

"I BELIEVE IN EVOLUTION—AND IN GOD"

The Law of Growth Will Attain Its Full Glory in the Life Beyond.

Blind Credence the Church's Foe

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There are two views of the creation of man. One is that God created man, completely furnished, physically, mentally, morally and spiritually, like the heathen legend of Minerva springing full-armed from the brain of Jupiter. The other is that his creation was a gradual instead of an instantaneous process, starting from a far lower form of animal life, slowly increasing in intelligence and in his physical, moral and spiritual nature until he reached his present state.

This last view may be likened to the creation and development of the telephone by Graham Bell, in our own day. It has been a gradual evolution. Even today it has not yet reached its full development. Every day adds new marvels. Nor has man yet reached his full development. For myself, I believe that man himself will only attain his final development in the future life beyond the grave. In that wondrous life I believe as fully as I do in my own present existence.

Do I also believe in evolution? Most assuredly. And for the very best of reasons, viz: that I see the evidence of it all around me every day. Even in my own lifetime I have seen a wonderful evolution in vegetables, in fruit, in flowers—compare the original wild rose of my boyhood, with its ring of only five petals, with an American Beauty rose—in pigeons and chickens, in the dog, the cow and the horse. The chronology of Archbishop Usher, who lived three centuries ago (1581-1656), when paleontology, geology, anthropology, philology, chemistry and the spectroscopy were in their infancy or even did not exist, is a made addition to the Bible which has no business to be there. To fix 4004 B. C. as the date of the creation is not only untrue, but has worked immense harm.

Dr. Schlesinger, the professor of astronomy at Yale, says that "many of the stars . . . are so distant that it takes more than a million years for their light (traveling at the rate of 186,000 miles a second) to reach us, and it is probable that some of them may require five million years or even more." He adds that there is "good evidence that the age of the earth must be reckoned, not in mere millions, but in billions of years."

In geologic times we have discovered one link after another which nearly fill the gap between the anthropoid apes and the lowest human being. The attitude of the church, and especially of the clergy, toward science and toward the origin of man is of incalculable importance. Darwin's "Origin of Species" was published in 1859, the year when I graduated at Brown university. The recrudescence of the warfare over evolution, which for many years had subsided and almost disappeared, except sporadically, is a strange phenomenon. The illogical and futile attacks upon science by some of the mis-called fundamentalists, and an illogical and even absurd attempt to prove that the Bible contains and anticipated the discoveries of modern science, are doing immense harm to religion. There is serious danger if present tendencies triumph that intelligent people—those who eventually mold the thought of the world—will be alienated from the church and finally driven out of it. It is not without deplorable significance that Lord Bryce, in his "Modern Democracies" (Vol. 2, page 328) states that in Argentina and Brazil "Men of the educated class have practically dropped Christianity."

The Bible is a textbook of religion, and not a textbook of science. Like our common speech of today, its language is popular, not technical. Sage and way-faring men alike find in it guidance and gospel, the good news of an immortal life through our Lord Jesus Christ. The "impregnable rock of holy scripture" and the impregnable rocks of the geologist are equally God's handiwork, and, rightly interpreted, must agree.

I have been a student and teacher of anatomy and surgery since 1860, a period of 62 years. I have diligently striven to know these two subjects as thoroughly as possible, and have written hundreds of papers and some books, in which I have set forth this knowledge.

On the other hand, I am a firm believer in Christianity. I follow, very faithfully, it is true, in the footsteps of my beloved Master and adore him as my divine Savior. In him are all my hopes for the future.

As a Christian man I find no difficulty whatever in believing absolutely in evolution and also absolutely in revelation.

Let me now point to facts—not theories, but facts which demonstrate this unity of the animal kingdom, including man.

Let me relate some operations I have done on the human brain. The brain in animals, including man, consists in a general way of (a) the cerebrum; (b) the cerebellum; (c) the spinal cord and (d) certain structures which bind these three together. Extend the fingers straight forward. The fingers then resemble the "convolutions" on the surface of the brain; the furrows between them resemble the "fissures" between the convolutions of the brain. The principal fissures between the convolutions are similar in man and animals.

In the convolutions on the surface of the brain are certain small aggregations of motor nerve cells in the gray matter called "motor centers." On being stimulated by an electric current these cells produce motion, each center in one definite portion of the body, and never in any other part. These motor centers are all grouped around the fissure of Rolando, which runs obliquely downward and forward above the ear. This and another

deep furrow called the fissure of Sylvius are always readily identified in the lower animals. The motor centers for movements of the leg, arm, face, fingers, etc., in the brains of the lower animals, up to the anthropoid ape, have been exactly mapped out by experiments on animals. In the human brain the location of the corresponding motor centers is a duplicate of those in the brains of animals. Let me relate some striking cases to confirm this statement.

