JOURNAL OF

THE TRANSACTIONS

OF

The Victoria Institute,

OR,

Philosophical Society of Great Britain.

EDITED BY THE HONORARY SECRETARY.

VOL. X.

LONDON:

(Published for the Institute)

HARDWICKE & BOGUE, 192, PICCADILLY, W.

1877.

ORDINARY MEETING, MAY 3, 1875.

H. CADMAN JONES, ESQ., M.A., IN THE CHAIR.

The Minutes of the last meeting were read and confirmed, and the following Elections were announced :—

MEMBERS :—

Rev. H. E. Fox, M.A. (Cantab.), Westminster.
Rev. J. M'Cormick, M.A. (Cantab.), Lewisham.
Rev. Canon J. C. Ryle, B.A., B.D., Stradbroke.
Rev. A. Stewart, Aberdeen.

ASSOCIATE :—

Rev. W. Magill, Presb. Dean of Residence, Queen's College, Cork.

Also, the presentation of the following Works for the Library :—

"Proceedings of the Royal Society." Part 160.	*From the Society.*
"Christian Psychology." By the Rev. T. M. Gorman.	*From the Author.*
"Evidence of Rational Evangelism." By J. Du Boulay, Esq.	*Ditto.*
"Evolution." By the Rev. A. Stewart.	*Ditto.*

The following Paper was then read by the Author :—

AN EXAMINATION OF THE BELFAST ADDRESS OF THE BRITISH ASSOCIATION, 1874, FROM A SCIENTIFIC POINT OF VIEW.

By JOHN ELIOT HOWARD, F.R.S., F.L.S., F.R.M.S., Acad. Med. Fr. Par. Mem. Corr., also Phil. Coll. Pharm. — Société de Pharm. Paris — Soc. Physico-med. Erlangensis — Allg. Oest. Apoth. Verein — Netherlands Industrial Soc. — Mem. Pharm. Soc. of Great Britain—Société Botanique de France—Society of Biblical Archæology, &c.

"Were men led into the apprehension of invisible intelligent power by contemplation of the works of Nature, they could never possibly entertain any conception but of one single Being, who bestowed existence and order on this vast machine, and adjusted all its parts to one regular system."—*Hume, as quoted by Tyndall, Address, page* 23.

PART I.—*The Introduction.*

THE Address delivered by Professor Tyndall before the British Association (1874) was regarded by the thinking portion of the public as an utterance of much importance; not only on account of the high standing of the speaker in the estimation of the scientific world, but as presumably expressing the opinions of others also.

It was probably imagined by most that the conclusions to which the author had arrived were the necessary and inevitable result of the progress of Science. Comparatively few possessed

either the means or the leisure to submit this hypothesis to the rigid scrutiny which it required previous to acceptance; and when it was understood how vast and how important were the consequences that must result from such acceptance, many were glad to fall back on the delusive hope that this skilful lecturer had really not succeeded in making his meaning understood. In this manner the task of coming to any decided conclusion about the whole matter was avoided.

Whatever ground there might seem for this expectation in the somewhat apologetic tone of the closing portion of the address, there can no longer be any excuse for entertaining so unfounded an opinion; since in the subsequent lecture in the Free-Trade Hall, Manchester, and in the prefaces to the first thousand, and to the recently-issued seventh thousand of this pamphlet, the author applies himself succesfully to the task of clearing away all ambiguity; and shows that he entirely adheres to those expressions of his views against which most exceptions have been taken.

It is very evident, however, that Professor Tyndall feels acutely the nature of the opposition which he has evoked. He assures us that the address was not any expression of passing feeling evoked by the cheers of his audience, but that the whole was the result of cool and careful preparation. "In the solitudes" (of the Swiss mountains) "I worked with deliberation, endeavouring (he says) even to purify my intellect by disciplines similar to those enjoined" by the Catholic Church "for the sanctification of the soul."*

What these measures of discipline were can be easily supposed by this comparison; and it is perhaps scarcely consistent with the honour which, in a certain sense, we owe to all men to regard so thoroughly earnest an advocate of his opinions with the feelings which are sometimes expressed. We may think him engaged (according to a felicitous comparison of his own in reference to another person) in sowing intellectual thistle-down†, but such a conviction should call forth other and far different emotions in our minds to those above referred to.

The Professor is rather severe on his critics. He says that "from fair and manly argument, from the tenderest and holiest sympathy on the part of those who desire my eternal good, I pass by many gradations, through deliberate unfairness, to a spirit of bitterness which desires with a fervour inexpressible in words my eternal ill." I trust in the analysis of his opinions here given he will have no occasion to complain either of "bitter-

* Preface to first thousand, p. xxxiv. † Page viii.

ness" or of "deliberate unfairness." As the result of some patient study at all events, I conclude (strange to say) that whilst persistently advocating Pantheism he has no intention to destroy religion; and that an address of such astonishing character was even the result of cool and careful, and what we must in a sense term *religious* preparation! I think that we must even go further and say that the object which he had in view appeared in his eyes something laudable and heroic.

The inner history of the life of any person (specially of those who have influenced largely the minds of their fellow-creatures) must needs be interesting; for nothing that is human, if described to the life, can be alien to us.* We are indebted to Professor Tyndall for the pains which he has taken, in his seventh preface, to present us with the history of his early life and the record of his early impressions. This enables us to form at once a more correct and a more charitable estimate of his present course.

"Sprung from a source to which the Bible was peculiarly dear, my (Professor Tyndall's) early training was confined *almost exclusively* to it." *Too exclusively*, perhaps, I may be allowed to suggest. It is not unfamiliar to those who know the world, to find a revulsion take place in manhood from a too severe repression of the inquiring faculties in youth.

The next thing mentioned by the Professor shows that he was trained (and who could doubt it considering his parentage) in *dogmatic* theology. "Born in Ireland," he says, "I, like my predecessors for many generations, was taught to hold my own against the Church of Rome."† And what was the *sequence* of all this—the Professor will not allow me to say the *consequence* of this particular training? "I can remember the time when I regarded my body as a weed, so much more highly did I prize the conscious strength and pleasure derived from moral and religious feeling, which, I may add, was mine without the intervention of *dogma*."‡

I need scarcely point out, at least to those familiar with the effects of biblical teaching, the improbability of the assertion that all this took place without the intervention of dogma. Let us turn to page xxxi., where we find alluded to as "spiritual experiences of those earlier years, resolves of duty, works of mercy, acts of self-renouncement." Did these arise spontaneously without any connection with the truths of Scripture in which he was daily instructed?

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* "Homo sum, humani nihil a me alienum puto."

† Preface, p. xxiii. ‡ Ib. p. xxx.

We have here the history of the formation of a character which would find a much more congenial home in the midst of those who cherish the Presbyterian traditions of Ulster, than in the arid regions of infidelity.

Such it is quite possible may be the conclusion of this remarkable career. Early impressions are very deep, and he may return to prove the proverbial influence of first attachments. May I add my sincere desire that such may be the case. But in the mean time we may fairly doubt whether such a mind is suited to be the apostle of a new dispensation in which *Science* is to prove itself the regenerator of mankind. He evidently classes himself with those who "believe undoubtingly that out of the coming struggle the truths of Science will emerge *with healing in their wings.*" *

We have become acquainted with Science in many aspects during the last half-century,

> "Einem ist sie die hohe, die himmlische Göttin, dem andern
> Eine tüchtige Kuh, die ihn mit Butter versorgt." †

But really the above expectation of healing from the truths of Science is the most remarkable that has fallen under my observation.

Is it not true that the effect of all experimental Science is to create a spirit of scepticism,‡ which (if kept within proper limits) may be really useful, for we ought to prove all things, and hold fast *only* that which is good. Even if pushed beyond these limits, it has this effect (as I think might be illustrated by the works of, at least, one other leading philosopher), that the mind becomes at last sceptical of its own scepticism, wearied with its flights, and almost desirous of returning again to the ark, having found no rest to the sole of her foot.

Is there not something of this tone of feeling in the following utterance of our author in the first preface?

