

## PROGRESS IN SCIENCE.

JOHN B. MECHAM, JOLIET, ILLINOIS.

### PART I.

We live in an age of progress, a time when old creeds, old dogmas and false theories are giving way to the light of truth; the veil of darkness is gradually lifting and man is now favored as never before by having some really accurate notions of the world in which he dwells. Thus, as the search for truth advances, the plane of civilization is raised. In the words of the wise old saying, "Today is better than yesterday; tomorrow will be better than today."

Professor John Dewey once said, "The future of our civilization depends upon the widening spread and deepening hold of the scientific habit of mind." The work of discovery has been going on from year to year until now it is said that we have eighty-eight known chemical elements, and these are the outcome of an organic evolution. Science has no equal in the revelation of knowledge in the world and it is progressing in spite of anything man may place in its way, for it is following nature's law.

How futile to oppose it. It would be as reasonable to attempt to turn back the tide as to try to change its course in its onward march. Truth is what the world needs and the working of the principle of evolution is nature's method of revealing the truth. The highest ambition of the scientist is to help make known the truth. Surely, searching for knowledge is no crime at the present day, for it truthfully may be said that the object of science is to discover and proclaim in truth and in fact the phenomena of the cosmos, thereby resulting in blessings to the inhabitants of the earth.

Thanks to the age of freedom of thought the days of Bruno are gone. The days of Galileo are also gone. Even he, after having been compelled to admit against his better reason and judgment the statement which he did not believe, and after placing his name on the dotted line exclaimed, "Epur si muove" (the earth) "still it does move." But while we note with satisfaction the advance science is

making, let us not forget that even to this day the three hundred years conflict for intellectual freedom against ignorance and superstition, which began in the days of those intellectual giants Bacon, Des Cartes and Galileo, has not entirely closed. It has been a conflict against ignorance, tradition and vested rights. "One of the most dangerous pieces of legislation ever passed," said Reverend Shailer Mathews, "is the Tennessee law prohibiting instruction of the evolutionary theory of man's origin." Following the action of Tennessee, observe the trend in Mississippi, Georgia, Oklahoma and elsewhere. Doubt not that our national legislature at Washington may yet be appealed to by anti-evolutionists. Has it come to this? Are we going back to the dark ages? Are people to be robbed of their birthright to do their own thinking?

To some people the name science has an alarming sound. The very utterance of the word causes them to have serious forebodings; they seem to think that something terrible is going to happen when the name science is mentioned. Some people have become so much disturbed upon hearing of new discoveries that they appear to fear that the scientist will, through the disintegration of the atom, start a conflagration that will explode this old earth of ours. They have doubtless come honestly by such belief, never having acquainted themselves with the mission that science is performing in the world. The evidences are all around them and still they fail to observe them. Are they getting nearer the truth when they shut their eyes and close their ears to the book of nature and declare that those who read from nature and nature's laws are wrong? Is the man who delves into the bowels of the earth and brings forth evidences of its age to be scourged for his efforts simply because he arrives at conclusions that differ from those who shut the book and will not read? He who points his telescope towards the stars in search of worlds unknown, who strives with earnest zeal to bring a little nearer the solution of the mystic deep, perchance to discover a world of beings not unlike himself—is not his work worthy of recognition and praise? He who plods with unfaltering tread in search of truth through the fields of the great unknown, making discoveries by the use of the spectroscope that are adding

to the plane of knowledge, resulting in benefits and happiness to the human race, is he to be scorned because he cannot accept the dictum of him who has steeled his mind against investigation and proof of nature's yet unsolved problems? Are the scoffers of science any more certain that they are right in their assumed position regarding the origin of men simply because they have read the Book of books and have placed their own interpretation thereon than their neighbor who is likewise familiar with the same great record and has an interpretation that differs from theirs? If both are candid, fairminded, intelligent and sincere, imbued with the desire to know the truth, one should have the same right to his interpretation as the other.

