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THE PROGRESS AND TENDENCIES OF SCIENCE

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THE

PROGRESS AND TENDENCIES OF SCIENCE;

An Address,

DELIVERED BEFORE THE

DIAGNOTHIAN AND GÖTTHEAN SOCIETIES

OF

MARSHALL COLLEGE,

AT

MERCERSBURG, PA., SEPTEMBER 29, 1840.

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BY ALBERT BARNES.  
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Marshall College, Sept. 29th, 1840.

TO REV. ALBERT BARNES.

Sir,—Permit us, in behalf of the Societies we represent, to tender you our sincere thanks for the very learned and eloquent Address which you did us the kindness to deliver this afternoon, and also to solicit the additional favour of a copy for publication.

Respectfully yours,

WM. P. SCHELL,

THEODORE APPLE,

ISAAC C. HOUSER,

Committee of Diognothian Society.

JAMES L. REYNOLDS,

F. B. THERFORD,

J. H. GOOD,

Committee of Gathean Society.

ADDRESS.

Gentlemen of the Diognothian and Gæthean Societies:

THE subject on which I propose to address you at this time is, THE PROGRESS AND TENDENCY OF SCIENCE. It cannot be new to you to go over the history of Science; but it may be useful to contemplate some of the achievements which it has made, and, from the vantage ground which we have gained, to contemplate some of the struggles of the past, and to look on the precise position which we occupy as we enter on public life. It is much to know what has been done; it is much to know where we can most successfully direct our efforts in future years.

Using the word SCIENCE in its widest signification, my aim will be to make some suggestions on its former history, and on its tendency in regard to some of the great questions which pertain to the welfare of man.

The difference between man in a state of nature and in a state of advanced science, is almost as great as that between distinct orders of beings. In the one case, the most striking feature pertaining to the subject now before us, is, that every thing is an object of wonder. The visible world is to him filled with prodigies, and the invisible world with imaginary beings. Objects and events now familiar to us from our childhood, and which to us create no apprehension, fill *his* mind with dread and amazement. Every new event becomes a prodigy to him, whose cause he knows not, and whose tendency he has no means of anticipating. Disease attacks him from causes which he does not understand, and carries its fearful desolations through his frame in a manner which he can neither trace nor retard. The thunder rolls, and the lightning plays in the sky or rives the oak, in a

manner which he cannot comprehend, and by an invisible influence which he cannot explain; and he learns to look upon a dark cloud without alarm (if he ever does), not because he understands the phenomena, but from the fact that he often witnesses these terrific wonders without personal injury. An earthquake or a volcano is equally an object of dread whose cause is unknown. An eclipse is a prodigy. He knows not when to anticipate it; he knows not its cause; he knows not what is its design; but as it sheds

“Disastrous twilight
O'er half the nations, and with fear of change,
Perplexes monarchs,”

it seems to him to be a proof of the anger of the gods, and he trembles with alarm.

To his view, the stars of night shine with unmeaning splendour, or they merely excite inquiry whether they exert an occult influence over the fates of men. On land, unacquainted with the causes of the changes which he witnesses; seeing around him revolutions which indicate the presence of some invisible being; or meeting events every where which to him are prodigies, he stands alarmed and trembling amidst these wonders. To him the invisible world becomes soon peopled with mysterious beings of malignant influence. Numerous orders of genii and gods are believed to preside over all things. The dead of past times are supposed to re-appear and to speak to men with a shrill and fearful voice. Thus Homer, speaking of the shade of Patroclus, says:

“He said, and with his longing arms essay'd
In vain to grasp the visionary shade;
Like a thin smoke he sees the spirit fly,
And hears a feeble, lamentable cry.”

“This night, my friend, so late in battle lost,
Stood at my side a pensive, plaintive ghost.”

The planets are believed to preside over the birth and the destiny of man; and it becomes the grand aim to ward off

malignant invisible influences, and to study the aspects of the stars, and to deprecate the wrath of imaginary beings. If from land he ventures out upon the waters, he keeps his eye upon the sun and the stars; anchors at night in some friendly bay; creeps timidly along the shore; and if in a storm he is driven from the sight of land, he gives himself up to despair.

But when science has shed its light on the human mind, how changed the scene! How changed the man! Each one of the objects which once affrighted him takes its place among the things known to be adapted to promote his welfare, and to furnish him happiness and security. He unpeoples the invisible world of its imaginary beings, and begins to examine the causes of the changes around him; and each new discovery makes him more confident of his own powers, and of his own safety. The eclipse, once a prodigy, is now understood, predicted, and looked at without dismay. He no longer turns pale at its approach, but examines it with reference to great questions of navigation and of astronomy. The changes in the world around him, which he attributed to some secret and malign influence of beings that are unseen, he traces to their proper causes, and makes them tributary to his comfort. No longer creeping along the shore, he ventures out on the vast ocean; makes the stars his guide; penetrates unknown seas; and encounters the storms of the deep, and directs his way with unerring precision to distant lands. The elements he subjects to his control; and on every hand innumerable agents rise up with more than the precision, and much more than the power of living beings, to aid him in the accomplishment of his purposes. Disease he learns to meet by the aid of science; danger he wards off by science; he makes war by science; and he examines the heavens and the earth, the mineral, the vegetable and the animal kingdoms, to make all tributary to the expansion of his mental powers, and to the advancement of society.

Between man, therefore, in a state of barbarism and man

when aided by the powers which science has placed at his disposal, there is nearly all the difference which we are accustomed to regard as characteristic of different orders of intelligences. This difference *we* are prone to forget, for at our birth we have been introduced into all the benefits which have resulted from the scientific discoveries of past times. We have not been witnesses of the slow advances which science has made, of its struggles and its conflicts, to secure the ascendancy of one scientific principle, and the slowness with which such a principle becomes undisputed, and is allowed to exert its appropriate influence on the welfare of society. To feel this, we must throw ourselves in fancy into something like the condition of the fabled Seven Sleepers,* and let age roll on after age while we are unconscious, till we wake as they did, surrounded by new generations of men, and find the rude arts of life laid aside, and civilization and science shedding their pure beams around us. "We imperceptibly advance," says Gibbon, "from youth to age without observing the gradual, but incessant changes in human affairs; and even in our larger experience of history, the imagination is accustomed, by a perpetual series of causes and effects, to unite the most distant revolutions. But if the interval between two memorable periods could be instantly annihilated; if it were possible, after a momentary slumber of two hundred years, to display the new world to the eyes of a spectator who retained a lively and recent impression of the old, his surprise and his reflections would furnish the pleasing subject of a philosophical romance." I do not say that the difference is to be traced wholly to science. I do not believe that it is. I doubt not that laws, and literature, and virtue, and pure religion contribute much to this change, and to the advancement of the species. But no one can doubt that science also has contributed much to produce

* Gibbon, Dec. and Fall, ch. xxiii.

this change; and that it is destined still to produce more important revolutions in the destiny of men.