> "I have noticed during years of self-observation, that it is not in hours of clearness and vigour that this doctrine ("Material Atheism") commends itself to my mind; that in the presence of stronger and healthier thought, it ever dissolves and disappears, as offering no solution of the mystery in which we dwell and of which we form a part."

All the established results of real practical Science may be compared to the gigantic empire of old Rome, won by the hard

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* Preface, p. xxxi. † Schiller's *Gedichte*, 1818, p. 126.

‡ σκέψις (from whence scepticism) in the sense of "hesitation or doubt" has far less to do with the errors of our "thinkers" than δόγμα, or "that which *seems true* to one, an *opinion*."—See Liddell and Scott, *Lexicon*.

fighting of centuries, mingled with many defeats, and held together not without much jealous care and supervision of the defensive outposts. Now we see that even so great a general as Julius Cæsar, when he attempted the conquest of Britain, was baffled in his enterprise, not so much by the bravery of the inhabitants as by a phenomenon on which he had not reckoned,—the remarkable rise and fall of the tide in the estuary of Richborough; * a phenomenon which, from the configuration of these "sandy" and flat "shores," † is there deceptive enough, as I have myself observed.

In setting foot on unexplored tracts of the regions of thought, our author proves himself a singularly rash leader. He is continually exposing himself to be defeated by the unknown power which he has omitted to take into his calculations; and he has moreover failed to secure any line of retreat amid the universally recognized truths of philosophy. He has not made himself master of Gaul before he invades Britain.

The real question, and that to which I now address myself, is whether there is any foundation in the solid acquisitions of modern Science for the speculations of this address?

Science, as it seems to me, is made to bear the blame of an attack upon religion, for which she has not lent her territories as a base of operations. The assault comes from another quarter altogether,—the dream-land of ancient or of modern Conjecture.

PART II.

The Address.—a. The Philosophical Argument.

I shall now attempt an analysis of the Belfast *Address*, in the very first page of which I seem to find a confirmation of the views above expressed.

On the authority of Hume (in his *Natural History of Religion*), and not from any discovery of the writer, we are told that mankind pursued a certain course "in forming their notions of the origin of things." We are instructed that their conception of "supersensual beings" was "a process of abstraction," resulting from the scientific tendencies or "impulse" "inherent in primeval man."

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* Portus Rutupinus, Richborough, in Kent.—See Smith's *Dict. of Greek and Roman Geography* for description, also the *Atlas of Ancient Geog.*, 1874. by same author.

† "Rhydtufeth."—See Camden's *Britannia.*

Primeval man then must have had "impulses" very different to those of the brutes, who never trouble their heads about such matters at all. But this process is quite the reverse of all that we learn from history, whether sacred or profane, where we find God revealing Himself, making Himself known in some way or other; and man disposed to suppress this knowledge (τὴν ἀλήθειαν ἐν ἀδικίᾳ κατεχόντων *), or at all events to reserve the truth to the custody of their priests or druids, the wise men who alone were suitable guardians of the secret. Do we not learn that this was the case in the earliest history of Egypt? Was not the worship of animals (as Manetho teaches) a later invention? Does not the very oldest writing of which we have any certain knowledge (the Book of the Dead) lead us to the conclusion that God was known as the Judge of all men, distributing rewards and punishments after death? †

The Hermetic creed tells us that "before all things that really exist, and before the beginning of all time, *there is one God*, prior to the first God and Ruler of the world, remaining immovable in the solitude of His unity. ‡ . . . .

"These are the most ancient principles of all things," according to Jamblicus, "which *Hermes places first in order, before the ethereal, empyrean, and celestial deities.*"

M. Lenormant, who has profoundly studied the whole subject, says,—

"Aussi haut que l'on remonte dans les documents relatifs à la religion Egyptienne, on y trouve pour fondement la grande notion de l'unité divine. . . . Mais cette notion sublime, si elle se maintint toujours dans la doctrine ésotérique, s'obscurcit rapidement et fut défigurée par les conceptions des prêtres comme par l'ignorance de la multitude. L'idée de Dieu se confondit avec les manifestations de sa puissance; ses attributs et ses qualités furen personnifiés en une foule d'agens secondaires, distribués dans un ordre hiérarchique, concourant à l'organisation générale du monde et à la conservation des êtres. C'est ainsi que se forma ce polythéisme qui dans la variété et la bizarrerie de ses symboles, finit par embrasser la nature entière."—*La Magie chez les Chaldéens, &c.*, p. 71.

Consider the following magnificent description of the Almighty from the Scriptures of our Aryan ancestors: —

"Possessed of illimitable resources, He has meted out, created, and *upholds* heaven and earth. He dwells in all worlds as Sovereign Ruler. The wind which resounds through the atmosphere is His breath. He has opened boundless paths for the sun which *He placed* in the heavens, and has hollowed out channels for the rivers which flow by His command. By His wonderful contrivance the rivers pour their waters into the one ocean but never fill it. *His ordinances are fixed and unassailable.* They rest on

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* Rom. i.

† Comp. *La Magie chez les Chaldéens*, par Lenormant, pp. 77, 78.

‡ See Cory's *Ancient Fragments*, p. 45.

Him unshaken as upon a mountain; through their operations the moon walks in brightness, and the stars which appear in the nightly sky mysteriously vanish in daylight. His messengers behold the worlds, He knows the flights of birds in the sky, the path of ships on the ocean, the course of the far-travelling wind, and beholds all the secret things that have been, or shall be done. No creature can even wink without Him. He witnesses truth and falsehood. The Great One who rules over these worlds *beholds all as if He were close at hand.* When any man thinks he is doing aught by stealth, the Gods know it all, and they perceive every one who stands or walks or glides along secretly, or withdraws in his house, or into any lurking-place. Whatsoever two persons sitting together devise, Varuna, the King, knows it, *being present there as a third.* This earth, too, belongs to Varuna, the King, and that vast sky whose ends are so far off." * . . . .

I must quote no more, but add Professor Roth's remarks:†—There is no hymn in the whole Vedic literature which expresses the Divine Omniscience in such forcible terms as this, which is found in the Atharva Veda. There is, however, one in the Rig Veda which is quite equally remarkable; also another in the Rig Veda Sanhitá, which inquires—"Who has seen the primeval Being at the time of His being born? What is that which, having substance, the unsubstantial sustains?—from earth are the breath and blood, but *where is the soul?*"

Now Varuna (from the root *var*, to cover) is equivalent to the Greek Οὐρανός; and thus antedates those "theories which took an anthropomorphic form"; for, according to Cicero,‡ Uranus was the father of Mercury and of Venus. We have probably another representative of the same idea in the "Shang Ti," the venerated "Heaven" of the Chinese.

These are amongst the most ancient "historic" records, and certainly do not favour the theory of Tyndall.

It would be easy to adduce abundant additional proof; but for the present this must suffice to show that in the opening of this Address, and in reference to no less important a subject than the rise of religion among mankind, our author (relying upon Hume) is deceiving his audience with eloquent but unsubstantial figments of the imagination.

We next are brought into acquaintance with the Greek philosophers, but I cannot say that justice is done to the deeply interesting question (as to its cause and its results) of their search after wisdom. The only phase of thought which seems to command our author's real sympathy is that of Epicurus, who maintained that the unhappiness and degradation of mankind

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* See "Contributions to a Knowledge of the Vedic Theogony and Mythology," by S. Muir, LL.D., in *Journal of the Royal Asiatic Society*, vol. i. p. 1, New Series, page 81.

† *Rig Veda Sanhitá*, by H. H. Wilson, M.A., F.R.S., 1854, p. 127.

‡ *De Naturâ Deorum*, iii. 22, 23.

arose in a great degree from the slavish dread which they entertained of the power of the gods, and from terror of their wrath. To remove these apprehensions was the great object of his teaching. In order to dispel these fears, he called to his aid the atomic theory of Leucippus, by which he sought to demonstrate that the Material Universe is not the result of creative energy, but that all is formed by the union of elemental particles which had existed from all eternity. As to the gods, if such there were, they lived in a state of divine tranquillity (like the Brahm of India), wholly unmoved by and indifferent to the actions of mortals! Indeed, as they also were composed of atoms, it might have happened to them to be resolved into their ultimate elements, if they mixed themselves up with mundane affairs!