A young woman with epilepsy, in whom the attacks were constantly increasing in frequency and violence, insisted that her attacks always began in her left thumb, then spread to the hand, then to the arm, followed by unconsciousness and violent convulsions all over the body. Careful observation for two weeks in hospital confirmed her statements that the fits always did begin in this left thumb. If, then, I could prevent the fit from beginning in this thumb, so I reasoned, it might be that I could prevent the entire attack. Just as, in a row of bricks standing on end, if I can prevent the first one from falling none of the others will fall.

The possibility of the exact localization of the little cube of gray matter on the surface of the brain dominating all the muscles of the thumb was the key to the whole operation. This localization of the thumb center had been made absolute by experiments on the brains of animals. Accordingly, I opened her skull, identified the spot corresponding to the thumb center (i. e., the great toe of the fore foot) in animals, and cut out a small cube less than an inch on each side.

Next note the fact that there are nine muscles moving the thumb, some in the ball of the thumb, some between the thumb and the fore finger, some extending up the front of the forearm, and some up the back of the forearm, all of the latter reaching nearly to the elbow. Some flex and some extend the thumb, some separate it from the other fingers, and

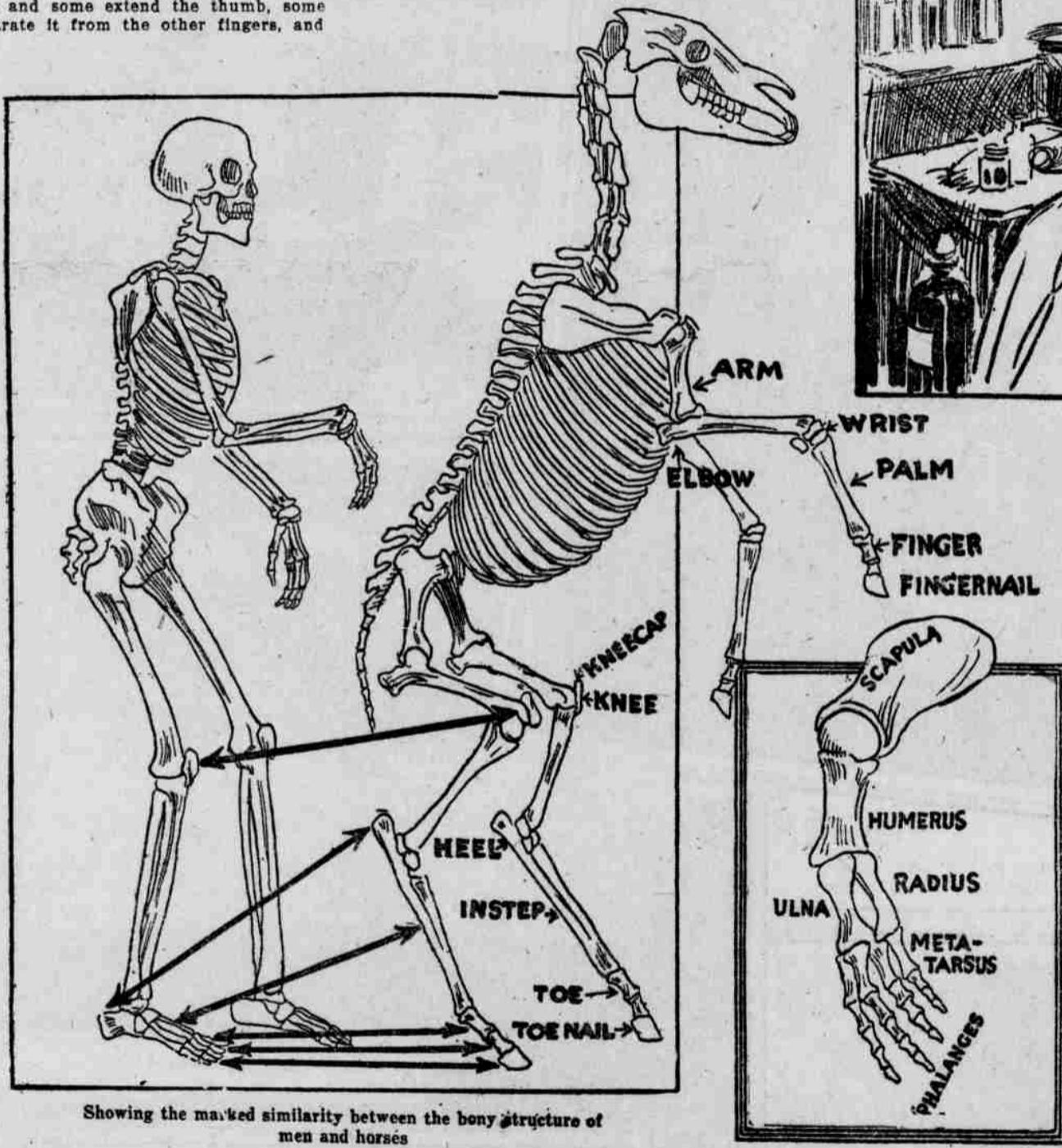
respond to the arm and leg in man. Bone for bone, they are counterparts of the human skeleton—shoulder blade, humerus, radius and ulna (the two bones of the forearm), and those of the hand, with a similar correspondence in the bones of the hind leg and foot.