Our own country has furnished the most striking illustrations of this difference which, perhaps, the world has ever witnessed. This vast territory, when our fathers came to these shores, was trod by a race of men ignorant of the very elements of science. A foreign race, guided by science, came across the ocean, prepared to level the vast forests; to build cities and towns; to apply scientific principles to the cultivation of the soil and the navigation of the streams; armed with the power of exterminating their foes by weapons which science had put into their hands, and appearing to the American savage as belonging to a superior order of beings. How few were the common sympathies between the red man and his invader! How soon has he vanished before the power of him who had learned to subject the elements to his control! A few linger among us—remnants of much injured tribes of men—as illustrations of this difference. Still they build no cities; they calculate no eclipses; they construct no ships, and no bridges; they make no use of the mariner's needle; they apply no principles of science to the cultivation of the soil, or to the removal of disease; they people still the invisible world with imaginary beings: and though on the streams where they once fished, and over their fathers' graves, science has strewed its blessings, yet the red man himself has turned away toward the setting sun; and though he trembles at the power, yet he despises the arts and the religion of his invader. Whether he lingers pensively around his fathers' graves, or heaves a deep-drawn sigh as he looks on the ample plains where in the elasticity of savage life he pursued the game of the forest; or whether forced away by national injustice, and by the violation of compacts, he turns his back sullenly on all these fair lands, and goes with "solitary step and slow" to the setting sun to lie down and die, he is a savage still. He builds no steamboat, and lays down no rail road to help him in his journey; he

marks his way by the moss on the trees rather than by the compass; he bears with him no telescope to tell him what are the stars that shine upon his nightly path.

The history of the progress of science remains yet, to a large extent, unwritten. We have abundant records of war, and of the development of the bad passions of men; but few and brief are the chronicles by which we can trace the advancement of man from a state of savage barbarity to a condition of civilization and refinement. Histories of the past, fabled and true, we have in abundance; but the historian, attracted by the glitter of military renown, has forgotten to record the things which most deeply and permanently affect the destiny of men. Yet, in this interesting history, there are some points which are understood, and we are able to mark some great epochs in the advancement from a state of barbarism to the present condition of the scientific world. To a few of those points, chiefly with reference to the most philosophic and scientific nations of antiquity, it may be interesting briefly to refer.

The first point relates to the OBJECTS of science, or the purposes at which scientific investigation aims. There are two ways of attempting to understand the works of nature, or of ascertaining the relation and properties of things. One is, for the philosopher to sit down in his closet, or walk in his grove, and attempt to frame in his own mind a plan of what nature *ought* to be; the other to become the simple *interpreter* of nature, and to tell what she *is*. The one attempts, on the basis of a few facts imperfectly ascertained, isolated in their character, and little understood in their connexions, to frame a theory that shall account for all the facts in the universe, and on a bed of Procrustes, to reduce all facts to the proper dimensions; the other approaches the works of creation with the spirit of a child, and humbly sits down at their feet. The former course was the most difficult, the least obvious, and was capable of giving the longest and most profound employment to the intellect, and would

most effectually separate philosophers from the rest of mankind, and produce what men of philosophic temperament have commonly sought—the honours of *caste*;—an elevation above the millions of humbler mortals at their feet. The most striking difference in science as understood by the ancients and the moderns relates to this point; and to the modern views of the *object* of science can be traced nearly all the advances which it has made. The difference between Bacon and Plato; between medical science now and medical science in ancient times; between the physical sciences now and in former times, is to be traced, more than to any thing else, to this. Socrates was almost the only man in antiquity who seems to have been free from the prevailing inclination to mere speculation; and *his* instructions related almost wholly to religion and morals. To the time of Bacon, the true object of science was unknown; and the profound sentiment with which he opens the *Novum Organum* was as new as it was beautiful in the philosophic world. *Man, the minister and interpreter of nature, can do and understand only so much about the order of nature as he has observed; neither does he know more, nor can he.** Never was there a more comprehensive maxim, nor one more fitted to revolutionize all the prevalent systems of philosophy. And this single aphorism contains the line of distinction between all modern and ancient science. “The ultimate object of the sciences,” says Bacon, “has by no one heretofore been well defined.”† “The greatest of all errors,” he says, “consists in losing sight of the ultimate objects of science.”‡ The end pro-

* *Homo, naturæ minister et interpres, tantum facit et intelligit, quantum de naturæ ordine, re vel mente observaverit; nec amplius scit, aut potest.*

† *Finis scientiarum a nemine adhuc bene positus est. Nov. Org. Lib. 1, Aph. 81.*

‡ *Omnium gravissimus error in deviatione ab ultimo doctrinarum fine consistit. De Aug. Lib. 1.*

posed by science, according to him, is to labour "for the comfort of mankind;"* it is to "work effectively for the purpose of lightening the annoyances of human life."† "It is," says he, to "enrich the human race with new discoveries and possessions."‡

This was the aim of Bacon; this is the object of modern science: an object unknown, or deemed degrading, in all the ancient philosophic world. The grand distinction between ancient and modern philosophy is, that the latter aims at utility and progress; the former disdained to be useful. The former was concerned in theories of perfection; in ideal schemes; in profound speculation; but it scorned to be connected with any thing that should minister to the actual comfort of human beings. "Once, indeed, Posidonius, a distinguished writer of the age of Cicero and of Cæsar, so far forgot himself as to enumerate among the humbler blessings which mankind owed to philosophy, the discovery of the principle of the arch, and the introduction of the use of the metals. This eulogy was considered as an affront, and was taken up with proper spirit. Seneca vehemently disclaims these insulting compliments.§ According to him, philosophy has nothing to do with teaching men to rear arched roofs over their heads. The true philosopher does not care whether he has an arched roof or any roof. Philosophy has nothing to do with teaching men the use of metals. She teaches us to be independent of all material substances, and of all mechanical contrivances. To impute to a philosopher any share in the invention of a plough, a ship, or a mill, is an insult. "In my own time," says Seneca, "there have been inventions of this sort: transparent windows; tubes for dif-

* *Commodis humanis inservire. De Aug. Lib. vii. cap. 1.*

† *Efficaciter operari ad sublevanda vitæ humanæ incommoda. De Aug. Lib. 2, cap. 2.*

‡ *Dotare vitam humanam novis inventis et copiis. Nov. Org. Lib. 1, Aph. 81.*

§ *Epis. 90.*

fusing warmth through all the parts of a building; shorthand, which has been carried to such perfection that a writer can keep pace with the most rapid speaker. But the inventing of such things is drudgery for the lowest slaves. Philosophy lies deeper. It is not her office to teach men how to use their hands. The object of her lessons is to form the soul. We shall next be told," he adds, "that the first shoemaker was a philosopher."*"

From this view of the design of philosophy; this belief that the philosopher must be a man of different *caste* from the rest of mankind; that it was beneath him to be engaged in devising means for promoting the happiness, and augmenting the power of men, we are to trace nearly the whole difference between the science of the ancients and the moderns. Abundant proofs, indeed, are furnished that the men engaged in such pursuits were not inferior in intellectual endowments to any who have since investigated the works of God. Incomparable specimens of the dialectical and the rhetorical arts are to be found in their writings. But when we look for something more, we are forced to say, with Bacon, that this philosophy was neither "a vineyard nor an olive ground, but an intricate wood of briars and thistles, from which those who lost themselves in it brought back many scratches and no food."† It has been well said, "the ancient philosophy was a treadmill, not a path. It was made up of revolving questions; of controversies which were always beginning again. It was a contrivance for having much exertion and no progress. The mind, accordingly, instead of marching, marked time."‡ There was no "accumulation" of truth; no advance in investigating the works of nature; few even of the simple contrivances which the humblest principles of science now have enabled us to originate.

* Rev. of Bacon, Edin. Rev. Lit Mus. Nov. 1837.

