PROBLEMS

OF

CREATION.

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PREFACE.

The following essays, so far as they relate to the origin of planets, continents and mountains, contain the substance of a series of lectures on the Problems of Creation, given before a company of friends who styled themselves "The Scientific Tribunal," and who assumed the task of discussing questions of priority in discoveries and advances in science. In accordance with a previous arrangement, a gentleman whom we shall name *Scepticus* was appointed to raise objections and elicit explanations; another gentleman, *Amicus*, who had previously made himself thoroughly acquainted with the views of the lecturer, volunteered to defend them.

Problems of Creation.

PROBLEM I.

ORIGIN OF MATTER AND FORCE.

If we attempt to find our way into the past history of the world, books and manuscripts lead us but a short distance. We then resort to monuments and ruins and the relics that we find among the former habitations and graves of remote generations. Next we betake ourselves to stratified rocks and to fossils, and by means of these we reach a time when the ocean covered the entire globe. We then contemplate the earth as a planet, and, adopting the nebular theory, (though not that of Laplace,) we assume that there was a time when the earth and all the planets were connected with the sun, and when the whole together was a rotating mass of nebulous matter, more thin and attenuated than any gaseous substance with which we are acquainted. Whence came this nebulous matter? It is highly probable that it formerly existed in a still more expanded state, and consisted of ether (etherium), a substance that fills all space and permeates all planetary bodies;

a substance the condensations and undulations of which produce light, heat, magnetism and electric phenomena. Possibly etherium was the original mother matter of the chemical substances that constitute all worlds.

Force (energia) is that which causes or which resists motion. When the constituent atoms or molecules of any substance have a great degree of motion among themselves they are driven far apart, and the mass is then said to be expanded—it occupies a large space; when it loses a part of its expansive force it is said to be contracted or condensed. Etherial matter has more motion among its constituent atoms than any other substance. When it loses a certain quantity of its expansive force it becomes nebulous (cloud-like) matter; when the nebulous matter loses a certain part of its force it becomes planetary matter.

Force or energia receives various names, according to the sources from which it appears to be derived, and the manner in which it manifests itself. Its original source, so far as reason and science can trace it, is in etherium. Its first function (assuming that all matter was originally etherial) was to keep etherium in an expanded state. When the etherial matter became condensed and nebulous, and the nebulous masses collided, the collision produced axial rotatory motions, some of which ultimately resulted in orbital motions.

The condensation of matter in the sun is the

cause of its radiant light and heat; the condensation of aqueous vapors is the cause of mist and rain; the expansive force set free by condensation appears to us as heat and light or as lightning; when coal or other fuel burns, the resulting heat is not derived from the coal, but from the condensing oxygen. The expression often used, even by scientists, that our coal is a vast reservoir of heat force, is erroneous. It is the expanded oxygen that contains the force which results from combustion. The force of the human body, the force of the human mind — is all derived from the oxygen in the blood. A brain, large and well-formed, may produce thoughts—profound, correct, beautiful—while the current of blood is small, but long continued manifestations of normal passionate energy can only proceed from a healthy brain that is well supplied with oxygen. Sleep, trance, tremens, fainting, result from the lack of good oxygenated blood in the tissues.

PROBLEM II.

CAUSE OF GRAVITATION.

Gravitation is the tendency of matter to concentrate. We know of no cause of concentration except a loss of expansive force (heat, light, electricity). When etherial particles come in contact with ponderable planetary molecules, the particles lose a part of their expansive force and become assimilated to planetary matter. The force (heat and light) thus set free is radiated away, and the etherial matter is condensed. This condensing and radiating process produces vacua, which the surrounding etherium moves to fill. This movement, thus produced, is the cause of gravitation. The greater a mass, that is to say, the greater the number of molecules it contains, the greater is the quantity of etherium that it condenses and assimilates, and consequently the greater is its (so called) attractive force.

Scepticus.—There are several objections to this novel theory of gravitation. One is that, if true, it would follow that the radiation of force would be in proportion to the mass; another is that every ponderable mass would be continually growing larger. Neither of these propositions can be proved;

a third objection is that the quantity of heat evolved in planets would probably be greater than that lost by radiation, and thus concentration, the very basis of the nebular theory, would fail.

Amicus.—There is some apparent reason in these objections, but it is a question whether their force is sufficient to overthrow the theory. It must be considered that the effects of gravitation are so slight that it is only when observed in large masses that they can be appreciated, and of course the radiation must be equally feeble. As far as we know, the largest celestial bodies are the most radiant. In regard to the increase of bodies by etherial assimilation, it is a question whether human life is long enough to enable us to ascertain, by observation or experiment, whether the theory is true or not.

It is an interesting fact that gravitation and radiation act in contrary directions, and that both decrease in the ratio of the squares of the distances. We know that the radiant force is generated among the constituent molecules of the radiating mass, and consequently it is most powerful there: it is reasonable to presume that the same is true of gravitation. We know that gravitation is not a force emanating from the mass as a whole, but from its smallest constituents, since the force increases or diminishes in proportion to the increase or diminution of those constituents.

In justice to the lecturer, however, it should be stated that he does not regard this hypothesis as one

susceptible of proof; he only insists that it is more reasonable than any other that has been advanced.

Scepticus.—I am glad to hear that it is a mere hypothesis, that is, an experimental or tentative theory, which may be set aside as soon as a more plausible one can be substituted. I have no objection to such theories; indeed, it is only by mental experiments of this kind that true theories can be found. The discoveries of Copernicus, of Columbus, of Newton, of Leverrier, were at first mere guesses that were subsequently verified.

Allow me to mention another objection. If all the celestial bodies are assimilating and condensing etherium, and radiating heat and light, where does the radiant force go? and what is to prevent the etherium from all being used up, and thus bringing nature to a standstill?

Amicus.—It is generally assumed that gravitation is a law of all infinitum. But this is not certain. The universes with which our telescopes make us acquainted are so limited, compared with the unknown and infinite, that we are not warranted in assuming that gravitation is omnipresent. There may be vast regions of space in which expansion, instead of gravitation, is the law; where planetary matter is gradually returning to its original etherial state, and where the movements of gravitation and radiation are reversed. In this manner, the balance of nature would be kept even. But speculation is

not science. We shall be satisfied if this hypothesis can be made to appear probable, or even plausible. Huygens, the great philosopher and the friend of Newton, declared that in science there is glory in arriving at probability.

PROBLEM III.

ORIGIN OF THE SOLAR SYSTEM.

Let us suppose that in a vast region of infinite space the etherial matter gradually radiated away its heat, and thus changed into nebulous matter. Let us suppose that a large number of nebulous clouds were thus formed at no great distance from each other. The mutual attraction of these cloud-like masses would ultimately bring them into collisions which would cause the united mass to rotate upon its axis. It was from such a rotating nebula that, according to the opinions of our most eminent astronomers, the solar system was formed. There being at first no central sun, the parts farthest from the center of the nebula moved fastest, and those nearest the center slowest. The etherial matter presented some resistance to the nebulous movements, and this resistance tended to carry the nebulous matter to the center. The parts of the nebula that were the least dense and those parts that moved most rapidly were most affected by the etherial resistance. Rotation, gravitation and the resisting medium necessarily caused a great variety of chemical elements to press together into the center where combustions and radiations would be certain to occur and produce a

condensed mass — a sun. This central mass, though at first small, continually increased until it either absorbed or controlled the whole nebula, and introduced the laws discovered by Kepler and Newton. That portion of the nebula that was most distant from the center possessed the most centrifugal force, and could not therefore be drawn into the sun, but formed a revolving disk, analogous to Saturn's disk of rings. All but a seven-hundredth part of the matter of the solar system is concentrated in the sun. This disk, from which all the planets were made, was a very small part of the original nebula.

Scepticus.—Our lecturer was not the first to assert that the planets were formed from a revolving disk, for that was a part of the hypothesis of Laplace. That great geometer began by assuming the pre-existence of a sun and a disk, without attempting to account for the origin of either. Applying well-known mechanical laws, he arrived at the conclusion that the disk would cool and shrink until the centrifugal force of its outermost parts would just equal the sun's attraction, and would therefore separate from the main body and become a distinct ring. The main body would then shrink still more, and produce a second and a third ring, and so on, Mercury being the last. In several astronomical works that have been published lately, I have noticed that the authors have admitted that the sun and disk were created separately, and so far they agreed with Laplace; but they denied that the rings were succes-

sively thrown off from the outer parts of the disk, and adopted the opinion that they were all formed at one time.

Amicus.—The lecturer was the first, as far as our information extends, to suggest that the resisting medium was one of the causes that operated to concentrate the matter in the center, and thus create a sun and disk. He was also the first to remark that the difference of the planets in density was the necessary effect of the resisting medium. His idea was that the matter which was the least dense would be winnowed from the more dense, and that this would occur most decidedly in the interior parts, where the orbital velocities were greatest. Before the sun was created the axial velocity of the nebula was greatest at the outer parts, but afterward it was greatest in the inner parts; consequently the least dense planet (Saturn) is near the middle part of the disk. Furthermore, he was the first, as far as we can learn, to attempt to explain how the disk could be separated into rings in any other manner than that supposed by Laplace, and also how the rings changed into globes.

Scepticus.—Will you please to give us the dates of his first publications of this theory, so that those who claim priority can verify their claims, or see the justice of admitting his?

Amicus. 1. About twenty-five years ago he published it in a newspaper in Brattleboro, Vermont, and submitted it to the criticism of General Phelps,

of that city, who, I believe, was a graduate of West Point.

2. In a lecture given in Boston, in 1857, before the members of the Mercantile Library Association, he explained this theory and illustrated it by large paintings, made for the occasion by John S. Bugbee, Esq., an officer of the association, and now a citizen of San Francisco.

3. In 1866, he published it in his geonomy. (Boston: Nichols & Co.) Let us now proceed.

INTERVALS AND MAGNITUDES.

Assuming that the planets were formed from a revolving disk, the question is: How came they to differ as they do in their magnitudes and their intervals? No one, except the lecturer, has proposed even a plausible hypothesis on the subject. His theory is that the forces that acted on the disk tended, or, so to speak, attempted to separate it into rings, which, when concentrated into planets, would have intervals successively wider with distance from the center. This attempt was but partially successful, as will be seen by the table of the planetary distances and intervals. "Bode's law" was an endeavor to represent the ratio of increase of the intervals, by a mathematical formula. Notwithstanding the failure of this law, the *fact* still remains that the intervals of the planets, and also of the satellites, as a general rule, increase with distance from the primary.

Bode's (or Titian's) Law.

A scheme to show how near the intervals of the planets come to being successively doubled,

	Distances.	Intervals.	Actual Distances.	Actual Intervals.
Mercury	0+4= 4		3.9	
		3		3.3
Venus	3+4= 7		7.2	
		3		3.8
Earth	6+4= 10		10.4	
		6		5.2
Mars	12+4= 16		15.2	
		12		12.8
Asteroids	24+4= 28		28	
		24		24
Jupiter	48+4= 52		52	
		48		43.4
Saturn	96+4=100		95.4	
		96		96.5
Uranus	192+4=196		191.9	
		192		108
Neptune	384+4=388		300.6	

It will be observed that the interval between Uranus and Neptune falls far short of the requirements of Bode's law.

Humboldt, in his Cosmos expresses a doubt whether the cause of the planetary intervals and magnitudes will ever be known. He probably assumed that the hypothesis of Laplace (that the planets were successively thrown off from the outer parts of the nebula) was true; and it is certain that on his hypothesis the relative magnitudes and intervals can not be explained.

NEW THEORY.

The following appears to be the true explanation: As soon as the disk was formed, two opposing forces

acted upon it: one was the mutual attraction of its parts, which, unopposed, would have held it together as a single disk; the other was the tendency of the parts that differed in distance from the center to differ in their orbital velocities. This force, unopposed, would have separated the disk into a great number of exceedingly narrow rings, each differing from all the others in velocity. The compromise or resultant of the two forces, would (all else equal) have been that the disk would have separated into a definite number of rings which would have been successively wider with the distance from the center. When the rings were all concentrated into planets, their intervals would also have successively increased.

Scepticus.—The fact of the increasing intervals is well known, though no theory has heretofore been invented to account for it. If the lecturer's theory were the true one, it would necessarily follow, not only that the intervals would increase with distance, but that they would increase in a regular mathematical ratio, and the orbital velocities would differ by a common difference: That is to say, if the planet nearest the sun were A, and the next B, the third C, and so on; and if the velocity of A differed 10 from that of B, the velocity of B would differ 10 from that of C, and so on through the series. This is far from being the case in the solar or in the satellitic systems.

Amicus.—Very true, but if the disk had been

uniform in thickness and density, the intervals and the magnitude would both have increased in a definite ratio. Let us suppose the force of mutual attraction in all parts of a disk to have been uniform, and to have been represented by 10; of course it would have required a force (produced by the difference of velocities) at least equal to 10 to rupture the disk and form a ring. And as (by virtue of the force of gravitation combined with centrifugal force) the velocities decrease in the inverse ratio of the square roots of the distances, it would have required a wider and wider interval (width of ring) to obtain the necessary differences of velocities. But if the disk were very thick in some parts and thin in others (as it actually was), the intervals and magnitudes of the planets would be irregular. There would still be an attempt, so to speak, to produce increasing intervals and magnitudes, but the attempt would be only partially successful. To illustrate this theory, let us imagine an ideal system, formed from a uniform disk in which the magnitudes and intervals increase with distance; let us represent this by a table. Now make another table to represent the actual relative intervals and masses of the planets. Of course the largest planets were made from the thickest parts of the disk, and the smallest from the thinner parts. Let us now make a similar table of the satellites of Jupiter, and another of those of Saturn. Upon comparing these, we find that the three systems are formed upon one plan, and evi-

dently by the operation of similar causes. In each system we find more than two-thirds of the matter located in that third of the disk nearest to the center. In the outer parts of the solar system, where, in the ideal, the planets would be the largest, they (Uranus and Neptune) are relatively small; and in the interior third, where, in the ideal they would be small, we find Jupiter containing more than twice as much matter as all the other planets together. Even Mercury, the smallest of the planets, is many times larger than one in the same position would be in the ideal uniform system.

This whole theory may be stated in a single sentence: The two forces that acted on the disk, when it was first formed, *tended* to make the intervals and magnitudes successively greater with distance from the center in a regular ratio, but the abnormal quantity of matter collected in the inner parts of the disk prevented this regularity.

On comparing the three tables of the planets and satellites, we find that in each system there is one gigantic globe, containing more matter than all the others of that system together. This giant is placed in the interior third of the radius of the system. It was here that the disk was thickest; and this thick part, by its powerful attraction, resisted the tendency to divide it into narrow rings. It attracted to itself the matter from a great distance, and thus created two abnormal intervals, one on each side, and formed

a large massive ring or belt, leaving the outer and inner remainders of the disk to form two other belts. Each of these three belts afterwards concentrated into a single globe—unless it was thin and wide enough to separate and form several globes.

Let us recapitulate. 1. The first tendency of a nebula was to concentrate all its matter into a single globe. This really occurred in the case of Mercury and Venus. 2. When a nebula failed to concentrate the whole into one globe, the remainder assumed the form of a revolving disk. The tendency of the thick middle part of the disk was to attract to itself all the matter and form a single globe. This occurred in our terrestrial system. We have but one moon, and that is relatively larger and much more dense than any other satellite. Probably its nebula was also more dense than any other, and for that reason it is all concentrated into one body. 3. In Jupiter's disk the massive middle belt concentrated into one large satellite (Ganymede) containing more matter than all the other three together. The outer belt also concentrated into one globe; but the inner belt divided into two small satellites, with narrow intervals. 4. Saturn is the least dense of all the planets, and his original nebula was probably the least dense also of all, except that of the solar system. This fact, added to his rapid axial velocity is, perhaps, the reason of the extraordinary diameter of his system. Saturn's middle belt divided and produced two globes, one of which (Titan) is truly the giant that

his name implies. The other (Hyperion) is much smaller, but very near Titan, thus indicating that they were originally one belt. (See the table.) The inner belt gave birth to five small satellites with very narrow intervals, besides the beautiful rings that have not yet concentrated, though they have separated into three belts. The outer belt of Saturn's disk has concentrated into one large globe (Japetus). Here we have a fine illustration of our theory. In the inner part of this system, where the velocities are greatest and the disk thin, five small moons, with narrow intervals, are created; and in the outer part of the system, at a great distance from the center (and where the velocities must have been relatively slow), an amount of matter that appears to be greater than that in all the five inner moons, is concentrated into one. 5. In the solar system the middle belt divided and produced Jupiter and Saturn. The quantity of matter contained in this belt, when compared with that of all the other planets, is as 39 to 3+. (See table.) It is therefore by no means strange that it has created such a wide interval on each of its sides. The outer belt produced Uranus and Neptune, with an interval that is probably normal, and the only one that is so; it has therefore been made the basis of the ideal system and the table. The inner belt, being situated where the velocities are very great, and where the disk was relatively thin, is divided into four small planets, besides the asteroids.

Scepticus.—How does this theory account for the production of the asteroids?

Amicus.—After the rings were formed, and before they were concentrated into globes, each ring, in consequence of gradual condensation, broke up into separate nebulous masses, which moved in different orbits, and consequently soon came near enough to so attract each other as to come into collision and form a single planet, the axial rotation of which was caused by these collisions. But the asteroidal ring was so perturbed by the attraction of the enormous mass of Jupiter (when Jupiter existed as a ring), as to prevent the asteroids from concentrating into one globe. The small quantity of matter in the asteroidal ring, and also the small quantity in Mars, plainly indicate that Jupiter has appropriated to himself a quantity of matter that, in a fair division, would have been given to the planets below him.

Some astronomers have supposed that the asteroids are fragments of an exploded planet. It is a much more reasonable supposition that they are the fragments of a nebulous ring which was prevented from concentrating by the attraction of Jupiter

Scepticus.—If this theory is true—if in a uniform or ideal system there would have been a common difference of orbital velocities, and if the difference between the velocities of Neptune and Uranus (3,000) represents the common difference—then, in the actual solar system, there should be some indications of that difference, notwithstanding the varia-

tions of the disk in thickness; that is to say, the difference between any two planets' velocities should be a multiple of 3,000. I do not mean to insist that it should be precisely that in every instance, and to a fraction, but it should be so near as to indicate that it is not a mere coincidence.

Amicus.—In 1866, the lecturer published a table to show that there is some evidence of a common difference, but he now regards such tables as more curious than convincing; for it is impossible to prove that the coincidences are not merely accidental. I will, however, give you the table and let you judge for yourselves whether or not it is a mere play upon numbers.

	Velocities by Theory.	Actual Velocities.
Velocity of Neptune	12	12
Add 3	= 3	
Velocity of Uranus	15	15
Add 3×2	= 6	
Velocity of Saturn	21	21
Add 3×3	= 9	
Velocity of Jupiter	30	29+
Add 3×8	= 24	
Velocity of Mars	54	54
Add 3×4	= 12	
Velocity of Earth	66	66
Add 3×4	= 12	
Velocity of Venus	78	77
Add 3×9	= 27	
Velocity of Mercury	105	106

Scepticus.—Does the lecturer suppose that any law regulates the axial rotations of the planets?

Amicus.—He supposes that the rotations were originally caused by the collisions of the nebulous masses that united to constitute the globes. But when a nebulous globe was once formed, and began to shrink and contract, as its diameter diminished its rotation increased. Its present velocity, therefore, depends upon its original velocity, to which is added the increase gained by contraction.

Now suppose a large and a small nebulous globe to be made (in consequence of collision) to rotate with equal rapidity, the large one would, by contraction, increase its velocity much more than the small one, the constituents of which had shrunk and condensed in the same degree. Mars, Earth, Venus and Mercury, are small and dense, and so, doubtless, were their original nebulae, and therefore they have shrunk less than the larger and less dense planets—possibly this is the principal reason that they rotate more slowly than Jupiter and Saturn.

AN IDEAL SYSTEM.

Let us assume that the two most distant planets (Uranus and Neptune) are so small and so distant from each other that the disk was not thick enough in the part from which they were made to prevent their interval from being a normal one. If this were the case (disregarding the fractions) the difference of velocities (3,000 miles per hour) between Uranus

and Neptune would be also the *common* difference between any two next neighboring planets. And as the orbital velocities of planets are in all cases inversely as the square roots of their distances from the primary, we have a simple means of knowing what the intervals and masses must have been in an ideal uniform system, and how far the actual solar system deviates from it.

The annexed table is constructed on this hypothesis. As the masses and magnitudes of the planets in such a system must be as the areas of the intervals, we have the means of estimating them also with sufficient accuracy for our purposes. If any critic is capable of detecting errors in the table, he must also be able to understand that they are too slight to affect the general conclusions. It appears that if the solar system had been produced from a disk of uniform thickness and density, and had been so thin that the planets could not have been massive enough to perturb each other destructively, there would have been one planet between Uranus and Saturn; two between Saturn and Jupiter; seven between Jupiter and Mars; three between Mars and Earth; three between Earth and Venus and eight between Venus and Mercury.

Ideal System.

	Planets.	Orbital Velocities Miles per hour.	Sq. Roots of Distances.	Distances in Millions of Miles.	Intervals.	Relative Masses of the Planets.
1st.	Neptune	12	5267	2774		232
					1000	
2d.	Uranus	15	4213	1774		90
					542	
3d.	——	18	3511	1232		38
					327	
4th.	Saturn	21	3004	905		19
					212	
5th.	——	24	2633	693		10
					145	
6th.	——	27	2340	548		6
					104	
7th.	Jupiter	30	2106	443		3.60
					76	
8th.	——	33	1915	366		2.14
					58	
9th.	——	36	1755	308		1.647
					45	
10th.	——	39	1620	262		1.025
					36	
11th.	——	42	1504	226		.786
					29	
12th.	——	45	1404	197		.441
					24	
13th.	——	48	1316	173		.397
					21	
14th.	——	51	1233	152		.254
					15	
15th.	Mars	54	1170	137		.212
					14	
16th.	——	57	1108	123		.161
					11	
17th.	——	60	1053	111		.124
					10	
18th.	——	63	1003	100		.101
					9	
19th.	Earth	66	957	91		.0868
					8.6	
20th.	——	69	911	83		.0555
					6	
21st.	——	72	877	77		.0505
					5.9	

	Planets.	Orbital Velocities Miles per hour.	Sq. Roots of Distances.	Distances in Millions of Miles.	Intervals.	Relative Masses of the Planets.
22d.	——	75	843	71	——	.0427
					5.4	
23d.	Venus	78	810	65	——	.0351
					4.8	
24th.	——	81	780	61	——	.0307
					4.3	
25th.	——	84	752	56	——	.0225
					3.8	
26th.	——	87	726	53	——	.0206
					3.4	
27th.	——	90	702	49	——	.0176
					3.2	
28th.	——	93	679	46	——	.0142
					2.7	
29th.	——	96	658	43	——	.0124
					2.5	
30th.	——	99	638	41	——	.01099
					2.3	
31st.	——	102	619	38	——	00932
					2.1	
32d.	Mercury	105	610	36	——	.00767

Jupiter's System of Satellites.

		Distances in Miles.	Intervals.
Inner Belt Mass, 40,104	Io	260,000	
			—— 154
	Europa	414,000	
			—— 247
Middle Belt Mass, 88,437	GANYMEDE	661,000	
			—— 501
Outer Belt Mass, 42,475	Calisto	117,200	

Saturn's System of Satellites.

(Newcomb.)

		Distances.	Intervals.
Inner Belt.	Mimas	?	
	Enceladus	?	
	Tethys	42.70	
			11.90
	Dione	54.60	
			21.52
	Rhea	76.12	
			100.63
Middle Belt.	TITAN	176.75	
			37.47
	Hyperion	214.22	
			300.42
Outer Belt.	JAPETUS	514.64	

Solar System.

	Planets.	Masses.	Distances in Millions of Miles.	Intervals.	Orbital Velocities. Miles per hour.
Inner Belt Mass, 198	Mercury	7	35¾	— 31	106.38
	Venus	79	66¾	— 26	77.296
	Earth	100	92⅓	— 49	66.108
	Mars	12	141		53.964
				— 339	
	Jupiter	30,000	480		29.06
Middle Belt Mass, 39,000				401	
	Saturn	9,000	881		21.427
				— 890	
	Uranus	1,300	1771		15.120
Outer Belt Mass, 3,000				— 1004	
	Neptune	1,700	2775		12.090

It will be observed that in the Solar system the quantity of matter in the middle belt is to that in the other two belts as 39 is to 3+; in Jupiter's system it is as 88 is to 82; in the Terrestrial system it takes the whole. In Saturn's system the masses are not well known, but Titan is the largest of all known moons. It will be noticed that Hyperion is remarkably near to the giant Titan, thus confirming the hypothesis that it was at first united with Titan, and a part of the middle belt.

The Asteroids are situated between the middle and the inner belts of the Solar system, and do not, therefore, belong to either. Possibly similar asteroids will yet be found between Saturn and Uranus.

PROBLEM IV—GEONOMY.

THE CREATION OF THE OCEANS AND CONTINENTS.

1. When the great navigators of the 16th century, by their discoveries, had enabled geographers to make correct outline maps of the world, they naturally began to speculate concerning the peculiar forms and analogies of the continents. They were unable, however, to invent a reasonable hypothesis. Humboldt, in his Cosmos, expressed a doubt whether the problem would ever be solved. Dr. Edward Hitchcock, the eminent geologist, remarked that it would be a strong recommendation of any new theory of the earth, if it would furnish an explanation of the continental forms. Ritter, A. K. Johnson and Guyot called especial attention to the fact that the continents consist of three somewhat analogous pairs. Guyot, after remarking that there is a North and South Pacific and a North and South Atlantic, adds that "the Indian is but half an ocean." It is true that there is *now* only a South Indian, but Geonomy points to the conclusion that there was formerly a North Indian ocean.

According to the theory which we propose to explain, the ocean currents all tend to flow in elliptical circuits of such dimensions that there is not

room enough to form an ellipse any where except between the equator and the 45th parallel. There is satisfactory evidence that before there was any dry land there were three elliptical currents each side of the equator. The sediment accumulated on the ocean's floor, within the limits of these ellipses, in greater quantities than elsewhere, and by its weight produced the North and South Atlantic, Pacific and Indian sinking basins. The lava that was crowded away from beneath these basins was forced into the angular inter-oceanic spaces, which being thus elevated became the continents.

NOTE.—The word *Geonomy* is from two Greek words, *ge*, the earth, and *nomos*, a law, and is analogous to astronomy, which is from *Astron*, a star, and *nomos*. (See Worcester's Unabridged Dictionary.)

IDEAL MAP.

2. If the northern and southern ocean basins had been placed symmetrically opposite each other, and if the sediment had been so distributed as to cause all the basins to sink equally, in all their parts, the continents of the two hemispheres would have been equal, similar and symmetrical. There would have been three continents projecting southward from the arctic circle, three similar continents projecting northward from the ant-arctic, and three angular tropical continents, equally divided by the equator. Let us denominate this *the ideal map of the world.* (See diagram.)

3. Let us now enquire in what particulars the actual map of the world differs from the ideal, and what were the causes of the departures. One very important departure is that each of the southern oceans is placed between 45° and 50° east of its northern mate. A consequence of this variance is that the isthmus of Central America trends northwest instead of north, and the same is true of the partially submarine isthmus that connects Asia with Australia.

4. Another consequence is that Australia and nearly all of South America are south of the equator, instead of being equally developed on the north and south sides of it. The northern half of South America is suppressed and its place occupied by the West Indies, the western extremity of the North Atlantic. In the same manner the northern half of Australia is suppressed and its place occupied by the East Indies, the western extremity of the North Pacific. When the North Indian existed, its western portion covered northern Africa, and was analogous to the West Indies. Southern Africa then was above the ocean and was like Australia now, all south of the equator. Let northern Africa be sunk, all but a few islands, and we should have the West Indies repeated, and southern Africa would be a repetition of South America and Australia. On the contrary, let the East and West Indies become dry land, and we should at once see their resemblance to northern Africa. These analogies have resulted

from the fact that the three northern ellipses were, so to speak, pushed about 50° westward, so that the equatorial current flows over the area that otherwise would have been occupied by the northern halves of the three tropical continents.

5. A second important departure from ideal symmetry was the great development of the ocean in the southern hemisphere and of the land in the northern. The southern basins, by sinking, suppressed the embryo ideal southern continents, and forced the subjacent lava across the equator, under the crust, and thus elevated the northern continents to an abnormal degree, extended them further southward than they otherwise would have been, and elevated them above their normal height.

6. A third departure—a consequence of the second—was that the floor of a large area of the North Indian ocean was raised above the sea and added to the continent of Asia, Europe and South Africa. By this proceeding these three continents are nearly connected together, and one vast complex continent created. By restoring, on a map, the North Indian, it will be seen that all of northern Africa, the eastern part of Europe, and the western part of Asia were formerly covered by this ocean, which then was analogous to the North Atlantic and the North Pacific.