Mr. Donald A. Laird in the columns of *Life* gave the repartee which passed between the Bishop and Mr. Huxley. The Bishop, turning to Huxley with smiling insolence, begged to know whether it was through his grandfather or his grandmother that he claimed his descent from the monkey. Mr. Huxley, calmly and deliberately rising, replied that he was not ashamed of having a monkey for an ancestor but he would be ashamed to be connected with a man who used great gifts to obscure the truth. The cut was deep; the effect was tremendous; the Bishop said no more.

However, a brighter day for the natural sciences has dawned and they are coming into their own, and while as much cannot be said for the social sciences, hope lies in intelligence for the future. The old ways have been tried and found wanting.

When this old earth, called the "geocentric sphere of the universe," became a wandering planet circling around a central sun, the cause of truth advanced to higher ground. All attempts since 1450 A. D. to enslave the world either physically, mentally or spiritually have ended in failure.

The human race will be advancing toward true culture and greatness when with sober thought and sincerity of purpose it takes courage to question all things, weigh all things, prove all things, making knowledge and understanding seasoned with love for fellow man the foundation upon which to build a higher, a better and a more advanced civilization.

We live in an ever changing world. The changes resulting from recent discoveries are so great that the rank and file of people are not ready to receive them. The leaders in science and investigation have made too rapid strides for the people. The great discoveries of radio activity, whereby the music of the spheres has been harnessed by the hand of man resulting in sweetest harmonies that charm the world, the X-rays, the divisibility of the atom, the discovery of the electron, have swept the multitude off their feet. The explorations of the physicists and chemists in the world of atoms and molecules, electrons and protons have been crowned with miraculous triumph in the modern fields of science. The harnessing of electrons i. e. causing them to flow through wires as an electric current whereby lamps are lighted, engines propelled, cars run, factories operated and great systems of transportation carried on are among the marvels of the age that have been wrought by scientists and all for the convenience, advancement and betterment of the human race. A most important phase of scientific investigation of the material universe came with the discovery of radium in 1898, a new property of matter.

No idea has been so powerful in the fashioning of knowledge as the simple but profound thought of evolution that the past is the parent of the present, and the present the parent of the future. Evolution has influenced all the sciences forcing its devotees to think of everything as with a history behind it.

The solar system, the earth, the great cordilleras and the mighty ocean, the rocks, the crystals, the fauna and the flora, even man himself, all must be seen and recognized as the outcome of a long process of development.

The spectroscope, that most wonderful instrument with which the scientist is able to solve many of the questions pertaining to the stellar world, that but a few years ago were unsolved, to it we owe our knowledge of the composition of the sun and stars. It is said that the spectroscope will detect the millionth part of a milligram of matter and still the limit is not reached, that it will detect the nature of the forms of matter trillions of miles away and that it will measure the velocity with which these forms of



matter are moving with slight variation. Must we not confess, as has been said, that it is the greatest instrument ever devised by the brain and hand of man.

Science teaches that things came through a logical order; that there is a controlling power and that this power controls all things; call it God or what you will, that this power has often been misunderstood and that science is striving for the truth. "Seek the truth and the truth shall make you free" is a most salutary doctrine for both science and religion.

The scientist does not claim to know whether the universe is finite or infinite, temporal or eternal and he makes no claim where there are no facts to warrant him. So far as is known in science today there is no evidence of spontaneous generation.

The scientist having divorced nature from chance, it follows as a logical sequence that nature's order of procedure is not to be turned and twisted to suit the whims, fancies and prejudices of man, but rather its course appears immutable, unchangeable despite the false theories of men.

Although man is but an infinitesimal part of that vast world, still it appears that he is endowed with a mind and a capacity that raises him to a station far above all other sublimary creatures. It behooves man therefore, as an intellectual human being to try to form true conceptions of the diversity of the things that go to make up the great system of nature's complexity.

The true scientist will not go so far as to assert that such has always been the case nor will he dogmatise that so and so is the only way, but when he is asked to concede that such always has been the case and the only way, he has a right to weigh the proof.