† Nov. Org. Lib. 1, Aph. 73.

‡ Rev. of Bacon, as quoted above.

This will account for the fact, otherwise so inexplicable, that so few scientific improvements are found in the ancient nations. We go to Egypt, the parent of civilization, of learning, and of science. But what has ever been found there in regard to the sciences that would entitle her to the very lowest place in our schools? While we admire the monuments of her power; while we stand gazing with amazement on her pyramids; or while we wander among the broken columns of Thebes and Beni Hassan, we pause and ask, Where are the monuments of her science? Unless it were in the power of moving immense masses of stone to be employed in rearing useless piles; or of fixing colours in plaster and stone to endure for ages; or in the art of making and staining glass, never used by them for any important purpose, the whole of that wonderful land may be traversed without meeting scarcely a memorial that shows that she would now be respectable in science. Of what use was it to the world to construct her pyramids, her obelisks, her sphynxes, her labyrinths? Of what use that she had the art of embalming for future times all her dead, and of peopling the earth beneath her with the preserved forms of her departed people? Her most magnificent works were the playthings of kings, fit tombs of monarchs whose genius and ambition could be satisfied by seeking immortality there; while the great mass of intellect grovelled in the most abject ignorance, and only lived to accomplish what we do now much better by the steam engine.*

* "As far as we can judge from the unparalleled number, and gigantic dimensions of the temples, palaces, gateways, alleys of sphynxes, and cemeteries, that cover the site, and fill up the environs of Egyptian Thebes, the resources of the monarchs, who made it their residence, must have exceeded those of the Roman Cæsars, when the world obeyed their sceptre. But, when we inquire after the influence of this mighty monarchy on the welfare of the human race; when we ask for the lights of humanity that adorned its annals, for the teachers of truth, the discoverers of science, the champions of virtue, the statesmen, the legislators, the friends of man, it is all a dreary blank. Not one bright name is preserved in

We are not less struck with the absence of the plainest principles of science in Greece and Rome. I would not undervalue their classic learning; I would not have it banished from the schools. I would not have its study diminished. I would have it loved and studied as long as the walls of a college shall adorn our land, and as long as the spire of a Christian temple shall point to heaven; and I believe it will be. To that study we owe much of whatever usefulness and skill we may have in any of the professions of life; and as long as liberty and religion endure, the academic grove will be loved as well as the sweet retreats of piety; and they who fill the professions, and adorn the various departments of public life, as well as they who preside in our seminaries of learning, will delight to revisit the land of classic Greece, as well as the land which the prophets trod. Yet we cannot but be struck with the almost total want, in the classic remains of antiquity, of any very valuable explanations of even the most common phenomena of nature. What a conception, far, far beyond the loftiest thoughts of antiquity, is presented by the simplest truths of modern astronomy! Though this science among the Persians, the Chaldeans, and the Greeks, was that to which most attention had been paid, yet to what did it amount? To theories involved, unintelligible, and undemonstrated about the *possible* order of the movements of the heavenly bodies; to the formation, with infinite care, of *pictures* of the heavens—arranging the stars into constellations, and giving them outlines having a fan-

their history; not one great or generous deed, if ever performed, has escaped from oblivion; not a word ever uttered or written by the myriads of rational beings, the lords or the subjects of this mighty empire, has been embalmed in the memory of mankind. A beam of light from the genius of a modern French scholar, cast upon the sculptured sides of obelisks and temples, has redeemed the names and titles of forgotten Pharaohs from ages of oblivion; but no moral Champollion can pour a transforming ray into the essential character of the Egyptian monarchy, and make it aught else than one unbroken record of superstition, ignorance, and slavery.”—Gov. Edward Everett’s *Memoir of Mr. John Lowell, Jr.*

ciful resemblance to some object among animals or reptiles; to a vague and indeterminate supposition of some imaginary influence which the planets exerted over the destinies of individuals and nations. What was more obvious in the healing art than to approach the human frame, and to examine it by dissection? Yet among all the ancients this was never done. What more plain than to collect *facts* about diseases, and to arrange them by patient induction, and from the science of physiology, and the recorded *facts*, to attempt to *cure* the sick? Yet the whole of the ancient science of medicine consisted, so far as it was practised at all, in attempting to *parry* and ward off the attack of disease, and was a stranger to the art of restoration. And even the whole science of medicine, in the view of philosophers, was of very disputable advantage. Plato, in his Republic, did not object, indeed, to quick cures for acute disorders, or for injuries produced by accidents. But the art which resists the slow sap of a chronic disease; which repairs frames enervated and exhausted by indulgence; which mitigates the natural punishment of the sensualist, had no share in his esteem. A life protracted by medical skill he pronounced to be a lingering death. And as to those who had bad constitutions, why let them die; the sooner the better. The best thing that can happen to such men, is to have them die at once.*

One of the most obvious, and, indeed, unaccountable instances of the want of science in antiquity, related to the simplest laws of hydrostatics. The aqueducts of Rome and Athens, and indeed of all ancient cities and towns, are probably among the most striking monuments on earth of an entire ignorance of some of the simplest laws of science among people so refined and intelligent as they are acknowledged to have been. So amazing has it appeared that one of the simplest laws of hydrostatics should be unknown to

* Republic, Book 3. Quoted in the review of Bacon above.

them, that a reason has been sought in a desire of magnificence and splendour to account for such vast expenditures in supplying their cities with water. We are struck with the same thing in the mechanic arts. The application of water to turn a mill, a thing so obvious to us, is not known to have ever been accomplished at all in Greece, and was unknown in Rome till near the age of Augustus. The propulsion of the saw by any other power than the hand, was a novelty in England so late as the sixteenth century. Nothing like the *pump*—an instrument so obvious to us—was known to any of the ancient nations.*

These remarks might be extended to almost any length. But there is not time to go further into this subject. There are two or three principles in the progress of science which may be here just adverted to. One is, that in the obscure records of the past, we sometimes see a single truth, stricken out by some splendid genius, that seems long to stand alone, like a solitary star in a night overcast with clouds. It may shed its rays on an entire generation, and be all that shall distinguish the memory of the times or the man. It may gleam awhile by itself in the darkness of the night, and then perhaps it shall appear to sink away, like the last star that shone through broken clouds, and all shall again be night. Or if I may be allowed to amplify this figure, one truth after another may seem successively to gleam alone, like a single star, and then be lost in the overcast heavens, until some man like Bacon or Newton, as with a magic wand, shall scatter those clouds, and reveal those long forgotten truths, having taken their place in brilliant systems and constellations. So Copernicus disclosed the great truth pertaining to the system of astronomy which now bears his name, and then for ages it died away as behind a thick cloud. Thus also the idea of propelling vessels by steam was advanced, and a patent secured by Jonathan Hulls, in

* Webster's Lecture before the Mechanic's Institution.

