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ARTICLE I.

AGNOSTICISM.[1]

When Auguste Comte propounded his philosophical system to the world, he gave that system the name of Positivism. The scientific method which he in common with the body of physical inquirers pursued, and which he commended as the only method that is fruitful of valuable or satisfactory results, he styled the Positive, and the thinkers who, under his guidance, adopted and advocated that method to the exclusion of every other, he denominated Positivists. These descriptive terms were willingly accepted by the bulk of his followers; even by such of them as John Stuart Mill, and perhaps *M. Littré*, distinguished pupils who considerably modified and extended the views of the acknowledged master of the school. From this it was a very natural step to apply the convenient term "Positivists" to *all* who, in addition to the familiarity they betray with Comte's nomenclature, agree with Comte in his essential principles; nor has the fashion of doing so wholly gone out even now that so

[1]This paper takes its starting-point from the article on Positivism in the work entitled "Modern Philosophy, from Descartes to Schopenhauer and Hartmann. By Francis Bowen, A. M., Alford Professor of Natural Religion and Moral Philosophy in Harvard College. Second Edition. New York: Scribner, Armstrong & Company, 1878."

ARTICLE VI.

COSMIC VAPOR.

1. Cosmic Vapor having come to the front as an explanation of the totality of things, it is opportune to inquire what we are to understand by the totality of things, what Cosmic Vapor is, and what claim it can show to be regarded as the author of the universe.

First, then, as to the material universe, somewhere in the midst of which we find ourselves. We live on the surface of a globe so large that it surpasses the conceptions of its inhabitants, yet so small in comparison with the rest of the universe, that, if earth were annihilated, it would hardly be missed more than a grain of sand from the beach of the ocean.

Of the surrounding portion of the universe there may, of course, be vast districts from which no light has reached us, and of which we know nothing whatever. We say "may be," and then pass on to consider the part of the universe, if part it be, that is accessible to our intelligence. On such a theme one must be nothing, if not scientific; although it would seem to be the dictate of common sense, rather than of science exclusively, not to expatiate too largely on things of which we know nothing, and whose very existence is questionable; while on the other hand it may be wise, and certainly is modest, to acknowledge that the totality of things may not come under our purview.

We are in a forest of worlds, and in the direction of the Milky Way can by no means see our way out of the maze, though our sun is apparently doing his best to get us out on one side that is toward the constellation of Hercules. We have often turned the telescope to the Milky Way and the adjacent sky. In some places we see a multitude of small bright points, and back of them a luminous haze. No telescope made by man has ever penetrated through this haze. The larger instruments, however, multiply the number of bright points; in other words, they resolve more of the Galaxy into separate stars. In other places brilliant cohorts of stars appear to leap forth from their ambush:

as near the dividing line of Scorpio and Sagittarius in the south, and in the sword handle of Perseus in the north. These are seen by the naked eye as condensations, more or less distinct, of the general nebulosity.

Then there are several fine constellations in the Galaxy, as Cassiopeia, Cygnus, Aquila, and Scorpio; and not far away, the splendors of Lyra, Delphinus, Taurus, Orion, and Sirius, are visible in our latitude. In the far south α Centauri, and α and β of the Southern Cross gleam out like jewels from a diadem of down. For a century past the view has been gaining ground among astronomers that there is a stratum of stars whose length and breadth several times, if not very many times, surpass its thickness. We are in this stratum, and can see out above and below in the direction of the thickness, but not in the level of its length and breadth. It is reasonable to suppose that such gorgeous suns as Vega, Sirius, Betelgeux, and Aldebaran, lying so near the apparent level of the Milky Way, are really in the stratum, but are comparatively near us, and are merely displaced by viewing them from our stand-point. In fact Vega and Sirius are among the nearest fixed stars.

Leaving the stratum we come into the region of the nebulæ, some of which can be resolved into stars, while others are composed of incandescent gases. The latter are the true nebulæ; the former are star clusters. Mr. Cleveland Abbe has studied Sir John Herschel's catalogue, and Prof. Newcomb in his Popular Astronomy (p. 460) gives the following result: "Imagine a belt thirty degrees wide extending around the heavens, including the Milky Way, and reaching fifteen degrees on each side of the central circle of the Milky Way. This belt will include nearly one-fourth the surface of the celestial sphere, and if the stars or nebulæ were equally distributed, nearly one-fourth of them would be found in the belt. Instead, however, of one-fourth, we find nine-tenths of the star clusters, but only one-tenth of the nebulæ."

It seems, then, to be pretty well made out, that the material universe consists of a countless multitude of worlds arranged in a tolerably thin, irregular stratum, reinforced by contiguous star-

clusters on each side of the main layer; while outside of these lie scattered masses of glowing gas as far as Lord Rosse's colossal telescope can penetrate into space, and probably much farther. Nearer home, we have our own solar system, admirably adjusted, wonderfully poised, and flying through space at a rate not yet sufficiently ascertained; we have our earth describing a spiral such as would be made by a helix coiled about an oblique cylinder with an elliptical base. We have a superficial crust of a world on which to live, move, and have our being. This abode is exquisitely adorned with fountains and streams, with lakes and seas, with the grandeur of mountains and the goodliness of vales. It is clothed with grasses and flowers, shrubs, and trees, endogens and exogens, in measureless profusion and infinite variety. It is inhabited by innumerable kinds of animated beings from the radiata to the vertebrata, from infusoria to elephants and cetaceans, from the mollusk to man. Yes, to man towering above the rest, striving to understand them all, striving yet more to understand himself, ever asking whence he is, and whither he is going, palpitating with thoughts that wander through eternity, crying out for Somewhat to worship and to trust; aglow with poetry and heroism, love and hope; ever dissatisfied, ever self-reproachful, ever longing for the unattained, and miserably failing to find it in the finite, or winning it, if at all, in the Infinite alone.

2. *Competitors for the place of Author.*

(*a*) A God would be an adequate cause; a Being of sufficient wisdom to plan the universe, and sufficient power to execute a plan so august. There must be power somewhere; and who knows but it may reside in One Being. Intelligence may have produced the order and the glory everywhere manifest. If it be not a necessary cause, yet it is at least a sufficient cause; and if there should prove to be no other sufficient cause, intelligence may turn out to be the one necessary cause. And this intelligence may be a quality of the same Being in whom the power dwells; intellect and force combined in Him as in us, yet to an inconceivably higher degree in Him. This hypothesis will gain strength if it be once admitted that mind exists as well as matter;

for matter cannot create or beget mind; and if mind exists at all, it must have existed from eternity, which brings us back to theism, as before.

