of Dromed.*

In an earlier age the sentiment thus expressed assumed the form of a "vain idolatry" in the Zoroastrian worship. Another perversion of it has been witnessed in the mystical theories and vile impostures of Astrology. The proper effect is realized when the thoughts are raised in sacred homage to Him by whom "the Stars were ordained;" "who bringeth forth their hosts by number, who calleth them all by their names;" and who "hath set his glory above the heavens."

In a clear night, two or three thousand of the Stars—less an opinion than a fact—being so many more—are visible to the naked eye, under the telescope, they swell into numbers defying computation, and apparently limited only by the penetrating and defining power of the instrument employed in their examination. Their distance, as is proved by the scarcely appreciable smallness of their parallax, is by the entire absence of any parallax susceptible of measurement by the most delicate process of investigation, is immense. Our distance from the Sun is above ninety millions of miles; but the distance from the Sun, of what is believed to be the vast remote of the Stars, exceeds the former distance more than two hundred thousand times. Their visibility at such unimaginable distances implies both their transcendent magnitude, and their surpassing splendour. The Stars are, in truth, *lamps*, shining, not like the planets, by reflection—but by their own intrinsic brilliancy. The analogies of our own system would, accordingly, lead us to conceive of these centres of attraction and sources of Solar influence, to planetary spheres revolving around them; and this conception is sustained in the case of some of them by a variable brilliancy, most readily explicable, at least in certain instances, as the suspension of a dark body, such as that of a planet interposing occasionally between them and us, and so causing a partial obscuration of their effulgence.

In the irregular distribution of the Stars over the heavens at unequal distances from our system, many of them no doubt appear

to be in close juxtaposition without any particular connection being implied; the seeming connection is merely optical. But in other instances it is different; and combinations of Stars are found revolving about one another, or about their common centre of gravity, conformably to the same grand law which regulates the movements of the planets about the Sun. Thus we have the sublime phenomenon of revolving Suns; and assuming these Suns are respectively planetary accompaniments, the results must obviously be systems at once, the most magnificent and the most complex.

When one body revolves about another under the influence of their mutual attraction, the period of their revolution being ascertained, furnishes means for determining both their distance from one another and the sum of their mass. In this way the distances of certain Stars from certain other Stars has been calculated, together with their united mass. And thus, for example, two Stars, apparently in closest conjunction, are found with a combined mass not very different from that of our Sun, to be separated by an interval much wider than that interspace between the Sun and the furthest removed of the planets, the dimly described Neptune—than an interval, that is, of about three thousand millions of miles.

When the telescope is directed to certain portions of the Milky Way—Star or Star is observed as far as the power of length terminates in a different brightness, proceeding from crowded myriads of Stars which the telescope fails to resolve. But in other directions are the Stars as less densely aggregated; the telescope penetrates into the boundless regions of space beyond; and there, relieved against the dark background of the sky discursive firmaments, as they have been termed—starry clusters—comprising numbers of single Stars, or of groups, and exhibiting singular diversities of form, among which the globular structures are the most frequent, and in particular instances, dependant for their stability on the operation of dynamical laws, whose character is involved in profoundest mystery. Such starry clusters—observed and understood under such conditions as have been described, or otherwise—are many in number; and some of them are so remote—for there can be no doubt of their belonging to this classification, though hitherto unresolved into distinct Stars, as to be visible only to the most powerful telescope, and even in them, but a faint and feeble gleam. Our Sun and the Stars more immediately surrounding it, are believed to constitute a cluster of the class now under consideration. Among those which occupy the profounder depths of space, is more than one instance whose relations obtain as would seem to be a real connection, and the probable revolution of one around another. There is now no doubt but the Sun and our system as a whole are advancing towards a certain quarter of the heavens, whether this movement is to be ascribed to the internal arrangements of the cluster in which they are aggregated, or is attributable to a common revolution of the entire cluster around some invisible and unknown centre. "Nothing more magnificent," it has with reason been observed, "can be presented to our consideration than such combinations. Their stupendous scale, the multitude of their details they involve, the perfect symmetry and regularity which many of them present, the utter disregard of complication in thus heaping together system upon system, and construction upon construction, leave us lost in wonder and admiration at the evidence they afford of infinite power and of rational design." (Outlines, Art. 878.)

In contemplating the vast universal system of which so imperfect an outline has been presented, the inquiry naturally arises—When did this system so amazingly originate? What is the date of its wonderful birth? To this inquiry of course it is impossible to return a precise answer; it admits nevertheless, of a certain general solution. The fact that objects placed at such immense distances from us, as are many of the stars and starry firmaments, are, notwithstanding, visible to us—this fact is in itself significant of a lengthened period having elapsed since they first began to shed their effulgence in the illimitable realms of space. The velocity of light as deduced from observation of the Eclipses of Jupiter's Satellites from different points of the Earth's orbit, and confirmed by other observations, is such that it moves at the rate of about one hundred and ninety thousand miles in a second. The velocity of movement, which, even for considerable distances, may be regarded as virtually instantaneous, is far indeed from being so when such distances, as separate from the Stars are to be traversed. It is certain that thousands of years—perhaps no greater definiteness—must have been spent in the passing of light from some of the immeasurable remote regions of the universe, which by its transit it has revealed to us. So long therefore, must the more distant of the celestial fires have been kindled. And since luminous objects are discovered by us, such as they appeared at the instant of their emitting the radiance which perhaps long subsequently, reaches the eye—we therefore behold those starry spheres, and mighty aggregations of spheres, not, in truth, as they are now, but under the aspect which they exhibited years, or thousands of years ago, and for years—thousands of years—might they have suffered annihilation, and all their splendid garniture have been swept from the heavens, before we could perceive that their glory had been extinguished, or had begun even to wax dim.