Scepticus.—The first question that I will raise is in relation to the currents flowing in ellipses when there was no land. This statement is inconsistent

with what we are supposed to know, and what is taught by the best authorities. It is undoubtedly true that there is an elliptical current or whirl in each of the five great oceans, but they are supposed to depend principally upon the forms of the ocean basins. The differences of climate cause warm currents to flow poleward and cold currents to flow tropicward, and the earth's rotation causes poleward currents to turn more or less easterly and tropicward currents westerly. This is all plain, and is taught in our school books. But no one, except the author of geonomy, has pretended that an ocean current will flow in an elliptical circuit by virtue of these two forces (climate and rotation) only. The deflecting influences of winds and shores are, by all our geographers, regarded as necessary to cause currents to flow in ellipses. This is the main point. If it is really a fact that before there was any dry land there were three pairs of elliptical currents flowing between the equator and the 45th parallels, and if it can be rendered probable that the weight of the sediment produced depressions, the rest of the geonomical theory logically follows; for this will at once account for the number, the positions and the forms of the continents.

Amicus.—In 1857 the lecturer (J. S. G.) observed that the currents, in many instances, flowed in directions that could not then be explained on any known theory. For example, a current flows at least two thousand miles, almost due east, from the

Banks of Newfoundland, in the 45th parallel, without any sufficient reason that had ever been given. Upon investigation he found that in each of the five great oceans a current flows eastward in nearly the same latitude (45°). He also noticed that in each instance, before the current has proceeded entirely across the ocean, it changes its course and curves toward the equator. Again, in each ocean, near the equator, a large current flows almost due west more than two thousand miles, but while in mid ocean it turns poleward. Furthermore, there are several large counter currents that all the geographical authors acknowledge to be inexplicable.

Any particular place at the equator moves eastward upwards of a thousand miles per hour; and the rate of motion is continually less as we proceed toward the pole. If a man could be instantly transferred from the Gulf of Mexico (20th parallel) to the Banks of Newfoundland (45th parallel), he would find himself moving eastward more than two hundred miles per hour. If, on the contrary, he could be instantly transferred from the Banks to the Gulf, he would find the earth slipping past him eastward, at the rate of two hundred miles per hour. It is not strange, therefore, that the currents are so much affected when they flow from one latitude to another.

As a result of these investigations he pointed out an important fact that had been overlooked by all his predecessors. It was that when a current flows

poleward it is not only deflected eastward, but *it accumulates more and more easting* (relative easterly tendency) the further from the equator it flows. For this reason it can not proceed more than twenty-five degrees poleward without acquiring so much easting that it is forced to flow nearly due east several thousand miles. On the contrary, when flowing tropic-ward *it accumulates westing* (relative westerly tendency) until it is compelled to flow nearly due west several thousand miles. This discovery, when added to what was known before, becomes a key to all the mysteries and apparent anomalies of the ocean currents.

Let us apply this theory to the North Atlantic ellipse.

(1.) The current (the so-called Gulf Stream) that flows from the Gulf of Mexico (20°), acquires so much easting by the time that it reaches the Banks of Newfoundland (45°) that it flows east nearly across the ocean. (2.) That part of it which comes to the surface, or which comes in contact with cold water, cools and turns southeasterly. Near the 30th parallel the easting is exhausted; (3.) the current then flows southwesterly, but before it reaches the equator it accumulates so much westing that (4.) it flows nearly due west several thousand miles. (5.) While flowing west that part of it which becomes warm flows *northwest* (6) until it reaches the Gulf of Mexico again. Its westing is then exhausted and its elliptical circuit is completed.

Before this theory was announced no geographer could give a sufficient reason why a current in the northern hemisphere flows southeast or northwest. Authors attributed the current that flows into the Gulf of Mexico to the winds, and to the South American shores, shutting their eyes to the fact that in every ocean a current flows continually in its ellipse regardless of both shores and winds.

If a current could move through the ocean (as the planets are supposed to move through space) without encountering any resistance, it would flow more or less *easterly* from the 20th parallel on the western side of the ocean until it reached the 20th parallel again on the eastern side. It would then flow *westerly* until it reached the 20th parallel on the western side once more. But it expends so much force on the way that it ceases to flow easterly at the 30th parallel and westerly at the 20th; it therefore makes an irregular ellipse. The currents, however, do not always commence flowing easterly precisely at the 20th parallel, or westerly at the 30th. The ellipses change north and south with the seasons. Were it not for this fact, there might have been east and west isthmuses near the equator. If the oceans had the same annual swinging motion east and west, that they have north and south, there would have been no isthmuses.

Look on a good map and see the current leave the coast of California and flow southwest amid all the changes of the wind. See another current leave the

west coast of South America and flow northwest; see still another leave the east coast of South America and flow southeast and then in mid ocean turn and flow northeast. See a counter current generated near the equator in the North Pacific, and flowing northeast, while the elliptical current is flowing parallel with it in the contrary direction. This counter current is warm, of course, therefore, it must flow northeast; but the westerly current is a part of the ellipse and brings its westing with it from the cold north; in other words, it is its inertia —its accumulated westing — that impels it westward.

LOCAL CURRENTS.

Besides the great elliptical currents, there are necessarily a great many local and limited currents. A *cold* local current always flows toward the equator, and is deflected more or less *westward* by the earth's rotation. But a warm local current always flows away from the equator, and is deflected *eastward* by rotation. These currents often flow a short distance parallel with a section of an elliptical current, but in a contrary direction. The reason of this is plain to any one who has studied this elliptical theory; but these counter currents have been a puzzle and a stumbling block in the way of our geographers. They have overlooked the effects of inertia upon the currents, and therefore they could not under-

stand why a current flows northwest into the Gulf of Mexico, or east and southeast from the Banks of Newfoundland. Neither could they understand why one current flows west and northwest near the equator in the North Pacific, while another current flows northeast by its side.

Between the ellipses, and beyond them, north and south, all the currents are of a local character, and the lands beyond the 60th parallels are modified by them, and not by the ellipses.

It is not necessary to go more into details. It is sufficient to prove that all currents tend to flow in ellipses of a certain magnitude, and that when they have room enough they will do so.

Scepticus.—Allow me to ask—what determined the magnitudes of the ellipses, so that there are just three in each hemisphere?

Amicus.—The two forces that produce the currents are definite and nearly invariable, and consequently the ellipses have a tendency to become equally so. These forces are the sun's heat and the earth's axial rotation, the effects of which, when there was no land, were but slightly varied by local circumstances, and the ellipses, therefore, must have been nearly equal to each other. If the earth's rotation had been more rapid, the ellipses would have been smaller and more numerous. By studying the curves made by the currents, it would not be difficult for a good mathematician to demonstrate that the forces which produce ellipses are such that

no more than three could be formed in one hemisphere.

Scepticus.—Admitting that before there was any land there were three pairs of ellipses and all of them between the equator and the 45th parallels, and that the weight of sediment produced six sinking basins, let me ask—whence came the sediment? It is understood that the currents do not abrade the the bottom of the sea, and there was then no shore to furnish material.

Amicus.—We know very little concerning the condition of the earth when the ocean first fell upon it. It is now believed by eminent chemists that nearly all the metals found in the earth were originally dissolved in the ocean waters and have been precipitated from them. We can not estimate the quantity of meteoric matter that fell upon the earth and into the ocean during the long primitive geological ages. There is, however, less uncertainty concerning the chemico-vital precipitations that formed limestones. We know that some of them accumulated on the bottom of the sea several miles in thickness. But we have no positive knowledge concerning the coarser sediments (sand and gravel), until we derive it from the earliest dry land. We can only reason from what we know, and we know nothing of the origin of the immense collection of sediment that is brought to our view in the Laurentian Hills of Canada. There must have been abundant sources of sediment somewhere,

before that most ancient of lands was raised, and there certainly have been abundant sources since.

It is true that the present ocean currents do not abrade the bottom of the sea, but this can not be said of the first waters that fell upon the earth and gave birth to the ocean. What effect those abrasions had in disturbing the equilibrium of the earth's crust we have no means of learning.

Scepticus.—You speak of the southern hemisphere being depressed, and sending lava across the equator to raise the crust of the northern hemisphere. What evidence have we of such a proceeding?

Amicus.— (1.) The southern oceans are deeper than the northern; that is to say, they have been more depressed, yet the southern continents are less elevated and extensive than the northern. We know, therefore, that the lava which was displaced by the southern depression did not proportionally raise the *southern* lands, and if it did not cross the equator and raise the northern lands, what did become of it?

(2.) Another fact is, that the three southern continents (the ideal counterparts of Asia, Europe and America,) are suppressed, and deep oceans occupy their places.

(3.) The ant-arctic region is raised above the sea while the arctic is below it.

(4.) The ocean seems to grow gradually more and more shallow from the southern temperate zone to the Arctic sea.

(5.) In Europe, Asia and North America the first lands that emerged from the ocean were those near the Arctic sea, and from that latitude during the geological ages, they have gradually extended themselves southward.

All these facts are consistent with the hypothesis that the southern oceans' floor subsided and forced its subjacent lava north and south. That part of it which moved south raised the ant-arctic lands, and that which moved north crossed the equator and pushed as far as the arctic, but not in sufficient quantities to raise any northern lands above the sea. It however caused the northern seas to be so shallow that a comparatively slight depression of the *northern* ocean basins produced the early emergence of the lands near the Arctic sea.

Scepticus.—One would suppose that the southern depression would have raised the land above the sea nearer the sinking area instead of extending the rise as far as the arctic circle.

Amicus.—There must have been a very large area of gradual subsidence as well as of elevation to produce such long and gentle slopes and acclivities. The distance to the ant-arctic was comparatively short and therefore the rise was more abrupt; to the arctic the distance was longer and therefore the rise was more gentle. The most abrupt elevations of mountains, as well as of continents, are those that have resulted from the most narrow and abrupt depressions.

Scepticus.—I notice that Reclus, and some other writers, have lately stated that there was formerly an ocean between western Asia and eastern Europe. Did the author of Geonomy borrow the idea from that?

Amicus.—In his Geonomy published in 1857, he announced the former existence of a North Indian ocean. Before that time no one that we know of had ever suggested the idea. It had been remarked that the Caspian region was "semi-marine," but no one had supposed that all northern Africa and the area occupied by the Caucasus, the Alps and the Hindoo Kosh mountains, and even the mighty Himalaya, was formerly the bed of an ocean analogous to the North Atlantic, and that it was the northern mate of the South Indian. The truth is, that the recognition of this ocean was the logical consequence of the elliptical theory.

If it can be proved that this ocean never existed, Geonomy is untenable. A true theory or law leads by deduction to the discovery of new facts. As soon as the laws of the ocean currents were known and applied, they pointed to the truth that there was once a North Indian as well as a South Indian, and that the area of northern Africa was analogous to the East and West Indian archipelagoes.

The mere fact that water once covered northern Africa and a large part of Europe and Asia, would be of but little importance were it not for the bearing that the fact has upon the elliptical theory. But

it is extremely interesting now to trace the effects of the ellipse upon the present forms and limitations of the lands within the area which the North Indian formerly occupied.

Scepticus.—Does this theory shed any light on the causes of the glacial and drift phenomena?

Amicus.—It suggests the following hypothesis: The southern depression and the northern elevation commenced in the earliest geological period. It created a gradual and gentle rise from the southern temperate zone to the border of the Arctic sea. It did not itself directly cause any lands to emerge from the ocean, but it raised the crust so as to cause the ocean to be less deep—especially near the arctic circle. The consequence was, that when the *northern* Atlantic and Pacific ocean basins sank only a relatively short distance, they raised the lands on their northern borders in America, in Europe and in Asia. The northern elevations continued during all the geological ages, until the channels through which the Arctic sea communicated with the great oceans were blocked up and the Arctic left alone in its dreariness. But the atmosphere was not excluded; clouds rushed from the warm south, and rain, hail and snow were poured down upon this desolate area for centuries. The enormous glaciers thus produced, thousands of feet thick, crept, like monstrous cold blooded reptiles, over the temperate zone, destroying with their chilly breath every living thing in their path. The northern parts of the continent at

length subsided beneath the heavy load, the barriers of the Arctic sea gave way and poured a flood of water, which conveyed gravel and boulders on ice over half the temperate zone. The northern lands, being relieved from their burden, rose again nearly to their former level. The new channels thus made (or greatly enlarged) between Europe and America prevent, for the present, a repetition of the terrible invasion, though there are some premonitory symptoms of future danger.

Baffin's sea and the Iceland sea both intervene between America and Europe, and these channels are doubtless necessary to prevent a recurrence of the glacial drift phenomenon. Had these seas not been created, Iceland and Greenland would have been a part of Europe, just as Oregon, Columbia and Alaska are a part of North America. The shattered condition and diminutive size of Europe are owing to the fact that the principal arctic channel has been made to pass through her rightful territory.

Scepticus.—According to Geonomy the six oceans should have been nearly alike in their dimensions. But the North Atlantic is much smaller than the Pacific.

Amicus.—There can be no doubt that the ellipses were primitively nearly alike in their dimensions, but the irregular and unequal elevations tended to vary them. If the waters of the North Pacific could now be raised 500 fathoms, such large areas would emerge that this ocean would be but little larger

than the North Atlantic. The North Indian, as its bottom rose, continued to contract its dimensions until nothing is left but a few narrow inland seas.

Permit me to call your attention to one important circumstance that corroborates our theory. Geographers have often remarked the analogies of the continents. It seems as if the causes that produced North and South America repeated the process and produced Europe and Africa, and then repeated it again to produce eastern Asia and Australia. The elliptical *currents* do not extend further from the equator than the 45th or 50th parallel. The oceanic depressions which they produce can not, therefore, extend much nearer the pole than the ellipses do. If the sides of the basins were perpendicular the land would rise near the 50th parallel. But there is a gradual rise, so that the land (the edge of the basin) does not generally emerge until we reach the 60th or 65th parallel, which is 25° from the pole. In accordance with these principles we find that the repetitions of continental forms are confined within the same limits. Beyond the 60th parallel in neither hemisphere are there to be seen any of those remarkable analogies which have excited so much comment and which constitute such an interesting feature in the temperate and tropical zones.

PROBLEM V.

CREATION OF MOUNTAINS.

Mountains were not upheaved in consequence of the great and general oceanic depressions that raised the continents. They resulted from local and limited depressions, produced by the weight of sediment conveyed by waves from the pre-existing shores, and deposited upon the beds of the seas in lines parallel with the shores. Some of these depressions may have been made by the weight of sediment deposited on the *ocean's* floor in lines parallel with the shores. This may have been true of the Andes; but nearly all the mountains resulted from depressions made in submarine portions of the *continents* while they were rising. If all the continents on all their sides had been raised equally and simultaneously, as in the ideal plan they are supposed to be, there would have been no mountains except on the borders of continents. But when an inland sea was created, its bed, in many instances, sank, and raised mountains on the borders of that sea.

NOTE.—Mountains may be conveniently divided into *upheavals* which result from depressions; *corrugations* which result from lateral pressure; and *bluffs* which result from the erosion of adjoining areas.

NOTE.—"Observations on the pendulum have been supposed to

show that the specific gravity of the earth under mountain chains is generally less than in the adjoining plains."

"The heavier masses pressing upon the interior fluid would tend to elevate the surrounding lighter masses, and where the two were in eqnilibrium the latter would be the higher, as a floating block of pine wood will rise higher out of the water than a block of oak."—*Newcomb's Astronomy, p.* 299.

NOTE.—The author of Geonomy has advanced no theory concerning the *causes* of the fluidity of the matter below the crust. He only insists that the conditions below the crust are such that weight produces subsidence, the reaction of which causes elevations.

RELATIONS OF CURVES TO MOUNTAINS AND BASINS.

Islands and mountains produced by sinking local basins, are generally curved, with their concave sides toward the basins the sinking of which raised them. All the upheaved mountains in the interiors of continents, were originally raised in consequence of the sinking of the bottoms of inland seas that then existed near them. But the forces that afterwards raised the whole area, or the continent, above the sea, acted specially on the mountains and elevated them more, for the reason that they presented less resistance than the heavily loaded basins.

Volcanoes burst forth in mountains rather than in valleys, not so much because there is greater pressure there, as because there is less resistance to the upward pressure of the lava that is raising the continent. Large areas in the South seas, containing many volcanic islands, are known to be rising, while other areas that are not volcanic are sinking.

We are now prepared to understand the process

by which the North Indian ocean basin was raised, and converted into a complex aggregation of mountains and valleys. Some of its lands are lower and others higher than any others in the world. According to the primitive ideal plan, no part of this area was intended (so to speak) for dry land. It was not one of the continental areas, but one of the six oceanic basins. By the aid of geology we are able to determine, approximately, the positions and trends of the first shores and mountain ranges that were created within its limits. Eastern China, India and Southern Africa were above the sea before any of the east and west mountains of Europe and Asia were created. The bottom of the North Indian rose slowly, and contracted the area of the doomed ocean, until it became a long, narrow inland sea—a Mediterranean that extended from eastern China to France. The Altai mountain range rose on the north shore of this sea, and extended east and west, as its parent shore did; the water then retreated further south, and gave birth to a new shore and a new and parallel range of mountains. This process was repeated until the Himalaya rose—the youngest of the series, of which the Altai was the first born. This part of the inland sea had the North Pacific on its eastern, and the South Indian on its southern side. The north and south mountain ranges of Asia were raised by depressions along the Pacific shore, but the east and west ranges were produced by the inland sea.

In order to understand the elevations of Asia we

must regard them as the results of two distinct operations. The separate mountains were raised at first, and their position and courses determined, by the depressions of local basins, created while the whole area was an archipelago. After the plan of the surface was thus laid out by local causes, the depression of the great oceans raised the whole area, including valleys, basins and mountains, and thus created the great Asiatic plateau.

The Caspian valley was too far from the oceans to be raised in this manner, and the present Mediterranean was still farther off, and was therefore capable of retaining a small remnant of the ancient North Indian ocean.

The Scandinavian mountains were not raised by the operations of elliptical currents. Their trend and position indicates that they were elevated in consequence of the depression of the channel of the Iceland sea. After the Scandinavian range was raised, the sea retreated eastward to the Oural region, and created a shore that gave birth to a new range with the same trend.

The northern and western parts of Germany and France were once the boundaries of the North Indian. As the waters retreated and the lands advanced southward and eastward, the mountains arose; first the Jura, then some parts of the Alps, then other parts. Since that time the whole area, including valleys and mountains, have continued to rise. The present trends and curves of the moun-

tains, as well as the geological formations, indicate the positions of the ancient basins and shores, as well as the direction in which the water retreated.

Scepticus.—Do I understand you to assert that all the mountains in the interiors of continents—those far from the present shores—were raised in consequence of the depressions of inland seas that existed at the time on their concave sides?

Amicus.—That is our position. The Rocky and Nevada mountains afford examples. There was formerly a long inland sea that extended from the Gulf of Mexico to the Arctic sea. The depression of the bed of this sea raised the Rocky mountains on its eastern and the Nevada on its western side. The Rocky's are concave toward the great basin—toward the west—and the Nevada are also concave toward the same basin—toward the east.

It should be again remarked that though the depressions of the inland basins originally produced the mountains, it was the lava from beneath the great oceans that subsequently raised them to their present height.

Scepticus.—How do you explain the parallelism of the Appalachians, especially in those places where the ridges appear to be mere corrugations of the strata? And how do you explain the fact that in some places the strata subsided several miles, without producing any but moderate heights by the reaction?

Amicus.—The Appalachians present some facts that

are not easily explained on any simple hypothesis. It should however be observed that the greater subsidences, that are unaccompanied by corresponding elevations, are those that occurred when the continents just began to emerge, and when the waves eroded the land and spread its fragments upon the areas in the vicinity, thus producing local depressions amidst a general continental elevation.

The hypothesis that "the subsiding materials were brought from some foreign shore," we regard as utterly untenable. Our idea is that the Appalachian region was at first in nearly the same predicament that the Aleutians, and many other islands are now. The islands, and the basins between them and the continent, are slowly rising, but the winds and the waves are eroding the islands, furnishing sediment, and producing local depressions near them. When a shore is once permanently established, a depression near it will have the effect, as in the Andes, of raising high and permanent mountains.

Scepticus.—How do you account for the continental islands, and for the fact that they are so much more numerous on the Asiatic than on the American side of the Pacific?

Amicus.—A continental island is, in every case, a part of the continent. As a general rule the main land existed before the island began to rise. The sediment from the shore being deposited on a submarine part of the continent, over which the water was relatively shallow, created a basin, the depres-

sion of which, by reaction, produced the island. This theory is confirmed, if not positively established, by the fact, first pointed out by the lecturer, that, without exception, the continental islands and their mountains are curved, and have their concave sides toward the main land, and toward the basins the depression of which raised them. With this explanation in our minds let us look on a map and observe the remarkable curves of the Antilles, the Aleutians, the Kurilles; then turn to the mountains in the interiors of the continents, and mark how plainly they proclaim their origin by the curves that, in every instance, are concave toward the adjoining basin. See the curves of the Carpathians, the Jura, the Alps, the Himalaya. Observe the mountains on both sides of Asia Minor concave toward the interior. The reason why there are so few continental islands on the American side of the Pacific, is because the water is deeper there, and the depressions, if any, are oceanic and not continental.

Scepticus.—There are some facts that demonstrate that great lateral as well as vertical pressure was exerted upon some of the mountains as they rose.

Amicus.—The lava from beneath a sinking basin would necessarily move in the direction required to produce such a pressure. The folds, cleavage and steep sides of the Appalachians, for example, would inevitably result from a westward movement of the lava from beneath the floor of the Atlantic. This explanation was first suggested by those eminent

geological surveyors, Henry and Wm. B. Rodgers. A stream of lava, from beneath a deep ocean, raising the land on its sides, must move somewhat horizontally as well as vertically.

Scepticus.—How has this theory been received by those most capable of judging concerning its merits?

Amicus.—Those who had already committed themselves by their publications and lectures have looked coldly upon it. This, however, was to be expected. The discoveries of neither Copernicus, Kepler, Galileo or Newton were appreciated until half a century after they were made. Harvey states, in his diary, that no physician forty years old was convinced that the blood circulates. Galileo was greatly amused when a learned professor refused to look through the newly invented telescope, and declared that he would not believe in Jupiter's moons even if he should see them. The only argument that I have heard used against Geonomy, is that it is new, and has not publicly received the sanction of the old professors.

It is a curious fact that the elliptical theory of the currents was unanimously approved and applauded, when explained to the members of the American Association for the Advancement of Science, in Chicago, in 1868; but when afterwards applied to the formation of continents and mountains, it met with strong opposition, especially from those who had pet theories of their own.

Before the publication of Geonomy, Sir John

Herschel, in a letter to Sir Charles Lyell, suggested that possibly the sediment which accumulated on the sea bottom may, in some cases, intercept the heat from the interior of the globe, and its lower parts thus become melted, so that the weight of the superincumbent mass would crowd it aside and upward, and thus produce mountains and volcanoes. He did not attempt to show that any particular mountain or area had been raised in that manner, but he gave expression to the abstract idea that such a proceeding was not improbable. Mr. Babbage, the celebrated mathematician, proposed the hypothesis that the sediment became heated and swelled so as to produce mountains. In 1879, Prof. Le Conte, of San Francisco, in his "Elements of Geology," adopts the theory first taught by the author of Geonomy, that mountains have all resulted from sediment conveyed from shores and deposited on the sea bottoms. But he adds a novel hypothesis of his own. He imagines that the heat generated or intercepted by the sediment, softens the earth's crust to a great depth, and the secular cooling and contraction of the crust squeezes up the softened mass, and thus produces a mountain. He also attributes the oceanic depressions and continental elevations to the secular cooling and shrinking of the globe, but he makes no attempt to account for the continental forms; indeed, on the old shrinking hypothesis, the attempt would necessarily be a failure. According to the geonomic theory the same process that created

continents was repeated, on a smaller scale and at subsequent periods, to create the mountains. In these respects the continents are analogous to the planets, and the mountains to the satellites.

It may be added as a curious coincidence, that the discovery of the laws that control the elliptical motions of the planets laid the foundation of the Science of Astronomy, and the discovery of the laws of the elliptical motions of the ocean currents furnishes a basis for a Science of Geonomy.

The members of "The American Association for the Advancement of Science" will not soon forget the excitement produced at their annual meeting in Salem, Massachusetts, in 1869, when the author of Geonomy read a paper on "The Laws of Mountain Formation." The chairman of the section arose, and protested against allowing a paper to be read which, as he truly declared, "was contrary to the experiences of geologists for the last thirty years."

The proposition objected to was that "mountains have resulted from the depressions made by the weight of the sediment deposited on the sea bottoms in lines parallel with the shores!" The members present refused to sustain the motion of the chairman, and Col. J.W. Foster, at that time the president of the association, afterwards apologized to the author of the paper for the unparliamentary interruption. "Time brings its revenges." It is interesting now to see a book by Prof. Le Conte, an ex-president of the American Association, in which this same scientific heresy

is advocated with great ingenuity and ability; the only difference being in regard to the manner in which the sediment operates to produce the results.

Physical geography, as now taught in our schools, is not entitled to the name of a science; it is not even a system, but a confused collection of valuable facts. Geonomy performs the same office for them that the law of gravitation does for the facts of astronomy. It binds them together into a beautiful scientific system, demonstrates their mutual relations and bestows upon them a peculiar value and importance.

DIAGRAMS.

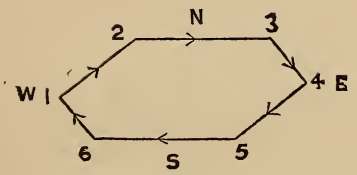


FIG. 1.

This diagram is intended to represent the theoretical and mathematical principles of an ellipse in the northern hemisphere. It is made irregular in order to emphasize the six points where the current changes its direction. The letters W, N, E, S, indicate the points of the compass.

1 is the western extremity (Gulf of Mexico), where the current begins to flow N.E.

2 is the point, near the 45th parallel (Banks of Newfoundland), where the current begins to flow nearly due east.

3 is the point where the current, being cold, begins to turn S.E.

4 is the point, near the 30th parallel, where, the easting being exhausted, the current begins to flow S.W.

5 is the point where the current begins to flow nearly due west.

6 is the point where the current, being warm, begins to flow N.W. to the starting point, 1.

The reason why the longer diameter of the ellipse is east and west, and the shorter north and south, is that the force derived from the earth's rotation is greater than the forces produced by difference of climate. If the forces had been equal the currents would have flown in perfect circles. The reason why the lines from 1 to 6 and from 3 to 4 are shorter than those from 1 to 2 and from 4 to 5 is that, though the current begins to flow eastward at the 20th parallel, it expends so much easting on the way that it only reaches the 30th parallel on the opposite side of the ocean before its easting is exhausted. This irregularity of the ellipses furnishes to a sceptic convincing proof of the theory of Geonomy, since it explains the hollow (short curve) on the N.W. side of the continent of North America, and also that on the S.W. side of the continent of South America; it gives a reason for the long N.E. line on the eastern side of North America, and also on the eastern side of Asia; it also enables us to understand the pointed form of South America and of Africa, on their eastern extremities.

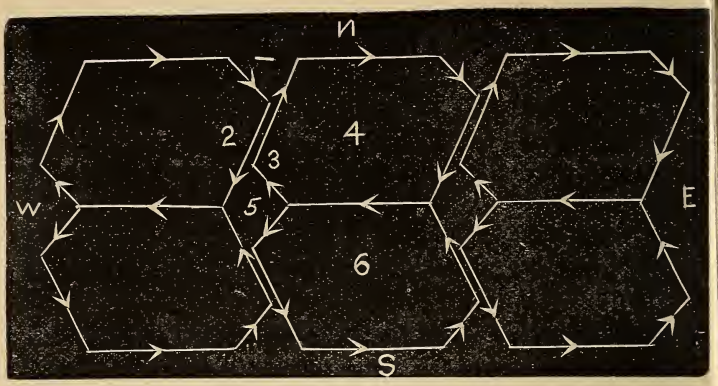


FIG. 2.

This diagram represents the ideal map of the world, showing in a very general manner the forms and positions of the oceans and continents as they would have appeared if the ellipses had at first been placed symmetrically—the northern ellipses exactly north of the southern ellipses—and if, also, the sediment had been so equally distributed as to make the depressions uniform in all the ellipses, and, consequently, the continents north and south equally elevated.

FIG. 4.

This map is intended to show the causes of the remarkable analogies of the three pairs of continents. 1, 1, 1 represent the relative positions and analogies of North America, Europe and Asia. 2, 2, 2 represent the three isthmuses that connect the three northern and the three tropical continents. 3, 3, 3 represent the western extremities of the three oceans, and show the analogy of the West Indies, the East Indies, and the western part of northern Africa. 4, 4, 4 represents the North Atlantic, North Indian and North Pacific ellipses. 5, 5, 5 represent the three tropical continents, South America, South Africa and Australia, and show that when the North Indian Ocean existed, Africa was much more like South America and Australia than it is now.

It should be stated that this essay and the diagrams are only intended to discuss and illustrate the theory and general principles of Geonomy, and, therefore, make no pretensions to precision in unessential details.