There are some very great advantages in the theistic solution, above all others that have been proposed. Many of the wisest, most sober, judicious, and virtuous of men, have unalterably held it to be the only solution possible. They have spurned from them every other solution as absurd in theory and mischievous in tendency.

(*b*) Chance would appear to have had a few adherents among the ancients; but the moderns are ashamed of their deity. Says Whewell in his Bridgewater Treatise, "Laplace has attempted to calculate the probability that it (the solar system as permanent) is not the result of accident. . . . . He finds that there is a probability far higher than that which we have for the greater part of undoubted historical events, that these appearances are not the effect of Chance. 'We ought, therefore,' says Laplace, 'to believe with at least the same confidence, that a primitive cause has directed the planetary motions.' "

Prof. Huxley also turns his back on this now abject divinity, and tells us that nobody worships at his shrine. In truth FORS is a blind old god; blind and deaf, dumb in all articulate speech, staring stupidly into vacancy out of his sightless eyeballs, without love or hate, sense or reason; and the only wonder is that any devotee ever bowed before his altar.

(*c*) Cosmic Vapor is set forth in our day as the rival claimant instead of Chance. The point of this whole article is that we are shut up to a choice between God and Chance. If Cosmic Vapor has any just claims to be considered the author of all things, by all means, let them be allowed. We come, then, to consider what is meant by Cosmic Vapor, whether there is now or ever has been such a thing, and what part, if any, it has taken in the production of the orderly universe in which we live.

3. Immanuel Kant, the famous metaphysician of Königsberg, after a profound study of the works of Sir Isaac Newton, propounded what has since been denominated the Nebular Hypoth-

esis. Prof. Newcomb quotes him as saying, "I assume that all the materials, out of which the bodies of our solar system were formed, were, in the beginning of things, resolved in their original elements, and filled all the space of the universe in which these bodies now move." Kant seems to have held that the material universe was limited in extent, and that in the beginning there was a chaos of particles, perhaps of atoms of matter, from which by mutual attraction and withal repulsion, the worlds were evolved.

Laplace modestly suggested that the solar system might have arisen, not out of absolute chaos, but from a central sun surrounded by an immense fiery atmosphere. This atmosphere, consisting of intensely hot vapor rotating slowly about the axis of the central sun, would cool by radiation, then contract, then by the recognised laws of motion rotate at an accelerated speed. Then again he thought the bounding layer would in the course of ages acquire such a velocity as to overcome the centrifugal force, and, as it were, tear loose from the rest of the vapor within. Or perhaps it may be said that the outer layer would become self-sustaining, and the subjacent portions of the vapor would tear loose from it. The ring of matter thus separated would gradually aggregate into a globe. Or the process might be repeated on a smaller scale and thus satellites be formed. Or even a revolving ring might be tardy in consolidating, and maintain its annular structure after the formation of a central spherical mass, as we see in the rings of Saturn. Thus planet after planet and satellite after satellite would be formed, and the central sun would contract through the ages by this process, but continue to be the source of light, heat, and attraction.

"But where," said Napoleon, "is the place for God in all this?"

"Sire," replied Laplace, "there is no place for a God in my system!"

This hypothesis, timidly put forth at first, has received some corroborations from advancing science.

Sir Wm. Herschel made some reflecting telescopes of higher

powers than had been used before, and began the study of the nebulæ. Some of these he considered as masses of glowing vapors, others as masses in which the process of condensation had begun; and others still, as those in which that process had been finished, and the vapor made up into worlds. So that every stage of the evolution was exhibited in the sky.

This view received a shock when Lord Rosse's mammoth reflector was turned on some of the phosphorescent vapors and resolved them into stars; while it brought to light new nebulæ unseen before, which even it could not resolve. It thus seemed most probable that we merely lacked optical power in order to resolve all the nebulæ, and the vapors appeared about to be swept from the firmament. Then came Wollaston and Frauenhofer, Bunsen and Kirchhoff, Huggins and Secchi, with their little magician of a spectroscope, and interpreted the mysterious symbols that had been for centuries showered upon us in vain from suns and nebulæ. In August 1864, Mr. Huggins directed his telespectroscope to the nebula 4374 of Herschel's catalogue, and was greatly surprised at finding a spectrum of three bright bands, indicating that the nebula was composed of luminous gas. By comparing these lines with those of terrestrial objects, he ascertained that the nebula contained nitrogen and hydrogen. Prosecuting his researches, he found twenty nebulæ of the same description and among them the Annular Nebula in Lyra, the Dumbbell Nebula, and the Great Nebula in Orion. A few of them, however, exhibit in addition a faint, continuous spectrum, such as is given by incandescent solid or liquid bodies. It has occurred to us that this last mentioned fact may be due to the presence of the solid or liquid bodies not only *in*, but beyond, or this side of the nebulæ.

In nearly forty others Mr. Huggins found continuous spectra, without the absorption lines which arise when the light of an incandescent solid or liquid body passes through a cooler surrounding vapor of the same materials with the body within. In this second list we find the long-known nebula in Andromeda, which We have so often and so wonderingly examined with the telescope, though to the casual observer it is an unattractive object. (Mr.

Huggins thinks it possible that there may be absorption lines so faint as to be indivisible.)

While, then, nebulæ of the second class are composed of solid or liquid bodies, it may be regarded as established that those of the first class do consist, some in part it may be, and others wholly, of luminous gas. Vapor then exists, whether worlds are made of it or not.

The next question is, what evidence the heavens afford of the transmutation of vapor into worlds; so as to entitle it to the name of Cosmic or Cosmo-Chaotic Vapor; a vapor which from a chaos becomes a cosmos. The forms of the nebulæ sometimes approach regularity, sometimes are wildly irregular and even "fantastic." Of the latter the Great Nebula in Orion is a sample. We have often examined it with the 6 in. Alvan Clark refractor of the University, through which it presents the appearance of a vague, formless luminosity dying away by imperceptible gradations into darkness, except near the intensely black window-shaped space adjacent to the trapezium. The edges of this are somewhat sharp. The Crab Nebula in Taurus, we have seen once or twice. The outline in our instrument is a tolerably regular oval, but in Lord Rosse's great reflector it shows a number of projecting arms which may justify its articulate designation. The spiral nebulæ, however, do look as though some kind of rotation were in progress. Noted among these is the one in Canes Venatici (H. 1622). It is hard to believe that any of these are in equilibrium. Indeed, notwithstanding the difficulty of drawing correctly the outlines of objects so indistinct, and the fact that the recent improved telescopes give different appearances of the same objects from those furnished by the earlier and inferior instruments, it still seems highly probable that real changes have been detected in the forms of some of the nebulæ. Newcomb cites as instances η Argus and the ω Nebula (H. 2008).