It was thought to be unnecessary to address such Beings in prayer, inasmuch as "everything revolves with unchanging laws in one eternal circle."* The true explanation of all this is probably to be found in the Brahmanical or Buddhistic speculations of the East.

Lucretius wrote a magnificent poem to uphold these tenets. His object, we are told, was the destruction of Superstition,—which statement is unquestionably true;—and after reading the poet's thrilling narrative of the sacrifice of Iphigenia, there is no one with any feeling who is not ready to join in with his conclusion—Tantum religio potuit suadere malorum!

"Such are the crimes that SUPERSTITION prompts."

But where is the application to our own times and circumstances? *We* are not in the habit of offering human sacrifices in order to obtain favourable weather; and it is very problematical whether "the mild light of Science" will avail much in remedying abuses which still remain, or superstitions which still influence Christian society. We are not at all disposed "to pour contempt upon matter"; and, as far as our observation extends, have little need of exhortation directed against excessive austerity or the danger of regarding our bodies as "mere weeds." On the contrary, I believe that to endeavour to maintain the "mens sana in corpore sano" is what most men regard as a dictate of common sense.

It is to be noticed that, little as there was to be valued in the state of society existing in Rome at the time Lucretius wrote, he is not without a fear lest, in seeming to destroy the bond of that society, he should be accounted guilty of a crime against the laws which bind men together.

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* See Hardy's *Manual of Buddhism*, pp. 34, 35.

"Illud in his rebus vereor, ne forte rearis
Impia te rationis inire elementa, viamque
Indugredi sceleris."*

"This is what I fear herein, lest haply you should fancy that you are entering on unholy grounds, and treading the path of sin."—(MUNRO.)

I cannot but think Lucretius would have been too cautious to issue a Belfast Address, and I scarcely think he would have been content with Tyndall as a correct expositor of his views. "He refutes the notion that anything can come out of nothing," says Tyndall. Now, what does Lucretius *really* advise his friend? It is this, that he never should allow his mind to entertain the thought that *God* could make anything out of nothing.

"Nullam rem e nihilo gigni *divinitus* unquam," †

"That nought from nought by power Divine has risen."—(DR. GOOD.)

The doctrine which he advocated, was delightful in his view, because it seemed to dispense altogether with Divine intervention.

"Quas ob res, ubi viderimus nil posse creari,
De nihilo, tum quod sequimur, jam rectius inde
Perspiciemus, et unde queat res quæque creari,
Et quo quæque modo fiant, *operâ sine divôm.*" ‡

"Developed then we trace
Through nature's boundless realm, the rise of things,
Their modes and power innate, *nor need from heaven*
Some god's descent to rule each rising fact."—(DR. GOOD.)

It was, then, not without reason that this materialistic philosophy was accounted atheistic. For it asserts that all would go smoothly if we could but get rid of the notion of Divine interposition.

It is necessary that I should follow our author into the examination of these theories, because of the prominence which he gives them as developments of the scientific imagination, and as if they formed in some way the basis of modern discoveries. "Physical theories which lie *beyond experience*," he tells us, are derived by a process of abstraction from experience; which is certainly a favourable manner of stating the origin of those notions of theorists, which are evidently *baseless*. Such was the dream about atoms which we are considering.

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* Lib. i. lines 80–83. † Line 150.

‡ Line 155, &c., "both the elements out of which everything can be produced, and the manner in which all things are done without the hand of the gods."—(MUNRO.)

"The atomists of antiquity had experience of gravity as manifested by falling bodies. Abstracting from this, they permitted their atoms to fall eternally through empty space. Democritus assumed that the larger atoms moved more rapidly than the smaller ones, which they therefore could *overtake*, and with which they could *combine*. Epicurus, holding that empty space could offer no resistance to motion, ascribed to all the atoms the same velocity; but he seems to have overlooked the consequence that under such circumstances the atoms could never *combine*. Lucretius cut the knot by quitting the domain of physics altogether, and causing the atoms to move together by a kind of volition." *

Then it was all a *baseless dream;* and the effort to get rid of Divine power landed them in the singular absurdity of an *eternal* ingathering of atoms towards some *unknown* centre of gravity, which must be *eternally receding* from the downpour!

> "Nec quisquam locus est, quo corpora quom venere
> Ponderis amissa vi, possint stare in inani." †
>
> "Nor through the boundless void one point exists,
> Where things may rest, as if of weight deprived:
> No power it boasts to uphold; but still recedes
> As nature prompts and opes the needed path."—(Dr. Good.)

It is important to notice in the above description of the Professor the use of the word *combine*, as if there were here some connection with the doctrines of modern chemistry. So far from this being the case, Lucretius expressly asserts that all things arise simply by the *change of arrangement* of his ultimate particles ("permutato ordine solo"), "the mode but changed, the matter still the same." ‡

Leucippus, the first propounder of the theory of atoms, accounted for the formation of the Universe by a difference merely in the magnitude and figure of his atoms. "Owing to the former, there would be, he conceived, an agglomeration of the bulkier particles round certain centres—owing to the latter cause, an entanglement of them, and a consequent cohesion of the particles thus brought together." §

Through Democritus and Epicurus the notion of the combination of atoms took a further development. Space is maintained to be an absolute and perfect void (inane), and the atoms ||

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* Address, p. 52.

† Lib. i. lines 1076–77. I follow in general Dr. Good's text, but have corrected by Munro (1873), who here translates "nor is there any spot of such a sort that when bodies have reached it, they can lose their force of gravity and stand upon void, and that again which is void must not serve to support anything, but must, as its nature craves, continually give place."

‡ Lib. i. lines 820—828.

§ Daubeny on the Atomic Theory, p. 12.

|| "Omnis ut est, igitur, per se natura duabus
Constitit in rebus, nam corpora sunt et inane."—Lucretius, lib. i. 420.

(nam corpora sunt et inane) are hard, impenetrable, primary bodies of various figures—round, square, pointed, jagged, and possessed of certain intrinsic powers of motion. Under the old school of Democritus the perpetual motions were of two kinds—a descending motion from the natural gravity of the atoms, and a rebounding motion from collision or mutual clash.

"Besides these two motions, Epicurus supposed that some atoms were occasionally possessed of a third, by which in some very small degree they descended in an oblique or curvilinear direction, deviating from the common and right light line anomalously.

"These infinite groups of atoms, flying through all time and space in different directions and under different laws, have interchangeably tried and exhibited every possible mode of encounter, sometimes repelled from each other by concussion, and sometimes adhering to each from their own jagged or pointed construction, and from the casual interstices which two or more connected atoms must produce and which may be just adapted to those of other figures, as globular, oval, or square. Hence the origin of compound or visible bodies—hence the origin of large masses of matter, hence eventually the origin of the world itself." *

We have here a mechanical theory of the Universe, which so far commands the sympathies of our modern atheists. But into the midst of this mechanical theory we find a wholly discordant and irreconcilable element introduced, in order to account for the freedom and individuality of the WILL. Why should any atoms deviate from the force of the laws that govern them? Every chemist knows that such an occurrence never takes place, and that he may reckon with infallible certainty on their never displaying any tendency to vary. Hence any chemist can contrast the laws which govern crystallization, and which result in perfect mathematical forms and arrangements, and those which govern organized bodies; conspicuous among which latter is the fact of constant, and frequently what we should call misguided variety —as in the abnormal development of plants and animals.

Lucretius pleads for the absolute necessity of introducing the idea of this discordant deviation.

> "Quâ re etiam atque etiam paullum inclinare necesse est
> Corpora, nec plus quam minimum; ne fingere motus
> Obliquos videamur, et id res vera refutet," &c. &c.†
>
> "Hence doubly flows it why the seeds of things
> Should from the right decline," &c. &c.