Nothing could be more unlike externally than the flipper of a whale and the arm and hand of a man. Yet you find in the flipper the shoulder blade, humerus, radius, ulna, and a hand with the bones of four or five fingers masked in a mitten of skin.

Observe the bones of the next chicken you eat. The breast bone of all birds has a great ridge developed to give a large surface for attachment of the large and powerful breast muscles for flight. You will find in the wing the counterpart of the shoulder blade, the humerus and the radius and ulna. The bones of the bird's wing, i. e., the hand, are three in number, the bones corresponding to the little finger and the ring finger being absent. They are thus modified to support the feathers. It is a hand altered to suit the medium in which birds move so gracefully.

While undoubted evidence shows that man has existed for only about 500,000 years, the horse has a consecutive geological history of over 3,000,000 years. The skeleton of the earliest horse, which was scarcely larger than a cat, had four toes in front and three behind. Gradually all the toe bones except one—the middle toe—have been lost. But the second and fourth digits, though they do not show externally, are represented by two rudimentary bones, the two "splint bones." The horse of today walks literally on tiptoe, for the hoof is the toe or finger nail.

The internal organs of the body have the same story to tell of likeness or identity. Let us first look at the heart. You all know there is a right side of the heart which sends the blood through the lungs



Showing the marked similarity between the bony structure of men and horses

Strangely like a human hand is the flipper of a whale

by one we can make the thumb touch each of the other four fingers. This is the motion which differentiates the human "hand" from the animal forefoot.

When this patient awoke from the ether every one of these nine muscles was paralyzed and in not a single additional muscle was motion abolished. The human brain center and the animal brain center for the thumb were proved to be precisely identical. My hopes were justified. Her epileptic attacks, which had occurred almost daily, recurred only about once in a year. In a few months she even regained full control over this thumb.

Do not such exact localizations of the brain centers in animals, as directly applied to man, in hundreds, if not thousands of operations by now, most closely ally man to animals?

So with me next into the museum of the Academy of Natural Sciences in Philadelphia and compare the skeleton of man with those of the lower animals. Practically, these animal skeletons all closely resemble the human skeleton, though when clothed with flesh and skin they look very unlike.

to be oxygenated, and a left side, which sends the blood to all the rest of the body. Each of these sides has two cavities—the auricle to collect the blood, the other, the ventricle, with strong, muscular walls, to drive the blood on its long journey. These four cavities are all united into one heart, with an important groove on the surface, marking a partition between the two auricles above and the two ventricles below.

A steady, rhythmical action of the four cavities is essential for the proper propulsion of the blood and, therefore, for health and life. The four cavities act, not all at once, but in succession, like the feet of a walking horse—1, 2, 3, 4; 1, 2, 3, 4, each foot having its own number. Until 1892 we did not know exactly what regulated this orderly sequence. In that year the younger Dr. His discovered that in the groove between the auricles and the ventricles there was a small bundle of muscular fibers which existed as a single bundle until it reached a certain point. There it divided into two smaller bundles, one going to the muscles of the right side of the heart and the other to those of the left side.

But the great importance of this "bundle of His" was not fully appreciated until 12 years later (1904). If, under an anesthetic, an animal's chest is opened, the heart laid bare, and this "bundle of His" is injured, the rhythm of the heart

is at once disturbed. Instead of 1, 2, 3, 4, the order in which the hoofs struck the ground might be 1, 4, 2, 3, or 1, 3, 2, 4, etc. This fluttering of the heart threatens life. If the bundle is destroyed death quickly follows.

Now, this bundle of His is found in all vertebrates, in man and other animals, in birds and even in frogs and fishes. Does not this show a solidarity of the entire animal kingdom? Do not so many such exact parallels between the human and the animal body strongly suggest a close inter-relation of the two? Even plants convey the same message.