London, in 1737; but for almost a century was that idea obscured, and in danger of being lost to mankind, till Fulton revived it, and by his genius covered half the waters of the world with vessels of this description. So many a successive truth was stricken out by the Arabian chemist; obscured again in the long night of ages; and again, in the hands of men like Davy, associated with other truths newly discovered, those old and new truths are placed near each other, and pour down their mingled beams, like the milky way, from the glorious firmament of science;—truths, like the stars, not less beautiful because the light of many is blended into one. It is one of the most interesting facts in the progress of science, that almost every great and central truth which we now possess has given immortality to some one of the most gifted of the species; perhaps has cost the life of some illustrious martyr. Every truth in geography, in chemistry, in political science, in astronomy, as well as in religion, has thus cost perhaps a most valuable life, or given immortality to some illustrious name. To discover it, foreign lands have been visited by men like Pythagoras; deserts have been traversed; sleepless nights have been passed; years have been consumed in the laboratory; until perhaps the single truth that was to give immortality to the man has shone forth with established lustre. Galileo spent his life to perfect the telescope, and was rewarded in a dungeon; Harvey in defending the doctrine of the circulation of the blood; Jenner in defence of the theory of vaccination; Columbus in showing that a new continent might be reached in the west, and in giving “a new world to the kingdom of Castile and Leon.”*

Another interesting thought in regard to the progress of science, closely connected with this is, that the career in

* Epitaph on his tomb in Seville.

A Castilla y a Leon
Nuevo mundo diò Colon.

splendid discovery is often suddenly arrested. The master mind that had begun to explore the secrets of nature, and that promised if life had been prolonged to lay open all her stores, is suddenly removed by death, and his removal is like withdrawing a central sun from a system. Or "grim-visaged war" invades the peacefulness of scientific pursuits; changes the observatory to a rampart; beneath his iron heel tramples down the crucible; and converts the plough-share to a sword, and the pruning hook to a spear. Not a few such checks have occurred in the history of the past, and it is interesting to observe how the fact of science thus being arrested has ultimately changed the aspect of different portions of the world. One instructive fact of this kind occurred in the progress of science in Arabia. The Arabian chemist was on the verge of the most splendid discoveries which have marked our own age, and he who had given numerical figures to Europe, and Algebra to the world, and who had thus laid the foundation for even the splendid discoveries of Newton, was on the verge also of making his own country the seat of science in all coming time, and on the lands of the religion of Islam the sun of science *might* have risen soon to the meridian, and have stood there in full-orbed glory, to go down no more. We can scarcely help pausing to contemplate what a different destiny *might* have awaited mankind if the Mussulman had suffered his attention to be diverted a little longer from war, and to have pushed his discoveries a little farther. Science would have returned, perhaps, to its native Egypt; would have spread over Arabia; would have travelled eastward to Persia, to Hindostan, to China. On the plains of Chaldea the astronomer would have again built his tower, and would have looked out on the heavens with the telescope in his hand, and there would have marked the distances and the periods of the stars to which the Babylonian had given names. The magnetic needle would have directed the ships of Islam to the western

world, and the Crescent would have been reared where Columbus planted the Cross. Our streams might have been navigated, and our lands cultivated by the Mussulman; and the Tigris, the Euphrates, and the Ganges have been the first to have opened their bosoms to bear the vessel navigated by steam. Empire would have retraced its way to its native seat on the plains of Chaldea; and the Prophet of Mecca would have swayed the sceptre perhaps over the whole world. But God designed that these sciences should receive their form and consummation on Christian soils; and it is a most interesting part of history to trace the wonderful means by which he has directed man in science and in the mechanic arts as he has in religion. Hence the splendid career of the Arabian was arrested; hence the empire of science was transferred to Europe and America.

But amidst the erroneous or unsettled views which have prevailed in regard to science; while its progress has been so slow, and so often arrested, there is one fact that must ever cheer and animate us in regard to its tendencies hereafter. It is, that when a truth has been discovered of value to society, it is never ultimately lost. It seizes upon great elements in human nature, and it will live. The human mind grasps it with a giant's power, and "the world will not willingly let it die." It works its way into the elements of society; incorporates itself with the customs and laws; modifies the morals and religion of a people; goes to the bedside of the sick and the dying; ascends the bench of justice; encircles the altar and the fire-side. It is related of Phidias, that in constructing the statue of Minerva at Athens, he so wrought his own image into her shield, that it could not be removed without destroying the statue. So the principles of science are so wrought into the very structure of society—its customs, opinions, language and laws, that no political revolution, no convulsion, no change can ever cause them to be forgotten. There is not the

slightest evidence that a single scientific truth of any value that has ever been known has been obliterated from the human mind. There is not the least reason to suppose that a single invention in the arts that was known to the ancients, and that would be now of any considerable importance, has been lost. The celebrated Greek fire is the only thing of any value possessed by the ancient Greeks whose nature is now supposed to be unknown. Yet of what value would that be to us, when its use has been far more than compensated by the invention of gunpowder? The only things supposed to have been possessed by the Egyptians that were ever lost to the world, were the art of constructing machines to move vast masses of stone, (if, indeed, they ever had such machines); the art of making and staining glass by causing the colours to penetrate accurately through the entire mass, formed as a species of mosaic, and fused so as to defy detection;* and the art of fixing colours in stucco and on stone—an art in which much is owing to a climate perpetually dry.† To us, of what value would all this be now? The art was lost, for it was useless to the great mass of mankind. But how can the principles of modern science ever be forgotten? How can the knowledge of the telescope ever be destroyed? Each night, from a thousand observatories, it is, and it will be, disclosing the wonders of the heavens to the eye of man. How can the knowledge of the safety-lamp be obliterated? Each day, and each night, it guides ten thousand miners beneath the surface of the earth, and is the protector of their lives. How can the knowledge of the mariner's compass be blotted from the memory of man? Every hour it guides the vessels of all nations with unerring certainty, and conducts the commerce of both hemispheres across the ocean. When can the

* Wilkinson's *Manners and Customs of the Ancient Egyptians*. Vol. iii. 89—113.

† On the Arts of the Ancient Egyptians, see Wilkinson's *Manners and Customs of the Ancient Egyptians*, vol. iii. pp. 262, 397

knowledge of the use of steam be forgotten? Every river and lake; every city and village; every art, and every nation, savage or civilized, begins to acknowledge its power: and the plans of all civilized nations, whether for war or peace; for commerce or manufactures; for ambition or for pleasure; for national aggrandizement, or for the conversion of the world to God, are felt to be dependent on it. What can obliterate the knowledge of the art of printing? What catastrophe *can* ever happen that shall destroy the last printing press, and annihilate the last printed book and newspaper? Nothing: till

The cloud-capped towers,
The gorgeous palaces, the solemn temples,
The solid globe itself shall all dissolve,
And like the baseless fabric of a vision,
Leave not a wreck behind.

All these, with all the future discoveries that science can make, belong to man as man; to the whole world; and they travel down, amidst all revolutions, to the judgment-day.

Nor in literature is there evidence that much that is truly valuable has been lost. We are accustomed to mourn over the wanton act of Omar, by which the library at Alexandria was destroyed, as well as to smile, at the profound reasoning which prompted the act. "If these books accord with the Koran, they are unnecessary; if not, they ought to be burned." We often speak with regret of the acts of the monks of the middle centuries, when the art was discovered of erasing an ancient writing from parchment, and when a book of Livy was made to give way for the legend of a saint. But it remains yet to be demonstrated that much that was valuable was destroyed. Of four hundred volumes of papyrus recovered from Herculaneum, and unrolled and read, all are unimportant works relating to music, rhetoric, and cookery.* They perished, because they were of so lit-

* Lyell's Geology, vol. i. 329.

the value that few or no copies of them had been taken. But no act of Omar, no volcanic eruption, could sweep far enough to destroy the Iliad; no hand of a monk could make the world forget the *Æniad*. And what wide desolation now can destroy the "Paradise Lost," the "Novum Organum," the "Essay on the Human Understanding," or the "Task"?