The poet then goes on to speak in a noble passage of the effects of this *Will;* but is it not obvious that he had constructed a Mechanical Universe from which he had not only shut out God, but the will of man and animals? In order to remedy

* Dr. Good, *Book of Nature*, quoted by Daubeny, p. 16.
† Book ii. lines 243—245.

this, he coolly overthrows the law of gravitation—supposing it to be intermittent and uncertain in its operation!

Gravitation was nothing to Lucretius, when once mounted on his waxen wings, although like Icarus,—

"ceratis ope Dædaleâ
Nititur pennis, vitreo daturus
Nomina ponto."*

In like manner Professor Tyndall passes from the regions of the *chemical* to those of the *structural* forces, taking leave of all caution when once he has abandoned the reins to his "scientific imagination."

"It is instructive to note from this point of view the successive introduction of new conceptions. The idea of the attraction of gravitation was preceded by the observation of the attraction of iron by a magnet, and of light bodies by rubbed amber. The polarity of magnetism and electricity appealed to the senses, and thus became the substratum of the conception that atoms and molecules are endowed with definite attraction and repellent poles, by the play of which definite forms of crystalline architecture are produced. *Thus, molecular force* becomes *structural.*" †

Does the Professor mean to say that "molecular force" is the same with chemical affinity, and that chemical affinity is the same with electricity and magnetism, and also with gravitation?—that we have thus safely reached the brink of an abyss over which we take a fortunate leap in the next sentence, and solve the great problem, landing safely in the hitherto unknown region of the forces which govern organization? The pace takes away the breath; but let us at all events look before we leap.

"It requires no great boldness of thought to extend its play into organic nature, and to recognize in molecular force the agency *by which both plants and animals are built up!* In this way out of experience (?) arise conceptions which are WHOLLY ULTRA-EXPERIENTIAL." †

For this last admission I am thankful, and for the elegant words in which it is clothed.

We can understand, in the first place, that "an atom is the smallest quantity of an element indivisible by chemical means, which can exist in a simple body; and, in the second place, that a molecule is a group of atoms forming the smallest quantity of a simple or compound body which can exist in a free state, or is able to take part in, or result from a reaction." ‡

But no boldness of thought can extend the play either of atoms or groups of atoms, that is, molecules, into the production of organic structure. This conception is ***unthinkable***,

* Horace, Book iv. Ode 2. † Address, p. 52.
‡ An Introduction, &c. By Dr. A. C. Wurtz, F.R.S., pp. 33, 34.

as well as ultra-experiential. That "molecular force should become structural," resembles much the supposition that two and two should, on some occasion, "play" at making five, which would, I presume, be simply *ultra vires*, or impossible!

I must entirely protest against our author's commendation of the Greek philosophy, "in that it had shaken itself free from that fruitless scrutiny by the internal light of the mind alone, which had vainly sought to transcend experience, and reach a knowledge of ultimate causes!" * This neither have the Greeks nor has Tyndall himself succeeded in doing.

Indeed Lucretius gives exactly the opposite account of the foundation of the system which he advocated in such admirable verse. He tells us, in his praise of his great master:—

> "Ergo vivida vis animi pervicit, et extra
> Processit longe flammantia mœnia mundi." †

His own poem is as full of passages of metaphysical and fruit less scrutiny, and as far from deserving the above commendation as even the Belfast Address.

The Greeks knew nothing of exact Science; and the connection of their doctrines with those of modern chemistry is not to be historically traced. We are more indebted to the experimental researches of the Chaldeans, the Egyptians, and their Arabian disciples, than to all the speculations of the Greeks. We owe probably much more even to the Alchemists—the last of whom, as he was termed, named Wenzel, was the first to establish, by well-conducted experiments, the doctrine of *equivalency*. He foresaw and predicted the conclusions that could be drawn from it respecting the theoretical calculation of the composition of salts, and the control of analyses.

Professor Wurtz, in his admirable "History of Chemistry," ‡ has said, not without some reason, that

> "Chemistry is a French science: it was founded by Lavoisier, of immortal memory. He was at once the author of a new theory, and the creator of the true method in chemistry, and the superiority of the method gave wings to the theory."

Instead of overturning gravitation, when it suited him, like Lucretius, he made it, in fact, the foundation of his science. But it must not be forgotten that

> "Robert Boyle, the first President of the Royal Society of London, and likewise the first in date of the true chemists, had confirmed the fact previously noticed by Rey, that metals increase in weight when calcined in the air." §

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* Address, &c., p. 11.
† Lib. i. lines 73, 74.
‡ An Introduction, &c., p. 5.
§ Idem, p. 8.

These observations, however, remained unfruitful, and it was the great merit of Lavoisier that he applied the balance to all chemical phenomena, and established chemistry as an exact science. Since his time chemistry has continually extended its discoveries and its triumphs; never abandoning the solid and sure ground I have indicated, that of weight and measure; but advancing its empire like the Romans, notwithstanding frequent defeats, and the abandonment of one theory after another, in obedience to the stern logic of fact.

Now Tyndall looks upon Descartes, who did not believe in atoms at all, as one of the two restorers of (atomic?) philosophy, and "the first to reduce, in a manner eminently capable of bearing *the test*" (not of the balance, but) "of *mental presentation, vital phenomena* to *purely mechanical principles!*" *

"Insight" then, and not "*weight and measure,*" is the real test which is valuable in the sight of Tyndall; and *dogma*, and not *Science*, is the result.

But to extend the dominion of (supposed) chemical theory into the region of metaphysics, as in the Address at Belfast, is nothing less than treason against chemistry, and *crime de lèse majesté* against common sense!

It would be well if some of our philosophers would study Democritus in the rules which he proposes for the acquisition of peace of mind (εὐθυμία) as the end and ultimate object of our actions.

"Abstinence from too many occupations, a steady consideration of one's own powers, which prevents our attempting that which we cannot accomplish;" †

these are some of the means which he proposes for this end.

Democritus had a sufficient amount of common sense to understand that the soul is somehow altogether different from the body, and therefore he made the soul consist of fine, smooth, round atoms, like those of fire. "These are the most mobile of all. They inter-penetrate the whole body, and in their motions the phenomena of life arise."

This, the Professor indicates, arose from his not understanding the nervous system,‡ "whose functions were *then* unknown."

He told us fourteen years ago, in the *Saturday Review*, "that every thought and every feeling has its definite *mechanical* correlative in the nervous system—that it is accompanied by *a*

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* Address p. 21, and *compare Appendix,*

† Smith's *Dictionary of Biography*, &c., *sub voce.*

‡ Address, p. 5.

certain separation and remarshalling of the atoms of the brain."

But if the atoms of the brain are really separated and remarshalled in the course of every thought and feeling, they must be dissociated and reunited by a force more powerful than the ordinary chemical force which binds them together What, then, is this superior force, and wherein does it reside? Not in matter, for we have seen that it acts upon matter and dissociates its particles. It is, then, an energy entirely unknown to Tyndall, and irreconcilable with all his ideas. It is and must be a tremendous force, such as that required to dissociate the atoms of water. He must have pondered over this question for fourteen years; and yet is no nearer to a solution than our Aryan ancestors, when they inquired (as we have seen), "Where is the soul?"

We have seen that our Professor's notions of matter were, in his youthful days, rather peculiar; but he has now discovered that this said matter is our master, and that "every meal we eat, and every cup we drink, illustrates the mysterious control of mind by matter."*

Moreover, matter is our god, which we must worship as the author and giver of life, for, "abandoning all disguise, the confession I feel *bound* to make before you is that I prolong the vision backward *across the boundary of the experimental evidence*, and *discern* in that matter, which we, in *our ignorance*, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium" (!) "the *promise* and *potency* of *all forms of life*." *

To this, which he seems to think his "good confession," our author adheres in his preface to the seventh edition; so that it is no exaggeration to say that we have from Ireland the extraordinary spectacle of a religious teacher of Pantheism; and that not on the ground of experimental evidence, but on the internal light of the mind alone. "*Matter* is raised to *the level it ought to occupy*, and from which timid ignorance would remove it." †

It so happened that almost at the same time at which religious Ireland was thus lending her ear to the advocacy of materialism, the assembly took place of the French Association for the Advancement of Science; and in the introductory discourse, France—that country so often scourged by infidelity—did, greatly to her honour, and through one of her most illustrious

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* Preface, p. xxv. † Address, p. 5.

scientific sons,* render her homage to the one primary, alone, and universal cause of all things, God himself!