But I shall not carry these suggestions further; it is not my purpose on this occasion in the few minutes allotted to discuss the science of government nor the conflict of the age-old question, science and the Bible, but I will express my conclusions in these few words, that I believe there is no conflict when rightly understood and that hope rises in the belief that this is gradually becoming recognized.

## PART II.

What I shall offer concerns recent discoveries in the field of one of the oldest, most wonderful and at the same time most progressive of the sciences pursued by man. The field of its operations is so vast and its discoveries so astounding that the intellect is almost lost in wonder when it sweeps forth into space to view an infinitesimal fraction of the vast universe.

Viewing the subject on broad lines, I shall refer to a recent discovery of scientific research in this all-absorbing subject which leads beyond the universe in which we live.

The data that has been taken, the discoveries that have been made, come from authority sufficiently eminent to dispel any doubts that another galaxy, another universe has been sighted.

I now call your attention to an aerial tour which you are invited to take with me through the most stupendous route ever taken by man into the depths of space to catch a glimpse of the discovery in astronomical science recently taken through the great one hundred inch reflector located at Mount Wilson, the largest telescope in the world.

Dr. Edwin Hubble of Mount Wilson recently pushed out the limits beyond our universe and brought a little nearer the mysteries in endless space of the great heavenly objects, among others the great spiral nebulae. I may say before starting on our trip that it is said this wonder of wonders, as it may be described, appears like a luminous haze or cloud in the sky with numerous faint stars appearing at the outer edge, located from earth's viewpoint in the constellation Andromeda.

Our journey will be somewhat extended although deep with interest all the way but I warn you that we shall travel at a rate of speed that may chill your circulatory system owing to the rarification of the ethereal air through which we shall pass, and remind you that a life insurance policy payable to your wife may be in order, for there is a rule in law that after an absence of seven years, death is presumed. However, let no one be alarmed for I guarantee that we shall return safely, which is more than the men who propose visiting the moon are able to offer at present.

First, you will think of the solar system with its sublimity and beauty, eight planets revolving round a central sun, that great body, the source of light and heat with a diameter of 865,000 miles. If its rays were withheld for one month from the earth, it is said, life thereon would cease. That monarch of the sky lies bathed in an azure blue, bespangled with diamonds whose beauty and brilliance transcends the genius of man to describe. No wonder that the great composer of harmony was inspired to write "The Heavens are telling the Glory of God." Throw open the windows of your imagination, for it will do you no harm to lay aside thoughts of business and let your minds roam for a while through the fathomless depths of immensity's realm.

You have not had an opportunity of taking just such a trip as this perhaps and to all that is passing I shall ask your close attention.

Moving out from the central orb, old sol, we pass the first, the smallest and nearest neighbor, planet Mercury which is thirty-six million miles away, taking three and one-half minutes to reach.

Lead on and salute with a smile bright Venus, the Goddess of Love and Beauty, whose distance is sixty-seven million miles from our central sun and whose beauty we so often behold as morning or evening star, and which, like Mercury, sometimes passes in transit because it lies within the earth's ecliptic.

We are now passing old earth on our right, ninety three million miles distant from our starting point, taking eight minutes to reach, which was once supposed to be the center of the universe, to doubt which brought on a controversy that lasted long and serious, leading on to far off Mars, the God of War, which revolves around the sun in six hundred eighty-seven days, with its two moons discovered in 1877, the planet that on the 22nd of August, 1924, approached within thirty-five million miles of our earth at perihelion and which was viewed by astronomers with great satisfaction, the nearest it will be for 120 years. We shall ski through her canals and prove whether or not Lowell might have said a world peopled with beings not unlike ourselves, although our latest authority doubts the

probability. Here, glance back to earth which we passed but 14 minutes ago and observe that she appears like a faint star in the distance. Does your mind grasp the thought of the grand panorama wherein millions of worlds like streams of light are moving before you with lightning speed and brilliance unsurpassed?