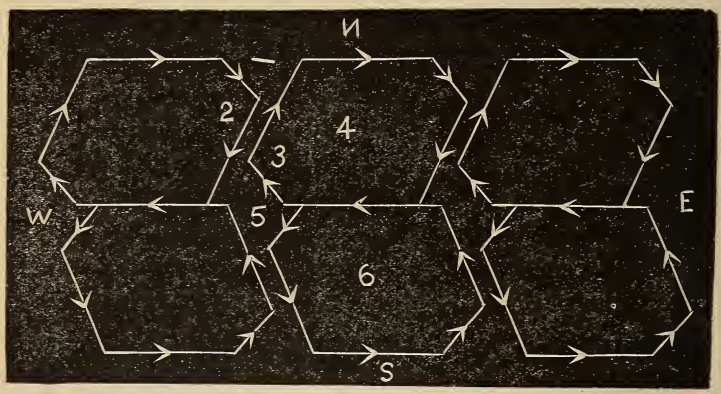


FIG. 3.

FIG. 3 is like FIG. 2, except that the northern ellipses and continents are all placed an equal distance west of the southern. 1, North America, 2, indicates the short curve or hollow on the north-west coast of North America. It will be seen that there is a similar curve on the south-west coast of South America. 3 indicates the position of the West Indies and the Gulf of Mexico; 4, the North Atlantic; 5, South America; 6, the South Atlantic.

This diagram is intended to demonstrate that Geonomy is founded upon strictly mathematical principles. The real distance of the northern continents west of the southern is about 50 degrees of longitude.

PROBLEM VI.

INTRODUCTORY REMARKS

RELATING TO THE NEW EDITION OF

PHRENO-GEOLOGY,

OR THE

PROGRESSIVE CREATION OF MAN.

Circumstances are the Fingers of God, by the agency of which He Created and Controls all things.

In the year 1839 the author of this volume published in Buffalo, New York., a new system of Phrenology, the principal novelty of which consisted in the announcement that the organs and functions of the body and the brain consist of three classes, namely, the Ipseals, or those related to self; the Socials, or those related society, and the Intellectuals, or those related to the acquisition of knowledge.

He next proceeded to demonstrate that the phrene organs of each of those classes, are super-added and arranged in a remarkable order, which may properly be termed the order of evolution. The Phrenological

societies of Buffalo, Albany, Hartford and London appointed committees to investigate the subject, all of whom reported in favor of the new classification.

In 1850 the author published Phreno-Geology, in which he advocated the hypothesis that the organs of the brain were created successively in different geological periods, as circumstances rendered them necessary.

Mr. Charles Darwin's now famous work on "the origin of species" had not then been published. The author stood alone, the sole advocate of the doctrine of evolution in this country. Phreno-Geology, on its appearance, was treated with great severity by all parties. The scientists condemned it because it was a departure from the old beaten track, and because it assumed the truth of phrenology. The infidel paper — the Boston *Investigator* — attacked it because it recognized the existence of God the Creator, who hears and answers prayer. The Puritan papers on the other hand denounced it as rank infidelity. The histriographer of the Episcopal Church, Dr. Jarvis, in a letter to the author's pastor, the Rev. Orange Clark, of Quincy, Mass., declared that "a man who could seriously advocate the idea that the brain received additions in successive geological periods, was only fit for a madhouse." After a small edition was sold, the author, at the solicitation of his religious friends, boxed up the stereotype plates, and has allowed them to remain unused for the past thirty years. In the

meantime the public mind has undergone very great changes. According to Dr. Gill, of Washington, three-fourths of the naturalists in this country are now evolutionists. Even theologians are beginning to accept the doctrines of *thesistic* evolution, though they protest, and with good reason, against the implied atheism which some writers have unnecessarily associated with the subject.

In the author's work, lately published, (Mysteries of the Head and Heart,) a reference made to Phreno-Geology has caused considerable inquiry for the book, and those that could be found have sold for a high price. The author has therefore thought it advisable to issue a new edition ; as it contains a discussion of the last and most important problem of creation, it may be regarded as an appropriate addition and sequel to the preceding parts of this volume.

PREFACE.

This work is the natural sequel to "The New System of Phrenology," published in 1839, in which I introduced a new classification and arrangement of the organs of the brain, and insisted that it is a natural arrangement, and therefore preferable to that proposed by Spurzheim, advocated by Combe, and generally adopted.

The phrenological societies in this country generally adopted my classification when it was brought before them, although a few prominent and influential authors and lecturers opposed it. At the present time those who do not adopt it are silent concerning it, and thus tacitly assent to its claims. For the information of some readers it may be proper to state, that Spurzheim classed the four lowest socials and the eight lowest ipseals together, and denominated them "Animal Propensities;" the eight highest socials and three highest ipseals he also classed together, and named them "Moral Sentiments." He taught that the sentiments differ from the propensities in being endowed with *peculiar emotions*, which the propensities do not possess.

I utterly repudiated this doctrine of Spurzheim, and, taking the elements of the science as their great discoverer, Dr. Gall, left them, I endeavored to find the natural relations which exist among them. How far I have succeeded, I leave it for others to determine from the following brief statement:

I first pointed out the division of the organs into three classes,—ipseal, social and directive. Secondly, I traced and established a connection between the organs of each class from the base to the upper lateral part of the head, such as to constitute three series of superadditions. The engraved bust of the head, in this work, is the same engraving that was used in my work published in 1839, and represents the three series by three different kinds of numerals. In 1844, I discovered and published an additional improvement in Phrenological Science, which is represented by the engraving of the converging fibres of the brain, on page 66. I taught that thought and feeling is not a function of the brain, but is confined to the oblongata; and that the real office of the brain is to receive impressions, modify them, and transmit them through the central phrene or consciousness to the muscles, and thus produce volition. This improvement seems to be generally admitted, without opposition, wherever it has been explained; it is recommended by its extreme simplicity and apparent truthfulness, and by its

affording a ready explanation of many hitherto unaccountable phenomena in psychology and mesmerism.

I now come before the public once more, with the results of several years' investigation, in a new and interesting field. My principal object in publishing this volume is to show the relation between phrenology and geology — between the structure of the brain and the geological series of changes.

CONTENTS.

INTRODUCTION.

PHRENO-GEOLOGY.

PHRENO-BUST.

The organs on the side of the head, included in the double lines, are the Ipseals, or those related to Self. Those on the back and top are the Socials, or those related to Society. Those in the front are the Intellectuals, or those that acquire knowledge. A?, B?, C? and E? are candidate organs. The other letters are the abbreviations of the names of organs.

INTRODUCTION

TO

PHRENO-GEOLOGY.

ARTICLE I.

If we trace the phreno-organs of man from their three different roots at the base of the brain, [see engraving,] and studiously notice the character of the super-additions, we shall find that as the organs rise in each of the three classes, they assume higher moral and intellectual functions, — they tend to produce more complicated actions, and require more extensive and various knowledge.

If, now, we turn to the adamantine volumes of Geology, to learn the structure and habits of the intelligent beings that inhabited the earth before man was created in his present form, we are struck with admiration by the harmony which is displayed, and the beautiful unity of design which is so unexpectedly discovered, between the structure of the earth, the structure of ancient animals, and the super-additions of the phreno-organs of the human brain. If we follow the geologist, from his examination of the lowest vertebrated fossil animals to the highest in point of intelligence and moral conduct, we find that phreno-powers were added to their minds in a manner and order exactly agreeing with that in which the organs are superadded and arranged in the human brain. [See engraving.]

We find the brains of vertebrated animals lower the further we descend geologically into the earth. The monkey is found a little lower in the geological series than man, and, accordingly, he has a brain differing from that of man only at the points where the very highest organs of man are developed. It resembles the human brain in its *general* appearance and structure, but it is deficient in certain parts which elevate the character of man, and give lateral expansion to the upper frontal region of the head Now, from the orang, let us descend to the dog and fox, and we find him still more deficient in the same important parts. Then let us go to the wolf, tiger, hyena, crocodile, and so down, until, when we finally come to the least intelligent fishes, the brain is merely a continuation of the spinal cord, apparently a mere simple oblongata, surrounded by a watery fluid, with several little knots of pulpy, nervous substances growing out of it. These knots are presumed to be phreno-organs; but the whole brain is such a simple affair that no one would suspect it to be a brain, were it not found in the skull, where it is supposed a brain should be. If we notice carefully the simplest of the fishes, and study their modes and habits, we find them showing distinctly those conscious powers only whose organs in man are found at the base of the brain. Their principal conscious powers are those which prompt them to breathe, to eat, to avoid injury, to propagate, and to perceive the objects immediately around them. There is essentially no cunning, nor foresight, nor parental affection, nor social regard, and consequently, no government nor society such as exists among higher animals. If there is any degree of these, it is so slight, compared with that of higher animals, as to be merely rudimentary. These facts, and such as these, have produced, in some inquiring minds, an opinion that man is but the result of gradual progression from the lowest vertebrata, — that, in fact, man was originally a fish, then a reptile,

then quadrumanous, (like an ape,) then a bimanous biped, — a semi-human savage, less intelligent than the present orang, — then more intelligent, and so on to the present time. This doctrine was boldly advanced and defended by Lamark, a distinguished French naturalist, who wrote about fifty years ago. He contended that man, and every other animal, is the result of circumstances acting upon organization, and causing it to *develope* its *latent* powers, — that the web foot of the duck is caused by the very act of paddling in the water, — the teeth of the tiger by the act of tearing; and so of other peculiar forms. A modification of the theory of Lamark has lately been brought forward in a work entitled "*The Vestiges of Creation.*" The truth of this doctrine is, however, denied by many distinguished geologists and naturalists, among whom is Mr. Lyell, who contends for the assumption that each class of animals, including man, was, independently of the others, created by the Almighty, and specially and miraculously adapted to the circumstances which were to surround it. This, in substance, is his conclusion, and it is also the opinion (if we may judge from their writings) of Cuvier and most of the great European and American naturalists. But history teaches us to receive the published opinions of popular and salaried philosophers, upon such subjects, with much allowance for the delicate circumstances in which they find themselves placed. It is dangerous to advocate important truths in advance of the age. Diana of the Ephesians is still too GREAT to be approached without prudence and respect. It is not forgotten that Galileo, and Buffon, and Lawrence, were obliged to retract their expressed opinions; and many, doubtless, approve of the timid wisdom of Aristotle, who, after the death of Socrates, left his country to avoid persecution, saying that he was "unwilling to give his countrymen an opportunity to commit another offence against philosophy." In science, we must be governed by the authority

of facts, and not of distinguished names. The general tendency of modern science is to prove that there was a time when no organized being existed on earth; that vegetables were the first organized existences; then certain animals nearly allied in character and form to vegetables; that, in succeeding ages, higher animals were produced, and last and highest came man upon the stage. Geology, Embryology, and Phrenology, combine to establish this result and to illustrate it.

Geology shows us the lowest animals in the lower fossiliferous strata, and the highest animals in the highest stratum. Embryology exhibits the first organs of the brain which are developed in man, (several months before birth,) and shows that they are the same as those possessed by the lowest vertebrated animals found in the rocky strata by the geologist. As the embryo-man progresses in development, his brain receives superadditions and offshoots, which make him resemble successively the fish, the reptile, the lower mammal, then the higher; and, finally, the endowments of humanity crown the performance, and man is born. In short, the manner in which the brain of man is developed before birth, the succession of organs and addition of parts, is the same as when the brain was (according to Geology) developed in the succeeding tribes of animals before man existed on earth. The phreno-organs at the base first being a mere continuation of the spinal cord, then afterwards receiving additions in a lateral and upward direction; at length, at the highest lateral portions of the front head, are formed the organs of causality, perfectiveness, and credenciveness, which man possesses above all other animals, and which principally contribute to his superiority.

ARTICLE II.

CIRCUMSTANCES ARE THE FINGERS OF GOD.

God created all organized beings — vegetables, animals, and man — by the agency of the circumstances by which they were successively surrounded. Geology abounds with evidences of this great truth; changes of the earth were constantly followed by changes of animal forms. There surely must have been a time when no animal with lungs could have existed on earth, for there was no pure air to breathe, such as we now enjoy. Carbonic acid and various vapors and gaseous matters were suffused through the atmosphere, rendering it absolutely impossible for any of the higher animals to exist. At this time fishes abounded in the sea, and vegetables flourished on the land; for the very carbonic acid which, when in the air in great quantities, is the death of animals, is the very choicest food of plants. As the earth grew colder, the vapors and gases became condensed to water, to vegetables, and to carbonic rocks. The immense amount of plants which grew upon the virgin earth consumed a vast amount of carbonic acid, and thus relieved the atmosphere of its presence. The formation of bituminous and of anthracite coal beds was one result. Immense quantities, also, of the atmospheric carbon was consumed in forming the carbonates of lime, such as common limestone and marble. After this the air was purer and cooler, and reptiles began to flourish, — animals that sprung from fishes, which gradually, and after ages of approximation, became at length capable of living on land, — at first for a few moments, then longer, and at length continually. It is easy to imagine

that myriads of fishes died when the circumstances came upon them which forced them to change their mode of life in that region in which they then lived; but when one pair did thus change and survive, it would become the Adam and Eve of a race of land animals. It is also reasonable to suppose that the change took place from necessity, in some situation where the land was alternately immersed in water, and then left partially uncovered by it, as we now frequently see land when the tide ebbs and flows. It may be that, instead of the water leaving the animals, the animals left the water, and went, gradually advancing, upon the land to feed upon its luxuriant foliage. The first inhabitants of the land were, probably, though not necessarily, vegetable eaters, which fed upon marine plants when they inhabited the water, and upon land plants when they lived upon the earth. It is a startling announcement that our ancestors once inhabited the mighty deep, and, sustained on broad extended fins, roved through the vast ocean. But, if our theory is admitted, such is the inevitable tendency of the arguments, and nothing but the interposition of a miracle can prevent this conclusion. One pair, at least, must have escaped from the water, and become changed to reptiles by the gradual but irresistible force of predestined circumstances; then, by the continuation of similar causes, they became exclusively land animals. What now took place? Vegetables became smaller and less abundant, while animals were more numerous, and continued to increase by reproduction; food grew scarce, until at length there was no alternative but to die or to feed upon each other. This introduced carnivorous land animals, even if none came from the water. Doubtless a great number of animals died from inability to undergo the change from vegetable to animal food, yet enough lived to reproduce land animals that could live on flesh exclusively.

ARTICLE III.

By the will of God the increasing coldness of climate produced the principal circumstances that produced animals and men.

The earth was once too hot to allow of the existence of animals; they were not produced until it had cooled down to a certain point; plants, infusoria, radiates, molusks, trilobites and fishes were then created. I do not mean to assert that these animals were created in the order named, they may have originated and progressed simultaneously. If the earth had continued at the same temperature which it then possessed until the present time, it is certain that man never would have existed in his present form. We should now have all been fishes or nothing, — *aut pisces aut nullus.* We could not even have advanced to the dignity of reptiles, enjoying the privilege of crawling occasionally out of the water into the mud on swampy islands of the sultry ocean. Still colder must it have been when our great reptile parents left the ocean altogether, stood on the solid earth, fed upon its herbage, and breathed with lungs instead of gills. It must have been colder, or such an atmosphere could not have existed. I doubt not that the atmosphere was the agent, under Providence, that created the lungs, — the solid earth created the feet, — the food created the teeth and digestive organs, — the temperature of the air created the skin, hair and feathers of land animals, and the light created and modified the eyes. It may have been millions of years in doing this, but Geology does not restrict us in regard to time.

Only admit, as every one must, that some slight change in organization can be produced in a thousand years' exposure to

some powerful influence, and the whole argument is at once surrendered, for Geology instantly steps in with its vast period of time to accomplish any amount of transformation which organization is capable of undergoing without destruction. It should also be considered that organization is capable of gradually assuming any form whatever that can be conceived, provided circumstances require it, and sufficient wholesome food, air and protection, can be obtained by the change, and not otherwise. The point that I am now insisting upon is, that, by the will of God, cold produced the circumstances which created man. Admitting that

"The vile race from which we sprung'

once inhabited the water, it is plain that when primeval man, in reptile form, first left his native ocean, bade it farewell, and established himself upon the land, feeding exclusively upon its productions, if the temperature of the earth had remained stationary from then until the present time, man, in his present form, would not have existed; his high powers, which now enable him to struggle against the modern climates, would all have been unnecessary. There was then no need of clothing, nor shelter, nor society, except of the opposite sex. The multiplication of animals, rendering food scarce, would change herbivorous animals into carnivorous, even if the temperature remained the same. This would cause some change in the organization, but it would merely be such as would be needed to adapt him to such food; it would go no further. No other improvement was made, — no advance to his present state, — until it became cold enough to produce some degree of the inclemency of winter; then more intelligence and skill became necessary to prevent destruction. Immense numbers of animals perished with cold and hunger. The animals that survived the changes grew smaller in their bodies and larger in their brains, (so Geology teaches;) for intelligence and skill

were more needed than strength. It is now evident that cold produced the circumstances which rendered intelligence necessary to prevent destruction, and intelligence is the great peculiarity of man.

ARTICLE IV.

GEOLOGY.

As I expect that this book will go into the hands of many who are unacquainted even with the elements of geology, I deem it proper to give a brief general outline of the features of the science, for the benefit of such readers.

Geology is the science which teaches the structure of the earth below the surface, and explains the causes of the various appearances which that structure presents. Notwithstanding the immense number of facts, details and technical terms which appear to encumber geology and embarrass the learner, a sufficient understanding of the general principles of the science may be obtained from a few pages.

"If," says Dr. Hitchcock, "we suppose ourselves placed in a meadow, which has resulted from the successive deposits of annual floods, and begin a perpendicular excavation into the earth, we shall pass through the different classes of rocks in the following order: —

"For a few feet only, — rarely as many as 100, — we shall pass through layers of loam, sand, and fine gravel, arranged in nearly horizontal beds. This deposit, from an existing river, is denominated *alluvium*. All deposits from causes now in action, which have taken place since the present order of things commenced on the globe, are usually regarded as alluvial.

"The second formation which we shall penetrate, is composed of coarse sand and gravel, with fine sand, and even sometimes clay, containing, however, large rounded masses of rock called bowlders; the whole mixed together, yet often distinctly, and horizontally stratified. This formation, evidently the result of glacio-aqueous agency, is called *drift*. It is distinguished from alluvium, first, by its inferior position; secondly, by the marks of a more powerful agency; and, thirdly, by extending over regions where no existing streams or other causes now in action could have produced it.

"The third series of strata which we penetrate in descending into the earth, is composed of layers of clay, sand, gravel, and marl, with occasional quartzose and calcareous beds more or less consolidated; all of which were deposited in waters comparatively quiet, and in separate basins. They also contain many peculiar organic remains, and sometimes dip at a small angle, though usually they are horizontal. These strata are called *tertiary*.

"The formations which we penetrate after passing through the tertiary, are composed for the most part of solid rocks. They are, however, mostly made up of sand, clay, and pebbles, bound together by some sort of cement. With these are interstratified many varieties of limestone; and throughout the whole series is found a great variety of the remains of animals and plants, very different from those in the tertiary strata. These groups of rock sometimes lie horizontal; but are usually more or less elevated, so as to make them dip at various angles. They are called *secondary rocks*.

"The stratified rocks below the secondary are distinguished by the absence of organic remains, by having a structure more or less crystalline, and by being more highly inclined. They are called *primary rocks*. This term has also been applied to the unstratified crystalline rocks.

"Immediately beneath the primary stratified rocks, we find the unstratified ones. As this is found to be the case wherever the stratified rocks have been penetrated, it is inferred that the internal parts of the globe, beneath a comparatively thin crust, are made up of unstratified rocks; at least to a very great depth.

"Among the primary rocks, there is no settled order of superposition. Perhaps gneiss most commonly lies immediately above granite; but the other members of the series are frequently found also in the same position. Among the fossiliferous rocks there exists an invariable order of superposition."

The following is Dr. Lyell's arrangement, names, and subdivision of the formations:—

Recent.	Tertiary Period.		Upper Silurian.	Primary Fossiliferous Period.
Newer Pliocene.				
Older Pliocene.			Lower Silurian.	
Miocene.				
Eocene.				
Chalk.			Cambrian and Older Fossiliferous.	
Green Sand.	Secondary Period.			
Wealden.				
Upper Oolite.				
Middle Oolite.			Clay Slate.	Metamorphic Rocks.
Lower Oolite.			Quartz Rock.	
Lias.			Hornblende Schist.	
Upper New Red Sandstone.			Chlorite Slate.	
Lower New Red Sandstone.			Hypogene Limestone.	
Coal.			Mica Schist.	
Old Red Sandstone.			Gneiss.	

According to the authority of Dr. Hitchcock, "the following is the order in which some of the most important animals and plants have first appeared on the globe: in other words, the epoch of their creation. It may, indeed, be hereafter found, when the rocks have been more extensively examined, that some appeared earlier.

Silurian & Cambrian, or Graywacke Period.	Echinodermata, Annelida, Zoophyta, Crustacea, Cirrhipeda. *Marine Shells.* *Crustacea,* (Trilobites.) *Fishes*—Placoidians and Ganoidians, (Sauroids and Sharks,) also those with heterocercal tails. *Flowerless Plants.* } Marine. *Flowering Plants.* } Terrestrial.
Devonian Period.	Fishes, (Cephalaspis, Chirolepis, &c.,) abundant and peculiar.
Carboniferous Period.	Peculiar Fishes: *Arachnidans*, such as Scorpions; *Insects*, as Curculionidæ: *Fresh Water Shells: Infusoria: Dicotyledonous Plants*, Coniferæ, Cycadeæ: *Monocotyledonous Plants*, Palmae, Scitaminæ. *Batrachians,* (tracks in Pennsylvania.)
Red Sandstone Period. Trias and Permian.	Tracks of Birds, Tortoises, and Chirotheria or gigantic Batrachians. (*Labyrinthodon.*) *Reptiles:* Monitor, Phytosaurus, Ichthyosaurus, Plesiosaurus, Thecodontosaurus, Palæosaurus. *Crustacea:* Palinurus. *Fishes:* Palæoniscus. *Dicotyledonous Plants,* Voltzia, &c.
Oolitic Period.	*Mammalia:* (Marsupials) Thylacotherium, and Phascolatherium, (Didelphys of Buckland.) *Reptiles:* Saurocephalus, Saurodon, Teleosaurus, Streptospondylus, Megalosaurus, Lacerta neptunia, Ælodon, Rhacheosaurus, Pleurosaurus, Geosaurus, Macrospondylus, Pterodactylus, Crocodile, Gavial, Tortoise. *Fishes:* Pycnodontes and Lepidoides. (Dapedium, &c.) with homocercal tails. *Arachnidans:* Spiders. *Insects:* Libellulæ, Coleoptera.

Oolitic Period.

Crustacea: Pagurus, Eryen, Scyllarus, Palæmon, Astacus.
Plants: Cycadeæ, (Pterophyllum, Zamia,) Coniferæ, (Thuytes, Taxites,) Lilia, (Bucklandia.)

Wealden Period.

Birds: Grallæ, (Tilgate Forest.)
Reptiles: Iguanodon, Leptorynchus, Trionyx, Emys, Chelonia.
Fishes: Lepidotus, Pycnodus, &c. Fresh water and estuary shells.

Cretaceous Period.

Insects.
Reptiles: Mososaurus, &c.
Fishes: Ctenoidians and Cycloidians.
Crustacea: Arcania, Etyæa, Coryster.
Plants: Confervæ, Naiades

Tertiary Period.

Mammalia: 1. *Eocene Period, 50 species:*— Palæotherium, Anoplotherium, Lophiodon, Anthracotherium, Cheroptamus (allied to the hog), Adapis (resembling the hedgehog); *Carnivora:* Bat, Canis (Wolf and Fox), Coatis, Racoon, Genette, Dormouse, Squirrel. *Reptiles:* Serpents.
Birds: Buzzard, Owl, Quail, Woodcock, Sea Lark, Curlew, Pelican, Albatros, Vulture.
Reptiles: Fresh Water Tortoises.
Fishes: seven extinct species of extinct genera.
2. *Miocene Period:* Ape, Dinotherium, Tapir, Chalicotherium, Rhinoceros, Tetracaulodon, Hippotherium, Sus, Felis, Machairodus, Gulo, Agnotherium, Mastodon, Hippopotamus, Horse.
3. *Pliocene Period:* Elephant, Ox, Deer, Dolphin, Seal, Walrus, Lamantin, Megalonyx, Megatherium, Glyptodon, Hyæna, Ursus, Weasel, Hare, Rabbit, Water Rat, Mouse, Dasyurus, Halmaturus, Kangaroo, and Kangaroo Rat.
Birds: Pigeon, Raven, Lark, Duck, &c.
Fishes: (in the formation generally) more than 100 species now extinct which belong to more than 40 extinct and as many living genera.
Insects: 162 genera of Diptera, Hemiptera, Coleoptera, Aptera, Hymenoptera, Neuroptera, and Orthoptera.
Shells: In the Newer Pliocene Period, 90 to 95 per cent. of living species; 35 to 50 per

Tertiary Period.	cent. in the Older Pliocene; 17 per cent. in the Miocene; and 3.5 in the Eocene; amounting in all, extinct and recent, to 4000 species. *Plants:* Poplars, Willows, Elms, Chesnuts Sycamores, and nearly 200 other species; seven eighths of which are monocotyledonous or dicotyledonous.
Alluvial Period.	*Man,* and most of the other species of existing animals and plants. *Gigantic Birds,* Dinonnis, &c.

Geologists have arrived at the following conclusions, as the results of their labors and researches:

The present condition of the earth is the consequence of a series of changes, in which heat has been the principal agent. The time once was, perhaps millions of years ago, when the whole earth was a mass of liquid fire and blazing vapor; and it has been gradually cooling until the present time. At one period, no animal, nor vegetable, nor crystal, nor any solid thing whatever, existed on earth; indeed, there was no earth, — all the world was fiery mist, like a blazing, half-transparent comet. Gradually the heat was radiated away into space, until the surface of the earth was formed by an incrustation of granite. Below this granite was boiling lava; above it were vapor and gas. The earth continued to cool, and the granite crust to become thicker. What is now water then existed in a gaseous form in the atmosphere. Losing a portion of its heat, it became vapor, steam, clouds, then rain; the rain formed rivers, the rivers formed oceans. The waters of the first oceans were hot and fresh. Tremendous torrents poured upon the heated earth, and rushed among the rocks, dissolving their particles and holding them in solution. In a short time evaporation returned the water to the atmosphere, while the mineral sedimentary particles, which had been dissolved and disintegrated, fell upon the crust, and formed another kind of rock, called gneiss. The rocks formed by sediment thus deposited from water are composed of

parallel layers, as if one layer was deposited at one time, and another was afterwards laid over it. These layers are called *strata*, and all rocks thus formed from water are called *stratified rocks;* while those produced by heat are called *plutonic*, or unstratified. The stratified rocks are many miles in thickness, and are subdivided and classed into systems or formations. In many places the volcanic powers beneath have broken up the strata, and turned them over in such a manner as to present to our astonished view several miles of the edges of the layers, so that we are just as well informed concerning their appearances as we should be if we had dug so many miles perpendicularly into the earth, for the express purpose of viewing it. These layers are composed of hardened mud, sand, gravel, crystals, metals, and organic remains, most of which once existed in an ancient ocean, and, by their appearances, and the manner and order in which they occur, tell their origin and history. The grand division of the stratified rocks is into primary, secondary, tertiary, diluvial, or drift, and alluvial.

The primary are the lowest, and rest upon the unstratified rocks. No organic remains are found in these. If any ever did exist, the evidences of their existence have been obliterated by the heat to which they have been subjected from the volcanic rocks beneath. The probability is, that vegetables and animals existed earlier than those whose remains we now find; for we know that the first animals must have fed upon vegetables, and that vegetables must therefore have been created first; but we find animals quite as low in the rocks as we do vegetables. I have no doubt that the time will come when geologists will be able to show, by the remains in the rocks which will yet be discovered, that vegetables existed first, and that animals were created afterwards; but at present, though we know that such must have been the fact, we cannot demonstrate it by the rocky remains themselves. Again, we know that vegetable-

eating animals must have existed earlier then flesh-eating animals; but we cannot yet demonstrate the existence of strata which we know contains the remains of vegetable-eating animals that existed before flesh-eating animals were created.

The rocks which contain the fossil remains of vegetables and animals are called *fossiliferous rocks*, while those below these are called the *non-fossiliferous rocks*. All the stratified rocks are fossiliferous, except the primary. The secondary rocks are subdivided and named differently by different authors, but in the main and essential points they generally agree. The very lowest rocks that contain animal remains are called *protozoic rocks*. These rocks have received so many different names, and been subjected to so many different subdivisions, within a short time, as to produce some confusion in the minds of those who have but a slight acquaintance with the subject. The first name which they received was *graywacke;* afterwards they were called the *transition conglomerate* rocks. Then again they were divided into Cumbrian, Cambrian, and Silurian; and the Silurian were subdivided into upper and lower Silurian. On the whole, I prefer the division, classification and names proposed by Mr. Lyell, as given on the preceding pages. He makes a greater number of subdivisions than other authors, but he generally gives good reasons for doing so. From the very nature of the subject, we may expect that new discoveries will for a long time lead to still more numerous and more minute subdivisions, and to new and more appropriate names for the sections which are most carefully examined. I would recommend Dr. Hitchcock's Elements of Geology as the best summary of the science, for the use of students, in this country. They will there learn many details which I do not deem necessary for the purposes of this treatise. Dr. Hitchcock has constructed a very ingenious and instructive chart, and prefixed it to his book, in which he represents the order in which plants

and animals were created. He says, "While this chart shows that all the great classes of animals and plants existed from the earliest times, it will also show the gradual expansion and increase of the more perfect groups. The vertebral animals, for instance, commence with a few fishes, whose number increases upward; but no traces of other animals of this class appear, till we rise to the saliferous group, when we meet with the tracks of chirotheria, tortoises, and birds. But not till we reach the oolitic period do we meet with the bones of the mammalia; and then only two species of marsupialia. No more of this class appear till we reach the tertiary strata, where they are developed in great numbers, approaching nearer and nearer to the present races on the globe as we ascend, until, in the historic period, the existing races, ten times more numerous, complete the series, with MAN at their head as the CROWN of the whole; or, as the poet expresses it, 'the diapason closes full in man.'"