In the view which we have taken of the progress of science, and in the facts to which we have adverted, we have discovered principles of the deepest value in reference to its future progress. In contemplating its tendencies, particularly as contrasted with what it was in former times, we may discern the following features.

1. Modern science has a tendency to elevate the mass of men. Formerly, its light was confined to the men with whom it originated, or to a few disciples who, like planets, revolved around central suns. Now, the light is shedding itself over remotest objects. Zeno, Plato, Aristotle, in their academic groves, gathered a few disciples, and sought to elevate *their* minds above what was esteemed the herd beneath them. But now, the pursuits of science are confined to no class of men; it has no sacred enclosure which may not be trodden by the feet of the uninitiated and the profane; no fruits which are forbidden to mortals. All the works of God, it is at least admitted, may be examined by any one who chooses, and as minutely, and as long as patience and life shall permit. The heavens gaze upon us at night, and ask us to turn away from the earth, and investigate the laws of their motion. The bud, the opening leaf, the flower, the insect, the dew-drop, the mineral, the solid diamond, nay, the playing lightnings ask us to subject all to investigation with the utmost freedom, and to learn their nature. And the truth has gone forth in science wholly, and in religion and morals in part, that all things may be examined. This truth is not to be recalled. It is one of the truths which has taken its place by the side of enduring

scientific principles, and is now to go down undisputed to the end of time.

Strange as it seems, the establishment of this truth has cost much, and is the bright result of centuries of opposition and conflict; and the victory by which it has been achieved is more brilliant than any or all that attended the triumphant progress of the Cæsars and Alexanders of ancient times. It was opposed, as we have seen, by the pride of philosophy; and by that spirit, it would seem almost innate in some form in the human mind, which seeks to establish the ascendancy of *caste* either in wealth, in birth, in religion, or in science, over large portions of mankind. It was opposed by the almost universal tendency in the ancient world to *theorize* rather than to examine; by that almost instinctive and insatiable desire in the human mind to tell what the world *SHOULD* be, rather than what it is. Then it was opposed by the scholastic philosophy, that most profound, subtle, wonderful system; that system formed by talents not inferior to those which in other times have given immortality to the name of Locke and Newton; that system—the first-born of night—extending the shadow of death over half the intellectual world, which received its “shape” and “substance” from the wearisome toil of some of the profoundest men that have lived—

“If shape it might be called, that shape had none
Distinguishable in member, joint, or limb;
Or substance might be called that shadow seemed.”

For centuries this dark system frowned upon all efforts to investigate the works of nature; and during all those centuries the human mind made no advances.

Then the right of free investigation was opposed by false systems and views of religion—not the *least* formidable obstruction in all ages to the progress of science. To me it would be interesting to go more extensively into an examin-

ation of this cause of opposition than my time or my design will now admit; for, to me, one of the most interesting of all points of history is the opposition which all forms of false religion have made to the progress of science. True religion prompts to investigation; invites and encourages us to prove all things. It *commands* us to hold fast that which is good. But I need not remind you that Galileo was imprisoned by the professed friends of Christianity; nor need I remind you of the triumphant note of victory which infidelity has sounded, or of the alarm which has been felt by the Christian world at the discovery of some new and splendid truth in science. Christians attached to their faith; building all their hopes on the truth of the Bible, and not yet confident that all the truth which science can disclose will be found in accordance with the Bible—just as the laws of light disclosed by the telescope pertaining to distant worlds accord with the laws of naked vision—have been alarmed at the progress of science, and have trembled at the prospect that some established article of faith would be overturned. Thus they were panic-struck at the high antiquity claimed for the sacred books, and the astronomical systems, and the historical records of India; alarmed at the amazing disclosures made by astronomy of the magnitude and extent of the universe; alarmed at the researches of geology, and the disclosures made of the long duration of the earth.

It has cost much to overcome this, and to restore confidence to the Christian world that the researches of science will never permanently clash with the doctrines of revelation. But the Christian world has come to that, and science is to receive no more obstruction henceforward from any alarm that its discoveries will contravene the revealed truth of God. No future Galileo is to be imprisoned because he can look farther into the works of nature than other men; and the point which we have gained now is that no obstruction is to be thrown in the way of science by any dread that any scientific truth will infringe on any theological system.

The great truth has gone forth at last, not to be recalled, that the astronomer may point his glass to the heavens as long and as patiently as he pleases, without apprehending opposition from the Christian world; the chemist may subject all objects to the action of the crucible and the blow-pipe, "with none to molest him or make him afraid;" the geologist may penetrate to any part of the earth—may dig as deep as he pleases, and no one may be alarmed. And this is much. The whole world of science is thrown open to men—to all men. No proud philosopher stands at the gates to say that the inferior rank and caste may not enter the temple; no religionist is there to say that there is any object that is not to be investigated as patiently and as long as he pleases. And the *first* feature in the tendency of modern science is, to *invite* all of all ranks freely and fully to examine all the works of God.

2. Allied to this, and growing out of it, is the *practical* character of modern science; the tendency to apply all its principles to some direct practical purpose. The dreaming and the speculative have passed away; and on the discovery of a new principle, men now ask at once to what purpose may it be applied in promoting human comfort, in abridging human labour, and in diffusing a knowledge of the arts of life. Society now is full of the application of scientific principles, from the mighty steam-ship that ploughs the deep, to the humblest operation in the mechanic arts. The effect of science has been to develop vast powers to be made subservient to man; and all which we taste or see or wear; all that promotes facility of intercourse, and all that diffuses comfort or luxury over the land, acknowledges its indebtedness to it. We cross the ocean by the aid of science; we climb the mountain-top by its aid; we ascend our mighty rivers, regardless of currents and winds by its aid; we invoke its aid in agriculture and in manufacture; we are applying its principles in every machine, in every vehicle, in every printing-press, in every article of apparel. To

use the language of one of the most eloquent men, and most distinguished statesmen of modern times. "The materials of wealth are in the earth, in the seas, and in their natural and unaided productions. Labour obtains them, works upon them, and fashions them to human use. Now, it has been the object of scientific art, or of the application of science to art, to increase this active agency, to augment its power, by creating millions of labourers in the form of automatic machines, all to be diligently employed, and kept at work by the force of natural powers. Spinning-machines, power-looms, and all the mechanical devices, acting, among other operatives, in the factories and workshops, are but so many labourers. They are usually called labour-saving machines, but it would be more just to call them labour-doing machines. When we look upon one of these, we behold a mute fellow-labourer, of immense power, of mathematical exactness, and of ever-during and unwearied effort. And while he is thus a most skilful and productive labourer, he is a non-consumer—at the least beyond wants of his mechanical being. He is not clamorous for food, raiment, or shelter, and makes no demands for the expenses of education. The eating and drinking, the reading and writing and clothes-wearing world, are benefited by the labours of these co-operatives in the same way as if Providence had created a race of giants, each one of whom, demanding no more for his support and consumption than a common labourer, should yet be able to perform the work of a hundred."*

3. Another more important tendency of science is, that it is to be one of many causes now in operation to break down the barriers between nations, and to re-unite the race in the bonds of one great brotherhood. Time has been, and the record of such times constitute almost all that we have of history, when the tendency of every thing was to separate

* Webster's second Speech on the Sub-Treasury Bill, delivered March 1838.

and isolate nations, with peculiar plans, customs, objects, pursuits.