Geological Science, by its investigation of the structure of our globe, not only confirms such conclusions in reference to the antiquity of the universe as has just been derived from another—yet kindred—source, but greatly extends them. To adopt the language of a Roman Catholic divine, second in profound learning to none—Geology may truly be called the science of nature's antiquities. Fresh and young as this power may look to us, and ever vigorous in all her operations—free from all symptoms of decay as her beauty and energy may appear—truth, as they are not, but under the aspect which they exhibited years, or thousands of years ago, and for years—thousands of years—might they have suffered annihilation, and all their splendid garniture have been swept from the heavens, before we could perceive that their glory had been extinguished, or had begun even to wax dim.

when the huge *Saurians* and *Megatheria* disappeared in giant proportions over sea and land, and find to our astonishment, all that a night-mare fancy might have dreamed of under unerring monuments." (Cardinal Wiseman's Lectures on the connection between Science and Revealed Religion, 4th Ed., vol. 1, p. 263-4.) In the phenomena of stratification and fossiliferous deposits, the Science thus eloquently described brings us into contact with a truth which is inseparable of rational explanation without supposing the agency of the natural causes therein involved to have been in operation through myriads of years. Abstaining from minuteness of detail on a subject which, in justice, would require very length, we may say that it may justly be noticed, that the great depth to which the fossiliferous strata descend—a depth in Europe, for example, of not less than eight or ten miles—the extremely slow rate of their formation—a few inches in thickness, except in extraordinary cases, being the work of a century;—their varieties of lithological character and organic remains—their successive elevations and the like—all unite in pointing to periods of time compared with which that of man's occupation of the globe dwindles into insignificance; and during which the marvelous process actually described brings us into contact with a truth which is inseparable of rational explanation without supposing the agency of the natural causes therein involved to have been in operation through myriads of years. Abstaining from minuteness of detail on a subject which, in justice, would require very length, we may say that it may justly be noticed, that the great depth to which the fossiliferous strata descend—a depth in Europe, for example, of not less than eight or ten miles—the extremely slow rate of their formation—a few inches in thickness, except in extraordinary cases, being the work of a century;—their varieties of lithological character and organic remains—their successive elevations and the like—all unite in pointing to periods of time compared with which that of man's occupation of the globe dwindles into insignificance; and during which the marvelous process actually described brings us into contact with a truth which is inseparable of rational explanation without supposing the agency of the natural causes therein involved to have been in operation through myriads of years.

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"Are these the pompous tidings ye proclaim?
Of light and life and dominion of fame?
O Starry World! last time we parted there
To wait till back the new world should appear."
—*PLAUSIBLE OR HOPE.*

For what is left us of immortal hope, if like him who—

"Divinely the Divine, and died
Chief poet upon Thine side!"

We must look through the "Great broad Universe," and behold no God. But that there is a God, "all nature cries aloud through all her works; and if a God there is, that God how great!"—how great in goodness as in wisdom, and in power and in all perfection. I am well aware that some of the views which have been presented in the course of the foregoing observations—I allude particularly to what has been advanced with reference to the age of the world—have been thought in conflict with the testimony of Revelation. Such conflict is not, indeed, believed to exist, so generally as once was; and it may be presumed, that among intelligent and well-informed persons there will not long continue to be much difference of opinion on this point. Between the testimony of Revelation, and the facts of Science, there can, of course, be no real contradiction. But interpretations, alike of the Book of Revelation and the Book of Nature may be erroneous, and so exhibit discordant results; and there can be no greater service to the interests of Revelation than needless persisting in interpretations which place it in opposition to well established scientific facts—hopeless as such persistence must ever be in the end. The grand epochal announcement of the Sacred Volume leaves the question of the age of the Material Universe to the consideration of Science, and it is not necessary to insist upon this point. We meet with organization and relative adjustment, there we meet with proofs of intelligence and design, implying the designer in whom the intelligence resides. And the study of the science of nature is conducted in a wrong spirit, and is not made subservient to its noblest uses, if it fail to draw the mind upward, in solemn reverence, and sacred awe, to that God who is the author of Nature—who has everywhere impressed it with evidences of the ineffable Wisdom, and Power, and Benevolence, which are His glorious attributes, and who in the incalculable ages and vast realms through which he has extended and perpetuated His Sovereign Working, may be conceived, in so

far as that was possible, to have symbolized the eternity of the Being and the immensity of His essence.