It seems that, before the carboniferous period, fishes were the only vertebrated animals that existed.

Next, in the carboniferous period, reptiles appeared for the first time.

In the red sandstone period, a low kind of birds appeared, though none had previously existed.

In the oolitic period, imperfect mammals appeared, but their brains were like those of reptiles, without convolutions.

In the tertiary period, all the perfect mammals appeared but man.

In the alluvial period, man appeared.

The common and popular idea is, that everything around us was created in a very brief period; and, in regard to the manner of creation, the idea is, that the Supreme Creator made things by an immediate and special effort of his power, just as

a potter makes a vessel of clay; or rather, as some wonderful magician transforms things in a moment, so that we can no longer recognize them as the same. Nothing has done so much to retard the advance of mankind in a knowledge of the natural sciences, as these unfounded notions; and what has rendered them so difficult to eradicate, is the fact, that it is believed that they are sanctioned by divine revelation. In some instances, the error of this opinion is so easily shown, and the demonstration of the contrary so palpable, that every one is forced, however reluctant, to abandon the fallacy.

Go to a citizen who lives near Niagara Falls, and ask him how long since the banks of that river were created, and the probability is that he will say 6000 years. Now proceed with him to examine the premises with science for a guide. Show him that the river must have been thirty thousand years cutting its way to its present bed, and that the rocks composing the channel were once at the bottom of a salt ocean, and had been raised by successive convulsions to their present place, before the river began to flow. Show him the proofs that many generations and races of animals had been created and destroyed during the period of time which had elapsed while the rocks were rising. Then examine the structure of the rocks themselves, and see them containing the organic remains of an immense number of generations of animals that once lived in the ocean, which rolled over the rocks when they were in the form of soft mud, — and the citizen will easily be induced to admit that a hundred thousand years is too little to allow for the creation of the rock by deposits made, as they evidently were, at the ocean's bottom, of sand, and mud, and pebbles, and plants, and animals, and various things which would naturally be precipitated from solution or sunk from the surface. The citizen would return to his home perfectly satisfied that divine revelation had never told the story of the earth's creation, and

that he had mistaken figurative expressions in Genesis for literal truth.

Go again to this same citizen, and ask him how long since the race of man, and other animals now living, were first created, and the chances are that he will again reply 6000 years. He will refer you to the book of Genesis, which relates that on the last day of creation man and all animals were created, except the fish of the sea and the fowls of the air.

Now lay before him the evidence that land animals existed in the carboniferous period, — that more than a million of years afterwards mammals were created in the oolitic period, — that all kinds of quadrupeds and apes existed in the tertiary period, and not before, — and that man did not exist till after the tertiary and diluvial periods had passed away. If the citizen is an honest man, and a man of good sense, he will at once abandon the idea that all these animals, and man also, were made in one and the same day, or in one and the same period, or even in one and the same climate. He will perceive that a literal interpretation of Genesis cannot possibly be sustained by the facts of Geology, and will afterwards content himself with regarding it as only a moral and spiritual lesson, given to us in the style peculiar to the ancient nations of eastern Asia, and adapted to the comprehension of a rude people.

It is quite as evident, to my mind, that animals and men were created gradually and progressively, as that the mountains were so created.

There is no scientific evidence that a single organic thing on earth was ever created suddenly. Everything is formed by the aggregation of many atoms, and always under circumstances favorable to such aggregation. The aggregation of chemical atoms formed minerals, the minerals composed mountains, but were an immense number of years in doing so. Just so chemical elements combined to form vegetables, and the vegetable

organisms, aggregated and arranged in a peculiar manner, compose animals. The first animals that were created had certain forms adapted to their need and conditions: a change in their circumstances produced a change in their forms, until man was produced. To say, then, that man was made at once in a single day, from dust or from chemical atoms, is to make man an exception to all the rest of nature. But the tendency of this treatise is to show that man, like all the rest of creation, is the result of gradual and progressive superadditions of parts and changes of form. Here, again, the literal interpretation of Genesis presents an insurmountable difficulty. For, in that book we are taught, literally, that man was made of *dust*, and that a perfectly formed and mature man was created before any female of the same species existed. The first woman was made, not in the way which science recognizes, but the man was made to fall into a deep sleep, and a rib was taken from his side, and from that rib, in a miraculous and incomprehensible manner, a perfectly-formed woman was created. Now, if we are to consider this statement as literally true, we are estopped from inquiring any further into the origin of man; and if we find the most positive proof that man was created as gradually as the mountains were, we must consider such proofs as so many fallacies.

It is useless to evade or to disguise the truth, that if we are to insist upon the literal interpretation of Genesis, we must totally abandon Geology, Astronomy, and Physiology, when applied to events which took place before the historic period commenced, and which have left their records upon the face of nature for our inspection. The literal and popular interpretation of this book does violence to every principle, not only of science, but even of common sense; for it conveys the idea distinctly that the world is stationary, upon immovable foundations, instead of turning upon its axis; — that the stars and

sun and moon are set in a solid firmament; — that rain-water comes from above the firmament, and, of course, from above the stars; — that fruit-trees and herbs were made before the sun was created; — that rain did not fall till after the creation of man, though Geology shows that it fell ages before; — that rainbows did not exist till the time of Noah, about 4000 years ago; — that serpents once possessed the power of human speech, and more than the power of human wit; — that the first man was created for the very purpose of tilling the ground, and was engaged in that employment while he was utterly naked and solitary; — that the first-born man was a farmer, a murderer, a vagabond, a married man, though his mother was the only woman in existence; — that he was marked, to save him from being slain by "*any man*," though no man existed but his father, and no other man could exist but such as were yet to be born of his mother; — that men suddenly fell off from living 900 years to 70 years; — that all existing animals, except those that live in water, sprung from the few that floated in one vessel with Noah; —and that all men, of all colors and features and characters, originated with Noah; and many other equally unnatural and improbable things are commonly believed, because it is supposed that unbelief is sinful and dangerous. It would seem that a little reflection ought to convince any candid mind that such a measure of credulity is not necessary to our salvation.

It is an essential element of the Christian doctrine, that the sin of disobedience was actually committed by the founders of the human family; that punishment followed as a consequence, and that repentance and atonement are necessary to regain the divine favor. The book of Genesis plainly teaches the fact, that the sin of disobedience was committed by our ancestors, and that it was followed by divine displeasure. It is necessary to believe this, in order to be fairly entitled to be considered as orthodox

Christians; but it is by no means necessary for us to believe that the tempter was a living, animal serpent, and used articulate human speech; nor that the tree of knowledge was an apple tree, or any other real vegetable substance; nor that woman was made of a rib-bone; nor that Cain married his mother or his sister; nor that all mankind sprung from Noah; — in short, we are not required to believe anything which is absurd and revolting, merely because it is taught by the strict letter of Genesis, especially when it is obvious that the language is allegorical, and intended to teach a spiritual and moral truth only.

ARTICLE V.

RELATION OF FAITH TO SCIENCE.

The Christian revelation appeals to faith founded upon reason. Science appeals to facts founded upon sensation and perception. Science relates to this life and the material universe, so far as it can be perceived by our senses. Revelation relates to another and an unseen world, and to another life, which it is supposed has no parallel nor analogy in this state of existence. Revelation relates to future things, which cannot be proved by past experience, nor tested by scientific ordeals.

When the pulse ceases to throb, and the heart is still, — when the muscles no longer move, — when the lustre of the eye is dim, and the tongue is silent, — where then is the mind? Let us enter the temples of science, and interrogate her most perfect oracles. Alas! they are dumb! They are gazing with speechless wonder upon the corpse of humanity. The outward form is there, — the bones and muscles, brain and nerves. The features still bear the stamp which was impressed upon them

by the mind; — where now is that mind? Does it still exist? If a man die, shall he live again? Can sensation, or perception, or experiment, penetrate the caverns of death, and descend into the depths of eternity?

Science sheds no light upon immortality. Astronomy may teach us the existence of a number of moving masses, — their distances, densities and revolutions, — but it can perceive no immortal beings there. No souls of men who once inhabited the earth are seen amid all the vast globes which the telescope surveys. No heaven of saints, no hell of demons, — no God, nor angel, nor any animated form, — meets the wearied eye, in all those distant spheres.

If we take the microscope, it reveals to us the existence of unnumbered myriads of beings, but all more frail, short-lived and helpless, than even ourselves. We see animals roving through the forest, the ocean, and the air, all possessed of limbs and senses and minds, which they use to minister to their wants; and *science* presents to man no higher motives of action than these animals possess: — to live, to eat, sleep, sport, decay and die, leaving posterity to the same inevitable fate, — this is the lesson, this the moral, this the religion, of science!

Anatomy shows us our limbs, and brain, and blood, acting and being acted upon like telegraphic machines, operating on galvanic principles; the mind itself depending, like any physical power, upon material agencies, — being at various times weak, deranged, powerful, or suspended.

The only immortality which science seems to teach is the immortality of matter and its properties! Oxygen may be, nay, it *must* be, immortal. The chemical elements will exist in imperishable perfection when individual man is gone forever, and his mind is lost to scientific ken. If science does not *deny* the mind's immortality, neither does it assert it; it stands mute, like an idiot who cannot comprehend the question, or else it

demands that religion shall be tried and proved by scientific rules. Faith is rejected as an element of science; yet faith is the foundation of religion.

When the pleasures and toils of life are past, — when death is immediately before us, — when all science and human skill are useless, — religion then offers her aid, and claims our confidence and faith in return.

Man naturally desires to live, to continue to be; he shrinks instinctively from destruction. When he composes himself to sleep, it is with a calm faith and confidence, derived from experience, that he shall rise again, invigorated and refreshed by the temporary suspension of his powers; but when he lies down to die, experience gives no such assurance, for death is a bourn from whence no traveller returns. It is, therefore, natural for him to look around with anxious longing for *something* to sustain him. As the earth recedes from beneath his feet, and a bottomless ocean rolls below, he longs for some safe island-home in the midst of the shoreless gulf, — some ship, or even a plank, — something, anything; a floating straw is clutched with eager madness by the drowning wretch. Such is dying man, with all the light and aid of science, without religious faith. Let us not longer wonder that man is a religious being; let us not be surprised at the extent even of his superstition. It is his floating straw, his plank, his ship, his happy island-home, when earth has sunk around, with all that once he knew. Blessed religion! even in its forms of error it is better than the stoic firmness upon which alone the sage depends. The believer quits this world, as the Israelites left the land of Egypt, with joyful hope of another and a better home in a promised land. The philosophic sceptic goes, like Lot's wife from her much-loved home and friends, with regret and despair, casting a longing, lingering look behind. The only relief which science affords is by freezing the agonized mind into an unfeeling pet-

rifaction, — a pillar of salt, — a mineral statue of human endurance, destitute alike of sorrow and of hope. Blessed religion! Like the angelic messenger, it hurries the homeless outcast to his heavenly mountain Zoar, where he may rest in safety when all the cities of the plain, with all their denizens, are lost forever in the fiery gulf.

It requires a powerful intellect and a towering, self-relying firmness, to die with calm and stoical indifference, — reckless and remorseless of past errors, — stern and unmoved by the present agony, — regardless of the vanishing scenes of surrounding enjoyment, and fearless of the future retribution. Few men can die in this manner. It is impossible for any man, not an idiot nor a maniac, to die with pleasure without religious faith. Scepticism merely professes to remove fear by removing superstition; but it also destroys all the foundations of hope. It places man upon a level with a vegetable; equally incapable, after death, of suffering or enjoyment. Religious faith offers pleasures without end and without measure; it promises more than the most extravagant imagination can conceive. In return, it requires nothing but faith and submission, such as a child can give. The most uncultivated intellect, the most uncivilized and barbarous manners, are as perfectly capable of performing all that it requires, as the most gifted and polished of the earth, — and perhaps even more so. Any one who would be eminently pious must become like a little child. The philosophy which proudly relies upon its own intellectual ability, scorns the humble credence of religion. The ignorance that sees God in clouds, or hears him in the wind, worships and adores with confidence, humility and fear; while the philosophy that sees nothing in the clouds but a combination of oxygen and hydrogen, floating upon the air and producing electric phenomena, feels exalted by the knowledge, and looks with contempt upon the wondering savage, who bends in adoration

under the impression that thunder is the immediate voice of God.

It is by no means astonishing that man is a religious being; and it is worthy of serious inquiry, whether it is not better for most men to be superstitious than to be utterly irreligious, — I mean better for their own temporal happiness. Is not the Indian more happy in his prospect of reaching the far-off island of future happiness, than the civilized scientific sceptic, who looks to annihilation as his certain fate? How many of our fellow-men are now happy in their religious prospects! — it may be that most of them are in error. Let us grant that they are so, and that science would expose those errors; if it would also destroy their hopes of future happiness, would it not be better for them to remain in ignorance? What is it that sustains the Indian savage at the stake, tortured by his enemies? It is religious hope, founded upon religious faith. His death song is a song of joy and triumph.

I go to the isles of the great Manito,
Whose shores through the mist I distinguish e'en now;
I shall hunt on the mountains and fish in the streams
Of the land that I often have seen in my dreams.

There shall I hold in my fondest embrace
The braves and the chiefs of my nation and race;
They shall applaud me, and welcome their son,
And boast of the heroic deeds he has done.

Spirit of evil, — thou never canst go
To the far happy land of the great Manito;
Spirit of evil, — spirit of pain, —
Farewell, — we never shall meet again.

Come on with your vengeance, — your tortures increase, —
I long for the blow that my soul shall release;
I hasten, — I come, — my fluttering soul
Is unfolding her pinions to fly to her goal.

In a dark, gloomy cavern, far under the world,
Where the ghosts of the wicked by Manito are hurled,
There the foes of my tribe shall forever remain, —
Their only companions the spirits of pain.

But I go to the isles of the great Manito,
Whose shores through the mist I distinguish e'en now;
I shall hunt on the mountains and fish in the streams
Of the land that I often have seen in my dreams.

I can appreciate the feelings which actuated the professor at Padua, who, it is said, refused to look through Galileo's tube, lest it might unsettle his religious faith. I can understand the pious horror with which the Brahmin looked through the microscope, and saw that all his food was filled with living creatures, so that it was impossible to eat without destroying life, while his creed forbade him to eat any animal food. I have always entertained the most charitable feelings towards those (and I have encountered many) who regard Geology and Phrenology as destructive of all that they hold sacred in religion, and who oppose them on that ground, while the most unfounded, and even silly notions, concerning these subjects, are applauded, sanctioned, and encouraged by them, if they appear to harmonize with their faith, and lend it some support.

When we consider the immense and eternal consequences which the believer considers as depending upon his religious faith, we ought not to be surprised at his unwillingness to hear or see anything which threatens to undermine its foundations, and to overthrow the happiness which he builds upon it. True, his apprehensions may be unfounded, but they are none the less terrible for that reason. If they have once taken possession of his mind, they create a painful anxiety and an indefinite dread, which are the greater in proportion as his piety is the more sincere, and his scientific acquirements the more limited. He has read his Bible more than all other books, and listened, with deep

and solemn reverence, to his minister's commentaries upon the sacred text. From his childhood he has been taught, by his pious mother, his Sunday-school teacher, his schoolmaster, his school-books, and by all others whom he respects and admires, that in six days, of 24 hours each, God made this world, — the sun, and moon, and stars, to light this world, — the fish, fowl, beast, and human kind, — all in one week, and that not yet six thousand years ago. Now, let us imagine this man listening to Emmons or Silliman, Hitchcock or Lyell; — hearing the announcement that animals, ocean, air, and earth, sun, moon, and stars, existed millions of years ago, — that this world was once a burning mass of matter, upon which no animal could exist, and has been millions of years cooling down to its present condition. Let him now be told how *mind* was first introduced into the world in the form of a vegetable, next a worm, a fish, a reptile, a bird, a beast, an ape, then a man. Let him see it demonstrated that man himself, in the womb, is first a worm, then successively a fish, a reptile, an inferior mammal, and then a man. Can it be expected that this man can listen without disgust to such startling propositions? Will he not *fear* that they are true, instead of being convinced of their truth? Will he not, like Desdemona, think "in faith 't is strange, 't is passing strange," and "wish" he "had not heard it"? He goes to a clergyman for relief, and is told that Geology, Embryology, and Phrenology, are all mere vain and idle conjectures, founded on human reason, and is dismissed with the exhortation, "Let God be true, and every man a liar." He turns to another of the same denomination, and is informed that Geology is true, but that Phrenology is false and heretical; and that the difficulties of Geology are easily avoided by a proper construction of certain words in the book of Genesis. He turns to another, and is told that Geology and Phrenology are both true, and of great importance, and that the book of Genesis is a beautiful and truthful allegory.

By this time the poor man is bewildered; his faith is unsettled from its former firm position; he is unhappy. The simple, confiding credence of his early days is gone. He is forced to construe the Bible from its plain literal meaning, and adapt it to the novel teachings of modern science, which he understands but imperfectly. He has been seduced to eat of the fruit of the tree of knowledge, and is hereafter banished from the paradise of simplicity and ignorance. He cannot return. The cherub of science looks every way, and guards the entrance with a sword of burning light. He is doomed to toil and sweat amid the briars and thorns of a real, material world; to be born in weakness and sorrow, and to die in despair. He has learned too little, or too much. He has drank just enough to intoxicate his brain; another draught will sober him again.

How welcome now is the voice of the teacher who will reconcile faith with philosophy! How delightful to hear that ignorance is not necessarily the mother of devotion, and that science is the handmaid of religion! How refreshing and encouraging to learn that men like Herschell, Silliman, Lyell, Emmons, Hitchcock, Buckland and others, are none the less Christians for being eminent philosophers. Let us, then, be emboldened by their examples. Let us not fear to look through the telescopic tube of science. Let us go forward with full confidence, like Bunyan's Christian, up the hill of difficulty, encouraged by the cheering voice of Mr. Interpreter on the hill, saying that the lions are chained and harmless, notwithstanding their frightening roar; that the book of Genesis is not to be construed literally when it seems inconsistent with natural science; that it teaches a great moral lesson concerning the consequences of man's disobedience to the divine command; and that, while the moral truths inculcated are of the utmost importance, the physical doctrines and illustrations belonged to a barbarous age, and may be rejected with propriety.

PHRENO-GEOLOGY.

THE PROGRESSIVE CREATION OF MAN.

SECTION I. — ORIGIN OF THE EARTH.

Human knowledge begins and ends in ignorance. If we attempt to trace anything, from its origin to its final result, we are soon met by insurmountable obstacles. In regard to its origin, we first find it arising from an abyss of eternal and infinite darkness. From this point we can trace it for a short space, but it soon sinks from our view in a direction opposite to that from which it arose, and no human power can follow it to its end. What we call the beginning and end of things, is but the beginning and end of our power of perceiving them. These remarks apply to the origin of the earth and its inhabitants. We know nothing of the origin of the earth, except what we can learn from its internal appearances and structure. The Bible informs us that "In the beginning God created the heavens and the earth," but it gives us no scientific details concerning the processes by which this wonderful result was produced. We are left to ascertain, by our own researches, and by the exercise of our powers of perception and reasoning, the successive steps which led from the beginning to the present. Our knowledge on this subject is mostly derived from various

sciences, which, seventy years ago, had no existence. Some astronomers have conjectured that the sun, the earth, the moon, and all the planets and satellites of our solar system, were once a single connected mass of matter, so expanded by heat as to be one vast solar wheel of semi-transparent vapor, and occupying all the space that is now vacant between the planets. This immense mass of fiery mist gradually cooled and contracted to its present condition. The planet of our solar system which is most distant from the sun, was the first-born, and was formed at the time when the body of the sun extended to that distant region. It is supposed to be composed of particles which the primeval sun shed from its surface. The next planet was many ages after given off in the same manner from the sun; and thus the earth and all the planets of our system were derived from what was originally one solar mass. The earth and the moon were once a single globe, and occupied all the space which at present exists between the earth and the moon. The moon was shed from the surface of the earth, in the same manner that the earth was shed from the sun. Since then the earth has cooled, and shrunk to its present size. Some geologists, taking the earth where the astronomers leave it, — in a state of igneous fluidity, — attempt to account for its present form and structure by the continued operation of the same cause, namely, by its cooling and contracting at the surface. They teach that when the earth cooled sufficiently, a rocky crust was formed upon its surface. The elements, which now constitute all the water in the world, then existed in a gaseous form around this rocky crust, — an

atmosphere composed of the elements of future oceans. As this atmosphere and the earth cooled, the gases became condensed to aqueous vapor, then mist, rain, rivers, oceans. These waters washed the rocky crust, and divided and disintegrated its particles, and deposited them, forming mud, banks, swamps, islands, continents. It was during these changes from gas to liquid, from liquid to solid, from solid rocks to soil, that organization began.

SECTION II. — ORIGIN OF ORGANIZATION.

Originally it is assumed that every substance now in existence was in a gaseous form. The loss of some portion of its caloric reduced some parts of the earth's surface to a liquid state; and then, by a still further reduction of temperature, some portion became solid. Here it was that the rudiments of organization began; for solid substances, when precipitated from a liquid solution, tend to assume *regular forms.* This process is denominated crystallization. Sometimes the crystals arrange themselves in forms very similar to the forms of vegetation; this fact is often demonstrated in winter mornings, upon our windows, in the various fantastic forms which the frozen vapor assumes. The resemblance of these figures to vegetables strikes every observer, and inclines us to suspect that the same general law operates in both cases.

The immediate cause of crystallization is unknown. In some way it seems to be related to magnetism, electricity, and caloric; but this only increases the mystery.

We only know that particles have a tendency to arrange themselves in a regular manner under certain circumstances; and that, under the same circumstances, precisely the same forms of crystals are always produced. The chemical composition of the crystals is also uniform, so that a proper crystal is not composed of fractions of different substances; but particles of a similar nature tend to combine together in a manner which almost seems as if they had the power of perception and of choice. The mystery of organization begins here. How do the particles of crystals arrange themselves in such regular and beautiful forms? We do not know the cause, but as we are certain of the fact, we call it a *law of nature.* This law we presume to be enacted by the great Author of universal law, for certain definite purposes, and we find it always ready to accomplish these purposes whenever circumstances require it.

SECTION III. — ORIGIN OF VEGETATION.

Vegetation seems to be essentially a modification of the principles of crystallization. Certain mineral substances in the earth are held in solution by water, and certain gaseous substances are held in solution by the atmosphere. When a proper degree of heat is applied, the two solutions act upon each other in a way which is not well understood, but the result is a combination of the ingredients of both, which assumes regular forms. This is vegetation, — a peculiar species of atmospheric crystallization, involving solids, fluids and gases in organic combination. Crystallization must have taken place on

the earth long before vegetation was possible. Crystallization would happen as soon as the gases were transformed to solids by the cooling of the earth's surface; but vegetation could not take place until after the surface of the earth had cooled sufficiently to allow water to remain upon its surface a considerable time without evaporation, and the action of the water upon the rocky surface must have collected a mass of particles of the right ingredients to constitute soil.

The first vegetables that existed on earth were probably destitute of flowers, fruits and seeds, such as modern vegetables possess; they propagated after the manner of crystals, by reproducing themselves. They grew in the water; land vegetables were not produced until some time afterwards. The first vegetables that grew upon the land, even at the poles, were such as now are produced only in the hottest climates, near the equator. The changes which vegetables have undergone, from the earliest geologic times to the present, are such as the increasing coldness of the earth would naturally render necessary.

SECTION IV. — ORIGIN OF ANIMALS.

The condition of the earth, before animals existed, was more favorable to vegetable than to animal life. Vegetables can flourish in an atmosphere which contains so large a quantity of carbonic acid gas that any animal would immediately perish there. From the time which followed the solidifying of the earth's crust, until the time that animals were produced, — and it was probably

an immense period, — the whole earth was enveloped in a carbonic atmosphere, and the whole primitive ocean must have been so saturated with carbonic acid that no marine animal could have existed. But, under these same circumstances, vegetables might have flourished as soon as a proper soil was formed, and long prior to the purification of the atmosphere, to fit it for animal life. Again, the first animals must have fed upon vegetables; and this would have been impossible, if vegetables had not previously existed. The conclusion is, that vegetables were created before animals.

There are many circumstances which indicate that animals were originally merely modified vegetables; one is, that every animal, from the highest to the lowest, is constituted of two distinct apparatuses, one of which is, to all intents and purposes, a vegetable. The organs of animals are divided, by all systematic physiologists, into the vegetative and the voluntary. The vegetative functions are those which are concerned in sustaining the organic and unconscious life of the body. These functions, in all healthy animals, are independent of the will; they relate merely to the growth, vegetation, and replenishment of the organs. These functions are sometimes denominated the *organic* functions, while the functions in which mind is concerned are denominated the *animal* functions. This distinction is not metaphysical, nor merely theoretical, but is founded upon anatomical and physiological demonstrations. In man, for instance, all the animal (conscious) functions depend upon the brain, and are entirely suspended during sleep; but the vegetative (unconscious) functions depend upon the

involuntary ganglia, and proceed without interruption during sleep. Animals, and some human monsters, have been born without brains, and yet lived for several hours, and performed all the vegetative but none of the animal functions. Experiments have been performed, by Le Galois and others, upon living animals, in which the animal organs (the brain and its dependent nerves) were destroyed, and yet, by keeping up respiration artificially, the vegetative functions were continued for several hours.

It may be assumed, therefore, as a settled truth in physiology, that the part of man which the brain and mind control, is a distinct piece of machinery from the vegetative part, which digests, assimilates, circulates, nourishes, and decays, like any vegetable, independently of the mind.

Another great truth which tends to establish this proposition that animals were originally modified plants, is, that the organs of the animal functions are actually *superadded* anatomically to those of the vegetative functions; in other words, the brain and its connecting nerves of voluntary motion and sensation were evidently created *after* the organs which relate merely to nutrition, and were made to grow out of them. Spurzheim insisted, with much force, in his work on the anatomy of the brain, that the brain is a continuation of the spinal chord, and that the spinal chord is not a continuation of the brain, as was formerly supposed. This view is now generally adopted by physiologists. The organs concerned in mental and voluntary motions are but auxiliary appendages to those concerned in vegetative opera-

tions. Another confirmatory fact is, that before birth the organs of the vegetative functions are active and perfect before the organs of the animal functions and mind are developed or needed in any degree. The vegetative part of man is, in fact, the only part which acts at all before birth, and is as perfect then as it ever is afterwards.

Another important link in this chain of reasoning is the fact that the animal organs which were first created are such merely as are necessary to sustain and preserve the vegetative organs, and were evidently created for that very purpose. To illustrate: suppose a plant so situated that it needed nourishment which was just beyond its roots and limbs, but which could not be obtained by the plant without a movement. Now, the very lowest and first created animal organs are precisely those which the vegetable would require, under these circumstances, to enable it to make the necessary movements to obtain proper nourishment. Another fact, and one which seems to render the chain complete, is, that the constitution of man is composed of a series of superadditions, the lowest or foundation of which constitutes him a vegetable, and the highest constitutes him a man, while the intermediate organs are such as are possessed by the different classes of lower animals. But another great fact, hitherto unknown, is developed in this work, which adds interest and value to all our previous knowledge on this subject, and that is, that the series of superadditions in the human constitution, is such as the succession of geologic changes would require and produce, by the sub-creative power of stimulating circumstances

with which organized beings have been surrounded during their progress from crystallization to humanity.

SECTION V. — ORIGIN OF MIND, OR CONSCIOUSNESS.

Consciousness first made its appearance in the world in a very humble garb, and to subserve a very unambitious purpose. It first inhabited animals which were but one degree above vegetables. The first uses to which consciousness was put on earth were low and servile, but exceedingly useful. It aided the most grovelling and unintellectual beings that ever had existence to gain the few objects which their low natures required. Why was consciousness needed by those animals? Vegetables accomplished the same objects without consciousness which those animals performed by its means. Consciousness did not elevate its first possessors in any degree above vegetables, unless the mere possession of the faculty itself is to be taken as evidence of elevation. What I mean is, that consciousness did not tend to any more elevated objects than those which vegetables attained without its assistance. What, then, were its uses? The first created animals were merely conscious, moving vegetables. In their structure there was the least possible departure from the vegetable form. In their tendencies there was the same end in view, namely, the growth of the individual, and reproduction. The vegetable accomplished this, the animal did no more; though he had mind, sensation, perception and volition to aid him, all that he accomplished was nourishment and reproduction.