> "Can such things be,
> And overcome us like a summer cloud
> Without our special wonder?"

PART II.

β. *The Chemical Argument.*

Remarkable as was the Address itself, the feeble amount of criticism with which its statements were received by the British Association is almost as remarkable. Amongst the multitude assembled—including, I presume, many clerical as well as lay members conversant more or less with chemical as well as with theological knowledge—there surely must have been those competent to trace out the plausible fallacies with which it abounds.

It now rests with me to affirm that modern chemistry has no imaginable connection with atheism. It is "the bold *ecclesiastic*" Gassendi, whom Tyndall seems to delight to follow. It is he who "applied the *known laws of mechanics* to the *atoms*, deducing *thence all vital phenomena*," and consequently showed that "the principle of every change resides in matter."

There can be no doubt that the atomic theory in its present form is one of the most extraordinary achievements of human intellect, whatever may be said against it metaphysically. Nor is it susceptible of doubt that the present chemical views of

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* Extract from the "Discours d'Inauguration de la Troisième Session de l'Association Française pour l'Avancement des Sciences" (Lille, 20 Septembre, 1874), par M. A. Wurtz, Membre de l'Institut: La Théorie des Atomes dans la Conception générale du Monde:—

"Tel est l'ordre de la nature, et à mesure que la science y pénètre davantage, elle met à jour, en même temps que la simplicité des moyens mis en œuvre, la diversité infinie des résultats. Ainsi, à travers ce coin du voile qu'elle nous permet de soulever, elle nous laisse entrevoir tout ensemble l'harmonie et la profondeur du plan de l'univers. Quant aux causes premières, elles demeurent inaccessibles. Là commence un autre domaine que l'esprit humain sera toujours empressé d'aborder et de parcourir. Il est ainsi fait et vous ne le changerez pas. C'est en vain que la science lui aura revélé la structure du monde et l'ordre de tous les phénomènes: il veut remonter plus haut, et dans la conviction instinctive que les choses n'ont pas en elles-mêmes leur raison d'être, leur support et leur origine, il est conduit à les subordonner à une cause première, unique, universelle, DIEU."

molecular organization are immensely in advance of the theory of atoms propounded by John Dalton.

When Tyndall, therefore, builds his doctrine of Pantheism on "molecular force becoming structural," he appears to the most part of his hearers to be crowning the edifice of well-established modern Science by an effort of scientific Imagination quite in accordance with, if passing a little beyond, the boundaries of rigid Baconian induction. But I trust to show that this is all delusion.

He begins with the doctrine advocated by Lucretius, which we have seen to be entirely mechanical. The poet's atoms take their place side by side, like the letters in a book, and their combination (if such it may be termed) entirely resembles that of the combination of letters to form a word.

This is not modern chemistry, nor is it, in any sense, connected with the doctrine of combination in *definite proportions*, from which (already laboured upon in measure by others) this great and profound thinker educed his theory of the Universe.

To illustrate this by a comparison. Some one, in ages past, must have invented the merely mechanical mode of expressing numbers by the juxtaposition of units, thus representing ten 1111111111.

This was an achievement quite beyond the mind of a monkey, but how poor, after all, compared with the decimal system. Every one sees that it *was* a discovery to express the same by 10, and that the whole system of modern arithmetic is founded on the latter, and not on the former. It is remarkable that when Dalton leaned to a mechanical view of combination, as in advocating the one atom to one atom constitution of water, he fought against the strongest elucidation of his own theory from the beautiful researches of Gay-Lussac on the combination of gases by volume.

The doctrine of *atomicity*, in a *somewhat* similar manner, comes in to supplement without overthrowing the doctrine of *affinity*.

I had the opportunity of meeting John Dalton at the assembly of the British Association at Edinburgh, in 1834, and find by my notes that he then contended against Dr. Thompson, who advocated the existence of one-third-parts of atoms. I cannot find in the "Transactions" any mention of this discussion, and, therefore, give this simply as the record of my own impressions at the time. I was there with my father, who was with Dalton on the Committee of the Chemical Class, and contributed a paper on meteorology.

I have little doubt that the discussion was connected with the then somewhat *transitional* state of chemistry. This science

was going through a most important crisis, out of which Dalton's theory may be said to have emerged, fundamentally unimpaired, because it had a solid foundation. It was less a pure speculation than a theoretical representation of well-realize d facts.* Dalton had ascertained that in the case in which two substances combine in several proportions, the quantity of one of them remained constant, whilst the quantity of the other varied according to very simple relations. The discovery of this fact was the point of departure for the atomic theory.

It was otherwise with the theory of Berzelius, a great chemist, and "the father of our modern analytical processes";† since he was, in one respect, seduced by a flattering appearance of things, not justified by the event. This has a special connection with my argument, because it is this exploded theory which serves to constitute the basis of Tyndall's speculations.

Berzelius compared his atoms to small loadstones.‡ He attributed to them two poles in which the electric fluids were distributed unequally, in such a manner that one of them was in excess at one of the poles. There exist, according to him, atoms with excess of positive fluid, and others with excess of negative fluid. The first attracts the second, and this attraction is the source of chemical affinity, and maintains the atoms in all their combinations. At the moment when these are formed, motion is created; but in the formed compound they are at rest, and, as it were, distributed into two camps, and kept in opposition by the two electric fluids of contrary name.

In order to account for binary combinations, Berzelius arranged bodies into electro-positive, as carbon and hydrogen, and electro-negative, as oxygen. He thus attempted to apply to organic chemistry the views which he had derived from the study of inorganic chemistry. But it would not succeed. As Dr. Wurtz well describes it, these notions "*ont abouté à une impasse.*"§ In proportion as the riches of the science augmented, it was necessary, in order to sustain the system, to heap up hypotheses (perhaps to divide atoms into three parts!) to construct more and

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* *La Théorie des Atomes.* Wurtz, p. 15.

† *Introduction to Chemical Philosophy*, p. 16.

‡ *La Théorie*, &c., p. 67.

§ "Modern chemistry has changed all that. The discovery of substitutions struck the first blow at the electro-chemical theory; and chemists will recall that famous discussion in which Dumas proved that chlorine, an electro-negative element, could replace hydrogen, an electro-positive element—that chlorine could enter into organic molecules otherwise than by molecular addition. This was the commencement of the new chemistry. Gerhardt commenced by saying, 'combinations do not take place by molecular addition—everything is effected by substitution.'" — *Int to Chemical Philosophy*, by Dr. A. C. Wurtz, F.R.S., 1867, p. 32.

more complicated formulæ; until at length what has been termed the old chemistry and the dualistic ideas gave way before the vigorous assaults of two young Frenchmen, Laurent and Gerhardt. I should say that Dumas on the one side and Liebig on the other had pioneered the way by the more attentive study of compound bodies; and chlorine was found to overthrow the theory of Berzelius. But Dumas and Laurent expounded to us the doctrine of *molecular chemistry*. The chemical molecules were looked at *as a whole*, and compared by Dumas to planetary systems. These molecules could become modified by substitution; and it is in vain to say that this theory may fall like the preceding; because in thus seeking out the mode of the Creator we are permitted to become ourselves to a certain extent creators; and to alter these molecules at will, so as to produce new bodies which we think ought to exist. But *we know absolutely nothing of organization*, and no chemist can make the smallest approach to the formation of the most insignificant plant or insect.

Tyndall, for the construction of his organizing molecules, confounds all this together. He says:—

"The polarity of magnetism and electricity appealed to the senses, and thus became the substratum of the conception that atoms and molecules are endowed with definite attractive and repellent poles, by the play of which definite forms of crystalline architecture are produced. Thus molecular force becomes structural. It requires no great boldness of thought to extend its play into organic nature, and to recognize in molecular force the agency by which both plants and animals are built up." *

We have here the exploded system of Berzelius made to account not only for dualistic compounds, but for all the organization which meets our view! This is neither the old chemistry nor the new chemistry, nor science in any shape; but simple and pure assertion—DOGMA, to be received and held on the authority of Tyndall alone!