The next point is that in some cases we find rings of nebulous matter. We have more than once examined the Annular Nebula in Lyra (57 Messier; between β and γ). It is of a nearly elliptical shape, luminous throughout, but very faint in the interior, the outer part forming a bright oval belt. Herschel's 604 and

854 have a nucleus and several imperfect rings. In some, two nuclei are found; in others, a pretty well defined, or "planetary", nucleus surrounded by a ring. Drawings of these may be seen in Schellen's Spectrum Analysis.

This brief statement presents in a nutshell the argument for the actual formation of globular masses out of the luminous gases in space.

There are two objections to be considered. The first lies against the theory as an explanation of *all* the cases. Only a few of the nebulæ exhibit what may be called a tendency to spherical consolidation. The second bears against the production of worlds like our sun or its planets. The annular nebula in Lyra, both in the ring and in the gauzy interior, yields the spectrum of nitrogen only. Others show nitrogen and hydrogen as the Planetary Annular Nebula in Aquarius, the Stellar Nebula (H., 450), and the Spiral Nebula (H., 4,964).

It may be rejoined that some of the spectral lines may be absorbed by the interstellar ether, as Huggins suggests; or that further study and improved instruments may reveal other lines. We evidently need more facts. The sum of the matter, we take to be this: if the Almighty chooses to make worlds, meteors, or comets in this infinitely slow and difficult way, none of us need object. No living man can offer anything more than a conjecture on the subject. Atheists of our day would do well to imitate the modesty of Laplace. Evolution may requre an Evolver, and that Evolver may be a personal God.

4. "It is related of Epicurus," says Whewell, "that when a boy reading with his preceptor these verses of Hesiod:

> Ἤτοι μὲν πρώτιστα Χάος γένετ', αὐτὰρ ἔπειτα
> Γαῖ' εὐρύστερνος, πάντων ἕδος ἀσφαλὲς αἰεί
> Ἀθανάτων.
>
> "Eldest of beings Chaos first arose,
> Thence earth wide-stretched, the steadfast seat of all
> Th' Immortals,"

the young scholar first betrayed his inquisitive genius by asking, 'And Chaos whence?' When in his riper years he had persuaded

himself that this question was sufficiently answered by saying, that chaos arose from the concourse of atoms, it is strange that the same inquisitive spirit did not again suggest the question, 'And atoms whence?' And it is clear that however often the question 'Whence?' had been answered, it would still start up as at first. Nor could it suffice as an answer to say that earth, chaos, atoms, were portions of a series of changes which went back to eternity."

We make the passing remark, that Hesiod's conception of the Χάος may have been derived by tradition from the Mosaic account: The earth was (TOHU VA BOHU) without form and void; more literally, as the words are nouns, desolation and emptiness. (LXX. Ἀόρατος καὶ ἀκατασκεύαστος. Vulgate: *Inanis et vacua.*)

It is more to the point to say that Epicurus's question was the most natural one in the world. Not only natural, but wholly unavoidable. Again, it is impossible to halt at Laplace's landing. A glowing sun, surrounded by a fiery vapor enormous in its extent and world-producing, is as truly a phenomenon to be accounted for, as the present state of the solar system. It cannot have existed from eternity, and if it sprang into existence by the fiat of Deity, atheism is at once consumed in its own fires. Kant's conception is more plausible, but needs modification or restatement. For, why have not the planets and the suns all grown old and cold like our moon? Matter must have always, even from everlasting, had its attractive force. It ought then to have consolidated and cooled off ages ago, unless one of three things were true. For it will be observed that Newton's great Law of Gravitation includes just three principles: (1) Universality, since every particle of matter attracts every other; (2) A direct ratio: directly as the mass of each; (3) An inverse ratio: inversely as the square of the distance. In accordance with this we have three alternative suppositions before us: (1) That the particles of matter were infinite in number and diffused throughout immensity; hence their mutual attractions so counterbalanced one another, that the resultant infinitesimal excess of one attraction over all others drew one particle to another in endless ages. Thus if four particles, *a*, *b*, *c*, *d*, were on a straight line, we must hold

that the attraction of *b* and *c* for each other will infinitesimally overpower the remaining forces, and bring *b* and *c* together in an infinite time. (2) That the particles were originally separated from each other by infinite distances. (3) That a finite amount of matter was resolved not only into its "elements," but into in finitesimal atoms, so that the masses would approach one another by infinitesimal advances in finite times. These seem to be the only three suppositions at all admissible. If even these appear extravagant and visionary, it is not our fault. We are trying to accommodate the materialists, and find a resting-place for the soles of their feet, if resting-place there be. If there be none such in all their philosophy, let them abondon it and find soul-rest with us in God.

5. Whence is this chaos? The question will not down. Let us take the third of the above hypotheses as far the simplest, and the least incredible of the three. As we cannot go back to the beginning of eternity, which has had no beginning, let us take any given epoch, say a thousand million of years ago. The atoms are in motion, very slow motion it may be, but real. I suppose that the atoms are infinitesimal, like the monads of Leibnitz. If heat be the motion of the particles of a body among themselves, heat can scarcely exist yet. The "fire-mist" has not been produced. Matter exists, matter infinitely subdivided, and moving with insensible velocity.

Still the inexorable question returns: Whence is the chaos?

The human race have given several answers to this, as that

(1.) It was created *ex nihilo* by the Eternal One, the Self-existent Spirit whom we denominate God, *i. e.*, the Good. This is clearly the doctrine of the Bible.

(2.) Perhaps it was an emanation from Him; of his substance originally, but now differentiated from his individualism, as the light, on the Corpuscular theory, is an emanation from the sun.

(3.) Or it may be self-existent, and lie plastic in the cunning hands of the All-wise and Almighty Artificer.

(4.) Or self-existent, but rebellious, defiant, resisting the Demiurge who would fain fashion it into order and beauty; the source also of all moral evil.

(5.) Or itself, the alone entity, monistic, God, attaining to self-consciousness only in man, as the Pantheists assert.

(6.) Or wholly phenomenal, and based on no underlying substance, as the Idealists, whether Theistic or otherwise, affirm; yet backed in some way by a personal or an impersonal spirit, or by Force with or without a Spirit.

(7.) Or self-existent, eternal, imperishable, without God or soul of man, remorseless, pitiless, an inchoate machine, animated by undying FORCE, and self-evolved under the iron rule of stern-eyed FATE.

Men have indeed sought out many inventions, and will fly any whither to escape from the presence of the LORD.