Keep your imagination working; we are moving now with lightning speed. Continue the long and bumpy road, stopping a moment to view the remains of a once supposed wandering world, often looked for but never found, fragments of which were called the asteroids, goddesses familiar to Homer in his day. Modern research tells us that they are not the remains of a planet, but rather scattered meteoric material which was prevented from becoming consolidated into a single world by the attraction of the giant wanderer in the solar system. Advance, paying our respects to the largest known planet, old Jupiter, nearly thirteen hundred times larger than our earth, with his nine satellites, where moonlight never fails to light the pathway of the mythological god of power, and hear his thunder bolts as they roll away and make the very heavens tremble.

It is interesting to note that the outer moons of Jupiter revolve around the planet in the reverse order to other moons, and it was the discovery of the moons of Jupiter by Galileo, January 7, 1610, that solved the perplexing question and proved the theory that the earth and other planets revolve around the sun, a boon that science has bestowed upon the human race, proving that the sun and not the earth was the center of the solar system, the reverse of which had been held for 2000 years.

Here lead on to distant Saturn with her eight moons and her three ring circles. Pluck off one of these rings composed of meteoric iron and stone to lay a track to Uranus. Saturn with her rings appears as one of the most interesting of the planets. Work fast for she revolves on her axis once in ten hours, thus making the hours for labor very short. We are now about 480 million miles from our starting point and approaching the once outward rim of the solar system; here ponder a moment, wondering what lies beyond for it was here that science paused and pondered for many years whether or not any other planet lay beyond.



The irregularities in the motion of Uranus led Leverier to suspect that another planet existed outside of Uranus. Resuming our journey, we are now traveling on that almost endless trail, tired, silent and discouraged when someone shouts: "Look out there! Be Careful!" There comes a comet headed straight for the sun, a molten mass like a million rockets, seething and hissing with lightning speed as we pass through its tail. Were we back on earth we would call it a meteor shower. Baade's comet was a strange phenomenon which was headed from the sun, which is contrary to the observed law of comets, and nobody as yet knows why. Newton's laws of motion were almost overcome.

Advancing, we are hopeful that the last far off wanderer will be reached. Galle of Berlin University was rewarded for his search, for Neptune was discovered the 23rd of September, 1846. A peculiar thing about Neptune is that it revolves upon its axis from east to west, just the reverse of the other planets and takes 165 years to revolve around the sun. We shall take ample time to warm ourselves and plenty of rations, for the journey that now awaits us is long and winding and dark and would be dreary but for the way leading into the galaxy of stars which lie before us and through which we must pass as the night of space rolls on, remembering that the distance we have gone is but the radius of that heliocentric system for belief in which men suffered and died. Dr. Shapley of Harvard College estimates that the group of stars which astronomers call the galaxy is about 300,000 light years from side to side, a light year being the distance light travels in one year at the rate of 186,000 miles per second, a distance of 6 billion miles, but hold your estimates a little longer.

Resuming our journey we are now about to take a leap into the dark; we have gone two billion seven hundred ninety-two million miles and our brilliant old sun has faded into a dim, distant star, while dear old earth has long since vanished from sight. We are now to venture into a region where we shall have no longer clear lights to guide us. We now bid "goodbye" to moons and planets and are going out to roam among the suns of the stellar world. Tremendous as are the distances of the solar system, the widest sweep of the planetary orbits sink into insignificance compared