Lands, intersected by a narrow frith,
 Abhorred each other. Mountains interposed,
 Made enemies of nations, who had else,
 Like kindred drops, been mingled into one.*

Alliances indeed have been formed, but they have been usually for conquest, or to resist combinations for conquest. Far distant nations have been blended, indeed, into one; but it has been when some Alexander, Pompey, or Cæsar, has subdued them by arms, and when the power of resistance had failed. But another sort of confederation; another species of brotherhood, awaits the nations of the earth. It is that which is to be made by science; by commerce; by a literature in which all the world shall partake; by modes of transmitting thought, when a valuable discovery on the banks of the Mississippi or the Hudson shall soon, as if connected by galvanic wires, exert an influence on the banks of the Ganges or the Senegal; and by the possession of the same pure religion, and the worship of the same God. To that science tends; and that is its ultimate goal or result. When Fulton first projected the steam-boat, he observed, in descanting on its advantages, in Paris, greatly to the amusement of his incredulous auditors, that he had serious hopes of propelling it at the rate of five or six miles an hour. This he anticipated on the peaceful waters of the Hudson. Now, on the waves of the ocean, regardless of currents and tides and head winds, the steam-ship makes its way from continent to continent; has already made us a near neighbour to our father-land; and almost annihilated the distance between continents separated by wide oceans. The arrival of the Sirius and the Great Western in our waters was an event celebrated with joy not less deep-felt, and not less appropriate, than the victories of Marathon and Leuctra; far

* Task, altered.

more than of Pharsalia, or even Waterloo, for it was an event pregnant with far more important and permanent consequences to the nations of the earth. Every steam-ship that ploughs the mighty ocean is an important agent in the hands of a wonder-working Providence to bind distant nations together; and is doing far more than all that philosophy had ever done to blend them into one. There is science making use of the magnetic needle; looking with unerring accuracy at the stars; triumphing over winds and waves; and directing civilized man to a distant land. There too may be science conveying a printing-press to some barbarous clime; bearing the telescope, the quadrant, the safety-lamp, the cotton-jenny, to some distant country; there, too, conveyed by the triumphs of science across the deep, may be the herald of salvation borne onward to tell the nations of a common Saviour, and a common heaven. China speaks of herself as "the celestial empire;" regards herself as seated in the centre of the earth, and as too pure to mingle with other nations. She built a massive wall all along her northern borders, and she succeeded in enclosing herself in her vast prison. But the steam-boat is on the way to China; and not her wall, not her edicts can long conceal the truth that she is inferior in science to other nations, or make her unwilling to open her gates and admit the foreigner there. The Turk, in his proud capitol, proud of his military prowess, of his conquests, of his harem, of his religion, separated himself from the other portions of mankind, and refused communion with them. But the steamboat has found its way to Stamboul, and now departs each week for Smyrna, for Alexandria, for Trebizond, for Odessa, for Marseilles—and the steamboat is connecting the Turkish capitol with the world; and the customs, and manners, and dress, and arts of Christian nations may already be seen in the capital of the Sultan. Not long since it was proclaimed as a prodigious advance in literature in our fatherland that the "schoolmaster was abroad," an idea which,

from the greediness with which it was caught up, seemed to have been original in the mouth of the late Lord Chancellor, though familiar here for two hundred years. But now, the declaration, "the steam-ship is abroad upon the waters," conveys a truth respecting far more important revolutions than any single cause has yet produced. So on the land. We have heard, perhaps, even to satiety, the declaration that "time and space are annihilated;" and we are in danger of forgetting the effect of rapid communication in binding the moral world together; in diffusing a pure religion all around the globe; and not least in cementing our own republic. About the year 1760, an advertisement appeared in a Philadelphia paper, which we can scarcely now help regarding as a mere matter of humour. It was of what was called a "flying-machine." What think you it was? It was a stage-coach that should go from that city to New York in three days. Franklin, one of the most sagacious of men, had such a foresight of the future prosperity of his country, that as one of the last wishes of his life he desired, if it were possible, that he might be permitted to re-visit his native land after the lapse of two hundred years. And yet even his sagacious vision fell far short of the reality. *He* expressed, as a serious matter, his belief that the time would come when the journey from Philadelphia to New York would be made in two days. Not fifty years have elapsed since the great philosopher died. Could he now re-appear; could he take his station on the banks of the beautiful Schuylkill, where, with adventurous hand he first drew a spark from the clouds, it is easy to imagine what would be *his* amazement at the flight, almost like the lightning which he was disarming, of the lengthened train of cars, with a strange power of locomotion, pouring the rich productions of the mighty west into the city where he dwelt.

4. Your patience would not allow me to dwell on one other of the tendencies of science of far more interest than any adverted to yet. Nor would it be right for me to ask

your attention while this should be done. It is the tendency which is observable in all science to become tributary to revelation, and to confirm the great historical facts and doctrines of the Christian religion. The effort to divorce Christianity from science was early made; and no small part of the exertions of the foes of our religion have been to show that the revelations of science are contrary to the professed revelations of God. Part have sought to do this by an argument from the splendid views of astronomy which in modern times have amazed the world; part have unrolled the record of the dynasties of China and Hindostan, and told us of the names and lives of kings, many cycles of ages before the accounts of Moses; part have gone and interrogated the crater of the volcano, and searched its hardened scorixæ, to make it tell of ages long before the Scripture account of the creation of man; part have searched the undoubted chronicles of past times, to make them tell a tale unlike the Bible; and part

“Drill and bore

The solid earth; and from the strata there
 Extract a register, by which we learn
 That he who made it, and revealed its date
 To Moses, was mistaken in its age.”*

It would not do to go into an examination now of the difficulties suggested, or to give the history of the long war between religion and science. They have been afraid of each other; and have often come into collision like opposing armies, or as impetuous torrents from opposite hills, meet, and dash, and foam in the vale below. The clergyman has been afraid to compare his views with the professor; and the devotee of science has felt, if he has not avowed it—and he has often avowed it—that he has been conducted to conclusions that are at war with the Bible. All that can now be done, and all that my purpose demands now, is a bare

reference to *the present aspect* of this unhappy warfare, and to the position which science and revelation mutually occupy. Of the objections drawn from the modern astronomy, it is enough to say, that they were demolished by Chalmers. Since the delivery of his celebrated "Astronomical Discourses" we have heard no more of the objection, and it will *not* probably be referred to by an intelligent infidel again. At one time, indeed, infidelity claimed that such stupendous plans as the Bible refers to, would not have been formed for a world so insignificant as is this. Now it is admitted that no argument can be derived from that against revelation, but that the simple and sole inquiry is, *what in fact God has done.*