6. Let us consider the seventh, which is the Materialistic theory.

Matter must have possessed its "potencies" from everlasting, if it has existed so long, and if there has not co-existed with it a spirit capable of endowing it with needful properties. How came it to number among those potencies the principle of attraction? Without this there would have been no permanent worlds. There are countless chances to one against the atoms drifting into any regular figure by Epicurus's fortuitous concourse, and again countless chances against their remaining in it. So that all the moderns, from the time of Newton, clamor for attraction as one of the universal properties of matter. But why should it have been a property of any particle of matter? Every one knows that matter cannot exist without the properties which philosophers call primary, such as extension, mobility, figure, etc., but there is no *a priori* reason why one of its properties should be attraction; and yet, further, that this attraction of gravitation should appertain to not one or two, but innumerable particles; and once more, that the attraction should obey any one law, as the inverse square of the distance. On the doctrine of probabilities, the chance that every particle of matter should agree with every other in this particular is almost infinitely less than that a die thrown a million of times should invariably turn up an ace. Magnetic attraction is very limited in its range. Steel can be

permanently magnetized; soft iron only temporarily. Why should not this attraction be as wide-spread as that of gravitation?

Again, different kinds of matter have very different properties in other lines. To confine our attention for the present to gravitation, we should guard against the error that *mass*, in the formula "directly as the mass," means quantity of matter. Equal quantities of gold or platinum, iridium or osmium, have a far greater attractive power, than of hydrogen or oxygen. Every element of the sixty-five known has its own specific mass. So that they gravitate very differently in this respect, while they unvaryingly exhibit the other feature of "inversely as the square of the distance." As our globe is now constituted, the intensity of gravity at London is 32.182 feet: that is, a body will fall, in one second, about 16 feet 1.09 inches (Deschanel.) But if it were a globe of gold or platinum, a body would fall much faster; still, as now, the attraction would be four times as great at one million miles distance from the centre as at two million. Why is this? It was either a lucky accident, or it is due to the will and the wisdom of a higher power.

The more we reflect upon the Law of Gravitation, the more wonderful it appears. The two opposite kinds of electricity are kept asunder in a Leyden jar by a thin partition of glass. Light penetrates the glass, but is arrested by a thin plate of metal. Gravity spurns all checks and pierces through solid worlds. Thus when our moon or a satellite of Jupiter is in eclipse, and the light of the sun is shut off (almost wholly) by the intervention of the planet, the force of the sun's gravitation suffers no diminution. Imagine our condition in terrestrial matters if this were not the case. Our floors would arrest the attraction of the earth; our persons, our furniture, the bricks in our houses, would become lighter than air. Not even out-of-doors could we stay on our planet, for the attraction of the globe would be cut off by a superficial shell only a few inches thick. Everything would go spinning off the earth, and the earth itself would fly into pieces. Yet this law existed long before Life made its appearance. It

was one of the "potencies" of Matter by which it was to make itself into worlds.

7. A separate section may be devoted to the law of "inversely as the square of the distance." This was largely discussed in the last century, and is considered at some length by Whewell. The sum of what he says is this: 1st. So far from its being a necessary property of matter, this law was never dreamed of until modern times. 2d. The distinguished mathematician Clairaut, who did so much in the development of Newton's doctrines, denied that the law was true, because the apsides of the moon made a complete revolution in half the time called for by Newton's theory; *i. e.* in nine years instead of eighteen; and it took a long while to rectify the mistake and show that fact and theory coincided. 3d. While Newton shows (Principia, Prop. 64) that if the force of gravity *increased directly* as the distance, the planets would describe ellipses, yet gravity in bodies at the earth's surface would cease to exist, and an utter subversion of all terrestrial things would ensue. 4th. Among conceivable inverse laws, any diminution of the attractive force greater in ratio than the cube of the distance would cause a planet to describe a spiral, and hence either to fall into the sun or to whirl out into space farther and farther forever. 5th. Although the very laborious calculations necessary to estimate the perturbations on various possible suppositions have not been made, the stability of the system, and the moderate limit of the perturbations, would not, so far as we know, be obtained by any different law. By the existing law the orbits of the planets return quite regularly into themselves; there is simplicity in place of confusion.

We add the following considerations. By the Tenth Proposition of the Principia we learn that if the attractive force were directly as the distance, the sun would be in the centre, and not in a focus of the ellipse; and that all the planets would perform their revolutions in the same time, which indeed is easily deduced from the principle that the forces are as the squares of the velocities divided by the radii of the circles, or even more readily from the principle that the central forces are as the

radii of the circles divided by the times of one revolution. The velocities of all the planets would be enormously increased by this, especially of Uranus and Neptune, and to no good purpose, possibly to very bad purpose.

The fourth point we have quoted from Whewell will bear some modification. By Newton's Ninth Proposition, if the centripetal force be inversely as the cube of the distance, the orbit will be a spiral cutting all the radii vectores in the same angle. Mathematical readers will recognise in this the famous Spira Mirabilis or Logarithmic Spiral of Bernouilli. It would seem that a force greater than the inverse cube of the distance might produce some other spiral. In a word, Whewell has under-stated, rather than over-stated the case.

It is worthy of notice also that by the rule of the inverse square, all possible orbits are conic sections, and their equations are of the second degree only. This has been of signal service to astronomy. Equations of the first degree represent straight lines. The simplest curves are represented by equations of the second degree. If the orbits had been curves of the fourth or higher degrees, like the lemniscata, or the limaçon, or any other of the odd looped puzzles of mathematicians, or some queer transcendental form, when would the human race have mastered the subject? As it is, the problem has been hard enough, and never was solved until Kepler and Newton grappled with it; although the Greeks had invented all the conic sections eighteen centuries or more before Newton, knowing of course nothing about their astronomical utility.

To sum up this part of the subject. Everything resembles the skilful planning of a most ingenious mechanician, thoroughly understanding the business in hand. Everything is as unlike as possible to caprice, ignorance, accident. That any one particle of matter should attract a whole universe to its remotest bounds, and according to a law so unlike other laws, so marvellous, so simple, so necessary to the order and permanence of the system, that particles in number beyond computation should be subject to the same law in this particular, while differing so widely where utility would be subserved by the variation, points unmistakably

to wisdom and will. Taking the lowest empirical ground, there is well nigh an infinity of chances in favor of theism. Mark specially that evolution cannot in any wise account for the existence of forces and laws previous to evolution. Suppose that force acting according to law evolves form, order, beauty, utility, life even. Whence the force? whence the law? They are the cause, not the effect of evolution. No! We must choose between God and Chance. There is no third alternative.