The new chemistry has made us familiar with the doctrine of types (a wonderful display of the mind that regulates matter); and with the fundamental quality of atomicity which is essential to the formation of molecules. But Tyndall's atoms are devoid of "atomicity"; and his molecules are simply magnets, which yet, under his magic wand, become endowed with life, with will, and with the power to erect organic bodies!

It is really impossible, if we receive the teaching of modern chemistry, to avoid the conclusion that all the properties of matter are arranged by a mind of admirable skill and wisdom. There is here no question of evolution, nor of teleology, nor of

* Address, p. 52.

natural selection; but such unity of design and infinitely diversified result as must command admiration in every mind that is not debased by its hatred to the conception of an infinitely powerful Ruler.

In all the chemical combinations and adaptations of matter we find something which delights our minds; as meeting our conceptions of that mathematical correctness and harmonious adaptation towards which our own desires (as regards our own productions) always tend. I have spoken of matter as *regulated* by mind, but I should rather have said *dominated* by mind; for we never find in atoms and molecules the slightest tendency to swerve from the absolute laws to which they are subjected. To speak of "promise" and "potency" and "instinct" and "desire"* is to transfer to the ultimate particles of matter words expressive of ideas which have no relation to the subject. It is to prove false to science by coquetting with the language of poetry!

When life, and consequent organization are present, we have no longer the power to express ourselves as I have done above. To illustrate this, without attempting explanation, let us take the case frequently occurring in the vegetable or animal world, of two germs cohering and interfering with each other's organization. Here we have two wholly different kingdoms coexisting, subject to different laws. All the chemical combinations have taken place, as they always do, with rigid and mathematical accuracy; whilst all the living germ combinations have been going wrong.

There never is, nor can be, anything *abnormal* in the structure of the molecules; whilst nothing is more common in organized vital structure.

When we extend our survey to the differentiated and individualized creatures, we find them not unfrequently departing more or less from their normal instincts, and suffering in consequence.

When we rise to the highest type—man himself—we find him ever rebelling against law, ever prone to transgress that which he knows to be the highest and best aim of his being.

"Video meliora proboque, deteriora sequor."

Wherever there is WILL, there is an element of uncertainty.

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* Page 82. "The very molecules seem instinct with a desire for union and growth."

PART III.

The Conclusion.

No one can doubt the great abilities of Professor Tyndall as a lecturer; but these very powers give him great control of an audience, and enable him to place all his characters before his hearers in the light which suits him best. We have in a sort of scenic representation an array of great names, who all are brought before us with the appearance of contributing their respective testimony to the truth of his assertion "that SCIENCE has in great part conquered the domain that was supposed to belong to religion." When interrogated, one by one, however, it is obvious that their witness agrees not together.

Did his Manchester audience really consent to view things exactly in the light in which Tyndall placed them? Were they all persuaded to believe that "the doctrine of the grand old Pagans, Democritus, Epicurus, and Lucretius really received its consummation at the hands of the immortal John Dalton?" Imagine the surprise of this most staid and rather precise north-country "Friend," who used to boast that he could carry on his back all the books he ever read—who never swerved from the paths of pure reason, nor ever brought to its consummation the theory of "*molecules*" at all—when charged with being the reviver of "the dangerous doctrine of the heathen"! Whatever the private sentiments of this "immortal" man might be on the subject of religion, the habitual reticence of his education probably did not allow him to divulge; and most certainly a charge of the above description would have raised in his mind profound wonder and disgust. His atomic views were essentially his own; and Europe did homage to the depth of his intellect, whilst at the same time England was allowing him to wear himself away in the laborious and ill-paid task of a schoolmaster!

I truly think his advice would have been to leave such subjects alone, and not to venture on themes which no one can understand.

I will refer, in the next place, to Mr. Darwin, as one who has deeply influenced the scientific, and perhaps still more, the *pseudo*-scientific mind of our era. It is not necessary that I should express my sincere acquiescence in the universal tribute of admiration to the eminence of this gentleman as a Naturalist; from which concession it must not be inferred that I accept either in whole or in part his ex-

planation of the order of Nature. But, as a witness to be summoned on behalf of Atheism, Tyndall is himself aware that Darwin's testimony is all the other way. Not only has he brought forward the most beautiful and striking evidence of adaptation in the works of nature; but, if I understand aright, he looks upon all as parts of one great *design*, though he may regard the results as wrought mediately, rather than immediately. But Tyndall tells us that Darwin "rejects teleology, seeking to refer these wonders to natural causes." They illustrate, according to him, "the method of Nature, not the technic of a man-like artificer." *

This is *Tyndall on Darwin!* But we have not Mr. Darwin's authorization of Tyndall as his interpreter. However, let this pass; for the undeniable fact remains that the foundation of Darwin's theory is *not* Atheism, but that it imperatively requires that to which its author frequently reverts—the original creation of things by Divine power.

So Tyndall unkindly turns round upon him with these crushing observations:—

"What Mr. Darwin thinks of this view of the introduction of life I do not know. But the anthropomorphism (!) which it seemed his object to set aside, is as firmly associated with the creation of a few forms as with the creation of a multitude. We need clearness and thoroughness here. Two courses, and two only, are possible. Either let us open our doors freely to the conception of creative acts, or, abandoning them, let us radically change our notions of matter."†

Truly a change somewhere appears desirable, for Tyndall describes with evident approbation and adhesion the notions of Bruno.

"The infinity of forms under which matter appears were not imposed upon it by an external artificer: by its own intrinsic force and virtue it brings these forms forth. Matter is not the mere empty capacity which philosophers have pictured her to be, but the universal mother who brings forth all things as the fruit of her own womb."‡

But what about the *paternity* of the offspring? The universal *father* is not forthcoming. By taking one-half of the old fable of "Heaven and Earth," and obliterating the other, our scientific moderns have made nonsense of the whole.

It would be tedious to multiply examples of the skill of the writer. No doubt, as the author of "*Heat as a Mode of Motion*," he is able to expound to us the theory of La Place. "According to it, our sun and planets were once diffused through space as an impalpable haze, out of which by condensation came

* Page 42. Is it in reference to this that Tyndall quotes "It were better to have no opinion of God at all, than such an one as is unworthy of Him; for the one is unbelief, the other is contumely"? (BACON.)

† Page 54. ‡ Page 20.

the solar system. What caused the haze to condense? Loss of heat" (that is to say of motion). So loss of motion produces motion, and "the nebulæ and the solar system, life *included*, stand to each other in a relation resembling that of the germ to the finished organism"—man is originally the product of "*a loss of motion*"! *

I cannot allow Tyndall to summon Kant to his aid without a protest, because this illustrious reasoner has in a few words defined a truth which scatters the whole of the Professor's philosophy to the winds.

"*The cause of the particular mode of existence of a living body resides* IN THE WHOLE."

What, then, becomes of "*molecular* organization," or a power residing in the molecules—that is to say, in an almost infinite number of *parts*? †

I cannot follow out the metaphysical views of our author, nor do I know whether he does justice to those whom he quotes. To use his own expressions, "a word-weariness has taken possession of my mind. I am sick of (metaphysical) philosophy and its verbal wastes, which lead to no issue and leave the intellect in an everlasting haze." ‡ But on one point he shall not find me slumbering, as he does his imaginary bishop—aware, perhaps, that it is not uncommon for admissions to be made under such circumstances.

"I admit," says this imaginary bishop, "that you can build crystalline forms out of this play of molecular force; that the diamond, amethyst, and snow-star are truly wonderful structures which are thus produced. I will go *further*, and acknowledge that even a tree or a flower might in this way be organized."

Before thus giving up the whole question, I should require a refutation of the above doctrine of Kant; which, however, is so unquestionably the truth as to be continually reckoned upon as such by those who have to do with organized structures, whether of plants or animals.