But although the animal accomplished no more than the vegetable, he gained the same objects under more difficult circumstances. The animal obtained nourishment and reproduced his kind under circumstances in which the vegetable would have perished; and this he was enabled to do by means of consciousness and its appendages.

When a vegetable is situated in a dry and dark place, it must die; it is utterly helpless; it is blind, senseless and motionless. Although at the distance of only a few inches there is abundance of moisture, soil and light, yet the unconscious being must perish for want of them. If, under these circumstances, the plant could receive such faculties as would enable it to move to the moist and sunny soil, it might preserve its existence, and continue its race to other generations. It would then be an animal. Here we get a clear idea of the distinction between these two classes of beings; we can now understand the uses of consciousness in those animals which are considered but one step higher than vegetables. It is to enable them to bring themselves into contact with the objects which they need when those objects are at some distance from them. This was the purpose for which mind was first introduced into the world, and this was the only use to which it was put for millions of years. The only emotions which mind could then produce, (in the first animals,) where those of suffocation, hunger, thirst, pain and amorousness; these emotions were relieved by those movements which were necessary for nourishment and reproduction. Consciousness was not developed until change of place was neces-

sary, and then it was made a part of the apparatus by which the change of position was produced. Consciousness and locomotion were introduced together, as dependent parts of one apparatus. The word locomotion implies that the whole animal moves from place to place; but many animals merely move their limbs about them, and never move their bodies. They are

> "Fixed like a plant to its peculiar spot,
> To draw nutrition, propagate and rot."

Their movements cannot properly be denominated locomotions, but they are strictly *conscious-motions*, that is, motions attended with consciousness; and I shall take the liberty to use the term *conscious-motion* in this sense, and the term *unconscious-motion* to designate vegetative motions, which are involuntary.

SECTION VI. — ORIGIN OF MUSCULAR MOTION IN CONNECTION WITH MIND.

Mind originated in the necessity of *moving* to supply the vegetative functions. Mind is inseparably connected with muscular motion, and was created to guide it to its proper objects. Mind came into the world when certain organized beings were in peril; it came to save them from death, by directing their first feeble movements to the objects which they required.

Here stood the plant, and there stood the object which it needed; neither could approach the other. If they both floated in air, or even in water, we could imagine that some degree of mutual attraction might bring the

plant and the nourishing object (food) together on magnetic principles. Perhaps animal life did commence in such floating circumstances. Perhaps the magnetic principle did operate to bring the plant in contact with its object. It is fully settled that electricity is concerned in chemical attraction, in crystallization, and in muscular motion and sensation. And it is also settled that magnetism is, in effect, but a modification of electricity. Every new discovery in physiology tends to bring it within the jurisdiction of chemistry. Every discovery and improvement in chemistry tends to bring it within the jurisdiction of electric principles. And every discovery in electricity tends to prove that magnetism, galvanism, caloric, light, electricity, and chemical attraction, are all related to one general etherean principle, which brings all existing things into communication with each other. It is now thought that the brain — the great fountain of animal motions — operates on electro-galvanic principles, or at least on *analogous* principles to those which are concerned in galvanic and electric phenomena. All these things being considered, it is not extravagant to suppose that the first animals were moved by the same cause, though operating in a more direct and simple manner.

My conjecture is, that the action of a species of magnetism between the plant and its food produced a tendency in the plant to move its parts toward the food, and thus originated muscular motion and animal function. The best physiologists ascribe all muscular motion to the operation of a nervous fluid, or influence, similar to the galvanic, which is invisible, but which

uses the nerves for its conductors. I suspect that formerly this same etherean influence was much more powerful than now, in consequence of the earth being in a state more favorable for its development. It may, therefore, under peculiar circumstances, have acted more effectively upon the organization of plants than it can at the present time. Admitting all that I have conjectured in regard to the origin of muscular movements, it may enable us to understand how it was possible for muscular motion to commence in plants, and increase with successive generations, until an animal resulted. But this would, by no means, explain how *mind* came to guide the movement. Does mind exist in every atom of matter, or in a limited class of atoms, or is it the result of a combination? This cannot be explained at present. Consciousness must be assumed as having a latent existence beforehand, just as atoms of matter themselves existed, and always must exist, because they cannot be annihilated even in imagination. In reasoning upon any subject, we must commence by *assuming* something which cannot be explained. Here we commence, then, by assuming that the principle of consciousness, or mind, exists in every animal in the centre of his nervous system; or, more properly speaking, it exists in that central part of his nervous system where sensation terminates and volition commences. But whence the conscious principle was derived, we cannot tell. When an animal moves towards any object, it does so because the object first sent an etherean impression from its surface, thence along the animal's nerves of external sensation to his internal consciousness or sensorium; and the motion

of the animal is always in return for such an impression, directly or indirectly. This impression is called a stimulus, motive, or inducement.

SECTION VII. — ORIGIN OF NEW ORGANS.

If the organs of animals were made perfect at first, without the agency of external circumstances, it must have been done by a special miracle, and not by natural causes, and the miraculous power must have been exerted as often as any new organ was added.

To my mind, it seems utterly improbable that organs were made at first except by the same natural causes which afterwards normally operated upon them. We know, to a certainty, that the want of stimulus tends to the annihilation of organs; and we know that a new kind of stimulus, applied to organization, tends to develop a new faculty. The use of tobacco, opium, or animal food, begets a tendency to continue its use. All sorts of practices have been rendered agreeable by long continuance. The goitre of the Alps, — a peculiar change in the structure of the throat, — was begotten by a peculiar stimulus, and was afterwards perpetuated for many generations. If all men but these who had goitre should suddenly die, and their history be lost, in future ages it might be supposed that the goitre was derived from Adam, and that it had been possessed by all his descendants. Or if the goitre should increase until half of the human race should possess it, it might hereafter be a question whether it had been acquired by the one

half, or lost by the other; just as it now is a question what complexion our first ancestors possessed, white, black, or yellow. Sometimes external circumstances produce very powerful effects upon the unborn, *marking* them in a singular manner; and such marks, thus produced, may be transmitted to other generations, and originate a new species. I know a family in which the mother, being frightened by a wounded and limping cat, brought forth a daughter, who limps in a similar manner; and this daughter has two sons, both of whom are afflicted in the same way precisely. This fact is instructive, and agrees with many others, well authenticated, of a like character; and all tend to prove that a new species may result from an accident, a disease, a violent impression, or any cause which radically affects the organs of a parent. If the new species thus produced happened to be, by their new peculiarity, better adapted to the circumstances and difficulties that beset them, it would be likely to be perpetuated, and might seem like a miraculous adaptation. It may be that the differences in human complexion originated in this way. White men may be perpetuated and improved albinoes, whose ancestors were black, and whose whiteness was at first a diseased condition, but is rendered permanent by its adaptation to mountainous and northern regions.

If it is urged that the goitre, and other instances of the addition of new parts, only show the modification of organs which already exist, and not the origin of new ones, I answer that the super-addition of phreno-nervous organs is by a similar modification of the preëxisting organs. What we call *new* organs, are often, if not

always, mere modifications of old organs; and I particularly insist that the whole nervous system of man is but a modification of the ganglionic apparatus, which the lowest vertebrated animal possesses; and higher animals are but modifications of lower ones. If it is admitted, as it must be, that the brain is composed of fibres and pulp, which in all animals has a similar appearance, structure, and chemical composition, and differs in different tribes of animals only in its quantity of pulp, and the number and direction of its fibres; and if it is also admitted, as it is by all phrenologists, that the vigorous exercise of parts adds to their quantity; and if it is further admitted that the changes produced by peculiar exercises are transmitted to the next generation; — if all three of these propositions are admitted, it will be inconsistent afterwards to deny that the brain of a fish might be elevated, by repeated additions, to equal that of man, provided that favoring circumstances and abundance of time are allowed and ordained, by the Supreme Creator, for the purpose.

SECTION VIII. — ORIGIN OF MAN.

According to the book of Genesis, as commonly understood, all mankind, at present existing on earth, descended from Noah, about four thousand years ago. Assuming this to be correct, we are at once met by several questions, which seem unanswerable, and by an array of facts which seem to be insurmountable. First, the monuments, pyramids, and hieroglyphics of Egypt, prove,

beyond all doubt, that Egypt contained an immense population, ancient and permanent religious institutions, and a line of powerful monarchs, in the time of Noah. They can be traced back from the time of Moses to the very time when the flood is supposed to have happened, and many years before. Institutions which could only be created gradually, and during ages of progressive advancement; monuments built by sovereign authority, rendered sacred by the religion of a ceremonious and superstitious people, and made inviolable by being the sepulchres of the great and the good of a long succession of generations. Their authenticity cannot be questioned; for each monument contains public inscriptions, proclaiming the name of the sovereign who raised it, the time of his reign, and the principal events which marked his career. Each new sovereign, on his accession, commenced a new monument, for the express purpose of commemorating his reign, and of containing his embalmed remains. At his death, his successor caused his sepulchre to be closed, and his monument to be completed. Besides these monuments, there is an immense number of mummies, each containing a document distinctly dated, which plainly describes the person, sex, and rank of the deceased.

Second. If all mankind descended from Noah, then Negroes, Indians and Malays, as well as Whites, all sprang from him as a common parent; and all the differences of complexion, feature, form and character, have been produced by circumstances, such as climate, food, and occupation. But these same pyramids rise again before us, and show us the pictures, and even the very

skulls, of negroes who existed about the time of Noah, and of others who lived but a short time afterwards. In the time of the prophet Jeremiah, negroes were so intensely and permanently black, that the prophet chose them as an apt illustration of immutable darkness. *Can* the Ethiopian *change* his skin? Would the inspired prophet have used this language, if he had known (and he must have known it if it had been true) that the Ethiopians *had* changed from whites in the short time which had elapsed since Noah; and that, by reversing the causes, they could be changed back again?

Third. The ancient Americans were ignorant of the use of iron, and so also were the ancient Egyptians; whereas, the earliest men mentioned in the Bible understood the use of iron, and Tubal Cain was an instructor of every artificer in brass and iron. This seems to prove that the most ancient Egyptians and Americans flourished before the time of Tubal Cain, or even of the first Cain; and supports the opinion, which has been advanced by some able critics, that the Bible account is confined to the Hebrew race only.

Fourth. The ancient Egyptian language was inscribed upon their monuments, and is thus proved to have continued essentially unchanged, from a time long prior to the supposed time of Noah, to the time of Solomon; yet it was far inferior, and very different, in every respect, from the ancient Hebrew. This proves that the confusion of tongues did not extend from Babel to Egypt; and, also, that the language of Abraham and his associates was different in its origin and more modern in its structure. In this connection it should also be observed.

that Abraham probably spoke the Hebrew language, and that he was a lineal descendant of Shem, the son of Noah, and lived with him more than a hundred years. Shem, who was born before the flood, was still living when Abraham visited Egypt, and found one of the Pharaohs on the throne, and all their institutions in a flourishing condition; and monuments are still standing which stood then; and paintings, and skulls of negroes and whites, still exist among Egyptian mummies, whose owners lived before the visit of Abraham. Does not this indicate that the Egyptians were then an ancient people? Or, if they descended from Noah, as Abraham did, how did it happen that Abraham and his tribe were living like wandering Arabs, while the Egyptians were so far advanced in permanent civilization, though it was not more than five hundred years since the flood? I have not space, nor is it necessary, to pursue these inquiries further. It must be evident, to every unprejudiced mind, that the popular notions on this subject are erroneous, and that the whole human race, nor even the white race, did not originate at the supposed time of the flood. The Rev. Dr. Hitchcock quotes with approbation the opinion of the Rev. John Pye Smith, that the flood did not extend beyond a limited region in Asia; and, of course, that it did not destroy but a small portion of the men and animals then existing. Some distinguished naturalists think that the creation described in Genesis refers to a limited part of Asia, and to a limited part of the human species; and that Negroes, Indians, Chinese, and various other races, were created at other times, and in other places.

Leaving the Bible out of the question, the tendency of all that we know is, to prove that man existed on this earth thousands of years before the computed time of Noah or Adam, and that he has arrived at his present elevation from a very low origin. Even written history proves that man has gradually advanced from a condition of savage barbarism. We have no reason for supposing that man advanced from the condition of a brute to that of a human savage by any other means than those by which history shows that he afterwards arose from the condition of a savage to that of a philosopher.

The resemblance of the monkey, orang, and especially of the chimpanzee, to human beings, and the approximation of the lowest tribes of men to the highest apes, has led many to suspect that man may have formerly belonged to one of these lower orders. But I do not believe this. It seems to me much more probable that the human race has been distinct ever since they abandoned the ocean. If man and the apes ever belonged to one race, it was probably before they became inhabitants of the land, and while all the higher animals were mere reptiles. It is certain that the ancestors of man and the apes were once all reptiles, or else that a special miracle of creation has been interposed to prevent it, and to create man suddenly, in a manner which passes human comprehension. If he has been created by a special miracle, then, of course, we cannot be expected to explain such an operation on scientific principles; but if he has been gradually raised from the condition of a reptile, we can understand some of the successive steps by which he has been elevated. It is also quite certain, that, if man was created

suddenly by a miracle, yet all the marks of gradual creation are left upon him, so as to counterfeit the work of nature most perfectly.

There was certainly a time when reptiles were the highest animals that existed on earth. It is probable that our ancestors were among these reptiles. At that time, the ancestors of all the different races of men and of apes may have been but one species. If the ancestors of the apes left the water first, and became permanent residents on the land, they would immediately assume a character peculiar to themselves, and suited to their new habitation. They would soon differ from their marine brethren in many important particulars. Ages afterward, another portion may have left the water, and landed on a different shore, and become the ancestors of negroes. Still later, and on another island, the ancestors of the white man may have landed; and thus, though all originally were one species, they have been so differently affected by the different circumstances which have operated on them, that they seem to be fundamentally unlike. Amidst all the conjecture and uncertainty which attend this investigation, there are some important facts, which are perfectly certain, and which serve to guide us on the main route of our inquiry. It is certain that the highest and most intellectual inhabitants of the earth were successively fishes, reptiles, mammals, apes, and men. It is certain that, from the first we know of man, he has progressed. It is certain, also, that the organization of the phreno-nervous system of man indicates a progression from vegetation to humanity, through every stage and degree of animal intelligence. The Deity, in cre-

ating man, has left the prints of his fingers upon every part of his nervous system; indicating that he is no exception to the rest of his works, but that, even in creating the human mind, the lowest powers were made first, and adapted to the primitive condition of things; and that new additions were made to the mind, as new difficulties were created for it to surmount.

Let us now proceed to contemplate the architecture of the brain, —

"The dome of thought, the temple of the mind."

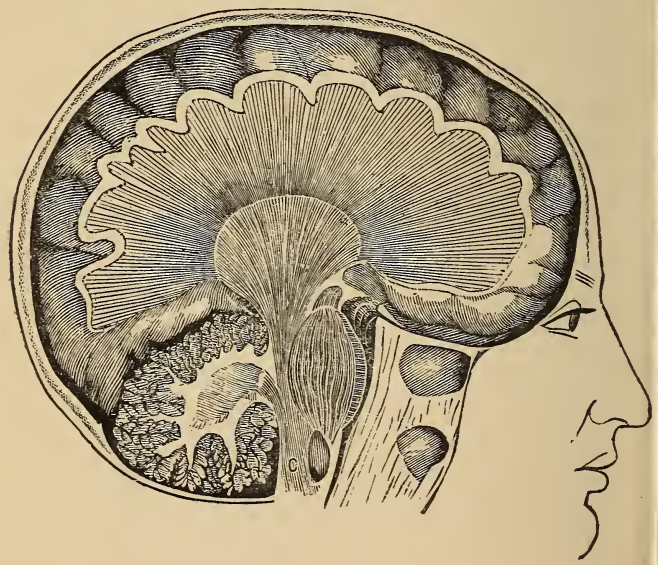
SECTION IX. — THE PHRENE, OR CENTRAL CONSCIOUSNESS.

It should be understood that, according to my peculiar system of phreno-philosophy, the brain is not considered as the organ of mind. Mind, or consciousness, is exclusively confined to the medulla oblongata; and the real office of the brain and phreno organs is to produce voluntary muscular movements, by transmitting impulses to the various muscles in a telegraphic manner. Each phreno organ produces a motion of the muscles peculiar to itself; and, in sending its influence down to the muscles, each phreno organ rouses the mind to a state of consciousness. The state of consciousness produced by each phreno organ is different from that produced by any other: thus, hunger is produced by Alimentiveness, pain by Sanativeness, fear by Cautiousness, reverence by Submissiveness, wonder by Credenciveness, pity by Kindness; thus, also, flavor, color, and sound are mere states of

mind, produced by impressions which perceptive organs make upon the oblongata, where the mind resides. The fibres of the brain all converge from the circumference near the skull to a common centre in the oblongata; and from that same centre the principal nerves and the spinal chord proceed to the body and face, to convey the impulses from the phreno fibres. It will be seen, then, that the mind does not occupy the brain, as has been hitherto supposed, but is situated in an advantageous position, — a narrow strait, — where it can command the whole passage; so that no impulse from the brain can pass through to the body or face, without the mind receiving notice of it, and telegraphing up to all the phreno organs, receiving in return their sanction or their opposition; and if there is more phreno force in favor of the movement than against it, the impulse is permitted to proceed along the motor nerves to the muscles, causing them to contract and produce speech, smiles, frowns, blows, or any other actions which the leading impulse requires.

For a more particular explanation, I refer to my work on the Philosophy of Mesmerism, and also to page 87 of the Compend of Phreno-Philosophy. The fibres of the brain are denominated *inter-phreno senses*, or *inter-phreno fibres*, because their office is to convey impressions to and from the mind. The doctrine taught by all phrenological authors, before I published my Phreno-Philosophy, in 1845, was, that thought and feeling were performed by the brain itself; and that, instead of there being one central organ of mind for a sensorium, each organ of the brain had in itself the power of feeling, thought, or consciousness. It seems to me that the truth

as well as the beauty of my phreno-central theory will be so apparent, as to render it acceptable, not only to phrenological students, but even to those metaphysical philosophers who have hitherto regarded phrenology as crude and imperfect, for want of that very unity of plan which this system establishes.



In the annexed engraving, the fibres of the brain are represented as proceeding from the convolutions at the surface of the brain, and all converging to a point at *c*, where consciousness is presumed to be located.

SECTION X. — ORIGIN AND SUCCESSION OF THE ORGANS OF THE BRAIN.

I shall now proceed to an inquiry concerning the origin of the phreno-organs, and the circumstances which rendered their creation necessary, in the precise order in which they are arranged in the engraving of the bust.

On the side of the head, from I. to XII., are arranged the organs which impel to self-relative actions only; they are denominated Ipseals. On the back and top of the head are arranged the organs which impel to acts which tend to establish, govern, and perfect society; they are denominated Socials. Both ipseal and social organs are arranged in the engraving in the same order as that in which they were successively created, the socials commencing with 1st, on the lower back of the head, and extending over the crown to the upper front.

In the directive class, which occupy the forehead, there is not the same evidence of regular geological succession as in the other two classes of organs, and the reason is, that the directives, being the mere agents of the impulsive organs, were developed as the impulsives needed them. The very first animals needed the six lowest perceptive organs, which are situated on the lower and central part of the forehead. Order was probably not needed till cold weather rendered Constructiveness necessary. The reflective organs must have existed in a very slight degree, if they existed at all, before the tertiary period introduced Acquisitiveness and Experimentiveness.

The earliest animals possessed three ipseals, one social, and six directives. We shall find, as we proceed in our

investigation, that the ipseals received four more additional organs before the socials or the directives received any further accessions. But when Constructiveness was created, then Order was added to the directives, and Parentiveness to the socials. When Experimentiveness commenced in the ipseals, then nearly all the socials, except 12th, must have sprung into existence in rapid succession, together with the higher directives.

I would most earnestly request the critical reader to study carefully the order of arrangement in the engraving of the bust in connection with the following sections concerning the origin of the organs.

ORDER OF THE GEOLOGICAL PERIODS.	COTEMPORANEOUS PHRENO-ORGANS.	COTEMPORANEOUS PHRENO-ORGANS.	COTEMPO. PHRENO-ORGANS.
	Ipseals.	*Socials.*	*Directives.*
Protozoic or Cambrian,	I. Pneumativeness.	1st. Amativeness.	Lowest
	II. Alimentiveness.		and most
In which the first animals existed.	III. Sanativeness.		central parts of the forehead.
Silurian,			
In which the first fishes existed.	IV. Destructiveness.		
	V. Combativeness.		
Carboniferous.	VI. Secretiveness.		
	VII. Cautiousness.		
Saliferous.		2d. Parentiveness.	
Tracks of reptiles, and birds with web feet.		3d. Inhabitiveness.	
		4th. Adhesiveness.	
Oolitic.			
First mammals, but of the lowest kind.	VIII. Constructiveness.	5th. Imperative.	Reflective
		6th. Approbative.	
		7th. Firmness.	organs
		8th. Justice.	
Cretaceous.		9th. Submissive.	continue
First of the present fishes.		10th. Kindness.	to expand
Tertiary.	IX. Acquisitiveness.		until the
	X. Experimentiveness.	11th. Imitative.	
Monkeys.			present
Orangs.			time.
	XI. Perfectiveness.		
	XII. Hope.	12th. Credencive.	
	The three	The last	
Prehistoric.	last organs	organ	
Negroes.	continue	continues to	
Whites.	to expand.	expand.	

NEW CLASSIFICATION AND ARRANGEMENT OF THE PHRENO ORGANS.

I. IPSEALS.

These are arranged in five ranges on the side of the head.

1. CORPOREAL RANGE.

I. *Pneumativeness* — the impulse to breathe and to obtain good air.

II. *Alimentiveness* — the impulse to eat.

III. *Sanativeness* — the impulse to preserve health, avoid injuries, and obtain personal comfort.

2. BELLIGERENT RANGE.

IV. *Destructiveness* — impulse to kill for food, or for any other purpose which we deem necessary.

V. *Combativeness* — impulse to fight, to contend, to contradict, to resist.

3. PRUDENTIAL RANGE.

VI. *Secretiveness* — impulse to conceal, to act in a circuitous and indirect manner.

VII. *Cautiousness* — impulse to look forward and anticipate danger.

4. INDUSTRIAL RANGE.

VIII. *Constructiveness* — impulse to engage in mechanical operations. With the assistance of the Directive organs this impulse bestows skill, but not without.

IX. *Acquisitiveness* — impulse to acquire, to economize, and store up property for future use. In ignorant persons, with weak powers, it tends to

produce a mean, miserly, penurious character. With great vigor, in ignorant persons, it tends to produce a grasping, avaricious character. In a cultivated mind it produces honorable and prudent desires and exertions to acquire property.

5. IMPROVING RANGE.

X *Experimentiveness* or *Mirthfulness* — an organ which all phrenologists admit, but concerning the uses of which they are not agreed. I consider it the impulse to try novel experiments, either in sport or in earnest endeavors to accomplish some desirable object.

XI. *Perfectiveness* or *Ideality* — the impulse to do things in the most perfect manner known, and if possible to improve, so as to excel all similar performances: it gives good taste and a desire for self-improvement. Those who have it small are indifferent to self-education and improvement.

XII. *Hope* or *Migrativeness* — the impulse to abandon home and present enjoyments, and look with confidence to the future and the distant for happiness and success.

II. SOCIALS.

These are divided into three groups, and extend from the back of the neck to the forehead.

1. GROUP THAT ESTABLISH SOCIETY.

1st. *Amativeness* — impulse to become intimate with the opposite sex. In well regulated minds it tends to virtuous love and matrimony; in vicious minds it tends to licentiousness.

2d. *Parentiveness* or *Philoprogenitiveness* — impulse to protect and cherish the young and helpless.

3d. *Inhabitiveness* or *Concentrativeness* — impulse to remain in one place, and concentrate the ideas, the affections, and the domestic comforts in as small a circle as practicable, and not to wander or change residence, nor employment, nor topics of thought or conversation.

4th. *Adhesiveness* — impulse to cling with filial fondness to parents when young; and to form strong attachments to companions and friends, to the exclusion of strangers.

2. GROUP THAT GOVERN SOCIETY.

5th. *Imperativeness* or *Self-esteem* — impulse to take the lead in society, and to act independently, without reference to the wishes of others; in ignorance it produces pride and self-conceit.

6th. *Approbativeness* — impulse to please those who have influence, power, applause, or anything else which we wish; gives the love of compliments, of fame and glory. In a weak mind it produces vanity and a love of foolish display.

7th. *Firmness* — impulse to maintain any opinion, authority, or position; to resist social influences, and continue a consistent course of conduct. In ignorance, it tends to stubbornness.

8th. *Conscientiousness* or *Justice* — impulse to deal impartially and honestly. This organ alone will not bestow honesty, nor give a proper idea of what is right or wrong, unless the person is well instructed and trained in regard to moral duty.

3. GROUP THAT CONFORM TO SOCIETY.

9th. *Submissiveness* or *Veneration* — impulse to submit to superiors in power, or age, or position, — to treat people respectfully. In ignorance it produces slavery and idolatry.

10th. *Kindness* or *Benevolence* — to treat every one — strangers and even animals — with kindness.

11th. *Imitativeness* — impulse to adopt the habits, manners, language, and peculiarities of associates, and to learn their characters.

12th. *Credenciveness* — impulse to act on the testimony of others, to believe the assertions of others when they probably know better than ourselves. In ignorance, and when the organ is very large, it tends to the greatest extravagances and superstitions, delights in exaggerations, and spurns the simple and unembellished truth. When small, there is a disposition to require more and surer evidence than common people deem necessary.

III. DIRECTIVES OR INTELLECTUALS,

That occupy the forehead.

1. *Flavor* — which bestows skill in cooking, and nice discrimination in food and drink.
2. *Observation* of the forms, sizes and outlines of objects. Phrenologians generally divide this part, where the nose unites with the forehead, into three organs, namely, Individuality, Form, and Size; but, after more than twelve years' experience, I can only say that those who are large at

this part are generally skilful in the observation of general appearances and facts of common occurrence.

3. *Direction* or *Locality* gives the ability to know and remember the points of the compass and the direction of objects, and tends to make a good pilot.
4. *Weight* gives skill in wielding mechanical or musical instruments with precision and delicacy.
5. *Eventuality* gives memory and ability in the details of narrative, anecdotes, and history, and, combined with memory of words, and with Comparison, gives literary ability.
6. *Words* or *Language*, memory of sounds and words, and those verbal matters necessary in literature.
7. *Color* gives skill in the coloring of paintings, and good taste in matters relating to various shades of color.
8. *Order* gives skill and neatness in arrangements, and the ability to be precise and methodical.
9. *Number* gives skill in arithmetical calculations.
10. *Time*, a doubtful organ, which is supposed to give skill in chronology, and precision in marching and music.
11. *Tune*, a doubtful organ, which, in my opinion, merely gives the impulse to perform music, while other faculties bestow the skill.
12. *Comparison* gives the power to analyze, to class, to discriminate and distinguish slight differences and resemblances, and is the foundation of the talent for rhetoric and figurative expressions.
13. *Causality* gives the ability to combine, connect, and

systematize; with cultivation it gives talent to invent original and philosophic plans; and it also gives profound judgment and deep knowledge, provided it is well supported by other organs.

SECTION XI.—ORIGIN OF THE IPSEALS.

There are at least twelve ipseal organs discovered and admitted, including Pneumativeness and Sanativeness. They are all situated on the side of the head. The first animal that lived on earth needed but three of them, namely, Pneumativeness, Alimentiveness, and Sanativeness. These organs are so situated in the human head, as to give width and fulness to that part which is immediately above and before the ear. They are called the *Corporeal Ipseals*, because they are related to the body, and impel the animal to make exertions to supply his immediate bodily wants. Of course, no animal could exist without them.

I do not at present propose to show the origin of the very lowest organs of the brain, for the argument which I am pursuing does not require it; but, the lower organs being given, I propose to show that the higher organs grew out of them, as necessary modifications, produced by the circumstances in which the animal was placed. I shall, therefore, remark very briefly upon the three corporeal organs, in order that what follows concerning the other organs may be the better understood.

I. *Origin of Pneumativeness.* — The author of these pages first called the attention of phrenologians to the

anterior portion of the middle lobe of the brain, as connected with the tendency to make voluntary exertions to breathe, and denominated it *Pneumativeness.* If we admit this organ to exist, we must consider it as of such a nature that no animal could possibly live a moment without it, since all their motions depend upon oxygen. In all climates, and under any circumstances in which animals have ever existed, they must have been supplied with a greater or less quantity of oxygen. This organ cannot be said to be indebted to cold for its original creation, except so far as the cooling of the earth and the purification of the atmosphere were necessary to render animal life possible in the earliest geologic ages. Breathing is the first function of animal life, and its cerebral organ is the first in the order of the ipseal arrangement. The first vertebrated animals inhabited the water, and breathed with gills the air that the water held in solution. Then the reptiles inhabited the muddy and low swamps upon the shores of islands but little elevated above the surface of the surrounding ocean. These first breathed air unmixed with the watery fluid. The birds had large and perfect apparatuses for breathing. This was the natural consequence of their mode of locomotion. Among quadrupeds, their perfection and energy have always been in exact proportion to the perfection of their respiratory apparatuses; and the colder the region which they occupy, the more they are dependent upon respiration to produce warmth and resist the effects of the cold.