8. Given, then, the Law of Gravitation, and in addition Newton's three Laws of Motion and all his Corollaries from them; in order to produce a single solar system by force under these laws without any subsequent oversight or direction, the particles must have been pre-arranged with the most admirable skill. The adjustment would have taxed a Divine wisdom. If God did make the solar system thus, he set before himself a problem of superlative intricacy. The orbits of the planets were to be nearly in the same plane; or if the inclination should be great, say as much as 34°, which is the case with Pallas, the second asteroid discovered, the weight of the body must be insignificant. The larger planets must be much more distant from each other than the smaller. The unavoidable perturbations must be so admirably arranged as to be self-corrective. But these depend upon the original collocation of the particles, upon the inverse element of the law of gravitation, and also upon the masses of the particles and their direct influence; none of which things have any causal connection with the collocation, and can in no way have determined it. Nor can the mutual adjustment of collocations and laws have been brought about by evolution, because they preceded any and all evolution. Hence we are driven back again to the same issue as before, and must choose between God and Chance. As even Laplace has said that Chance can not have been the author of the solar system, that author must have been God.

And if a God is needed for one solar system, what wisdom must have been requisite for the establishment and maintenance of such a cluster as that in Hercules, or 47 Toucani described

by Herschel as "a most glorious globular cluster, the stars of the fourteenth magnitude immensely numerous * * * * * compressed to a blaze of light at its centre"; or H., 3,504: "The noble globular cluster ω Centauri, beyond all comparison the richest and largest object of the kind in the heavens. The stars are literally innumerable"?

If there was no God, the problem was solved by blind Chance, who, without knowledge, skill, or sense of grandeur, surpassed all human wisdom by infinite stupidity.

9. An inconceivably vast portion of the self-existent and eternal matter, however, does not condense into worlds. It fills all the interstellar spaces, and may extend far beyond the outmost orbs or nebulæ. We borrow and abbreviate a Greek word for a name, and call this apparently imponderable substance *ether*. If it had possessed that well-nigh universal property of gravity, it would, in the lapse of the infinite ages, have accumulated about the suns and the planets, leaving impassable voids between. But while it is not attracted by other kinds of matter, it is capable of being agitated by them in a most astonishing manner. Either the motion of the particles of molecules among themselves, or that of particles attracted toward each other by gravitation, was communicated to the slumbering ocean of ether, and then Force said to Matter, "Let light be", and light was! Yet not by the sudden and magnificent outburst indicated by the Hebrew prophet, but rather by infinitesimal dimness of beginnings. Nor yet by any sort of beginnings exactly, for there never was a beginning of light, but a coeternity of light with matter; and the dazzling sun-throbs of the Present faint indeed upon the far stretches of the boundless Past, but never absolutely die away.

According to Huyghens's theory, *i. e.*, the now generally accepted undulatory theory of light, the vibrations are transverse to the lines of radiation from the centre. Roemer first found from the eclipses of Jupiter's satellites that light came from the sun in about eight minutes. Deschanel puts its velocity at "about two hundred and ninety-eight million metres per second, or one hundred and eighty-five thousand miles per second. As the circum-

ference of the earth is only forty million metres, light would travel seven and a half times round the earth in a second." He may well say, "A velocity which may fairly be styled inconceivable."

The ether consists of inexpressibly numerous atoms differing from other sorts of matter where it was desirable that they should differ, and, without concert or perception, plan or knowledge, agreeing with each other in prodigious elasticity, extraordinary repulsion, and uniformity of wave speed, and of direction when unimpeded or when reflected, but uniform change of direction when refracted. There are light rays, heat rays, and actinic rays, all bound together in one pearly or golden beam, but to some extent separable by glass prisms, rock-salt, and other media.

Let us notice specially the light rays. In red light the number of vibrations striking the eye in a second is about four hundred and fifty billions; in violet, eight hundred billions" (Schellen). This is nearly the same as Professor Tyndall's estimate. It is to be remembered that by billion here is meant a million of millions, not a thousand millions; 450,000,000,000,000 and 800,000,000,000,000. Deschanel gives three hundred and ninety-two and seven hundred and fifty-four millions of millions. It was necessary, therefore, in order that our eyes should see the different colors from red to violet that a medium should be pre-existent, capable of producing from four hundred to seven hundred or eight hundred millions of millions of vibrations in a second. Again, we say, if the capacity, "potency," or call it what you will, had not been in each and every one of numberless individual atoms from eternity, there would have been nothing to evolve. How far ahead sees the blind god, Chance!

It is not within the scope of this article to dwell particularly upon life, either vegetable or animal; but it may be remarked here, that life could not have existed on our planet but for light, solar heat, and actinism. How could the molecular vibrations of interstellar ether produce the eye? How could light make the cornea, the crystalline lens, the sclerotic coat, the choroid with its black lining, the iris with its double set of muscles, and its variable opening?

10. The heat evolved by the condensation of the cosmic vapor affects different substances very variously. As the process of cooling goes on, some of them solidify, others liquefy, still others continue in a state of vapor, while there is a multifarious passing to and fro on the part of some substances from one to another of these states. For instance, the oxygen and nitrogen of our atmosphere are mixed, but not chemically combined. They form an upper sea of about one hundred to one hundred and ten miles in height. If they should combine, universal death would ensue. If they should liquefy or solidify, it would be equally disastrous. Yet oxygen forms about one-half of the solid crust of the globe; nitrogen appears in various nitrates in the plants, in the lean flesh of animals; but there *chances* to be such a supply of these that the overplus constitutes an atmosphere. The oxygen is diluted with about four times its amount of nitrogen. Without this dilution our bodies would consume, and unextinguishable conflagrations would sweep the earth. But dilution implies that one of the ingredients, as here the nitrogen, should lack certain properties possessed by the other. Thus the nitrogen will enter a blast furnace in company with oxygen, and reissue unscathed and without having formed a single combination. Is there not design, foresight, selection here?

Now, as to the mass of both these elements of our atmosphere: if there had been much less, their weight would not have sufficiently repressed evaporation; our most humid climates, as at present, would be dry and parched, compared with the excessive dampness that would have arisen. If there had been much more, the evaporation would have been insufficient, deserts would have been the rule, not the exception; and the healthful breeze would have been converted into a tornado.

Again, the amount of each had to be adjusted to its own specific gravity, which brings in the size and weight of the earth. There is, then, a wise adaptation of the specific gravity of oxygen and nitrogen to that of the sixty-three other elements composing the earth, and also of all their amounts. This must have been arranged by a wise Creator, or by Chance in the eternal properties of matter. Evolution cannot have effected it. The evolution of what, pray?