It would be necessary, also, that we should be certified concerning the recondite causes of the fact that the most skilful physicists, and the most eminent microscopists, find themselves face to face with § "phenomena, which we at present call vital, because we do not know any physical causes for them."

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* Preface, p. xv.

† See Müller's *Elements of Physiology*, vol. i. pp. 19–26.

‡ Address, p. 18.

§ See works of Dr. Lionel Beale, *passim*; and, as to plant life, "The Action of the induced Current upon the intra-cellular Protoplasmic Circulation in Plants," by Henry Pocklington, F.R.M.S., *Pharm. Journal*, March, 1875, from which I take the above quotation.

Dr. Lionel Beale, who uses the most powerful microscopes in the world, declares that no molecular force will account for the remarkable changes which occur in living matter.

Even Tyndall believes in "a power of organizing experience furnished at the outset to each *individual*"; "possessed in different degrees by different races and by different individuals of the same race." "Were there not in the human brain" (he says) "a *potency* antecedent to all experience, a dog or cat ought to be as capable of education as a man."*

In his most recent revision of his opinions† he tells us that "when we endeavour to pass from the physics of the brain to the phenomena of consciousness, we meet a problem which transcends any conceivable expansion of the powers we now possess. We may think over the subject again and again, it eludes all intellectual presentation,—*we stand at length face to face with the Incomprehensible.*"

This is all very evidently true, but Herbert Spencer, as quoted by Tyndall,‡ is not content to leave us in our ignorance, without affording us an incomprehensible explanation of his own; according to which "the human brain is the organized register of infinitely numerous experiences received during the evolution of life, or rather during the evolution of that series of organisms through which the human organism has been reached. The effects of the most uniform and frequent of these experiences have been successively bequeathed,—principal and interest, and have slowly amounted to that high intelligence which lies latent in the brain of the infant; thus it happens that the European inherits from 20 to 30 cubic inches more of brain than the Papuan."

Such *latent intelligence*, if made the subject of speculation at all, ought surely to be thought of in connection with the ψυχή or soul; for it is impossible to conceive of such powers as attached to the atoms of which the brain is composed; which do not differ at all from those of the air which the man breathes or the dust on which he treads.

If this materialism be the meaning of Spencer, he appears to have succeeded no better than his predecessors in lifting the veil of Nature; and the assistance of this § "Apostle of the Understanding" is of no avail in extricating Tyndall from the difficult position in which, by his own confession, we find him placed above.

If, however, our professor be compelled to admit that there is something more in man than atomic substance—that he is com-

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* Page 52.
† Preface, p. xxix.
‡ Page 52.
§ Page 49.

posed of BODY, SOUL, and SPIRIT—the entire purport of "the Address" disappears; and the stately edifice of molecular and materialistic philosophy crumbles into dust!

On the whole, it appears to me that throughout the very elaborate and skilfully concocted dissertation under our notice, nothing is so much proved as the skill of the lecturer, by which he succeeded in entangling his hearers in a labyrinth, from which they found no clue to escape; preferring to place themselves at the disposal of this master of the art of captivating the minds of the multitude!

"Cogito, ergo sum!" according to Descartes, is the best proof of a man's own existence. What shall we say, then, of those who never think for themselves, but only hang on the words of their favoured orator? I cannot understand the reception of such an Address by the body of persons to whom it was delivered, except upon the supposition that his hearers trusted themselves implicitly to the guidance of a great name!

The British Association for the Advancement of Science ought surely to have considered whether Science can be advanced through a departure from the only paths by which it has arrived at results truly beneficial to mankind.

*** All the above quotations from Professor Tyndall are from the Edition of the Seventh Thousand "with additions."

APPENDIX.

PHILOSOPHY AS "RESTORED" BY DESCARTES.

"It may prove instructive to the student and general reader to make a brief allusion to Descartes's doctrine of *Vortices*, by which he attempted to explain the phenomena of the material world, and which created such a lively interest among the literati of Europe when it was first published.

"He maintains there is nothing but substance in the universe. This is divided into two kinds; one a spiritual, or thinking, and the other an extended substance. Descartes affirms there can be no vacuum in nature; that the world is full; as everything which is extended is matter.

"Now he supposes that the Deity created matter of an indefinite extension; that it was portioned out into little small square patches full of angles; that it was, by His sovereign power, impressed with two motions. One which made each part revolve round its own centre; and one which enabled an assemblage of these patches to turn round a common centre; and thus as many different vortices or eddies were created as there were masses of matter created.

"The mode of operation is thus unfolded by Descartes. The various

angular masses of matter could not move amongst each other without breaking off their angles; and this necessary friction of the different parts would prodnce three elements. The first a fine dust, formed from the broken angles; the second, the spheres formed after their angularity was destroyed; and the third, those spheres whose angles might remain entire, or be only partially destroyed.

"The dust, or the first of the three elements, would, according to the established laws of motion, take its place in the centre of such system or vortex, on account of its diminutive parts; and this Descartes thinks, constitutes the sun and fixed stars. The second part, rendered smooth by the destruction of its angles, constitutes the atmosphere. The third element, with a portion of its angles, forms the earth, comets, &c. This is a concise view of this celebrated theory of vortices."—*History of the Philosophy of Mind*, by R. BLAKEY, vol. ii. pp. 230, 231.

The CHAIRMAN.—I am sure the meeting will return their thanks to Mr. Howard for his valuable and interesting paper.

The Hon. SECRETARY.—Before the discussion commences I have to state that Professor Tyndall is prevented from being present on account of a prior engagement in this neighbourhood.

Dr. H. COLEMAN.—In the first place I take exception to Mr. Howard's statement that the Greeks knew nothing of exact science. Certainly, if he restricted that to the higher departments of Natural Science, it might be true, otherwise the assertion is not susceptible of proof. I would call his attention to the speculations of Aristotle in his *Natural History*, and his treatise on the *Principle of Life*, and ask whether he has reviewed Cicero's *De Natura*. I think Mr. Howard has shown the point he set about to prove, namely, that Professor Tyndall favours materialism; but I wish he had gone further and told us why he did so. It is much to be regretted that treatises like Professor Tyndall's, which tend to Scepticism, receive so much support in the present day; but I think it is because Scepticism is the only speculative school cultivated in England, and hence the great development of sceptica principles; and we want, not to prove that these materialistic theories exist, but to account for their existence, and to devise a definite way of meeting them.

Mr. L. T. DIBDIN.—I feel towards Professor Tyndall's address much as the friend of Lysias, in Plutarch's story, did towards his defence. I admired it much on the first reading; on the third thought it inconclusive. Though I cannot answer the address as Mr. Howard has done, I agree with that gentleman in his argument, and cannot follow Dr. Coleman in his objections to it. But I want to draw attention to a little bit of mental philosophy,