I conclude this imperfect sketch of a great subject, by a quotation from the scholar, whose eloquent language has already been adduced—"There is no way," he remarks, "in which they all (the Natural Sciences) can be made subservient to the interests of religion; by viewing them as the appointed channels by which a true perception and estimate of the Divine perfections are meant to pass in to the understanding; as the glass wherein the embodied forms of every great and beautiful attribute of the Supreme Being may best be contemplated; and as the impression upon the mind of the great seal of Creation, wherein have been engraved by an Almighty hand, mystical characters of deepest wisdom, Omnipotent spells of prodigious power, and emblems most expressive of an all-embracing, all-preserving love." And even as the engraver, when he hath cut some way into his gem, doth make good thereof upon the tender and soft, and if he doth not the image perfect, is not thereby disheartened, so long as it presents each time a progressive approach to its intended task; but returns again and again to his peaceful task; so we, if we find, not that at once, we bear upon our minds the clear and deep impression of this glorious sight, must not we fear to proceed with our labours, but go on, ever striving to approach nearer and nearer the attainment of a perfect representation." [Lectures on the connection between Science and Revealed Religion, vol. 1, p. 353-4].

*This and some other quotations have been added to the Lecture was originally delivered.

Rector Campbell and the Rev. H. Ward Beecher.

The rector has sent the following letter to the Secretary of the Emancipation Society:

Cornwall, Oct. 10, 1863.
Sir—In reply to your letter requesting me to inform my congregation that Mr. H. W. Beecher "will deliver a lecture in the Philharmonic Hall on the American war and emancipation," I beg to inform you that I decline to invite my congregation to attend a lecture on that species of "emancipation" which Lord Brougham, in my opinion, justly calls "a hollow pretext, designed to produce a slave insurrection."

I return you the platform ticket you have sent me, not intending to attend the lecture, being of opinion that persons professing to be the ministers of a "merciful God," the author of peace and love of concord, might be better employed than in advocating a fratricidal war accompanied by atrocities which, as Lord Brougham says again, "Christian times have seen nothing to equal, and at which the whole world stands aghast almost to incredulity."

Your obedient servant,
AUGUSTUS CAMPBELL,
Rector of Liverpool.

Mr. Robert Trimble.

The Herald.

CARLETON PLACE.

Wednesday, Nov. 4, 1863.

A variety of causes have contributed largely to the idea that Canada was to receive a large influx of emigration during the past season. The anticipations, however, have not been fully borne out by the published returns. At the commencement of the present season circumstances appeared remarkably favorable for a larger proportion of emigrants from the old world, than usual, to settle in this province. As the "Globe" says—in addition to the causes at work in ordinary years, which are constantly sending us a portion of the surplus population of the old world, the terrible disaster which had befallen the cotton trade, in consequence of the American war, had swelled the emigrating class far more than the usual proportions. An immense number of factory operatives had been thrown out of employment, and if they stayed at home, they had no prospect before them but pauperism, if not absolute starvation, for themselves. There could be little doubt that very many of this class would seek to emigrate, and that, if they had not enough savings of their own left, to carry them to some more fortunate land where honest industry would be certain to find remunerative employment, assistance from the benevolent, through the channel of relief committees, or other associations, to enable them thus to make their escape from poverty and destitution, would not be wanting. And to what country could they more advantageously emigrate than to Canada? We have here a healthy climate equal to any in the world, and a fertile soil capable of yielding to steady labour a comfortable subsistence for millions more than our present population. We have the advantage also of comparative nearness to Europe, the cost of a few days' sail from Liverpool or Glasgow to Quebec being but trifling when compared with the expense and tediousness of the long voyage to the distant fields of emigration in other British colonies. And this year, moreover, it was supposed that the United States being rent and torn by the convulsions of civil war, a much larger proportion than usual of the emigration across the Atlantic would be directed to the peaceful shores of Canada—and that Quebec, rather than New York, would be the chief landing place for the crowds who would be coming to seek new homes and better fortunes in America.

The expectations have not been realized. The emigration from England, as was anticipated, has been very much larger than usual, but the proportion coming to Canada has been very little in excess of the average number of arrivals in past years. And of those who have arrived in Canada, a large number have merely made it the route by which they passed to the United States. It will probably be found, when the returns are made for the whole season, that the actual accession to our population by immigration during the present year, that is, the number of emigrants who have not only arrived in Canada but stayed here, will not exceed 15,000 or at the most 20,000, and in this estimate we include those coming via Suspension Bridge, having made New York

their landing-place, as well as those who have landed at Quebec.

The number of emigrants who left Liverpool during the quarter ending 30th September last, exceeded by 16,517 persons the number during the corresponding quarter of 1862. But of the large exodus this year from England, Canada has received comparatively a small share. For this more than one cause may be assigned. One is the continued insufficiency of the machinery provided for making thoroughly understood in the old world the inducements we have to offer to emigrants. And, undoubtedly, another cause which has checked emigration more than one cause may be assigned. One is the continued insufficiency of the machinery provided for making thoroughly understood in the old world the inducements we have to offer to emigrants. And, undoubtedly, another cause which has checked emigration more than one cause may be assigned. One is the continued insufficiency of the machinery provided for making thoroughly understood in the old world the inducements we have to offer to emigrants. 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