A highly interesting phase of this subject is that of human language and music. These depend entirely upon the presence of an atmosphere, and in their perfection depend upon an atmosphere constituted as ours actually is. In an atmosphere of hydrogen, music would be almost or quite impossible. Everything would have to be reärranged, at all events, and we do not know that music would be possible even then.

Apropos to this, we have lately seen, in the office of a medical gentleman, a human skull remarkably well prepared as an anatomical specimen. One thing particularly struck us: the thick and very hard bone back of the ear had been so ingeniously sawn, as to exhibit *in loco* the delicate little *incus*, *stapes*, *malleolus*, and *annulus*—the anvil, the stirrup, the hammer, the ring—so well known to every student of otology. How is it conceivable that the vibrations of the air should ever produce these four singular and wonderful little media of hearing? No room for evolution here. It was a God, or else Chance, that constructed the ear; and without hearing, what would men have been? What, too, without vocal organs suited to address the ear, and meaningless and useless if the ear were not?

Nor should we omit the consideration of the lower animals, who have need of voice and hearing, as well as man. The Scriptures beautifully represent the Infinite One as hearing the cry of the young ravens for food; and one charm of earth would be lost to man if the feathered warblers had no early song. The air moreover is their home, to which they are so wonderfully adapted. We could almost be willing to rest the theistic argument upon the wing of a kestrel, so charmingly described by the Duke of Argyll in his Reign of Law. To take our own view of the case: Oxygen and nitrogen, uncombined in the air; oxygen and nitrogen combined in the wing; total result, a little bird's heart thrilling with ecstasy in the atmosphere, which is its Heaven.

11. Hydrogen is a gas with which oxygen combines more readily. If the two are intermixed, an electric spark or the smallest flame at once brings about a chemical union with the development of an enormous amount of heat; so that if earth

should ever plunge into a hydrogen nebula, it would be wrapped in a sheet of fire, and the aërial heavens would pass away with a great noise. According to the recent speculations, there was a time in the remote past when the two gases were heated so highly that the force of repulsion prevented them from uniting. At our present ordinary temperatures, their affinities are not strong enough to effect a union. But there may well have been some intermediate point at which the two gases would combine.

Why hydrogen should combine so easily with oxygen, when nitrogen will not, must be due to the will of a Creator or else to Chance. The same alternative is presented to us, when it is asked why the product is water, a liquid at ordinary temperatures, and not a gas, like ammonia, formed by hydrogen and nitrogen; or again, why water is a nearly universal solvent; why it is not acrid, like the several compounds of oxygen and nitrogen; how it is converted into vapor at so surprisingly different temperatures, and can thus form clouds and be borne from the ocean to the land, to water and replenish the earth, making vegetable and animal life possible? How, too, has it happened that we have just so much water and no more? Much more would have flooded the continents now, as in the early geological periods (if Dana may be trusted). The upheaving power of the internal heat, it seems, has sufficed to elevate not only the mountains, but the plateaus and the plains. There was then an adaptation between the amount of the water and the inner fires, as there is between the surface of the water and that of the land. Much less water would have left earth arid; but the amounts of the hydrogen and the oxygen not otherwise to be used and hence available for water, must have been weighed out before water was evolved.

Its convertibility into ice at 32° Fahrenheit, or 0° Reamur and Centigrade, and the greater lightness of ice than water, have often been referred to. These came by design or by the luckiest of accidents.

12. It appears to be the common opinion of geologists that in the carboniferous period, the mammalia could not live on the earth owing to the excess of carbonic acid in the atmosphere.

The late formation of carbon, monoxide or di-oxide (CO, CO_2) can be accounted for by supposing that at a very high temperature the repulsive force of heat was too great to admit of combination between carbon and oxygen. In our day a bit of charcoal might be exposed to oxygen for centuries and not oxidize. But there was an intermediate temperature passed through in the process of cooling, at which carbon and oxygen would combine, as has been said of hydrogen under the preceding head.

Both compounds CO and CO_2 are deadly poisons if inhaled in sufficient quantity. But then they are food for the plants. Besides nitrogen vegetation needs little more than water and carbonic acid. Hence the vegetable world stepped in and relieved the air of its poisonous foreign substance. The vegetable then became food for the animal, and the shell fish secreted carbonate of lime which forms so large a part of the earth's crust. Much of this may have occurred before the carboniferous period proper. In that period—if we may believe the speculations of the geologists—immense tree ferns, rushes, and a few other plants, flourished in broad savannahs on the margins of marshes; fronds, bark, trunks of trees, fell, were submerged, were overwhelmed with mud and sand, and losing their oxygen, and much, sometimes nearly all, of their hydrogen, were stowed away as bituminous or anthracite coal. This is certainly an interesting speculation, and may be founded on fact. If a Deity were preparing earth for the abode of the mammalia, and particularly of man, it would be a sagacious measure thus to remove a poison and to turn it into food. The evolutionist may confound his own understanding in this case, being bewildered by the introduction of life, that mysterious potency. As before remarked, it is foreign to our present purpose to discuss the evolution of life from dead matter. It is consonant to that purpose to say that the laws of combination between oxygen and carbon, and the suitableness of the compound to enter into a cell, and to develop other cells, as also to destroy animal life, by inhalation, are all older than life; older than everything save God and Chance.

The permanency of the world systems is provided for by methods already noticed. The permanency of the animal king-

dom is secured by its relations to the vegetable realm. When a plant dies, the oxygen of the air is busy reconverting its partially oxydized carbon and hydrogen into carbonic acid and water. These compounds are borne away to living plants for their nutriment. Thus the vegetable system might go on performing its revolutions, with a prodigious amount of carbonic acid in the atmosphere. It has been ordained, however, that a considerable amount of the carbonic acid and water shall pass into animal organisms first, and be exhaled by the aid of ever-busy oxygen. Yet this would be only retarding or hastening the return of those elements to the inorganic world, and need not affect the equilibrium of the general system. But man has been burning fuel and light-producing substances for several thousand years, and for the past century has been using the coal deposits of an earlier geologic period. If the abstraction of the coal from the surcharged atmosphere was necessary to enable the mammalia to breathe the air, and we return it to the atmosphere by household fires, factories, mills, and locomotives, shall we not endanger the purity of the atmosphere? This is partly a quantitative question. As to the qualitative aspect, the tendency must be toward the deterioration of our atmosphere unless vegetation be stimulated so as again to withdraw the poisonous element. Now this may be accomplished by a general increase of the world's population, and the cultivation of larger areas of earth's surface. So well has the All-wise Creator,—or else the blind god—adjusted matters for us.