touched upon at the end of Mr. Howard's paper: I refer to the supposed discussion between a Lucretian and Bishop Butler. The Bishop, it is well known, maintained what is called the theory of living agents,—that the body is but an instrument of the soul. The supposed Lucretian brings forward objections to that view which are a characteristic specimen of Professor Tyndall's reasoning. "The true self," he argues, "has a local habitation in each of us, and therefore must possess a form." Is this correct? Has the true self a local habitation? And even if it were localized, would it necessarily possess a form? Then the Professor goes on, "When a limb is amputated, the body is divided into two parts; is the true self in both or in one? You say, in the one which retains consciousness. What do you make of the case where the whole body loses consciousness? Is the true self lost?" Now Butler's argument is this: "Why should we suppose that the soul perishes when the body is destroyed? We may lose large portions of matter without losing any portion of the soul; legs or arms may be removed, but still the self remains intact; why should we suppose the dissolution of all the body to be the destruction of the soul?" He lays down that where consciousness is, the self must be, but not, as Tyndall assumes, the converse, that where the self is there consciousness must be; he does not endeavour to show that consciousness is necessary to the existence of the soul, but only that where consciousness is there the whole self is, and that there is none in the amputated limb. "But," says the Professor, "you never mention the brain or nervous system. The brain cannot be removed without prejudice to the perceiving power." What of that? Butler's argument is that a portion of the body may be removed, and consciousness yet remain; that is not touched by saying that there are parts which cannot be removed without loss of consciousness. The Professor proceeds to draw a distinction between the nervous system and the instruments of a telegraph operator. "Destroy these," he says, "and you sever his connection with the world, but the man still survives, and knows that he survives. What is there that answers to this consciousness, when the battery of the brain is disturbed so as to produce insensibility, or destroyed altogether?" The illustration seems rather to tell on Butler's side; the Professor begs the whole question. What is there to prove that the man does not exist after the body is destroyed? Can any one say he does not? Butler himself might have used the illustration, had the electric telegraph been known in his day. The only evidence of the existence of the operator to the people to whom the message is sent is that they get it, and when the machine is broken they have no proof that the operator survives. Just so when the body is destroyed the evidence to the outside world of the man's existence is at an end; but it does not follow that he ceases to exist. There is much that is amusing in the way in which the Professor compliments himself through the medium of the two interlocutors; but I will only trouble you with a word or two on the whole scope of his address. Its object is to show that philosophy has been all along working towards the point at which he imagines himself and all scientific people

to be about to arrive. Here he has failed. He shrinks from post-Christian philosophy, for that, he says, must necessarily owe something to Christianity; he quotes Epicurus and Descartes with approval, but is obliged to explain away the fact that both believed in a Creator. And he does not tell us, as he ought to do, how matter first began, nor what was the origin of life. In short, he seems to put it thus: "Much evidence has been brought out, but it is not complete, and therefore we request you to accept our conclusions without evidence; and if you will not do so, you must be content to be included among those who stagnate in the stillness of a swamp."

Mr. T. W. MASTERMAN.—With regard to Mr. Howard's remarks on the testimony of History in regard to deity, I think it will always be found that, however far we may go back, both in the monumental and written history of any country, we shall always find that there has been a belief in a deity and a sacrifice to him.

Dr. E. HAUGHTON.—May I venture to say that I think it would have been better had Mr. Howard's otherwise admirable paper contained more quotations from Professor Tyndall's address.

Mr. D. HOWARD.—Lord Bacon's *Novum Organon* may be very profitably studied in connection with much more modern controversies. It is a great pity that Professor Tyndall has not given a true representation of the great thinkers that preceded him, instead of belabouring a straw bishop. It may fairly be said that the Greeks had no science in our sense, for they had not that accurate putting together of facts by induction which we call science, but as metaphysicians they were certainly far superior to us. I must confess I do not entirely share the doubt expressed as to the meaning of Tyndall's system; we have arrived at an important point in modern science, we have learnt very much about the brain, but are we one bit nearer knowing the telegraph operator in the brain; and the whole point is simply this,—our material studies, however far they are carried, lead up to something entirely apart from and beyond matter, which, call it what you will, we must face. The simplest name as well as the truest is "the Will of God," and this answer to the question, "What is it?" is far more truly scientific than that of the pantheist which ascribes it to a universal intellect or some other such term, which is but a confession of ignorance. Tyndall is no more able to solve the question, "What underlies Phenomena?" than were the Greek philosophers two thousand years ago.

Captain F. PETRIE.—I would venture to call attention to some errors contained in the historical sketch given by Professor Tyndall in his Belfast address, my attention having been drawn to them when reading some remarks recently made by Dr. McCosh, and I cannot do better than give his words:—"Professor Tyndall talks of Empedocles 'noticing the gap in the doctrines of Democritus,' whereas, every tyro in philosophy knows that Empedocles came before Democritus. Speaking of the centuries lying between Democritus and Lucretius, he makes Pythagoras then perform 'his experiments on the harmonic intervals,' as if Pythagoras

had not died before Democritus was born. He represents Aristotle as preaching induction without practising it, whereas he did practise induction in his Natural History, but certainly did not preach it as Bacon afterwards did. He ascribes, it could be shown, a doctrine to Protagoras the Sophist which no scholar would attribute to him. A writer (Thomas Davidson) in the October (1874) number of the *Journal of Speculative Philosophy*, proves that he has not given a thoroughly correct account even of the philosophy of his favourite Democritus, whom he represents as making all the varieties of things depend on the varieties of atoms in number, size, and aggregation, whereas Aristotle, the only original authority on this subject, says that he made them depend on the figure, aggregation, and position. In the same article it is shown that Dr. Tyndall mistakes throughout, in the few allusions he makes to Aristotle."

The CHAIRMAN.—With reference to what fell from Dr. Coleman, I understood him to express a wish that there should be something more positive in this paper—that we should have something about the reason of scepticism, and how best to meet it. I think that if we went into these questions we should be exceeding our limits as a scientific society. I do not charge sceptics with conscious dishonesty ; no man has a right to make that charge against any other ; but in the case of some sceptics with whom I am intimately acquainted, who profess to be honestly seeking the truth, it is easy to be seen that there is in their minds a bias which makes them cling to every difficulty. They believe they are seeking the truth, but they are not seeking it with unbiassed minds, and I cannot but think that scepticism is mainly founded on a distaste to revelation, often working unconsciously in the minds of those who say they would be glad to believe. To enter into such considerations is foreign to our object ; all we can do is to deal with two branches of the subject. We may show, as far as we can, that science tends in some degree to confirm revelation, and that there is nothing in scientific discovery which properly tends to produce a sceptical frame of mind. I think that Professor Tyndall himself really adduces strong arguments in favour of religion when he admits that physical science is not sufficient to satisfy the wants of the human mind, and when he endorses the opinion of Herbert Spencer, that evolution involves an inscrutable mystery which man cannot fathom. He might have gone further and have said that the simplest facts around us involve a mystery which we cannot fathom. Take one of the most familiar, that of a stone falling to the ground ; we say that it falls because the earth attracts it, but this is only a statement of the fact that there is some cause which induces one particle of matter to move towards another. We are surrounded by mystery. That one mass of matter should thus act upon another at a distance has been pronounced by one of the greatest of modern philosophers to be inexplicable, and the only ground on which the mind can take refuge is that there is a God who is the mainspring of creation. The other branch, which naturally is chiefly dealt with here, is the answering particular objections which scientific men bring

forward in favour of scepticism or to oppose revelation. I think, therefore, that this society is necessarily confined within limits which prevent its entering usefully or properly into the wider field which Dr. Coleman has proposed for it. (Cheers.)

Mr. J. E. HOWARD.—In reply to Dr. Coleman, and in defence of the course I have pursued, I would mention that Professor Tyndall's address has been republished, together with another lecture by him called *Science Lectures for the People : Crystalline and Molecular Forces.* The copy which I have is one of the seventh thousand, consequently the doctrines taught go forth very widely among intelligent people on the authority of a man who is much admired. How are we to meet this? Certainly by plain speaking rather than by taking refuge in mysticism. It would be a superfluous task to combat imaginary theories, propounded by imaginary nonentities. No one would listen to us, and we should not increase in any way the value of the Institute. The next objection which has been made to my paper was in reference to my having said that the Greeks knew nothing of exact science. Of course, I did not speak of mathematics, but of their ignorance of science in the modern acceptation of the term. Dr. Coleman sends me to Cicero *De Naturâ Deorum.* But what does this book teach of exact science? Dr. Coleman censures me for not having given reasons for the spirit of scepticism, and for not having shown how it was to be met. Well, I never undertook to write on those subjects, or to *prove* that Professor Tyndall is a Pantheist. In my opinion there is no need for this, as he seems to tell us that unhappy fact most distinctly himself. In answer to what was said by Dr. Haughton as to the absence of quotations, I must say that I thought I had given plenty. But whether I have done so or not, I feel certain that I have not misrepresented the sentiments of Professor Tyndall. If he had been here, as he was invited to be, I am confident that he would not complain that I have misrepresented him in any way. These are the chief objections that I have to answer, as I have noted them down, at least so far as the discussion seems to warrant.

The meeting was then adjourned.