II. *Origin of Alimentiveness.*—If we study the matter carefully, we shall find that all the organs of the

brain are indirectly related to nutrition; though, in some instances, the relation is apparently so remote and disguised, as to escape the notice of the ordinary investigator. The only true method of acquiring a knowledge of the functions of the brain is, by considering the base of the front, the base of the middle, and the base of the posterior part, as needed by the first animals, and then looking upon all the other parts as superadded to these three; just as three trees are developed above their roots.

III. *Origin of Sanativeness.* — The author of this treatise was so fortunate as to be the first to point out a portion of the brain which is concerned in producing pain when any part of the body is injured. The nerves which convey the impressions of pain are, in all animals, most numerously distributed over those parts which are most exposed to injuries; and I have no doubt that injuries were the original sub-creators of this organ, and of the nerves which send it impressions of pain. But it is not necessary to extend my remarks upon an organ which all animals seem to possess in some degree.

IV. *Origin of Destructiveness.* — It is easy to understand that an animal might be so situated as to need no phreno organs but those that relate immediately to respiration, nutrition, organic protection, and reproduction. This would be the case if the animal lived in a climate unchangeably hot, surrounded continually by abundance of vegetable food, exactly suited to its taste and nourishment, — enjoying the company of other animals of its own species, of both sexes, and all similarly supplied. Phrenology and geology agree in teaching that this was

actually the condition of some of our predecessors. The animal, being surrounded by all that it needed, had only to breathe and eat, and enjoy existence in security and ease. What use would destructiveness or combativeness be to him? Why should he care for the future? Why guard against enemies, if none existed? Why store up provisions, build houses, or make clothes? Why exert his powers to invent new modes of acquiring a competence? Why migrate to new regions? Surrounding nature supplied all his wants, and anticipated his wishes. He lived beneath a burning sky; but his blood was so constituted then, as in some reptiles now, as to exactly adapt him to be happy in its refulgent beams, and make him rejoice in its scorching glory. He slept beneath the protection of the gigantic fern, and awoke to experience enjoyment which ended only with existence, and which consisted in corporeal gratification alone. He lived peaceably, amid beings like himself, that had no cause of contention; "his food the primal plants, his drink the crystal stream, his couch the verdant banks of earth, his canopy the star-lit sky." He had not yet been driven to the necessity of eating flesh, for vegetables had always been abundant. Why, then, should he kill any animal? There was no winter to apprehend in future; no cold to annoy at present: to-day was full of luxurious enjoyment; to-morrow was rich in promise. The same bountiful hand that fed himself nourished and protected his offspring also. He had no personal fears, no parental cares, and no social nor political responsibilities. He had no enemies, and no cause of enmity. He had no friends, for he needed none; and he owed no duty to

posterity but to increase its numbers. Such was, doubtless, the condition of our earliest progenitors; and such must necessarily have been our present condition, if food and climate had remained unchanged in quantity and quality.

Phrenology points to the fact that, after the creation of the three bodily phreno powers, the next developed organ is Destructiveness; that it is a continuation of alimentiveness, — superadded to it, apparently, to modify its operations. It is interesting to revert back to the time, and endeavor to imagine the circumstances under which this terrible organ came into existence. Animals must have been produced, at first, in immense numbers; so that, without any diminution of vegetation, the supply must soon have been less than the demand. Famishing animals, with peaceful and innocent dispositions, must have met, at first, and divided the vegetable food which nature yielded within their reach, without attempting to rob or to injure each other. Multitudes died of starvation. The survivors fed with much reluctance upon the carcasses of the unresisting dead, and thus first acquired a taste for flesh. The next step was to feed upon those who were too weak to resist. Then it was that oppression began its reign. Then was enacted the dreadful law, that might is the evidence of right; and the organs of Destructiveness and Combativeness were created, and commissioned to put the law into execution. The taste for blood, the habit of eating flesh, acquired in a slight degree in one generation, is transmitted to the next, and increased by continuation of practice. The third and fourth generations have it in a still higher de-

gree; and thus, in the course of ages, the whole organization becomes changed, to adapt it to the nature of the food. The claws become formed to seize animals, the teeth to tear them, and the stomach to digest their flesh. The brain also changes in its form, receiving an addition, denominated Destructiveness, which in man impels to destruction in general, but which originally related to food only. Geology abounds with evidence that destructive races of animals uniformly succeeded the races of vegetable eaters; and every great class of animals is susceptible of being subdivided into two classes, founded upon their habits of eating vegetable or animal food. Thus, fishes, reptiles, birds, and mammals, can each be divided into the carnivorous and herbivorous. The first created animals *must* have fed upon vegetables; for, in the first place, if they had fed upon each other, they would soon have been extinct; and, in the second place, it is a well established fact in physiology, that the organization of all animals is composed of elements formed by vegetation: in other words, animals are formed from vegetables, — composed of vegetable substances. Oxygen, hydrogen, and carbon, must go through certain processes *in plants*, before they can enter into the constitution of any animal.

V. *Origin of Combativeness.* — In the same way that Destructiveness is a modification of Alimentiveness, so also is Combativeness a modification of Destructiveness, and a posterior addition to it. A glance at the convolutions of the brain renders this manifest. Combativeness differs from Destructiveness in being aimed at possession merely. When two animals meet, and both aim to pos-

sess the same object, whether it be prey or any other gratification, a contest ensues; the aim of which is, not the destruction of each other, but the exclusive enjoyment or possession of the object of contention. This being so, the defeated party is not necessarily pursued and destroyed, but is merely conquered into a peaceable mood, and forced to acknowledge the supremacy of its conqueror. These contests take place among animals of the same race, and even the same family. Animals that never feed upon flesh are often exceedingly contentious, especially when instigated by amorous jealousy.

We have now five self-relative impulsives developed in the inhabitants of the earth. By the addition of the last two, the world has been changed into a scene of destructive carnage and contention. Whole tribes of innocent and unoffending creatures have been doomed to death, to save other tribes from starvation. Many animals, when Destructiveness began its bloody career, were doubtless destroyed without resistance: they had not yet learned to avoid enemies, nor to resist them; experience had not yet taught them to dread any fellow-being. Innocent themselves, they suspected nothing dangerous in others. They made no attempt to escape, but allowed themselves to be devoured without a struggle. When food grew still more scarce, the carnivorous animals must have contended with each other for the possession of their common prey. This would lead to that modification of Destructiveness which we call Combativeness; an impulse to fight for possession, instead of an impulse to kill and eat, which Destructiveness originally was. In the brain we find the convolution of Alimentiveness

continued to constitute Destructiveness, and then Destructiveness continued to constitute Combativeness.

VI. *Origin of Secretiveness.* — Those animals which were partly carnivorous and partly herbivorous, would know by their own experience what a powerful ferocious animal intended when he made his appearance among them. They would, therefore, endeavor to escape destruction, either by concealment or flight. On the other hand, the superior animal, seeing his prey escape, and finding that when he came near without being discovered he was more frequently successful, very naturally endeavored to surprise them by unexpected approaches. This practice produced a peculiar modification of Alimentiveness and Destructiveness. That Secretiveness is a peculiar modification of these organs, is evident, not only from its auxiliary character, but from its position, — immediately superimposed upon Destructiveness, its front part connected with Alimentiveness. It is large in many carnivorous animals; the cat, fox, and owl, for instance. They make much use of Secretiveness, as an auxiliary of Destructiveness; indeed, they could not often seize their prey without its aid. Animals of inferior strength or speed, being unable to contend with their enemies, would avoid them by concealment. Natural history is full of interesting illustrations of the modes in which this power is useful to animals; but, in all cases, it has reference to obtaining animal food, or of avoiding destruction. Such an organ would have been unnecessary before Destructiveness existed; but it became indispensable afterwards.

VII. *Origin of Cautiousness.* — The carnivorous sys-

tem of "treasons, stratagems, and spoils," would expose animals, especially the weak, to continual danger. They would hear the footsteps of Destruction afar off; catch the alarming sound of his voice in the distance; smell their enemy in the passing breeze, and expect to see him spring upon them from behind every bush. Such a state of things is certainly sufficient to account for the creation and development of a modification of Secretiveness and Combativeness, at its upper back part, which is phrenologically denominated *Cautiousness* or *Watchfulness*. It is the "look-out" organ. When first discovered, it was, not very erroneously, denominated "the organ of foresight." It is especially necessary to those who are surrounded by danger, which, though not now present to the senses, may nevertheless be upon them in a moment, with very little warning. It is accordingly most developed in those animals and those men that are timid, apprehensive, irresolute, and disposed to take every precaution, and restrain every dangerous impulse, to prevent future trouble and danger.

Even in this stage of the world's progress which we are now contemplating, there were, phrenologically, several classes of animals in existence. First, there were the perfectly innocent and unsuspecting animals, — guileless, harmless, fearless; then the destructive carnivorous animals, that resorted to no strategy, but looked around, discovered their prey, pursued it directly, seized it, and devoured it; then the wary and cunning animal, that gained the same object by means more complicated and intellectual; and then, also, the prudent, timid, watchful creature, that avoided all destructive contests,

and used no animal food, yet lived in constant apprehension of destruction from powerful and artful animals of carnivorous appetites.

VIII. *Origin of Constructiveness.* — If we consider the nature of this organ, and the circumstances which generally call it into action, we conclude that, whatever good fortune other animals may have enjoyed, our progenitors were destined to be persecuted by cold. It is, however, a consolation to know that what they had apparent reason to deem a misfortune, was in reality a very great blessing to their offspring. They must, at this period, have been placed in some insular situation, from whence it was not practicable for them to migrate, or they would not have submitted to such labor and inconvenience; for, if they could have found their way to more southern climes, where the effects of winter had not yet been felt, they would have had no need of additional powers of mind to enable them to sustain their existence. Constructiveness, in a torrid region, would be almost useless. But it was fortunately and providentially ordered that they should be placed, at this time, in a situation where the changes of the seasons could produce corresponding changes in their characters and structures. Fruits were no longer produced at all seasons of the year. Winters became longer, and more and more severe. Shelter became necessary, not only for themselves, but also for their young and tender offspring. Dens were resorted to; then holes were burrowed in the ground; then trees and bushes were used to protect and hide them from chilling storms and inclement weather. These circumstances caused a superaddition to Se-

cretiveness; for their dens were at once places of concealment from enemies, and protection from cold. We find the organ of Constructiveness developed immediately above and upon the front part of Secretiveness, [*see the engraving of the bust;*] and this fact is in harmony with the other circumstances which indicate that it was primitively a modification of that organ. It is a mode of concealment when we use Constructiveness to cover our limbs with clothing, and when we construct hiding-places for our bodies. Were it not for the life-devouring cold, we should not need Constructiveness, neither for clothing nor shelter; it could, therefore, only be developed in a comparatively cold climate. It is small in the African and New Hollander, while in the Caucasian it is large. Beavers manifest this power more perfectly than any other mammals, except man; and they are seldom found, in this country, south of 40° north latitude.

This organ, doubtless, commenced cotemporaneously with winter. If before that time it was manifested, in a slight, rudimental manner, it must have been excited by the necessities of animals engaged in offensive or defensive war, or in shaping their food to enable them to swallow it; but this scarcely deserves to be called by the name of Constructiveness. If we consider that mammals were created during the oolitic period, and that the mammæ were rendered necessary by coldness of climate, we shall perceive the probability that the rudiments of Constructiveness were created at the same period; though the organization of the first animals does not indicate Constructiveness till the eocene period.

IX. *Origin of Acquisitiveness.* — The protection af-

forded by Constructiveness would prevent the animal from perishing during short periods of cold; but, as winters became longer, vegetation would be entirely suspended, so that starvation would threaten him, even in his comfortable hiding-place. Fruits, and such other food as our progenitors were accustomed to use, could not be found during winter; it must be stored up during the season of plenty, or suffering and death must ensue. It was the opinion of Cuvier, that man originally fed on fruits. Nothing but cold could render it necessary for animals to lay up fruits for future use. Accordingly, we find that all the animals which are now most remarkable for their prudence in this respect, are inhabitants of cold climates. Beavers are wonderfully sagacious and skilful in planning and constructing their storehouses, and gathering a supply of provisions for consumption during the long winter which reigns in their native regions. Their whole organization and habits, and the nature of their food, all indicate that they are fitted to live in a cold country. They could not exist in any other, and continue to be beavers. It was, in fact, the cold which, under Providence, created their organization of brain, and teeth, and claws. Let a race of beavers live a hundred thousand years in a torrid clime, and they would unquestionably change again to some other kind of animal, of a less provident and industrious character.

The probability is, that our progenitors, at the time that the organ of Acquisitiveness was first started into existence, were in an isolated situation. Perhaps they inhabited an island near the polar region, so far from other lands that they could not escape to a more southern lat-

itude. They were thus compelled to submit to the changes which the polar climate forced upon them. When their constructive and acquisitive organization and habits were once formed, it would in turn operate to prevent them from migrating when they did have an opportunity; for only amid their native streams and forests could they find the means of gratifying the peculiar faculties which the surrounding scenery, and food, and climate, had conspired to produce.

The organ of Acquisitiveness is a part of the brain growing directly upon and out of the organ of Constructiveness. It is thus no small confirmation of these views, that each successive organ is a superaddition, an offshoot from the preceding organ. The very powers which the animal successively needed, are actually the very ones which are developed, one upon the other, and the next upon that, and so on, from the lowest to the highest. It should be particularly noticed, that the arrangement of the ipseal organs, which is thus found to be in such beautiful harmony with geology, was discovered and published, by the author of these pages, more than ten years ago, and long before this application of them to geology was thought of. This affords strong presumptive evidence of the truthfulness, both of the arrangement, and also of the geological theory by which their successive development is accounted for. Every truth harmonizes with every other, in whatever part of the universe it is found; and falsehood finds an enemy in every part of nature.

PRELIMINARY REMARKS ON THE IMPROVING RANGE OF IPSEALS.

The organs of this range are of a much higher and more comprehensive character than of the others, and they relate to operations which imply a greater amount and extent of knowledge.

The functions which they perform are not as definitely settled as those of the lower organs, and there has been much more difference among phrenologists concerning them. One reason of this is, that the nature of these organs, and their sphere of action, are not as limited and definite, nor the objects that excite them as tangible and obvious.

These organs are *modifiers* of the action of the lower organs. They tend to the same objects as the lower organs by new, improved, and more complicated means. They require the auxiliary aid of the reflectives to a greater degree than the lower organs, and they also naturally tend to combine in action with the higher socials, especially Credenciveness and Imitativeness. It is this *general* nature of these organs, their high aim and extensive connections, that has caused their real function to be often mistaken.

PRELIMINARY REMARKS ON EXPERIMENTIVENESS, WIT, OR MIRTHFULNESS.

This organ, when first discovered, was called WIT; then it was called MIRTHFULNESS, by Spurzheim. By some of the Scotch phrenologians it was considered as a perception of incongruity; by some others, the perception of difference.

In my new system of Phrenology, in 1839, I advanced the opinion that it is the organ of PLAYFULNESS, and that it impels the young to sport. This was the opinion, also, of Brousais, and of Vimont. Notwithstanding this difference of opinion as to the nature of this organ, it will be observed that phrenologians do not disagree in respect to the facts observed, but only concerning the inferences drawn from those facts.

My present opinion is, that it is the experimenting impulse, and gives the love of *novelty*, of new modes adapted to new circumstances, and new things, new practices, and untried expedients. I consider this its *primitive* function; but I admit that it is one of the elements of Play, and Wit, and Mirthfulness. Much of what is commonly called *play*, is an idolatrous manifestation of this organ. It is a sort of experimental exercise of the various powers during leisure. Watch the sports of the young. Are not their mimic performances mere experimental tests and trials of their powers, to which they are prompted by the Pneumative-mercurial impulse, to do something to get rid of the excess of oxygen in the blood? Having nothing serious which demands attention, they exercise their powers in playful experiments, which have a tendency to qualify them for future usefulness. I consider *wit* as an experimental mode of exercising the intellect in leisure. A brain *spontaneously* active during leisure, is apt to take on an *experimental mode* of action; this is sport, play, wit. Combined with Constructiveness, this organ gives the tendency to make mechanical experiments, and try new modes of operating machines. It is large in all great experimental mechanics and philos-

ophers, — Perkins, Watt, Cuvier, Davy, Newton, and Franklin. It is small in practical conservatives, — those who are slaves and creatures of imitation and habit, and averse to all changes. In youth and leisure this power is manifested in sport; in mature and earnest operations it is manifested in experiments which aim at saving labor and trouble, by adopting novel methods of proceeding, such as peculiar circumstances require. When in excess, it despises steady, continuous labor in the beaten track, and longs for variety.

X. *Origin of Experimentiveness.* — This organ originated, like all the others, in times of trouble, when no other existing powers would enable the animal to preserve and enjoy his existence by ordinary modes of operation. There is a great difference among animals, in regard to their ingenuity and ready wit, when placed in embarrassing circumstances that require them to act in a way in which they never acted before. A goose could not escape from a prison from which a fox would soon find his way, carrying the goose with him. We occasionally see a cow that can unfasten a gate, a cat that can ring a bell, and an elephant that tries a bridge carefully before he ventures upon it. We see many species of animals, when frequently disturbed in one place, resorting to another more secure, and varying their proceedings, in some slight degree, as new circumstances require. But this is manifested more decidedly as animals rise higher in the scale of intelligence. It seems reasonable that when our progenitors could not exercise their powers in the old and time-honored method, — driven and stimulated by the scarcity of food, the

prevalence of enemies, or the inclemency of the season, — this organ would then be called into existence and requisition by the new stimulus of such circumstances. One of the most distinguishing traits of humanity is this ability to vary and change to suit any new condition or change of circumstances. Not only so, it is this, with the next higher organ, which distinguishes the highest class of men from the lowest. It gives variety to life, and breaks up the monotony which is so delightful to the stupid and plodding followers of the past. We always find it manifested in the highest degree in the rough regions where it is most necessary: Switzerland, Scotland, Old and New England, and northern France and Germany. But we see little of its beneficial result in the south of Asia, Africa, or America. We find it nowhere but where necessity demands it.

XI. *Origin of Perfectiveness, or Ideality.* — This is the impulse to improve and perfect, — to beautify and adorn. Before the organ of Perfectiveness was developed, man — if he could be called man — must have been inferior to the modern chimpanzee (the most intelligent of apes) in point of intelligence. For although this organ does not directly acquire knowledge, it accompanies reflection, and directs it to higher and more comprehensive views, and thus it elevates the character in every respect. It was probably produced originally in a country where nature's productions were various and beautiful, but where food was not abundant without labor, and where society was in large communities. That Perfectiveness was produced when communities were large and crowded, and society nearly perfected, is

proved by the fact that it is one of the highest ipseal organs, and borders upon Credenciveness, the highest social organ. They (Credenciveness and Perfectiveness) were undoubtedly produced simultaneously, under the same circumstances. Society must then have been complicated; its members must have been able to converse with each other, and transmit their conversations to posterity by memory and tradition; for I suppose writing, even by hieroglyphics, was then unknown. The higher ipseals appear to be, in some respects, dependent upon the socials for their perfection. In functions they are intimately associated, like two vines beautifully interwoven and closely entwined around each other, yet each perfectly distinct from the other, and capable of a separate existence. The complicated state of society would produce many occasions for the exercise of skill and ingenuity, to enable all to enjoy equally the benefits which the community afforded. The expressions of applause or preference, which others would make, would lead to renewed efforts to excel, and the excellence of one would lead to imitation by another, until the excellence would be general.

The attachments of society, — its advantages, its pleasures, its wants, its increasing numbers, and consequent necessities, — would bring on frequent critical occasions and crises, which would lead to improving efforts. In some cases it would happen that (as in Ireland now) some must die from want, or immigrate, or else, by some ingenious contrivance, must improve the methods of economizing, of producing, of pleasing the powerful, or in some way rendering themselves useful, that thus they

might be permitted and enabled to exist, to remain in the community, and to enjoy its advantages and refinements. This state of things would seem to be sufficient to give origin to the improving impulse. It was here that modern humanity commenced. When improvement became an instinct, the elevating process began in earnest. From mere brutes our ancestors became *men*, savage and barbarous indeed, but yet such men as were capable, by another forward movement, of becoming half civilized, and laying the foundations of human society as we find it represented in our most ancient records; a wonderful structure of usefulness and folly, of superstition, ignorance, genius and stupidity, all entangled and commingled beyond hope of immediate, or, perhaps, of ultimate unravelment; regulated by law, modified by accident, and controlled by a mysterious Providence; its existence a wonder, and its destination a problem yet to be solved.

I consider Experimentiveness as a lower species of Perfectiveness. Yet there is a distinction between wit and poetry; between change and improvement; between a new method and the most improved mode of operating according to a well-known method. They both, however, tend to the same result, which is *economy*, — the economy of living. All the ipseals, if carefully studied, aim at the easiest and best mode of sustaining the individual in comfort and happiness. These two organs of Experimentiveness and Perfectiveness lead to invention, ingenuity, improvement, and the most skilful and perfect modes of proceeding and operating in all things. But they originated in circumstances of pressing necessity, or they would never have existed.

It is a maxim that "Necessity is the mother of invention;" and this argument which I am now pursuing is but an illustration of its truth. I insist that necessity was the mother, not only of ingenuity, but also of the improving disposition and the *ability*. The whole history of man illustrates this. Great men and great nations have arisen, like volcanoes, from beneath the pressure of a mountain of discouraging circumstances, which nothing but the concentrated fires of native genius, forced into convulsive action, could possibly have upborne. Take away the necessity of exertion, and the exertion itself, its motives and its organs, will gradually sink, and, ultimately, disappear entirely. Strike the sub-creator from existence, and the creature will be annihilated also.

PERFECTIVENESS CONTINUED. — ORIGIN OF THE FINE ARTS.

The incidental and playful action of the organ of Perfectiveness has been mistaken by all phrenologians for its primitive and essential function. It has been supposed to be exclusively related to the fine arts. Now, I conceive that the fine arts are but the abnormal and morbid manifestations of the higher powers; perhaps I might say that the fine arts are the results of the idolatrous and sportive action of Perfectiveness and its combinations. The same powers which were created to improve our means of sustaining life, contribute to our enjoyment in leisure, by exercising themselves in a sportive way, to produce the agreeable merely instead of the necessary. The same perceptive organs of *Extension*, *Weight*, *Color*, *Order*, *Comparison*, *Causality*, and

also the constructive, experimentive, and perfective impulses, — all those organs, indeed, that are used in complicated cases of embarrassment, and in troublesome times, to extricate the individual from danger and bring him necessary enjoyment, — these very same powers, in their sportive and idolatrous operations amid leisure and luxury, produce the fine arts, poetry, music, sculpture, and painting, under the especial promptings of Perfectiveness and Imitativeness. But it would be absurd to suppose that the organ of Perfectiveness itself is exclusively related to the fine arts. The fine arts themselves never existed in savage communities; yet the organ was then active in some degree, supplying the stern necessities of humanity. The fine arts are the sportive manifestations of the highest powers of man. The useful arts spring from the same powers, when seriously engaged in struggling with adversity.

The organ of Perfectiveness grows out of the top of Constructiveness, and is, doubtless, a modification of it, and more intimately related to it than to any other organ. Experimental and mechanical philosophy and the fine arts are the results of this combination, — this modification of Constructiveness by Experimentiveness and Perfectiveness.

ORIGIN OF THE USEFUL ARTS.

All animated nature teaches the truth that the natural progress is from vegetable to animal food. The number of vegetable-eating animals is necessarily limited by the quantity of vegetation to be obtained. When that limit is reached the stronger animal necessarily becomes car-

nivorous, and puts on the character of a hunter. In a few generations the organization of the hunter becomes adapted to the change in his mode of obtaining food. The change becomes so great, as to render animal food necessary to the enjoyment of happiness. Man is no exception to this law, and, like all other flesh-eating animals, he has undergone this change. The first art which man in primeval times was forced to acquire, was the art of seizing his prey,—hunting and fishing. Animals that were too weak to prey upon others, and too numerous to live on the vegetables within their reach, perished. The difficulty sometimes arose, not so much from the excessive number of the animals to be fed, as from the severity of winter temporarily cutting off the whole supply. This condition of things gave origin to the arts of *construction* and *storing*, as a means of avoiding starvation, by preserving vegetable food for winter. No animal but man has acquired any other arts than those of hunting, fishing, constructing habitations, and storing vegetable food. Animal food could not be stored without a higher degree of art. Man is the first and only animal that has manifested the ability to get possession of living animals, and keep them within his reach that he may feed upon them at his pleasure. The nearest approach to this is the instinct of dogs and foxes, which makes them conceal bones and fragments of flesh, and keep them until they are wanted; but man is the only animal that keeps his food alive; he is the only shepherd,—I apply the term shepherd to the herding of all animals, though *zoo-herd* would be more proper. Shepherding is an art founded upon hunting, as a substitute for it; it is a higher art, more

economical and intellectual; it led to ideas of wealth, and to the exclusive possession of land, for purposes of grazing and watering; it led to the selection of lands which were best adapted to these purposes; and this in turn led to some slight attempts to improve the land, by digging wells, and removing the obstacles which prevented the access of cattle to good watering-places. The next step would be to remove the obstacles to vegetation itself in those instances, where plants or trees were found to be valuable, — to prevent their destruction, and encourage their growth by watering them, and digging around them, and by favoring the growth of more of the same kind by planting or scattering the seed, and preventing the intrusion of browsing animals. This was the rude *origin* of *agriculture.*

Men were fruit-gatherers before they were hunters, and hunters before they were shepherds, and shepherds before they were farmers, and farmers before they were mechanics, and mechanics before they were philosophers or merchants. The use of implements in agriculture rendered the manufacture of such implements necessary; as the axe, the spade, the plough. The scarcity of vegetable food rendered hunting necessary; the scarcity of animal food rendered shepherding necessary; the scarcity of both rendered farming necessary; and the greater the scarcity, the greater the skill that became necessary, and the better the tools and the storehouses. Those who were the most skilful, would be the most wealthy, and this would at once make mechanic arts important, and lead to their encouragement and improvement; and as communities increased, this led to experimental philosophy and

the fine arts. The skilful supplied the unskilful. Cities were thus founded, improved and ornamented, and *commerce began as a consequence of mechanical skill.*

Thus men were mechanics before they were merchants. Excessive wealth and leisure produced the fine arts. In crowded cities, amid luxury and vice, the powers of man were directed to a thousand objects of a trifling, idolatrous, and sportive character, until at length it has become a difficult question, with some philosophers, whether some of his powers were not originally bestowed for the mere purpose of trifling and idolatry. The primitive nature of man is entirely overlooked and lost in the mazes of superstitious idolatry and depravity.

Agriculture and commerce are both related to Hope. They are means of preventing the necessity of migration. Shepherds were necessarily rovers; as their flocks and herds increased, they were forced to find new and more extended plains; but agriculture gratifies the same expectant impulse of hope, by leading it to expect a reward of labor in future crops. By making the present home more productive, migration becomes unnecessary.

Commerce, also, is a substitute for emigration; for, instead of going to the land of plenty, we can, by means of commerce, bring its productions to us. This doubtless is the reason that the organ of Hope is large on enterprising merchants, and energetic farmers, and on all men who are disposed to look with confidence to the future, and act with promptness and cheerfulness.

XII. *Origin of Hope, or the migrative impulse.* — This organ is admitted, by all writers on phrenology, to be large in enterprising, confident, cheerful, adventurous,

visionary characters. Religious hope is considered as a confident expectation and desire to reach "another and a better world," — a distant "happy land of promise," — a land of plenty — "a land flowing with milk and honey" —

"Some happy island in the wat'ry waste."

Hope, in Collins' ode,

"Bids the lovely scenes at distance hail."

Now, what were the circumstances in which hope originated? What is its natural stimulant?

It seems to me that, if we consider this the migrative impulse, the explanation covers and reconciles all other views which have been taken of its nature and functions.

Migration is the last resort of animals from the rigors of winter. When Alimentiveness cannot get a supply of vegetable nourishment from the earth, — when Destructiveness furnishes no flesh, nor Constructiveness no shelter, nor Acquisitiveness no stores, nor Experimentiveness nor Perfectiveness no new modes of supplying wants, — then it is that Hope takes its flight to sunnier climes, and bids farewell to a native barren land. Northerners have always migrated to the south in cold seasons, and unproductive times. Some animals manifest this propensity in a high degree, and works on natural history offer numerous interesting illustrations of the migratory instinct.