I have seen Professor Bose of Calcutta put plants to sleep with ether and chloroform. If enough is given they are killed just as a man is killed. If only a moderate dose is given the plant passes into a state of greatly lessened activity, which may be well called sleep. When the anesthetic is withdrawn it gradually awakens and returns to its normal activity, just as a man does.

One can even descend still further in the scale to the bacteria, that is, germs visible only by the microscope. As Welch of Johns Hopkins points out, "The gentle killing of certain bacteria by chloroform enables us to detect in their bodies toxic (poisonous) substances which are

destroyed by more violent modes of death."

Another evidence of our animal origin is found in organs which are well developed and actively functioning in some of the lower animals, but which in man are only rudimentary. The best-known example of this is the appendix, which, in some of the lower animals is well developed and functions actively. Its frequent inflammation is also a good example of the fact that such imperfect vegetative organs are very prone to disease and often require the surgeon's skill to avert disaster. The only really safe place for the appendix is in the surgeon's collection of trophies.

Let us now turn to the very significant evidence of our animal origin in the embryonic development of man. I have time to note but a single, though very enlightening, instance.

During prenatal development in man, between the two upper jaw bones is a triangular bone which carries the four upper incisors, or "front teeth." At birth and afterward there is normally no such bone because it has become fused on each side with the upper jaw bone. In sheep and some other animals this always persists as a separate bone called the premaxillary bone. Now note a curious defective development in human fetal life. Sometimes this premaxillary bone in the human embryo fails to unite with the upper jaw bone on the right or the left side, and then we have what you all know as "cleft palate." If not only the bones fail to fuse together, but this failure extends also to the lips, we have a "hare-lip." We see in some cases only a cleft palate, in others a harelip, in still others both harelip and cleft palate.

When there is such a deformity it never occurs in the middle line, or any indifferent place, here or there, but invariably to the right or left side and corresponding exactly to the site of the failure of this premaxillary bone, to unite with the upper jaw.

Is not such an exact correspondence between the anatomy and development of the sheep and of the child most significant of the ancestry of the human body?

Lastly, there have been discovered several grades of actual prehistoric men. Their skeletons or skulls, their flint instruments and the remains of their fires are evidences of the grade of their several civilizations. This chain of human ancestors was unknown to Darwin, for they have been discovered since his death.

I have myself seen in the caverns of southern France the extraordinary and convincing evidence of the assured existence of our immediate ancestor, the Cro-Magnan man, who lived about 25,000 years ago. There are to be seen the work of the first painter and the earliest sculptor, prehistoric Sargents and Rodins of remarkable skill.

Before the Cro-Magnan man came the Neanderthal man, "whom we know all about, his frame, his head-form, his in-

dustries, his ceremonial burial of the dead," as Dr. Henry Fairfield Osborn has pointed out. Before him was the Pittdown man; before him the Heidelberg man; still earlier, in Java, the Trinil man; and still further back in geologic time was the Foxhall man—all named for the localities in which their remains were found. This earliest Foxhall man lived in England before the great ice age, about 500,000 years ago.

Bateson himself, who has been misquoted as an opponent of evolution, says: "Let us proclaim, in precise and unmistakable language, that our faith in evolution is unshaken. Every available line of argument converges on this inevitable conclusion."

The difference between the highest anthropoid apes and the lowest man gradually grow less and less the further we trace them backward. We must clearly understand that no existing species of anthropoid apes could have been our ancestors. The latter and we are collateral descendants from apelike species living far, far back in geologic time; before, and probably long before the great ice age. The earth is very big, the various excavations have covered only a very minute part of its surface during only half a century. Every discovery has but confirmed the wonderful story of the ascent of man.

Man's ascent from an animal of low intelligence seems to me to be absolutely proved by the many phenomena which reveal identical organs and physiological processes in the animal and the human body, a few of which, chosen out of a very great number, I have described. It is confirmed by the discovery of the remains of a number of prehistoric men, as is now definitely proved. This ascent of man, in perfectly orderly sequence, is far more probable than that evolution progressed up to the anthropoid apes and stopped there, and that God then made man by a separate, special creative act, yet—mirabile dictu—with all these minute and exact correspondence of similar structures and functions in animals. Microscopically the various structures in man and animals are practically identical. Even the tiny muscles moving the wings of insects, such as the fly and mosquito, resemble microscopically the muscles of man.

If man was a special creation the Almighty was not limited to the lowliest form of matter—the "dust of the ground"—as material for the human body. He could have created a nobler, a more subtle, a more puissant and exalted stuff out of which to fashion man. The plan and structure and function of man's body would then supposedly have differed toto caelo from man's present body. Probably it would have been free from the defects and deformities inherent in the animal body, and free from the diseases which it shares with animals.

But, no! God deliberately made man

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