THE AFFINITY OF THE HUMAN MIND WITH THE DIVINE.

A LECTURE BY PROFESSOR AGASSIZ.

[Reported for the Scientific American.]

The last lecture of Professor Agassiz's course was delivered in the Academy of Music in Brooklyn, on Sunday evening, Feb. 23. It was announced by the trustees that at some future time they hoped to have another course on a different subject by the same lecturer. The announcement was responded to by general applause. The lecturer said :—

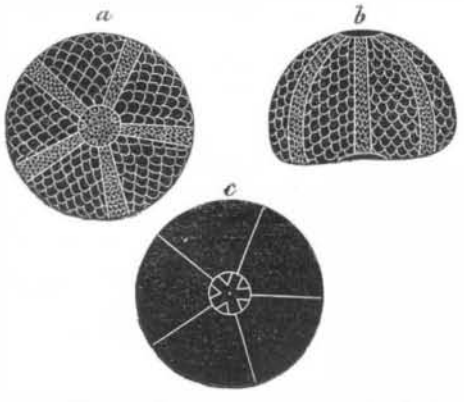
At my last lecture I showed that the animal creation is formed upon a plan proving the existence of an intelligent Creator. I now propose to show that the intellect of the Creator is of the same nature as our intellects. That the finite mind of man differs only in degree from the infinite mind of God. In illustrating this from zoology I shall take the simplest form of animals.

I have already explained that all radiated animals are constructed upon the plan of the parts being disposed about a vertical axis. Now if the problem were presented to any human mind to construct an animal upon this plan, what would be the simplest mode of proceeding? It would be the same as that which has been adopted by the Creator. This is not supposition. I asked one of our most eminent mathematicians what would be the simplest form of the parts for the construction of a symmetrical figure around a vertical axis. After considering the subject he replied that the form would be that of a wedge. He made this answer purely from mathematical considerations, as he knew nothing about zoology. This is the form which we find in nature. It is illustrated by a melon or by this orange. If I take off the peal in this way, and tear the orange apart, you all know that the pieces are in the form of wedges—vertical wedges they are called by mathematicians.

[The lecturer explained that all classes of animals belonging to the order of the radiata are constructed upon the plan of the disposition of the several parts around a vertical axis; similar to the structure of an orange in which the thin edges of the wedges occupy the line of the vertical axis. He then continued.]

Now let me be more particular, for you have taught me by your attention that I may enter into very minute particulars. I wish to show that when the Creator modifies this general plan, he does it by the same simple and direct devices which would be employed by a human intellect; only that they are more simple and direct than would be conceived by the genius of man. The affinity of our minds to the divine, is shown in the fact, that when we discover these designs we are able partly to appreciate the wisdom which formed them.

Among the higher forms of radiated animals are two classes, the sea urchins and the star fishes, which differ very much from each other in external appearance, but which on close examination are found to be simple modifications of the same plan of structure. I will draw upon the blackboard three views of the sea urchin, a view from above, a profile, and a view from below. This (*a* in the cut) is the view from above, this (*b*) is the profile, and this (*c*) is the view from below. Looking upon the upper surface of the animal,



we see in the center a circular space from which radiate five rows of small plates, the spaces between being occupied by large plates. In the circular space, alternating with the rows of small scales, are five large plates, each pierced with a hole in which is an eye. The remainder of the circular space is occupied with small plates. In the center below is the mouth surrounded by five jaws. The profile view (*b*) shows the radiating rows of small plates extending from top to bottom. Through the holes in the plates the spines protrude which are the organs of locomotion.

The star fish in its external form bears very little resemblance to the sea urchin, yet by a close examination we shall find that its structure is but a simple modification of that. The starfish has five arms radiating in this manner. [We gave an engraving last week.] The upper surface of these arms is all covered with small plates, while the mouth and the organs of locomotion are all below. Each arm has an eye at the extremity. Now a simple expansion of the sea urchin produces the star fish. I will illustrate it with the orange. Before being cut it will represent the spheroidal form of the sea urchin, and if I open the peal in in this way, I have a star. The eyes you see would be carried to the extremities of the arms, and if the interior of the orange was expanded with the bark, all of the organs would be carried below, precisely as we find them in the star fish.

If we examine the several species of any other order of animals we shall find that the great variety is produced in the same way by simple modifications of the original plan. Take for instance the articulates, which are composed of a number of rings connected by joints or articulations. The simplest of these is the worm which is formed of rings without any appendages. But worms of the next higher order have a little appendage to each ring, and we shall find if we examine closely that the external organs of the higher classes of radiates are merely modifications of the appendages to the rings. [The lecturer then explained that the fins at the lobster's tail, the paddles under the tail, the legs, the claws, the jaws, and the feelers are all modifications of appendages attached to the several rings that make up the creature's body; each successive step in the change constituting but a slight variation from the preceding.]

The same law prevails through all the species of the vertebrates. And all of these modifications are wise changes to adapt the new species to circumstances different from those of the species that preceded it. They bear the evidence of intelligence. The supervision exercised by the Creator over His works is that of the intelligent engineer who alters the working of his machine to bring forth new products, and not that of a mere manufacturer of a machine, who after it is once constructed, allows it to run blindly forward by its own forces. This intelligence has its highest manifestation in the creation of the human mind, which is formed in the image of our Creator. The proof that we are formed in His image is in the fact that by a study of His works we are able partly to comprehend the plan upon which they are made.