This organ is superadded to Acquisitiveness, grows out of the top of it, and seems to be in its nature a modification of it, — a sort of substitute for it. This will be obvious if we reflect that, in severe seasons, animals must store up provisions sufficient for the approaching winter, or

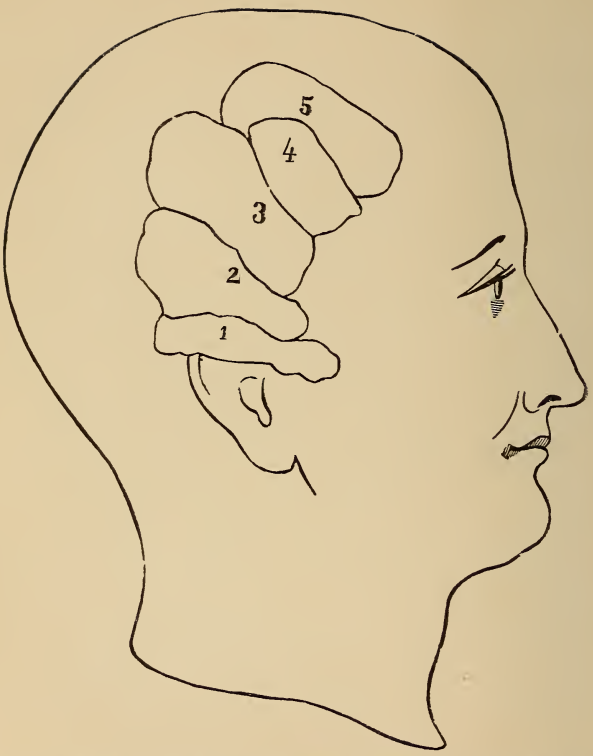
emigrate to a milder clime, or they must perish. Had it not been that the cooling of the earth produced winter, the earth could not have produced the migrative propensity, and Hope would never have existed. Under Providence, therefore, winter may be considered the creator of Hope, one of the very highest attributes of humanity. This being so, man, as we now know him, — man possessed of Hope, Constructiveness, and Acquisitiveness, — could not have existed before winter rendered shelter, and stores, and emigration necessary; and as such winters did not exist before the tertiary period, man, in his present form, could not have previously existed. If he existed before, he must have been in some lowlier and less intellectual form.

I consider migration as the primitive mode in which Hope was manifested; but it is incidentally exhibited in numerous other modes: planting, commercial enterprises, and, indeed, all operations where the present immediate gratification is deferred to gain a greater future good, indicate the influence of this impulse, and proceed from it. But the object of this treatise is not to illustrate all the phases of the organs, but to indicate their primitive function and origin.

IPSEAL SUMMARY.

We have briefly reviewed the ipseal phreno-organs, and seen them receiving superadditions, as external circumstances and the surrounding earth demanded. We have seen the animal commence existence with, I. Pneumativeness, II. Alimentiveness, and III. Sanativeness, and proceed happily until the scarcity of vegetable food added IV.

Destructiveness, the operation of which produced V. Combativeness; the scarcity of animals fit for prey, and their experience in warfare, added VI. Secretiveness, and VII. Cautiousness. The coldness of the weather had now increased to such a degree, as to act not only upon the food, but upon the constitution of the animal himself, so as to render shelter necessary, and thus produced VIII. Constructiveness. But the cold still increasing, and cutting off the supply of food during winter, it became necessary to introduce IX. Acquisitiveness. We now find him with a store of provisions, with parents to nurse and protect him, and allowing him leisure for X. Experimentive playfulness in youth, preparing him for experimental plans of happiness in mature age. Next, the increasing wants and numbers of a complicated community render improvements necessary in all the various departments of industry, and this introduces XI. Perfectiveness, which carries man forward and supplies his wants, until he is again at his wits' end. Finally, XII. Hope, rises on her migrative wings, and bears him to a distant promised land, where he is to enjoy all the pleasures which his soul desires, but which could not be found in his native home. Hope makes him engage in perilous and doubtful enterprises with confidence and energy, casting his bread upon the waters, like seed upon the ground, assured that the future will return it with great usury. Although the present country is cold and cheerless, migrative hope leads him to another and more genial clime, where primeval plenty still exists to cheer his heart, and reward his perseverance.



The above engraving represents the Ipseal Organs, developed in five ranges, or strata, which are superadded, in a regular and progressive order, from 1 to 5, corresponding with the order in which animals were created and adapted to the successive geological conditions.

1. This range is at the base of the brain, and relates to the lowest necessities of animal existence. It was possessed by the first created vertebral animal.

2. This range relates to the violence and contention which arose from the necessity of eating flesh.

3. This range relates to the cunning and prudence which violence rendered necessary.

4. This range relates to the necessities produced by cold, since the carboniferous period.

5. This range relates to the ipseal wants produced by the increase, progression, and concentration of society, from the oolitic period until now

SECTION XII. — ORIGIN OF THE SOCIAL ORGANS.

1st. *Amativeness.* — The first and lowest organ of this class is Amativeness, — the propensity to propagate the species. It is manifested in some manner by all organized beings, from the lowest vegetable to the highest animal. Reproduction is a mode of disposing of an excess of nutrition, and is manifested in the highest degree in warm countries, and where food is the most abundant. This impulse seems to become less powerful as the climate becomes more severely cold. Animals become less and less productive as they rise in the scale. The fish, which is at the bottom of the vertebrated class, produces millions at a birth; and a single pair can multiply, in two years, so as to outnumber the whole human family. The elephant, horse, whale, and beaver, are in this respect more like human beings; but, even in regard to the higher animals, it is found by experience, that a mode of living similar to that enjoyed by the lower animals, — plenty and ease, without labor, — is highly stimulating to the reproductive instincts.

It should be remarked, that this impulse being the lowest of the social class, I do not propose to discuss its origin; it is sufficient that the lowest vertebrates possessed it in perfection; and we will, therefore, proceed to the next organ of this class.

2d. *Origin of Parentiveness*, or *Philoprogenitiveness.* — Natural history affords abundant evidence that this impulse is greatly dependent, for its activity, upon coldness of climate. Geology teaches us that the earliest vertebrated inhabitants of the earth were fishes. Now it is

well known that the simplest fishes manifest the slightest degree of parental affection, although they are exceedingly prolific. Indeed, I doubt whether they manifest any at all. The seal, the whale, the dolphin, and some other marine animals, are affectionate to their young; but these animals are not ranked by naturalists among fishes, nor did they exist in the primitive ocean in which fishes originated. They are first found in the rocks denominated oolitic.

Reptiles, though higher in the scale than fishes, manifest the parental instinct but slightly, and originally it is not probable that they did at all. Many of them leave their eggs to be hatched by the warmth of the sun and the earth, as the fishes do, affording no warmth to them from their own bodies, in the manner practised by higher animals. Reptiles do, however, show some regard for their young, by protecting them from the assaults of their enemies; and thus indicating that they are superior to fishes in this respect.

Birds are much more parental then reptiles. Reptiles and birds are first found in the new red sandstone. They existed at an age when no animal had yet been produced, capable of nourishing its young with milk. Such a mode of nourishing the young was not yet necessary. The oolitic era introduced the mammalia, and the eocene period saw them increased a hundred fold, in the midst of a climate of continually increasing chilliness. The mammals surpass all other vertebrated animals in point of intelligence, and in the number of their social impulses. They are capable of keeping their young in a warm situation, and nourishing them with their own

blood before birth, and of feeding them, after they are born, with the most delicious and appropriate food, drawn from their own bodies. It is obvious that, the colder and more barren the surrounding country, the longer it must be before the young of any animal can become independent of the parent.

It is said (I know not on what authority) that the pelican has been known to pierce her own breast, to furnish nourishment for her young. This may have been true, also, of other animals; and if practised by one animal, and then by its offspring, for several successive generations, this would at length so far modify the constitution of the breast, as to originate the teats and mammæ in one female; and from this one all other mammalia of one species may have descended. This hypothesis is perfectly consistent with admitted principles of physiology; for it will not now be denied that the changes produced in one generation are transmitted to the next, by hereditary descent.

The organ of Parentiveness is separated from the cerebellum by a membrane called the tentorium; and the lamellated structure of the cerebellum gives it an appearance so different from the rest of the brain, that, at first view, it seems difficult to reconcile the intimate relation, in function, of Amativeness to Parentiveness, with their apparent anatomical separation and difference of structure; but a further consideration of the matter may bring us to perceive that even this apparent contradiction furnishes a strong argument in favor of these views; for there was an immense period elapsed, after the creation of the cerebellum, before any other social organ was su-

peradded; and, during that time, the ipseal class, in the middle lobe of the brain, had received at least four new organs, and must have possessed the predominant arteries and veins; so that, when Parentiveness and other new social impulses were added to Amativeness, they could easier receive nourishment from the ipseal arteries than from those of the cerebellum. Thus the cerebellum was left alone in its glory, with its tentorium wrapped around it, separating it from contact with the rest of the brain. A similar separation, though less in degree, exists, and probably from the same cause, between the base of the middle and the anterior lobes of the brain. It is called "the fissure of Sylvius." These anatomical separations seem almost to represent the vast periods of time which elapsed from the creation of the separated organs; for there are no organs which geology indicates as waiting so long for their superincumbent organs, as Amativeness and Secretiveness. The probability is, that Constructiveness and Tune were, in our race, undeveloped until after they became residents of the land; and that Amativeness was the only social organ that existed until after seven of the ipseals were developed.

3d. *Origin of Inhabitiveness.* — This impulse would be rendered necessary by the wants of the young, especially of those animals which cannot take their young with them, as the bats and whales do. Geology shows that animals inhabited more and more limited regions, as the cold increased. They not only occupied limited regions, but they became more diversified in their forms and habits, to correspond with the various degrees of temperature, and the various kinds of food, which sur-

rounded them. These forms and habits, once acquired by long continuance in their native regions, could not be suddenly shaken off, and they could no longer even exist in a climate like that which their progenitors once enjoyed. Migration to a much colder or warmer climate would be their destruction. When it became necessary for the parent to go in search of food to bring to its young, it also became necessary for those young to remain where the parent left them, in order to be found on her return, that they might be fed, and thus saved from starvation. In this latter view, Inhabitiveness is a social impulse of much importance, and is made necessary by the wants of the animal, which wants are produced, directly or indirectly, by cold.

The cultivation of the earth is related to Inhabitiveness. It originated in the coldness of the earth, preventing it from producing a sufficient quantity of food. Men were, doubtless, shepherds before they were farmers; they lived on the spontaneous productions of the earth first, and cultivated it when it produced too little without assistance. Farming is a kind of vegetable midwifery; it enables mother Earth to bring forth many noble productions, which, without such assistance, would perish in her exhausted bosom. The cultivation of the earth, or even the feeding upon the productions of a particular region, would naturally develop Inhabitiveness.

4th. *Origin of Adhesiveness.* — This organ is superadded to Parentiveness, to make the young become attached to the parent, and to its mates of the same family. Thus it lays the foundation of all kinds of attachment, — filial, fraternal, platonic, and amorous or

conjugal, — according to the other organs with which it happens to be combined. Its primitive function seems to have been filial attachment; for it is almost as necessary that the young should be attached to the parent, as that the parent should be attached to the young; otherwise, the young would desert as soon as they were able to do so, and thus lose the benefit of the parental protection. The young of the whale is said to be carried through the water, attached to the teat; and the young of the bat is also said to be carried through the air, attached to the breast. The young of some of the monkeys are carried about, attached to the mother's neck; they only release their hold to receive nourishment, and then cling again to the neck. Infants have a strong tendency to cling to their mothers or nurses. As the young animal grows older, it attaches itself to its mates, and together they show a disposition to live in flocks, herds, or droves. Animals that store provisions for winter, as the beaver does, live in large families, mutually sustaining each other. The organ of Adhesiveness originated in the circumstances produced by Parentiveness, and in a state of helplessness and dependence produced by cold. The reason why the higher animals are born in a more helpless state than the lower, will be found, upon a careful inquiry, to be referable to the coldness of the climate in which they properly belong, and to the circumstance that the mother is more capable of nourishing them with her milk after birth, than with her blood before, when she was under the necessity of bearing them about with her while in quest of food.

5th. *Origin of Imperativeness*, or *Self-Esteem.* — The impulse to command:

> "Order is heaven's first law; and, this confessed,
> Some are, and must be, greater than the rest."

Parentiveness, Adhesiveness, and Inhabitiveness having already been rendered necessary, and produced, by cold, the operation of these organs necessarily tended to bring animals together in large communities. Now it seems impossible that any large community or family can long remain together without some kind of government. The strong would, of course, control the weak; the parent would govern the young. Contests would often take place, to determine claims to precedence and superiority; but, the victory once gained by one party, his superiority would afterwards be recognized by the weaker. The very discharge of the parental protecting authority would beget Imperativeness in the parent, and Submissiveness in the young, as a necessary consequence; for it should be recollected that the same stimulus which excites an organ, originally created it. We find this organ superadded (in the middle line of the head) to Inhabitiveness, the impulse to live continuously in one place. In its lower lateral portions it grows out of Adhesiveness. These two lower organs, Inhabitiveness and Adhesiveness, give a tendency to form communities, and gather them into one place as a home. When we consider how naturally government would follow this state of a community, and how naturally the circumstances would tend to modify the lower social organs, to harmonize with the governing action, we must admit that Imperativeness is a result which might justly be anticipated;

and the actual development of the organ, in the position which it occupies, is well accounted for upon the phreno-geologic theory.

6th. *Origin of Approbativeness.* — This organ is superadded to Adhesiveness, and is an offshoot, in a lateral direction, from Imperativeness; accordingly, in its function, it is a modification of both, and seems to partake of the nature of both, at the same time that it has peculiarities of its own. It cannot but happen, in a large community, that there will always be rival chiefs; and the superiority of one over the other must depend, in some measure, upon the aid of auxiliary forces. These auxiliaries must be conciliated, and their friendly influences obtained. That chief who could most successfully win the favor of his associates, would find himself preferred to his rivals; and, even though they might be individually the most powerful, yet, by the assistance of his auxiliaries, he would be sustained in the chief authority.

The disposition to court the favor of those who have influence depends upon this organ of Approbativeness. This is its primitive use—to gain popularity as a means of governing the community. The love of compliments and flattery, the shallow vanity and love of display, that are often referred to this organ, proceed from its unbalanced and misdirected operations. These must not be confounded with its legitimate, primitive, and proper manifestations. I suppose that this organ was begotten by the influences of community, acting upon Adhesiveness and Imperativeness, and producing a peculiar compound modification of both, which would enable its possessor to govern associates more successfully.

7th. *Origin of Firmness.* — This is the impulsive propensity to maintain the social position which Imperativeness has impelled us to assume. Firmness necessarily rests upon Imperativeness, and depends upon it; or, more properly speaking, Firmness is a modification of Imperativeness. When one member of a community assumed authority, and exercised it, there would be continual efforts and tendencies, on the part of the governed, to subvert or avoid his controlling influence; this would be resisted, and Firmness called into requisition. In order to account for the origin of this organ, it is only necessary to account for the origin of Imperativeness, and its modification, by attempts to overturn authority by force; or else to cause the governor to change his decisions, by persuasions and appeals to his friendship, kindness, reverence, sympathy, or credulity.

Whoever has been in a situation of authority where there were many who were interested in changing his decisions or plans, and bending them to their own selfish purposes, or the purposes of their party, will readily understand that Firmness is as necessary to resist kind and amiable persuasions, and appeals to our good nature, as to resist the open opposition of armed enemies. And I have no doubt that it is to these stimulating circumstances, which excite the organ of Firmness, that we are indebted for its original creation.

8th. *Origin of Conscientiousness, or the impulse of Justice and Impartiality.* — This organ is an offshoot from Firmness, and is immediately above Approbativeness, as it were superadded to it. In order to understand its function and its origin, we must consider it as

a modification of these two organs, and as principally needed to ensure the stability and usefulness of government, by causing justice to be impartially administered. Where there are, in any large community, many claimants of the same thing, and it is in the power of the parent or chief to decide between them, Approbativeness would incline to gratify the most powerful, agreeable, or useful favorite; Firmness would tend to decide in a manner consistent or analogous with prior decisions made under similar circumstances; the ipseals would tend to decide according to self-interest alone, without regard to either claimant. Now, it seems that this organ is the result of this struggle, aided by an intellectual perception of the fitness and propriety of being an impartial judge in all cases, even to the sacrifice of selfish and personal claims. We have already seen Approbativeness endeavoring to obtain power by consulting the wishes of the community, and Firmness endeavoring to retain power by consistency and a resistance of opposing influences. It is obvious that the individuals who were placed in authority, and in situations of responsibility, would naturally be tempted to take advantage of their situations to benefit themselves at the expense of the other members of the community. This would be resisted, and the rulers would be forced, (in order to be popular, and to be enabled to continue in authority,) to act for the good of others, even to the partial injury of self. If they would not do this, they would be ousted from power. They would thus be forced to be impartial and just, to a certain degree, and this would produce a modification of Firmness and Approbativeness.

Conscientiousness, or Justice, may be properly considered as a species of enlightened and improved Approbativeness; for a fair and impartial government, even among savages, will be ultimately the most popular and the most permanent. It produces the greatest good to the greatest number, and, consequently, engages the feelings as well as the interests of the greatest number in its favor, whenever they are capable of understanding the question. The conclusion is, that the stimulus which acted as the sub-creator of this organ, was the clashing and contending interests of a large community, gradually perfecting its modes of government, through a succession of generations, sufficiently numerous to allow of the development of this part of the brain, as an offshoot from Firmness, and a super-addition to Approbativeness.

9th. *Origin of Submissiveness*, or *Veneration.* — The exercise of Imperativeness in the superior is a powerful stimulus to Submissiveness in the subordinate. It is its *most* powerful stimulus, and therefore may be deemed its sub-creator. One generation being *forced* to submit, would undergo a slight modification of its organization, which would be transmitted to the next generation, and they would, in consequence, submit more readily than their ancestors did, and their offspring would be yet more submissive, until, in the course of ages, this organ would become distinctly developed, and would be excited whenever superior power or influence was brought to act upon the individual.

Perhaps Submissiveness may be a modification of Firmness. If we can imagine an animal with large Firmness and no Submissiveness, forced continually to

submit to superior power, in despite of all the power which Firmness could exert, it is reasonable to suppose that such proceedings would impress and modify the organ of Firmness in a peculiar manner. Bearing in mind that the brain is the source and organ of conscious motion, a forced modification of motion will, of course, force a modification of the organ in which such motion originated.

10th. *Origin of Kindness*, or *Benevolence.* — Primitively, this is the tendency to hold amicable intercourse with strangers, and to conform to the wishes of any one, whether previously acquainted with him or not. This organ and Submissiveness seem to be somewhat antagonistic to Firmness and Imperativeness. The necessity which exists in a large community of addressing individuals with whom there is but little acquaintance, and treating them with indulgence and hospitality, might naturally produce this development as a modification of Submissiveness, yet differing from that organ in being excited by the importunity, or even the presence, of *any* one, whether he has authority or not. It originated in the necessity of amicable and peaceful intercourse among members of the same community, when that community becomes extensive, and partially separated into classes and tribes. The common notion, that this is the organ of Christian charity or benevolence, must be abandoned; it is, primitively, merely an impulse to gratify strangers or slight acquaintances, and is very necessary in a large, expanded, and crowded community. Before large communities existed, this organ was not created; and we now find it most developed upon those who are most

successful, in *general* society, in rendering themselves agreeable to persons for whom they really have but little affection or attachment. Cosmopolites, philanthropists, and general lovers of mankind, such as Garrison and Wilberforce, have it large. Kindness, Justice, Approbativeness, and Acquisitiveness, must have been brought into requisition nearly at the same time, and that time must have been when the number of individuals and their difficulties required more perfect social institutions.

11th. *Origin of Imitativeness.* — This organ is intimately related to Kindness, both in function and also in anatomical position. The two organs run parallel to each other at the upper front part of the head; both seeming to have their roots in Submissiveness, they run forward to reach the intellectual directive organs in the upper part of the forehead. Kindness is the impulse to do as others desire; Imitativeness is the impulse to do as others do, and to adopt the manners of associates upon slight acquaintance. It tends to produce uniformity of manners throughout any community. It is obvious that society is the natural stimulus of this organ, and, therefore, must have been its original sub-creator, by producing a modification of Submissiveness and Kindness. It is excited by any new or very peculiar modes of action of our associates.

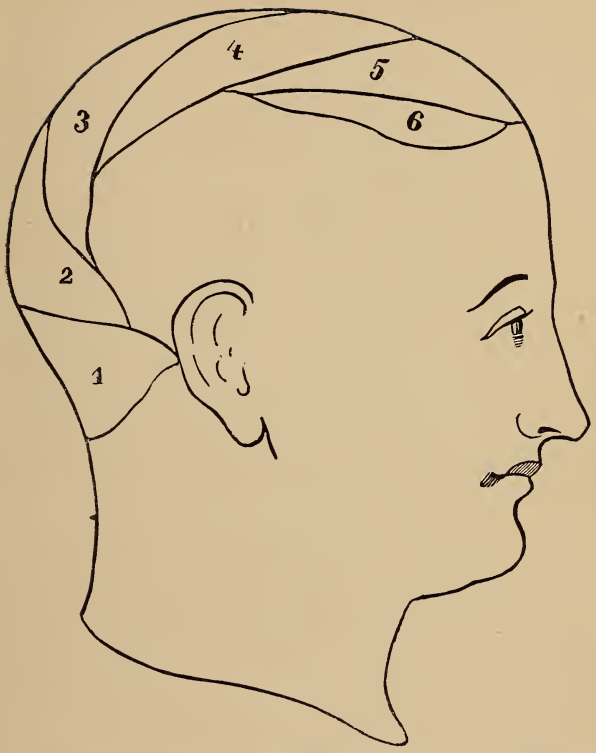
12th. *Origin of Credenciveness*, or *Marvellousness.* — This organ finds its stimulus in the motions, sounds, writings, or other signs that intelligent beings make, to inform us of what they think. It is a mode of substituting the perceptions of others for our own, when we are so circumstanced that we have no good opportunity to perceive for ourselves. In large and complicated

communities there is no possibility that all can be personally present to witness the proceedings which interest them. Many important transactions, in which they are deeply interested, happen before they are born. They must, therefore, depend upon the assertions and representations of those who were then present. Such assertions are the natural stimuli of this organ, and excite it to action. They are, unquestionably, its sub-creators.

All language is an appeal to Credenciveness, and all social beings have language. I consider this a highly important and interesting organ; its influence upon human destiny is immense. It is the foundation of all belief, all religion, all literature, and, indeed, of everything in human institutions which raises man above other terrestrial animals.

The more language is cultivated, and the more men believe in truthful assertions, the greater is the distance in time and space with which we can be acquainted; for we can use the perceptions and recollections of others, instead of our own, and thus make them our agents for acquiring knowledge to guide our conduct.

This organ is a modification of Submissiveness and Imitativeness, and it is anatomically connected with them both. We rarely fail to believe those to whom we submit, and whom we imitate. An individual, therefore, surrounded during his whole life by a large community of social beings, would be likely to receive this modification, and his offspring would increase it, until it became what we now find it in the human head. I am inclined to think that Credenciveness is the organ which gives the impulse to talk; or else an organ adjoining it, not yet defined, performs this function.



The above engraving represents the successive stages of social progression, and the order and direction in which the Social Organs were created.

1. This part of the brain was created first, and existed cotemporaneously with the lowest ipseals and directives.

2. This part was added when the geological changes rendered parental care necessary.

3. This part was superadded when the rudest and most violent government was instituted, between the oolitic and tertiary periods.

4. This portion was created in the eocene period, when communities became rudely and imperfectly organized, and subordination was rendered necessary.

5. This was created between the eocene and diluvial periods, when society gradually assumed a regular and organized form, such as is exhibited by beavers, bees, orangs, and New Hollanders.

6. This part was created in modern ages, when those institutions commenced which are peculiar to man, and which elevate him above savage life.

SECTION XIII. — ORIGIN OF THE DIRECTIVE OR INTELLECTUAL ORGANS.

These organs seem to be merely the guides and directors of the blind ipseal and social impulsives; the probability is, that the lowest of them came into existence simultaneously with the principle of consciousness.

It would almost appear that vegetables have blind impulses to acquire nourishment, and to reproduce their kind, but they probably have no external senses and no perceptive powers, such as we can understand; but the instant that a vegetable rises to the dignity of an animal, it has a greater or less number of external senses, which are impressed by such objects as the animal needs, and such impressions are transmitted along certain conductors, which, in higher animals, we call nerves of sense. The impressions, after passing along the nerves, pass through certain perceptive organs, that modify them, and analyze them in such a way, that, after leaving the perceptive organs, the impressions proceed to the central organ of consciousness, in the medulla oblongata, and there inform the mind concerning the form, flavor, color, sound, motion, direction, arrangement of parts, resemblances and connections of the various objects which surround the individual, and which require the action of the impulsive organs that are in connection with the oblongata.

In arranging the directive organs, I have placed *Flavor* first, because it seems to be the very perceptive faculty which the lowest and first created animal would need, to

enable him to perceive the qualities of his food, and to guide the alimentive impulse to its proper kind of nourishing stimulus. Another reason for placing it first, is that it is situated in the lowest and most posterior position; it constitutes the portion of the middle lobe which borders upon the median line, and, when large, is, capable of crowding forward the bones of the face under the eye near the nose.

The next organ is commonly denominated Individuality; but I am so much dissatisfied with the function which Spurzheim and his followers have ascribed to it, that I am disposed to deny its existence altogether, as a distinct power of the mind. The function which is ascribed to Individuality seems to me to belong to Causality. Spurzheim says, it gives such ideas as God — man — tree. Now is it not palpably erroneous to bestow upon the very lowest faculty of the intellect the power of understanding such an idea as that which we have of God — the unity of all causes — the centre of all things? Is it not obvious that this idea can only result from Causality, aided by all the other powers of the mind? Dr. Gall never admitted the organ of Individuality, nor the organ of *Size;* he named the parts called Individuality and Size by one name, which signified the power of observing the essential appearances of things, "*the spirit of observation.*" I agree exactly with Gall, that all which we know of this part is that those who have it large excel in the power of noticing the general outline of objects, and I think it may be called the organ of *Extension*, which is the same as to call it the organ of *Size.* What Gall called the organ of Locality, I think is the organ which

perceives the *direction* of objects. I doubt the existence of what Gall calls the organ of *Form*, and which is supposed to give width between the eyes. In place, then, of the organs of Individuality, Size, Form, and Locality, I have only two organs, namely, Extension and Direction. I find it convenient to call the whole space where the nose joins the forehead *Observation*, as Dr. Gall did, but I include in it all the organs known as Individuality, Form, Size and Locality. It seems to me that a good metaphysician can explain all the perceptions usually ascribed to these four powers, by the combination of Extension and Direction; thus, Form is extension in various definite directions: Locality is the direction of an object at a certain definite distance; Individuality is the idea that various properties and attributes, which we perceive associated, constitute one object, and this clearly is the function of Causality. Besides the advantage of rendering the science of phrenology more correct and philosophical, this mode of viewing this part of the head renders examinations more practicable, by reducing four small organs to two large ones. It has often been objected to the science that the size of the organs in this part of the head could not easily be determined, because so many were crowded into such a small space. These views are the result of many years of experience; but I am aware of my liability to err, and I shall receive judicious corrections and criticisms with respect and gratitude.

The organs situated along the brow were probably created in the order in which they succeed each other, from the most low and central to the most lateral, thus: Flavor, Extension, Weight, Color, Order, Number; Fla-

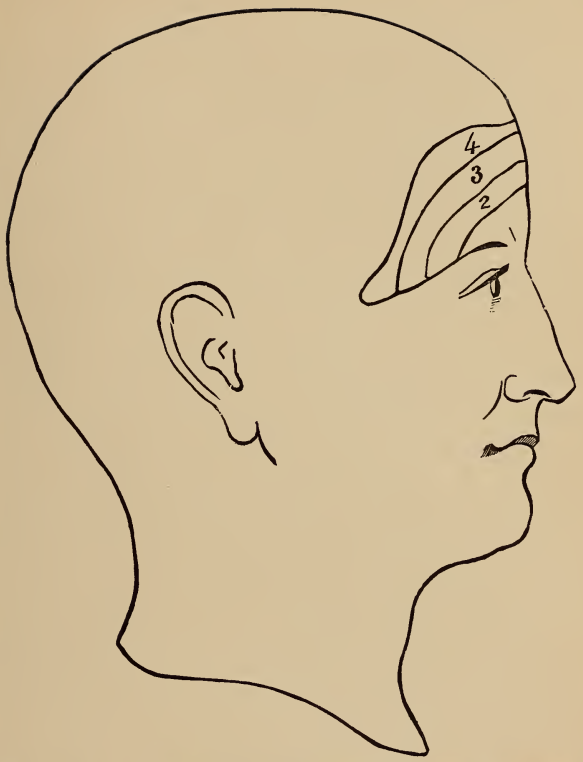
vor and Extension being created first of the series, and Order and Number last.

Direction and Motion, or Eventuality, were probably created at the same time with Extension. I am inclined to think that the first vertebrated animals that were created possessed the power of perceiving flavor, extension, direction and motion, and, perhaps, weight also; and that Order was created at the time that Constructiveness was, and Number simultaneously with Acquisitiveness.