At another time it was held, that the account of the origin of languages in the Bible was improbable and absurd; that the hundreds of languages and dialects on the earth could never have had a common origin, and that men could have never used the same forms of speech. There were some hundreds of languages, having, as it appeared, no affinity, no resemblance, no appearance of a common source. The account of the dispersion on the plains of Shinar was held to be ridiculous and improbable; and the book which contained such an account was held to be incredible. Without any reference to the divine origin of Christianity, this vast field of research was entered. Soon it was found, to the surprise of those who had entered on the investigation, that languages grouped themselves into families, and that the number became insensibly smaller. New affinities were discovered, and new classifications formed. The probability became stronger and stronger that there *might* have been a common origin. Sir William Jones supposed that he could trace all the languages of the world back to *three*, and subsequently it was found that science furnished strong presumption that originally there was but one. I can only give you in a word, the testimony of two distinguished scholars, neither of whom

entered on the investigation with any intention to confirm the authority of the Bible. The first is that of Klaproth. He makes no secret of his disbelief of the Mosaic history of the dispersion, and tells us that, like many other writings of Western Asia, he regards it as a mere fable. Yet he says that in his view, "the universal affinity of languages is placed in so strong a light, that it must be considered by all as completely demonstrated. This," says he, "does not appear explicable on any other hypothesis, than that of admitting *fragments of a primary language yet to exist* through all the languages of the old and new worlds." The other witness to which I refer is Herder, who also says that he regards the history of Babel as a "poetical fragment in the Oriental style," and who, therefore, had no partiality for revelation. Yet he says, as the result of his investigations, that "there is great probability that the human race, and language therewith, go back to one common stock, to a first man, and not to several dispersed in different parts of the world." His conclusions do not stop here. He confidently asserts that, from the examination of languages, the separation among mankind is shown to have been violent, not indeed that they voluntarily changed their language, but that they were rudely and suddenly divided from one another. —*Wiseman's Lectures*, pp. 69, 73.

At another time, the Christian world was alarmed at the boasted antiquity of the Indies. Astronomical tables were discovered that were believed to have been formed at least 3500 years before Christ, and it was claimed by Bailly that these must be fragments of an earlier and far more perfect science. The Christian world was alarmed, and infidelity began to sound a note of triumph. The result of this, I may state, in the language of Laplace—himself supposed to have no special respect for Christianity—but whose name is sufficient to settle a question of this kind. "The origin of astronomy," says he, "in Persia and India, is lost, as among all other nations, in the darkness of their ancient his-

tory. The Indian tables suppose a very advanced state of astronomy; *but there is every reason to believe that they can claim no very high antiquity.*" He then proceeds to a detailed examination of the point whether the observations supposed by the Indian tables were ever actually made, and concludes that those tables were not grounded on any true observation, *because the conjunction which they suppose could not have taken place.*—*Wiseman's Lectures*, p. 237. The objection of infidelity from those astronomical tables has been silenced, and will not be heard again.

Simultaneously with this supposed difficulty, arose one from the historical records of China and of India. The names of long lines of kings were displayed; accounts of dynasties were furnished extending back millions of ages; and it was supposed here that an objection was started to the Mosaic narrative which would be fatal. Again infidelity triumphed, and the friends of Christianity became alarmed. Yet the result here has been the same. That result is before the world; and the world—infidel and Christian—now acquiesces in the conclusion drawn by the laborious investigations of Sir William Jones, that on the most liberal construction, the existence of an established government in the East can be traced back no farther than 2000 years before the Christian era, the age of Abraham, when there was already an established dynasty in Egypt, and commerce and literature were flourishing in Phœnicia. The Oriental nations have, therefore, taken their appropriate place in the history of the world; and the objection has died away, to be heard no more.

Once more the Christian world was to be alarmed, and once more the note of triumph was to be heard for a while from infidelity. The materials for the new argument which infidelity constructed were found in Egypt. "Volney had no hesitation in placing the formation of the sacerdotal colleges in Egypt, 13,300 years before Christ, and calling that the second period of their history."—*Recherches*, vol. ii. p. 440.

For the antiquity of Egypt, infidelity appealed to the huge and half-buried colossal images; to the subterranean temples; to the astronomical remains; and to the hieroglyphic legends of that wonderful country. In particular, an appeal was made to the zodiacs found at Dendera and Esneh, which were supposed to represent the state of the heavens at the time in which the temples where they were found were erected, and which indicated a very remote antiquity. At this period God raised up Champollion. He taught the world to read the hieroglyphics on the obelisks, the tombs, the temples of Egypt. That language long unknown, and whose meaning it was supposed was forgotten for ever, now disclosed the fact that the celebrated zodiacs extended no farther back than the time of Nero or Tiberius. On one of the zodiacs he read the name of Tiberius, and on the other the name which Nero takes on his Egyptian medals. The objection from the zodiacs, the pyramids, the tombs, and the inscriptions of Egypt, lost their power for ever when Champollion told the world how to read the inscription on the Rosetta stone. The objections from the antiquity of India and China; from the diversity of languages, and from the difference of complexion of nations, have thus died away. Science started these objections; science solved them. The scientific world pursued these inquiries as mere matters of investigation; infidelity seized upon the results to give alarm; and again science, of its own accord, removed the difficulty.

There remains but one point on which the warfare is now maintained. It is on geology. A weapon is occasionally thrown from that science against the strong hold of the Christian faith—the last weapon in the hand of infidelity, like that in the hand of Priam,

Telum imbelli sine ictu.

Æn. 11, 554.

In that science, system has risen against system, like the

moving pillars of the desert advancing in threatening array; but, like them, they have been fabrics of sand. In 1806 the French Institute counted more than eighty such theories hostile to Scripture history, not one of which has stood to the present time. Meantime, amidst all the advances in that science; all that has been said, or thought, or done, one fact is remarkable. The geologist proves that the world has stood many thousands of years, and we cannot deny it. He points to fossil remains, and tells us of orders of animals that lived many ages before the Mosaic period of the creation of man. The Bible tells us that **MAN** was created about six thousand years ago. Now, the material fact is, that amidst all the fossil remains of the geologist, and all the records of past times, there is no proof that *man* has lived longer than that period; but there is abundant proof to the contrary. Amidst all on which the geologist relies to demonstrate the existence of animals prior to the Mosaic account of the creation, he has not presented us with *one human bone*, or with one indication of the existence of man. Other fossil remains, other bones he has disinterred in abundance; but not one that belonged to the human species. So on all coins, medals, historical records, cities, monuments. There are no historical records that go back to such ancient times. There are no monuments of unknown cities; no tombs, no mausoleums that bespeak the existence of man amidst the fossil remains of extinct orders of animals. We wander in the past among decaying ruins. We are amidst broken arches, pillars, tombs. We look upon the splendid Coliseum; the mighty pyramid; the falling tower; the ivy-bound column; the ruined temple: we brush the dust from ancient inscriptions, and decipher these solemn records, and make the past generations speak out amidst their silent monuments; and there is not a solitary voice that disputes the record of the Jewish historian about the recent origin of man, or that points to a time when he lived anterior to the bliss of Eden.*

* Comp. Lyell's Geology, vol. ii. pp. 156, 157. Edit. Phil. 1837.