with the distances which separate from us even the nearest fixed star. Buckle up your belt, take up the slack, for the absolute cold of 458 degrees Fahrenheit through which we have passed has had a tendency to reduce your weight, turn on the power and let her go, forsaking the horns of Neptune, for he, even he, is yet relatively near our starting point. Pass on and out into the stellar world where all is dark and few travelers have been, to whose expanse the distance now traveled is, in comparison, just begun. Go on and on and on; go on; forget that we have passed Alpha Centaura, the nearest fixed star, more than twenty-five trillion miles from our starting point as onwards we pass along the glittering road where diamonds are falling and fading from sight. We have passed the confines of Vega, Capella, Canopus, Betelgeuse and the horns of Orion. Betelgeuse leaped into prominence in 1920 when Michelson measured its diameter which he estimated to be more than two hundred million miles, and it is stated that its size has probably been under-estimated. Recently it has been exceeded by Myra whose diameter is now thought by Michelson to be 250 million miles. Lend one thought to these mighty distances. Even these, however, are exceeded by Antares the largest star known to astronomy which is estimated to have a diameter of four hundred million miles and whose brightness is estimated at 5000 times the brightness of our sun. Does it seem like wisdom for the opponents of science to deny the unveiling of the wonders of the universe to the youth of the land and place an age limit of it all at 6000 years? Such a claim becomes an insult to human reason and intelligence. How wonderful are the works of Deity. Continue the magic flight until we have pierced and passed the star clusters, the nebulae, the star dust out of which it is believed worlds are formed, yea, the Magellanic clouds and the great white way consisting of myriads of suns many of which are moving at the rate of 200 miles per second encircling the heavens whose diminishing incandescent gleam shall have faded into night, and remember that we have even now but reached a fractional part, the one-fourth part of that vast expanse we yet must pass to come within a glinting gleam of that yet unexplored universe to which light in its travels to reach, moving at the

enormous speed of one hundred eighty-six thousand three hundred miles per second, would require more than one million years to span. Immensity, infinity itself—wake up men! Wake up! Old earth is vanished from sight. Our sun's lost in the fathomless deep; our stars are faded into night. We have nothing left but ourselves and space, even time is forgotten and gone; Einstein's Theory is but theory after all; the faint star cloud, the last cluster to pass, has now faded into night. And so it is! It must be true for all have fallen fast asleep while here I sit steering this car through endless space, a distant universe to find.

Roll on, thou deep and dark ocean of space, with speed of thought roll on. Roll on while the stars, the suns, and the galaxies have faded into night, while the dream comes over us that all is lost—but see! A gleam of hope! Another world is coming into view. Like a fleecy cloud she comes! She comes with lightning flash. She comes to view; behold a star; behold, a sun; behold, a myriad of suns; behold, an island universe (?)— and so it is!

Out there, above, below, beyond, outstretched a boundless universe. Far as the unpierced depths that limit swift imagination's flight, unending orbs are mingled in mazy motions, immutably fulfilling eternal nature's laws in a wilderness of perfect harmony. Eureka is our reward, for here we pass the outward portal of this new universe. All honor to Hubble who hath led us on. We shall soon be there for now the brakes are closing down, we have reached the first lap of our journey, the object of our tour and the name of this unexplored universe, the great spiral nebulae, no longer peering through the constellation, Andromeda, but shining in all its refulgence and beauty.

I have brought you here and have dealt with this subject, not as idle speculation, but rather to afford a little recreation for men of thought, and some suggestion of the immensity of the universe in which we live, through which we came. The thought of Deity was greater, nobler and wiser than to leave the destiny of cosmos to the narrow whims and prejudices against His laws and handiwork for, it is now believed outside, beyond, around and above all that we know or see, there are other suns and worlds and systems. Yea, even so like this, a universe we now behold

transcending in distance anything hitherto known to the mind of man. And now as we wait a moment, may we not query that if we had the great reflector with which to make the observation, would not our own galaxy of stars from whence we came appear not unlike the great nebulae that we have traveled so far to reach? I should like to pause and ponder with you the transcendent beauties of this vast universe and to roam at will through endless space, but I promised you that we would return and in view of the fact that the way is long and air craft slow, I shall take you back, not in the same way, not at the same speed at which we came, but with the speed of thought which has safely brought us here and will safely take us back to our native planet and without stopping along the road to gather the gems that have strewn our pathway. The next station will be dear old earth and here we are, all out, safe and sound. We have been gone more than one million years, have traveled twelve quintrillion miles. What the next era shall bring we know not. We are lost in wonder and only may say turn on the lights and let the flame of intellectual freedom burn that it may lead mankind to a higher and nobler station than he has yet attained. Let the truth be made known to all people until the dross of ignorance and superstition are purged and burned away.