It is interesting to note that a very small amount of carbonic acid is always in the air; less than one per cent., yet absolutely necessary to the continued existence of the vegetable kingdom. We have purposely omitted any mention of the ammonia (H_3 N), also in minute quantities diffused throughout the atmosphere. This is an essential ingredient of the protein compounds, or—as the phrase goes,—of protoplasm, the foundation of those carbon compounds. Why nitrogen should have had an affinity for hydrogen, no man can say. If it had not had it, there could have been no protoplasm, no cereals, no mammals certainly, and no evolution of the human race.

13. The weight of the earth.

Whewell, M'Cosh, and others, have remarked upon the adjustment of the weight of our globe to its vegetable productions. Any great increase of its attractive force would have broken down plants that now stand erect. In drooping flowers we find the pistil longer than the stamens, so that the pollen *falls* upon the stigma of the pistil and fecundates it. An instance which has often occurred to us, is that of our common grains, in which the stalk would be too weak to hold up the heads except for two provisions: 1st, the stalk is tubular, so as to get the greatest rigidity out of the material employed; 2d, it is stiffened by silex extorted from the soil in nature's laboratory. If the earth were much smaller or its specific gravity less, these provisions would have been unnecessary. There is here then a relation between the mass of the earth and the humblest stalk of grain.

The birds also have their adaptations to the mass of the earth, to the mass of the atmosphere, and to the specific gravities of both. The little humming bird, that animated gem of our Western continent, flitting about our honeysuckles, and poising himself at the mouth of their delicate cups, is a marvel of calculation. The contriver of his tiny body and wings must have known somewhat of dynamics. As the Duke of Argyll has pointed out, how wonderfully this wee creature succeeds in solving his problem of the equilibrium of forces! To keep poised mid-air is about the hardest thing a bird attempts to do. And then his colors, so exquisite singly, and so exquisitely blended!—linking him with the sun, whose light his plumage analyses, and flashes back to us in gorgeous tints. Man, too, is of due size and weight. A few overgrown monstrosities exemplify the inconvenience of any great increase; and dwarfs, likewise, of diminution. Prof. J. R. Young in his Analytical Mechanics says: "We accordingly find men of enormous magnitude, as O'Brien, the celebrated Irish Giant, to be so weak that they are scarcely able to walk about." Writers on Mechanics all teach that there is a limit to the strength of materials.

Again, on the surface of a globe as heavy as the sun, a man of ordinary size here, say 150 lbs., would weigh 4,200; a horse of 1,000 lbs., 28,000.

Man is adapted, then, to the weight and size of our globe, and to the size and strength of other animals. Whence this adjustment of men (and animals too) to the weight and distance of the molten masses of earth's interior? Could impersonal evolution have known the weight and the distance? It would be a weak evasion of this to say that only the fittest survive. Have men ever existed in any large numbers, of a size materially different from what we see now? There is no proof of such a vagary. The fittest have not survived the less fit. There have been no less fit to be survived.

Besides the mass of the earth, let us notice the length of our day, which is manifestly adapted to animals of various kinds. The moon keeps the same face always toward the earth, excepting of course the small changes due to libration. Why might not the earth have kept the same face always presented to the sun? Or have had a day of ten hours like Jupiter and Saturn, or of three or six months? This depended on laws and collocations antedating evolution. Why was our orbit an ellipse of so small eccentricity as to be scarcely distinguishable from a circle? How came its axis to be inclined to the plane of its orbit, thus giving us the advantages of the seasons? Why was it not parallel to that plane? But we forbear.

14. The most wonderful thing of all has not yet been touched. In the original, or, if you please, eternal laws, potencies, and adjustments, there must have been an intelligent or unintelligent arrangement for the generation of human thought. The audacity of Materialists just here has no bounds. It is better for the cause of truth, however, that they should come out boldly and say what they believe. An eminent American physiologist, for instance, says that it is not proper to call the brain the organ of the mind, because the brain produces the mind. A frequent mode of statement is that the brain *secretes* thought, as the liver does bile. Then it follows that man is a mere machine, wholly irresponsible for his actions; and that the direst fatalism is the only true philosophy. Indeed, Mr. Huxley says he would as lief be wound up every morning like a watch or a clock as any

other way, if he were only wound up so as to run right during the day. But as to rightness of running, it must be observed that, on materialistic principles, there is no moral right in the universe; again, that men will run as they are wound up to run, regardless of any consideration of any sort of rightness, and that robbers, murderers, and debauchees desire no more comfortable doctrine.

Let us look at the brain and see what its elements are, and how they are put together. The anatomists, the chemists, and the microscopists, have examined the brain with the most commendable care. As far back as 1812, Vauquelin made a quantitative analysis, as follows: Albumen 7 per cent.; cerebral fat, viz., stearine 4.53, elaine 0.70, *i. e.*, together 5.23; phosphorus 1.50; osmazome 1.12; acids, salts, sulphur, 5.15; water 80. In all, 100. The most recent analyses differ very little from this.

In 1835, M. John analysed the gray and the white matter separately, with this result: Of the white substance, in 100 parts: water 73, albumen 9.9, white fatty matter 13.9, red do. 0.9; osmazome, lactic acid, and salts, 1; earthy phosphates 1.3. Total, 100.

Gray substance: water 85; albumen 7.5; white fatty matter 1; red do. 3.7; osmazome, etc., 1.4; earthy phosphates 1.2. Total, 99.8.

His analysis of the whole brain gave the items, in the same order, thus: 77, 9.6, 7.2, 3.1, 2, 1.1. This brain was that of an insane patient.

Gray's Anatomy gives from Lassaigne almost the same: White substance: water 73; albuminous matter 9.9; colorless fat 13.9; red do. 0.9; osmazome and lactates 1; phosphates 1.3. Total, 100.

Gray substance: 85.2, 7.5, 1, 3.7, 1.4, 1.2. Total, 100.

Gray succinctly describes the brain as albumen floating in water.

Now as to the structure of the organ. We may omit the cerebellum, which no one seems to regard as connected with thought. The cerebrum constitutes much the largest part of the brain. The outer coat, which is quite a thin one, is of gray matter; and

is called the cortical layer, vesicular neurine, the hemispherical ganglion. Enveloped by this is the white matter of tubular formation, the tubes being so small (from $\frac{1}{2000}$ to $\frac{1}{4000}$ inches in diameter) as to require a microscope of 300 magnifying power. Ehrenberg used a power of 800, but that may have been on the sympathetic nerve. Considerable masses of gray matter, however, are found in the interior parts of the white portion, as also in the medulla.