At the interesting period of the world, therefore, in which we live, the friends of science and of revelation have equal cause to congratulate themselves and each other. The great battles have been fought. The human intellect is bowing before the authority of revelation. And could the mighty dead who have carried the achievements of science farthest, pass before us this day, they would come, in the main, profoundly bowing before the authority of Christianity. There would be seen Newton, "placed by common consent at the head of the race," laying all his honours at its feet. There Locke, having explored the deepest recesses of the human mind, and taught its laws, as Newton did the laws of the heavens, in like manner would be seen bowing to the authority of revelation. There Bacon, the father of the inductive philosophy; the man on whose principles Brahe, and Kepler, and Newton, and Laplace have acted, and who has given form to all modern science, comes with this impressive apothegm on his lips: "A little philosophy inclineth a man to atheism; but depth in philosophy bringeth men's minds about to religion; for while the mind of man looketh upon second causes scattered, it may sometimes rest in them, and go no farther; but when it beholdeth the chain of them confederate and linked together, it must needs fly to Providence and Deity."* There would be seen Hale, learned in the law, adorning the Christian profession by a most humble life; and there Davy, advancing at the head of chemical science; and there Cuvier, who has given a new form and impulse to the investigation of fossil remains, coming with the result of all that profound investigation, and contributing all these results to confirm the Bible. These are the lights of men—bright suns that spread their beams over all the firmament of science. Science and religion are two mighty and majestic rivers. Long indeed have they flowed asunder. They have traversed different regions, and have brought

* Essays, Civil and Moral.

down fertilizing influences like gold, from far distant lands. Now they meet—not in angry floods; nor to dash and foam and strew the world with ruins—but they mingle their waters gently in one broad stream that flows forth with majestic volume to enrich and bless the world.

In addressing for a moment those who are about to leave these college halls, and to take their part in the great duties of life, permit me to say, though I have already detained you long, that you enter on life under extraordinary advantages. You start on your way with all the benefits of the labours, the travels, the profound thinking, the patient sufferings, the brilliant thoughts, the eloquence, the patriotism of all past times. You begin where those whom the world loves to remember and to immortalize, left off. You begin with the best thoughts of the most profound men on government, science, religion and laws, as the elements on which you are to act. You begin with the mariner's compass, the quadrant, the printing-press, the blow-pipe, the telescope, as the instruments by which you may carry forward the triumphs of science, of literature, and of art. You are acting on the results, and reaping the benefit of all the experience of the past. You gather the fruits of all the self-denials and the sacrifices; the profound studies; the skilful inventions, and the sufferings of past times. Every happy discovery; every useful invention; every improvement of the past, has contributed its part to the refinement and intelligence of the age in which you live. There has not been a philosopher who has not thought for you; not a traveller who has not travelled for you; not a defender of human rights who has not bled for you; not a profound student who has not contributed something to the general mass of knowledge which now blesses your condition; and not a martyr who has not died to establish the religion whose smiles and sunshine you now enjoy. "Other men have laboured, and you enter into their labours." For you—if you will have it so—Plato and Bacon lived; for you Galileo

invented the telescope; Godfrey the quadrant; Gioia of Amalfi discovered the properties of the magnet, and Fulton perfected the steam engine; for you Newton and Kepler, and Herschell watched the stars of night; for you Columbus discovered the new world; for you Washington and Lafayette fought the battles of freedom; for you Hancock, and Henry, and Ames, and Adams, roused the nation to liberty; and for you John Marshall lived to explain the great principles of the constitution. What an inheritance—rich above the wealth of Cræsus, and honourable above all that coronets or crowns could give! And what a trust is about to be committed to your hands! All in liberty, in science, in religion, and in law that is valuable, is to be entrusted to you:—to *you*, to defend, to improve, to perfect, to transmit to future times.

Be not disheartened as if nothing remained for you to accomplish. The field is not yet half explored. Man has done much, and we owe to past generations great gratitude for what has been done. But the young man who enters this great field in any of its departments at this period of the world, need not be discouraged, as if all were done; nor need he sit down and weep, as Alexander did on the throne of the world, because there are no other worlds to conquer. In every field of scientific research there remains enough to fill the highest measure of ambition, or to gratify the highest love of investigation. In the science of astronomy, how little, comparatively, do we know. We have named a small portion of the stars; we have determined the distances of the worlds that compose the system to which we belong; we have measured their periods; we have even succeeded, after ages of unsuccessful effort, to determine the parallax of one—and but one—fixed star.* But how little is known of those distant worlds! How little that may be known! For who can tell what more perfect instruments; what more patient observation; what more profound thought, may yet determine in respect to that magnificent array of systems,

that shall be useful to man, and that shall fill him with more elevated views of God! In the sciences of chemistry, of geology, of anatomy, of pure mathematics; in the sciences of morals, of government, of law; in the application of science to the arts; I will add, in the science of theology, how much remains yet to be discovered! Remember the modest and beautiful declaration of the aged Newton. "I do not know what I may appear to the world; but to myself, I seem to have been only like a boy playing on the seashore, and diverting myself in now and then finding a smoother pebble or a prettier shell than ordinary, while the great ocean of truth lay all undiscovered before me."*—A few shells have been picked up since his time, but the great ocean of truth remains still unexplored.

What remains to be done is this. The truths of science and of revelation are to be explored and borne forward together. The one is to be allowed to throw light on the other. The war between them we trust is over, and the great principle—a principle worth all which it has cost to establish it—is settled, that the one will not conflict with the other. This principle is *so* settled that we are not to feel alarm in regard to any future discoveries. If Newton, if Locke, if Laplace, if Cuvier, if Davy; if—to speak of different men—if Volney, if Voltaire, if Gibbon, if Hume, have found nothing in science, in history, in philosophy, that conflicts with revelation, it may be assumed that no discoveries will ever be made in which the one shall be inconsistent with the other. The principle is settled that the truths taught by revelation do not conflict with those taught by science. They are to those of science what the facts disclosed by the telescope are to those discovered by the naked eye. Survey at night, with the telescope of highest power, the distant heavens. You see new worlds, and new glories. But the laws of vision and of motion there conflict with

* Brewster's Life of Newton, pp. 300, 301.

none of those that pertain to the discoveries of the naked eye. So in revelation. The Bible has opened the eye on distant worlds. It has disclosed truths above the discovery of unaided reason, *as* sublime as the revelations by the telescope are above those made by the unaided eye. Men were startled at these truths just as they were at the disclosures of the glass, and it was long before science *came up with them*, and saw that they were not in conflict with what man otherwise knew. This work done, what a field is before us! How inviting! How rich, and full! How ample the reward of discovery!

Will it be deemed improper on this occasion if my closing remark should pertain more directly to the studies to which I have devoted my life, but in which we have a common interest. I mean the study of the Bible. I will not forget that Newton, having disclosed the wonders of the heavens to man, sat down *then* with augmented interest to study the Bible; nor will I forget that the best days of Bacon and Locke were devoted to the study of the word of God. I will not forget that the same God that formed this wondrous universe gave to man the Bible as a light in regions where science could not conduct him. In that book, as in nature, all is vigorous, and fresh, and instinct with life. It is a fountain ever-flowing and health-giving; and the streams that issue thence create a rich verdure where they flow. In the world of literature and science, they are like the streams that flow along the parched deserts of the East. There, the channel of a river or a rivulet can be traced afar by the trees, and shrubs, and flowers, and grass that spring up on its bank, and that are sustained by it in its course—a long waving line of green in the waste of sands. Where the stream winds along, that line of green winds along; where it expands, that expands; where it dies away or is lost in the sand, that disappears. So with the truths brought out by the investigations of the Bible. Their course can be traced along in a world in many respects not unlike the pathless sands of



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as the stream can be traced in the solitudes and
the East. From this river of life, no less than
Mountains of nature, let the student of all coming
quench his thirst. Let him climb the hill of Calvary,
the heights of Parnassus; and though he linger
at the Castalian fount, let him also drink deep of

Siloah's brook that flows
Fast by the oracle of God

THE END.