Effects of Coal Gas Upon the Animal System.

A paper interesting to almost every person was lately read on the above subject, by Dr. C. B. Aldis, before the Royal Medical and Chirurgical Society, London. He stated that he was induced to investigate the question in consequence of the examination of gas, as to its purity, now forming an important branch of the public health. He also wished to ascertain wether cannel coal gas destroyed life sooner than common gas.

A rat was first killed, in order to compare the internal organs with those of others destroyed by the gases. The eyelids were closed; the lungs collapsed, and of a whitish color; both ventricles of the heart contained black coagulated blood.

Six experiments were then made—two with cannel, coal gas, three with common, and one with foul gas. The rats were placed under a glass vessel, into which the gases were passed. They soon began to gasp, and became insensible; and, after lying motionless for a few seconds, convulsive movements occurred, upon which death ensued.

The eyes were open, and projected; the outer surface of the skull was exceedingly red in all that were examined, and dark fluid blood escaped from them, when the head was opened; the vessels on the surface of the brain were pinkish, and some empty; the substance of the brain pale; the lungs collapsed, and of a pinkish color; the heart distended with dark fluid blood; congestion of the abdominal veins.

The eyes of the rat destroyed by foul gas did not project so much, and, on opening the body, a strong smell of sulphureted hydrogen escaped. The brain and lungs were much congested, and of a brownish color; the heart greatly distended with dark fluid blood—the auricles being nearly black; the abdominal veins gorged with black blood.

The rats compelled to breathe cannel coal gas died sooner than those exposed to the influence of common gas. Mr. William Bloxam, Jun., had favored the author with the account of a fatal case of poisoning by coal-gas. The man (a gasfitter) was found dead on the top of a pair of steps, in a closet, in a sitting posture. He should have been doubly cautious in his mode of making the connexion of the pipe with the meter, when it is considered that his head was at the upper part of the closet, on a level with the fanlight over the door, for, while the gas escaped, this part formed a kind of gasholder. The deceased, having become insensible, was unable to lower his head beneath the frame of the fanlight; or, had he but struggled and fallen, his life might have been spared.

The paper concluded with an account of further experiments, conducted in the same manner as the foregoing, except that the animals were rendered insensible only—four being afterward exposed to fresh air, another to the action of ammonia and fresh air, and the sixth placed under a glass filled with oxygen. The animals exposed to fresh air recovered more quickly than when other means were adopted. Persons therefore who are found rendered insensible by inhaling such gas should at once be carried to the fresh air as the quickest and best means for their recovery.

THE CHEMISTRY OF COAL.

Number VI.

THE COAL-TAR DYES.

The atom of benzole is composed of twelve atoms of carbon and six of hydrogen, $C_{12}\ H_6$. If strong nitric acid, NO_5, is mixed in the proper proportions with benzole, the following chemical changes take place. One atom of the oxygen in the nitric acid combines with one atom of the hydrogen in the benzole to form an atom of water, reducing NO_5 to NO_4, and we have left $C_{12}\ H_5\ NO_4$, which is called nitro benzole. This, when crude, is a reddish liquid, but by being submitted to one or two distillations its color is changed to a pale yellow. Distilled nitro benzole has an agreeable odor, resembling that of bitter almonds, and a density much greater than that of water.

Now, if nascent hydrogen is brought in contact with an atom of nitro benzole, all of the oxygen combines with the hydrogen to form water; and two atoms of the hydrogen are added to the five already in the combination, and we have $C_{12}\ H_7\ N$, which is aniline. This, after being purified by one or two distillations, presents itself as an oily liquid. It is white, when first obtained, but soon becomes yellow, rose tinted and red. It is reddened by the absorption of oxygen, and the more oxygen it receives the redder it becomes. The desired tint is produced by adding a suitable oxidizing agent.

To repeat :—

Benzole.....$C_{12}\ H_6$
Nitro benzole.....$C_{12}\ H_5\ NO_4$
Aniline.....$C_{12}\ H_7\ N$

And by the addition of oxygen we have Solferino, Magenta, &c.

NOMINAL HORSE POWER OF HIGH-PRESSURE ENGINES.—Multiply the square of the diameter of the cylinder in inches by the pressure on the piston in pounds per square inch, and by the speed of the piston in feet per minute, and divide the product by 120,000; the quotient is the power of the engine in nominal horses power. If the pressure upon the piston be 80 lbs per square inch, the operation may be abbreviated by multiplying the square of the diameter of the cylinder by the speed of the piston, and dividing by 1,500, which will give the same result.—*Bourne.*

ALLOY OF COPPER AND PHOSPHORUS.—The compounds of phosphorus with copper possess several valuable properties. It is found that phosphorus (which is so detrimental to iron) when contained in copper, in the proportion of from 2 to 4 per cent, imparts to that metal very considerable tenacity and hardness. Ordinary gun metal bears an average strain of about 5,000 lbs. on the square inch, while copper containing a small proportion of phosphorus will bear a strain of 348 or 50,000 lbs. on the square inch.