If the brain thinks, what part of it does the thinking? The tubular structure indicates the conveyance of something, whatever it may be. This is Solly's view, and appears to be the general impression. Whether thoughts of great magnitude can pass freely through such extremely delicate tubes, we leave to others to determine.

Let us go then to the gray, cortical layer. It is very hard to believe that water ever thinks: water, which is more abundant in the gray than the white matter, surprising as this fact is. It is also very hard to believe that fat thinks, whether it be colorless or red. Stearine, margarine, and oleine, are familiar names to the chemist, and occur in a remarkably curious series of the hydro-carbons, but can hardly be classed among the thought-producers, although useful where light and heat are desired.

The Materialists have pitched upon the phosphates as the true fountain of thought; the phosphates of the gray, cortical layer—or if you please, the sevenfold cortical layer. "No phosphorus, no thought," is their apothegm. Phosphorus may be without Thought, since there is a large amount of phosphorus in our bones, which are never said to think. But Thought cannot be without phosphorus. Proof: Solly, a staunch Immaterialist by the way, gives a case of a lean, consumptive-looking preacher, who taught school all the week and preached twice or may-be thrice on Sunday. Every Sunday night his urine was highly charged and colored with tri-phosphates. On Monday this abnormal condition began to diminish, and by Tuesday or Wednesday the patient was himself again. The prescription was, Rest and Recreation.

This is a sample fact. Every thought, feeling, or volition, is

accompanied or followed by the disorganisation of particles of the brain. This may be true; but the Materialists hold that some motion of the molecules of the brain *is* thought, feeling, or volition. Let us then go down into a vesicle of the gray matter. It is a minute sack—round, oval, angular, pyramidal, or otherwise in form; a thin membrane enclosing little granules, and they again surrounding a transparent nucleus or nucleolus. Eureka! It is the spinning, dancing, whirling, or indescribable gyrating of the minute particles of phosphorus with, over, under, around, and beside each other or minute particles of other elements, that produced the pathos of King Lear over his lost Cordelia; the hesitation, the murderous resolve, and the guilty terrors of Macbeth; the frenzy of Othello, and the perplexed speculations of the sorely distraught though sane Hamlet, in the brain of William Shakespeare! Mayhap the caudate vesicles—for such there are—produced Shallow, and honest Bottom, and Caliban; even though Man is not now externally a caudate Mammal. This potency of circular, elliptical, spiriform, or ineffable gyration of thoughts, of emotion, of will, of fear, sorrow, mirth, passion, or ecstasy, must have existed in phosphorus from all eternity. Again, we say, if the Almighty had striven to set before Himself a problem of the uttermost intricacy, we cannot conceive how He could have surpassed this. Indeed, it appears to us wholly insoluble even by Divine wisdom and power. But the blind god, Chance, has no difficulty with it. *He* solves it without intending to do it; without trying to do it, or knowing that he has done it.

The Theist adores the celestial Wisdom that planned the mind of our great dramatist, and learns somewhat of the depth of meaning in the inspired saying that Man was made in the image of God; while the absurdity of the materialistic view surely passes all bounds.

15. There is something exalted in a true Christian Theism. The first of all things was not matter, but mind; not a chaos of atoms, but a glorious spirit; one, self-conscious, and, beyond expression, strong and wise and good. He is the Creator of matter, and of finite mind; Himself before the universe, and greater

than the universe, all the beauty and all the grandeur of which are but shadows of the uncreated beauty and grandeur that are in Him. When the Hebrew sage inquired by what name he should designate Him, He answered, "I am He who IS; I AM the ever-existent; tell them I AM hath sent you." All other being flows from His being. But when He lifteth up His hand to Heaven and sweareth by Himself, He saith, "I LIVE, saith Jehovah of Hosts." All other life floweth from His life. To the devout believer, not only earth, but the heavens also become a temple. Earth is the Holy Place thereof; and the crimson blue and golden sky of evening, the curtain separating the Holy Place from the Holy of Holies. To him, too, when night has drawn this curtain aside, the pearly light of the Galaxy seems a Shekinah over the Mercy Seat, a symbol of the presence of Deity in the Most Holy Place.

But vast as this spacious temple is, will God indeed dwell therein? Behold the heaven and heaven of heavens cannot contain Him. Jehovah hath said that he would dwell in the thick darkness. So it was before Matter and Light were. So it is even now, although this island-universe has arisen out of the shoreless gulf of Night, whose waters still enfold it on every side. So it shall be, world without end; for the infinite spaces that environ Matter and the Day, will forever be the abode of the Eternal, as they have been in the ages past.

Here, then, is a Being that we can worship now and evermore. Not only now, but evermore. For there is not a point in space so distant but God is there and also beyond; not a moment in time past when he did not exist, and also before it; and not a moment in time to come, when he shall not be, and also continue to be thereafter. So there is no height of wisdom, truth, and grace, no depth of condescension, pity, and love, that it hath ever entered, or can ever enter, into the heart of man to conceive, but the same and yet greater heights and depths are in God. Archangels veil their faces at the view of his majesty and his excellency, and cry one to another, "He is holy! Heaven and earth are full of his glory." Yet materialism would blot out this beauty of holiness from the universe.

Let us examine *its* temple. Let us force an entrance into its penetralia, for we cannot say its most holy place. What shall we say of the deity hidden behind the foul curtain? hidden there though his flamens deny that he is there! Let us drag forth to the light, the blind, idiotic, howling god whom his own servants despise. IT, the author of this magnificent cosmos! IT, the father of our spirits!

Yet between these two we must choose. There is no other alternative: we must take the Lord our God, or Chance.

L. G. BARBOUR.

ARTICLE VII.

THE GENERAL ASSEMBLY OF 1881.

This Assembly, it is surmised, has left an extremely pleasant impression upon the minds of its members. The little "Mountain City" of Staunton, Va., as its inhabitants love to call it, is at all times a pleasant place to visit. Situated in the middle of the "Great Valley," midway between the Blue Ridge and North Mountain, it presents the tourist, in its bold and rounded hills, endless undulating surface, and distant but majestic mountain-ramparts, a landscape to whose perfect beauty nothing is lacking, except the contrast of the level azure of a Swiss lake. As though to greet the great convocation with a cheerful welcome, the country clothed itself in all the glory of summer verdure, combining the greenness of the North of England with the brilliancy of an Italian sky. Nor were the good people behind their country, in the hospitable reception extended to the visitors. The doors of the beautiful homes of all denominations were thrown open without distinction. All that a cordial, but unpretending, hospitality could do, was combined with mountain air, and propitious weather, to make the season of the Assembly's sittings enjoyable.

A representation absolutely full would have given one hundred