As for the organ of Time, I have never yet, from observation, been satisfied of its real existence. Tune, I think, does exist, and is situated between Constructiveness and Order; but I am inclined, at present, to the opinion that it is a mere impulsive organ of the ipseal class; — that its true function is merely to impel animals to make sounds, whether musical or not. It was probably created immediately after its possessors emerged from the ocean, trod upon *terra firma*, and began to breathe the atmosphere unmingled with water. The *perception* of sound depends upon the organ commonly called Language. The regular SUCCESSION of sounds in music, called *melody*, probably depends upon the perception of Order and Number; — the perception of its *force* upon the organ of Weight; — of its harmony, upon Causality; — of its *expression*, upon the higher impulsive organs, especially Imitativeness. The perfection of voice, of course, depends upon the structure of the vocal organs of the mouth, throat, and lungs. All these things considered, it is by no means strange that those practical phrenologists who have ascribed to the organ of Tune all the functions concerned in music, have made many gross

errors, and been forced to admit that there is some mystery connected with the organ of Tune, which they were unable to solve. I have freely submitted my own views of this matter, not in a spirit of dogmatism, but in the hope that the inquiry will lead to some satisfactory and unanimous conclusion. Comparison and Causality, which are situated at the top of the forehead, are commonly called the reflectives, though no good reason has been given for doing so. The reason which I shall give for thus naming them, and the important distinction between them and the other directive organs, which are commonly called perceptives, is this: that the perceptives receive impressions from the external senses, but the reflectives do not, except indirectly, through the perceptives and the conscious centre. Thus, the optic nerve conveys impressions to Color, and Color modifies and transmits the impressions to Consciousness; and from Consciousness the impression reaches the reflectives and the impulsives, which send to Consciousness an impression in return. It will, however, be seen that, in a certain sense, all the organs are sometimes reflective in their operation; that is, they receive impressions through Consciousness, and send them back again, modified and tinged by their own peculiar character.

It is difficult to fix a time when animals first needed the reflectives. It would almost seem that some degree of them was needed in the earliest stages of animal existence. But if this is admitted, then we can still insist that they have been gradually increasing in capacity to the present time, and are still advancing to new triumphs, as man approximates the goal of his ultimate destiny.



The above engraving represents the order and the direction in which the organs of the Directive class were created.

1. This limited portion, which occupies the central and lowest part of the forehead, was the part first created; and the other portions were added in the manner indicated by the lines in the engraving.

2. This part was created between the protozoic period and the eocene period.

3. This was added during the tertiary period, cotemporaneously with Constructiveness and Acquisitiveness.

4. This part includes the calculating, mathematical, and philosophical powers, and was created last.

SECTION XIV. — CONCENTRATION.

The causes that produced man are all now in operation, creating and decomposing with the same energy as ever. Man is changing still. Even within the last hundred years, great changes have been wrought, which will have some influence in changing the human form and organization, and rendering it more harmonious with civilization.

All the improvements which man has made in historic times, tend to centralization, — to the combination of all the race for the benefit of each individual.

The magnetic telegraph, which is the last great reformer, brings the most distant of earth's inhabitants into communication without any intervention of time or space. Next previously preceding, the influence of steam produced the same tendency, making neighbors and assistants of the most remote people. The cotton gin furnished clothing to all, and made it an object for vessels to trade in the most distant regions. The printing-press brought minds into communication with each other, and produced a more powerful movement towards centralization than ever was made before. The invention of the alphabet and the art of writing was the commencement of this great progress and the invention of the telegraph its consummation, thus far. The alphabet, the press, and the telegraph, brought the citizens of the world into acquaintance with each other, as if all were one family; and electricity, ink, gunpowder, cotton, steam, — these have informed, conquered, clothed, and conveyed them into harmony. Take away the influence of all these, and the

various portions of humanity would be sundered from each other, and mankind return to brutish barbarism. Let us learn from this to venerate the mechanic arts, and to encourage them. They are the true reformers of the world. Why were not these improvements introduced into the world before? Why were they postponed so long? and why do they come rushing upon us so rapidly now? I answer, that the gradual operation of social intercourse for ages was insensibly increasing the power of the brain after the art of writing became generally known. The knowledge of man was continually accumulating in written records; and when it began to move, though its motion was scarcely perceptible, yet it was, in truth, an intellectual avalanche, increasing in volume and rapidity at each successive bound, until, at last, its force is to be spent in reaction. The race of man cannot continue to advance forever. Do you ask me what is to set bounds to his progress? I reply, his wants, the pressure of social institutions, and the capacities of the earth; in other words, the stimulating circumstances that are brought to bear upon him, and around him. Man has not within him any power which moves him until it is stimulated and excited by surrounding causes, and the extent and duration of his advancing actions are proportionate to the power of the stimulus which operates upon him. The *direction* of his advance depends, in like manner, upon the direction of the stimulating causes of action that urge his powers forward. The tendency of circumstances has been concentrating, from the very beginning of organization to the present time. The nervous systems of the lower animals are constituted of

separated nervous masses, with little connection with each other; but, as we rise to more advanced forms, we find the nervous powers more and more concentrated, and more perfectly connected, and dependent upon each other. This is the reason why an injury of one of the parts of man produces such fatal consequences, while upon a reptile it is of little effect.

The tendency of the social impulses has been concentrating, from first to last, from the lowest and first geologic animal to man. The lowest vertebrates did not come in contact even for the purposes of reproduction; for the lowest fishes, I understand, are produced in the form of eggs by the mother, and it is upon these eggs that the male acts to generate life, and cause them to assume the forms and functions of animals. The next step was to act upon the eggs before they were brought forth, and this was done by sexual connection; then, next, the mother kept the eggs warm by sitting upon them; then the father assisted; then the eggs were hatched within the mother before they were brought forth, and nourished by her milk afterwards. And thus, as animals progressed, more and more care has been laid upon the mother, and more and more dependent upon her the young have become, and the longer after birth that state of dependence has lasted.

The next step in the social concentration was, to cause the young of the same family to be dependent upon each other for protection and assistance, and, at the same time, dependent upon a common mother. Next they concentrated in a locality, or home; then they admitted a common superior to govern the whole community.

Next succeeded a popular desire and tendency to acquire influence with the whole family; this was followed by a tendency to continue the social habits which were thus begun, — to make a consistent course of proceedings. Next, impartiality was introduced, to prevent anarchy and separation. Next, the duty of submission. Then, kindness to the remote members of the expanding community. Then, uniformity of manners throughout the whole; and, finally, a system of language and belief, of assertion and credence, to connect the history of all, and make experience available.

Credenciveness relates to numbers, space, and time, and concentrates them. To illustrate this, let me remark, that it brings *numbers* into communication, and enables each to profit by the experience of all, and thus concentrates in each the essential knowledge and experience of all; and this leads, of course, to the greatest improvements. It relates to space; in the most distant regions occupied by the members of the community, if they can communicate together, it is to each as if he himself had travelled to all the parts inhabited by all. It relates to time; for it brings each into communication with all, not only of his own time, but all the past time that can be remembered, or authentically recorded; all the past experience of all his kind is concentrated into the present time.

The tendency of the socials is to make all persons, of all times, act as one, and for one end; and that end is, to continue existence with the least exertion possible. When unnecessary exertions are made by any animal or man, the reason is that their progenitors made similar

exertions from necessity, and now, in the offspring, the exertions, having no object of a useful kind, are expended sportively.

Social institutions are founded upon the principle that the individual can sustain himself best and easiest by their means; they are conservative and economic of individual effort. I wish it to be understood that these remarks are suggested by the manner in which the social impulsives are developed and arranged in the human brain, and not by a study of the institutions of society, without the aid of phreno-geology. Nature aims to avoid all useless exertion; and large communities, like large manufacturing establishments, economize labor by dividing it.

THE MORAL.

The great moral of Phreno-geology is *the unity of humanity*, — the universal brotherhood of man. It shows scientifically that the tendency of the phreno powers, taken together, is to bring all mankind into communication, and into uniformity of opinions, manners, laws, and habits; at the same time they tend to the perfection of all the arts, sciences, and institutions of man. They tend to the occupancy and improvement of the whole earth, and the reduction of mankind to a single community, or confederation of communities, — to break down the barriers which have been temporarily established by partial and narrow views of human rights and duties From the time of the creation of the first animal, in the protozoic dawn, until the present hour, the wondrous principle of Consciousness has been gradually becoming

more and more catholic. Having first taken measures to preserve the existence of the individual, nature impelled him to protect his offspring, then his brother and sister, parents, kindred, and home. The first social impulses having created society, the next saved it from anarchy and destruction by introducing order, government, subordination, and equity. But each community, at first, was hostile to every other, just as each individual was hostile to every other before society existed. What was before a war of individuals, now became a war of races and of tribes. But again Consciousness received a new benefactor, — kindness, courtesy to strangers, forbearance to enemies. Slight, indeed, but prophetic, and full of promise, was the benevolent impulse at the first. The numbers of the tribes were increased, feuds became less frequent, peace of longer continuance. The wars of races continued without any mitigation; but the social institutions of each tribe continually progressed, and embraced a greater and still greater number. Then came the imitative principle, and introduced uniformity of manners, customs, tones, and signs. This made those who were previously alike in organization and in powers, alike also in modes of action; — it tended to prevent, in some slight degree, the hostility which arises from difference in education and habits. Finally came credence, faith, and language. Now dawned humanity. The intellect expanded into reflection; the ipseals brought experiment, and improvement, and enterprising hope, to aid the social structure, and increase the capabilities of the individual for the enjoyment of happiness. The earliest pages of infant history open to find all these

powers in a state of activity amid the darkness of ignorance. The most enlightened races now living existed then, but without the art of writing or printing; without history; without chemistry, geography, astronomy, botany, or mechanic science, except such as the rude savage possesses at the present time. But what a vast and amazing progress has been made since Geology first found the conscious principle blindly groping at the bottom of the sea, aiding the lowly polypus! and what a wonderful progress has been made since human history began! With what magic power now does the consciousness of man control the earth, belt it with lightning telegraphs, span it with iron pathways for steam carriages, rise over its mountains in aërial cars, and trample over its vast oceans in steam palaces that defy the winds and the waves! And the progress of consciousness — the march of mind — is still triumphantly onward. The past is prophetic of the future. The task of consciousness is yet to be accomplished. War, slavery, pauperism, superstition, must yet be conquered. The confederation of mankind, to insure peace, justice, and humanity, is yet to be established. These phreno powers clustered around human consciousness will not pause in their toil until the destiny of man is accomplished.

SECTION XV. — PROGRESSIVE IMPROVEMENT.

Events happen in the order of time, and succeed all previous events; but it by no means follows that each succeeding step is an improvement upon the preceding.

Improvement implies a deficiency existing before the improvement began, which is in some degree remedied by the improving process. Now I deny that there is any evidence whatever that any such deficiency ever existed in former ages. There was always a perfect adaptation of organized beings to their circumstances. This being so, they could not be improved. At the time when no animals with lungs existed, it would have been no improvement to have made fishes with lungs, for they could not have used them; nor would human brains have been any improvement, but rather the reverse. But when the atmosphere was purified of its carbon and vapor, and the earth rose from the sea, and became fertile and salubrious, animals underwent a corresponding change, which did not improve them, but merely adapted them to the changed circumstances. When the earth was low and meadowy, and no mountains yet existed, the reptiles flourished, and increased in size and numbers, until their food was insufficient to maintain them all. This rendered Destructiveness necessary, and they were forced to eat each other. Was this an improvement? When the earth grew cold, so that animals could not exist without shelter, was this an improvement of the climate? The animals that lived in those polar regions, at that time, were of course affected by the changed climate and productions of their country; and those that did not

perish became gradually adapted to their wintry circumstances: but it would be an abuse of terms to contend that this was such a progression as deserves the name of an improvement.

It cannot be denied that cold countries, provided they are susceptible of producing a sufficiency by cultivation, are most favorable to intelligence and enterprise; but when the coldness proceeds to such a degree as to cause perpetual winter, and to maintain eternal snows, — even at the level of the ocean, as in the south polar regions, — degeneracy and death, or emigration, are the inevitable results. The permanent improvement of the inhabitants of Greenland is impossible. They can never exhibit the varied genius of the Italians or the Americans; for there are not in Greenland the varied circumstances of scenery, and soil, and production, and there cannot, therefore, be the foundations and materials of art and science that Italy affords. Their only refuge from utter brutality is in southern migration. The age of improvement in that part of the world is past, unless the adaptation of the inhabitants to their frozen lands, their smoky, cavernous huts, and exclusive flesh and fish diet, deserves to be dignified with the name of improvement.

The great variety of powers manifested by some families of mankind, arises from the variety of circumstances of the country in which, for ages, they have continued to live. The variety of its soil and climate, and natural productions, vegetable and animal; its rivers, lakes, mountains, meadows, forests, fishes, and wild game; its contiguity to the ocean; its convenient harbors; its natural boundaries; the character of neighboring nations;

their commercial relations with such people; — all these things combine to give activity to all the powers of body and mind, and to develop the most latent ipseal and social capabilities.

There is a notion afloat, among modern philosophers, that man is in his very nature a progressive being; that he is designed to improve indefinitely; but we have seen that there can be no improvement beyond the point which adapts him to circumstances. I cannot conceive that a tropical South Sea Islander, who has never felt the cold of a snowy winter, who never has had any occasion for labor to procure subsistence, who only needs clothing on account of modesty, — I cannot conceive that he would spontaneously exert himself, merely from a love of improvement, (and there would be no other motive to prompt him to exertion;) — but a Chinese or a German, an Englishman or a Yankee, must improve, or suffer a severe penalty; therefore he improves and advances in the arts and sciences, and their application to industrial and social institutions.

The Yankee in the South Sea Islands continues, for many generations, to exercise the powers which he has acquired in New England and in Europe; but gradually he conforms to the surrounding conditions, and imperceptibly, but surely, loses his peculiar character, and becomes adapted and bends to the influences of the country. This change would be denominated a degeneration, but, in reality, it might be justly deemed an improvement. The Greenlander, transplanted to New England, would begin to expand his powers; and each succeeding generation would be more and more improved, until the adap-

tation to the country was perfected. It will now be perceived that there is a definite limit to all improvement, and that limit can be in some degree determined.

SECTION XVI. — ORIGIN OF THE VARIOUS FORMS OF ANIMALS.

All animals are formed essentially of oxygen, hydrogen, carbon, and nitrogen, with a little lime, soda, silex, or phosphorus. How great a quantity and how small a quantity of these ingredients can be combined, and constitute an animal, is not ascertained. The whale is the largest of known animals, and the infusoria are the smallest. I see no reason why an animal might not be as large as a thousand whales, if food could be procured in sufficient abundance, and during a sufficient number of generations. In regard to the forms of animals, I cannot perceive why an animal may not be of any imaginable form that circumstances may require, for circumstances are the sub-creators of animal forms. Aqueous circumstances create finny forms of limbs; and airy circumstances create feathers, and winged forms of limbs; while terra firma circumstances create feet.

Wherever we see vegetable or animal forms placed in new circumstances, we see them perish, or gradually assuming new forms adapted to those circumstances. We find other animals and man equally subject to this law. During the geologic ages we find the forms of animals always perfectly adapted to their circumstances; and, when those circumstances changed, we find that the

whole race perished which were dependent upon those circumstances, and a new race take their places, adapted to the new circumstances. From whence did the new race spring? It may have sprung from the old race; for if, amid the general destruction of the old race, a single pair were so situated, or possessed of such an idiosyncracy, as to be able to sustain the shock of new circumstances, and survive, — bending and modifying its organization to the new conditions, — from this pair would spring a new race, to swarm in the same region, which would seem like a newly-created genus. Who would think, on seeing a worm, that it could ever change to a butterfly? or who, on seeing a frog, would, unless they knew the fact, suspect that it was once a fish, with fins and tail, incapable of living on land? Who, on seeing the manner in which men live, and eat, and breathe, would think that they had lived in the manner they do before birth, for several months, surrounded by fluid like a fish, without eating or breathing? Who, on seeing the infant at the breast, would think of the whiskered ruffian? In regard to the time necessary to produce a given amount of change in the form, it is a difficult question. A few generations sometimes, when circumstances require it, produce vast changes; and, again, we see a change, apparently slight, producing death to a whole race.

When we see a whole class of animals distinguished from other classes by some slight peculiarity, we may well suspect, in harmony with these principles, that originally they constituted one class, and that the difference which distinguishes them was owing to the difference in

their circumstances during a sufficient length of time. When we see an immense subdivision of the animal kingdom having some very essential and fundamental organs in common, which they exhibit under a thousand forms, we may reasonably suspect that the time was when but one of these forms existed, and that all sprung from that one. This suspicion is confirmed, when geology shows us, in the plainest and most unequivocal manner, that there was certainly a time when but one of these forms existed, and that was the simplest of all. It is surely natural to infer that the existing forms sprung from the first form; and it is not reasonable to suppose that each slight variation from the first form was a special miracle, a separate and isolated creation, without any connection with other forms. Nothing but a most profound sense of religious duty will induce us to entertain such a mode of reasoning; and we feel relieved when we find that duty demands no such violation of common sense. It is most probable that all animals were originally animalculæ, so small that millions of them could exist in a drop of water. By aggregation some became larger, and this originated large animals; so that large animals sprung from the aggregation of small ones. Whatever may have been the original form of the small animals, (and the microscope shows them of almost every form and character,) the large animals derived from them assumed a form adapted to their situations and circumstances. Some became insects, some trilobites, and some mollusca. Amid these various forms, one assumed the vertebrated form, and became the founder of the immense and important class to which we belong. I can-

not understand the propriety of considering vertebrated animals as all superior to the invertebrated. There are, certainly, many invertebrate insects that are far superior in sagacity to any vertebrated animal except man, and in some respects superior even to him. It may have been that all animals sprung from one common and universal monadic form,* some of which became vertebrated, and others invertebrated; but it is more than probable that all vertebrate animals were originally fishes, of one form, and derived from one pair. It is a startling and interesting thought, that fishes, reptiles, birds, and mammals, had one pair for their common ancestors. That pair were fishes; for geology teaches that there was a time when no vertebrated animals existed, excepting fishes. They multiplied, in a few generations, until the whole ocean was abundantly inhabited by their offspring; being first herbivorous, then some of them carnivorous. Retaining the vertebræ, they assumed various forms, adapted to their various climes, and food, and enemies. In the course of time, some of them became amphibious reptiles, some mammals; so geology declares. The amphibia first lived in the mud, occasionally raising their heads above the water, until they gradually acquired the power to breathe in the manner of modern reptiles, spending a portion of time out of the water, upon the banks, in the manner of seals. Some would become more attached to land than others, and would continue to become more and more so; until, at length, they would leave the water entirely, and live altogether on land.

* By *monad*, I mean the smallest original infusorial animalcule that ever existed.

They would now be subjected to a great variety of new circumstances; they would need new and different weapons, limbs, and skin; and, after ages of approximation, they would receive and possess the forms which we now see them exhibiting. Those that were previously flying fish, became flying reptiles, and then flying birds. Those that once used to feed upon sea plants would next feed upon the roots that grew in the water upon the banks, then upon those which grew above the water; these would commence their terrestrial career with an herbivorous predisposition. It is likely that all the vertebrated animals were, at first, nearly the same in size; but, as they underwent various fortunes, some became larger, and others smaller; their sizes becoming as various as their forms, to adapt them to their different destinies. When one pair emerged from the sea, and became land quadrupeds or bipeds, it would multiply its kind, and fill the habitable regions of the surrounding earth, as its ancestors once filled the sea. The great variety of circumstances in which these first land animals were placed, — climate, food, and enemies, — would give a very great variety to their forms and sizes. One pair of these, peculiarly situated, might become the founder of one of the present races of land quadrupeds, and another of another. Among these ancestral pairs of reptiles, one may have originated the quadrumanous tribes, — monkeys, apes, and baboons. I do not believe that man sprung from the orang or the chimpanzee, but I deem it highly probable that God created man from a lower animal, and that the orang, ape, and man, all sprung from a common ancestor.

SECTION XVII.—ORIGIN OF LAND ANIMALS.

All land animals originally inhabited the water; but it does not follow, as a matter of course, that they all rose to an equal phreno dignity before they left the water; for the marine mammals are, some of them, possessed of an organization of brain far superior to many birds, and even superior to some land mammals. The seal, for instance, is not inferior to the dog in any respect, and in some social traits is even his superior.

Birds and land reptiles left the water without rising to the dignity of mammals. Birds are, in truth, mere flying reptiles, with feathers. Their wings and migratory habits have prevented them from becoming mammals. They have always been enabled to escape from the rigors of winter, and avoid the drudgery of becoming mammified to save themselves from destruction. If all animals, at all periods of past time, could have been so situated that they could have migrated to southern regions whenever winter approached their habitations, mammals would not now exist, and humanity would have been postponed until winter invaded the regions of the equator; or if, by any accidental or providential circumstances, any race of animals could be enabled to continue their species from eggs, without bringing forth their young alive, they would most certainly have done so; for nature never admits of any improvement, nor any change whatever, without the most urgent necessity.

Vertebrated animals are arranged by all naturalists in the following order: 1. Fishes; 2. Reptiles; 3. Birds; 4. Mammals; and it might, therefore, be thought that

my doctrine implies that all mammals must have necessarily passed through all these grades, before they could arrive at their present organization. But when we consider that birds are but a higher order of reptiles, — that they are, in fact, but feathered, flying reptiles, just as a bat is a flying mammal; when we reflect that a bird is but a fish that has lived in the air until he breathes it copiously and perfectly, unmingled with water, and has been exposed to the cold until his skin is covered with feathers, instead of scales, — we shall readily perceive that a mammal might just as well be descended directly from a reptile as from a bird, and that such a descent would be no departure from the principles of phreno-geology, as inculcated in this treatise. It may be that the rodents are descended from the birds. There are some circumstances that seem to indicate this: 1. Some rodents (squirrels) fly; 2. None of them have commissures nor convolutions in their brains; 3. The teeth of the rodents are nearer the form of the bills of birds than the teeth of any other mammals are; 4. The mechanical disposition of rodents is like that of the bird; indeed, birds and rodents are the only decidedly mechanical vertebrates, besides man; 5. Some of the rodents are migratory, particularly rats, and in this respect resemble many birds; 6. Rodents are generally highly gregarious, like birds; 7. Rodents easily stand upon their hind legs, like birds. One peculiarity of rodents and marsupials (kangaroo and opossum) is, that they do not have convolutions nor commissures, while all other mammals have. Now, if I am right in supposing that convolutions are caused by the large size of the brain compared with the body of

the new-born mammal, it may be found that the rodent is no exception, but rather a proof of the correctness of the rule; for I think it will be found that the brains of the rodents are all smaller, compared with the body, than are those of any other mammal. I have not now before me a work from which to ascertain the relative size of the brain in rodents; but, from my own observations, I know that they *seem* to be quite small. If I remember aright, there is a species of small squirrels that have cheek pouches in which to carry their food, and that have convolutions. It would be curious to compare the size of the brain with the rest of the body in these creatures, to see if the convolutions are not related to the pressure at birth.

It is quite evident that there is no necessary connection between the advancement of the organization of the different parts of the animal system. Birds are, in respect to some parts of their circulatory system, more advanced than even man, while they are behind the very lowest mammals in their manner of bringing forth their young; and, again, in their mechanical skill they excel all animals except the rodents and man. The cetacea, (whales and dolphins,) while they are inferior to other mammals and to birds in their circulation, are above all birds in their mode of producing their young. The only trait which, among naturalists, distinguishes a whale from a reptile, is its bringing forth its young alive, and nourishing them with milk; and the trait that distinguishes the birds from reptiles is their more perfect circulation. A bird, then, is a flying reptile, whose circulation is perfected; and the whale is a swimming reptile, whose

reproductive powers are perfected. Quadrupeds have both systems perfected. Man has the brain and hands perfected. Now if we go back, and examine the reptile, or even the fish, we find the undeveloped elements, the expansion of which constitutes all other animals. We find the breathing apparatus of the bird existing in a lower degree, but capable of expansion and modification to suit the exigencies of birds, if circumstances should demand it, and give opportunity for its development. We find, in the way that the fish produces its young, the essential process of the mammal; since it is now known that the young of the mammal are produced from eggs similar to those of reptiles and fishes, and differ only in being hatched within the parent, and then expelled, instead of the eggs being expelled first, and hatched afterwards. It is not difficult to imagine a combination of circumstances which would gradually but certainly reduce all animals again to fishes of the simplest forms. We have no means of determining whether the progenitors of man were mammals before they left the water, or whether they became so afterwards; but man certainly went through an extraordinary variety of fortunes and changes before he assumed his present form of brain and body; and when he left the water, he must have possessed a form which was easily moulded into that which he possesses at present. It may be that the ancient idea of mermaids was not entirely fabulous; and a species of sea mammal, as nearly resembling a chimpanzee as the seal resembles the dog, may have but lately become extinct, as many other animals have done. It is to be hoped that the future researches of naturalists may yet

throw some light on this obscure question. It would be really delightful, if, in consequence of their labors, we should be able to determine, with reasonable precision, all the various forms and changes which our race has undergone, in its rise from the ocean and the mud to the cultivated field and the classic temple. My own opinion at present is, that the progenitors of man never were land quadrupeds, nor do I think they were quadrumanous. I do not agree with those who consider man as an improved ape. Man is the only biped mammal in existence. Much of his superiority depends upon his standing upright, and having the free use of his hands It seems quite probable to me that man was formed a biped when he first left the water, and that he never used his hands for feet. Providence distinguished him from all other animals in this respect. Apes and men may have been alike when they both inhabited the ocean; but the apes degraded themselves beyond redemption, by acquiring the habit of walking on their hands, as this circumstance prevented them from acquiring those arts which gave superiority to man, and enabled him to exist in cold regions.

SECTION XVIII.—ORIGIN OF RACES.

Any one who carefully observes the differences of mankind in complexion, hair, temperament and physiognomy can not easily resist the belief that many of those differences originated under circumstances and conditions that do not now exist. But if in our imaginations we go back to the time when our ancestors first left the ocean and gradually became exclusively land animals, we can easily conceive that external circumstances would, during a great number of years, produce all the differences that we find. Those that landed in Africa became negroes, those that landed in certain parts of northern Asia became whites, those in America became copper colored.

In the present civilized condition of the better portion of mankind the tendencies are to make them alike in every respect. The different races mingle and amalgamate, and by artificial means all are, in a considerable degree, protected from the exposures and hardships that their pre-human ancestors suffered. The fact that Australia was, until lately, utterly unknown to the people of Europe, Asia and America is ample proof that a race of savages could live for unknown ages entirely excluded from all communication with other races. There is no evidence or probability that the Australians are the kindred of the negroes or the whites. Each dis-

tinct race has been separate ever since they began to live on land, and they owe their distinctive peculiarities to their several native countries, their climates, food, scenery, occupations, diseases and customs. So far as we can judge, each race possesses the temperament and form of head which their country and their occupations would primitively have naturally produced.

It should be remarked that there are striking differences among people of the same complexion, which plainly indicate that, though they may all have originated in similar climates, they must have primitively differed widely in their habits, especially in regard to the manner in which they used their mouths. We frequently see white people who differ from each other in physiognomy quite as much as they do from the negroes. The mouths and teeth of some persons remind us of those of a beaver; others have jaws and teeth that resemble those of the bull-dog or the lion; others again remind us of the sheep or the horse. These features are transmitted from one generation to another, thus proving that they are tribal in their character and not merely individual idiosyncracies. It is utterly improbable that these different faces originated spontaneously under similar conditions and among people of similar habits.

The phrene organs of the brain which are needed in a cold climate are small upon the negro and large upon the Caucasian. This difference gives the

peculiar form that is admitted by all naturalists to distinguish the African from the Caucasian skull. The large development of Constructiveness, Acquisitiveness, Experimentiveness, and Perfectiveness, — these give the oval form to the Caucasian head; while a deficiency of them gives the peculiar flat appearance which characterizes the negro head. How perfectly does this agree with the negro character! They are miserable mechanics, exceedingly improvident, and averse to all industrial improvements and commercial enterprises. When they live here at the north, the houses which they occupy are known, almost at a glance, by their broken windows and neglected appearance. They do not yet seem to have forgotten their African instincts. They never seem to be aware of the approach of winter, nor the necessity of preparing for it. When it comes, they act as if it will be gone to-morrow; when summer comes, they enjoy it while it lasts, regardless of the coming winter. They bask in the warm sun, and feast upon the ripe fruits as if they would continue to drop from the trees into their mouths all the year long. Nothing but compulsion makes them labor during the summer, and nothing but charity or slavery keeps them comfortable during the winter. The Caucasian, on the contrary, makes the summer the very time for labor, and the winter the time for enjoyment.

The negroes who have been brought to this country, and subjected to northern influences, must be greatly benefitted by the process which they have undergone. When they return to Africa, they will spread the ideas and habits which they learn, by imitation and experience,

from their masters. What seems a curse will prove a blessing. They will avoid the hard lessons which our ancestors had to learn, in their progress to the same point of mental improvement and power.

The native region of the white man is Norway, Sweden, Denmark, Russia, Poland, — Ancient Scandinavia. The present nations of Europe have sprung from those countries. The northern tribes, or the northern horde, as they are called by historians, have repeatedly swarmed and overspread the southern parts of Europe and Asia like locusts, conquering the effeminate nations of the invaded regions with astonishing facility; but, according to these principles, this is precisely the result which we should expect under such circumstances.

In this, our own country, energy, wealth and barrenness, are found at the north; and indolence and poverty, amid natural fertility and plenty, at the south. So it has ever been in all times, and thus it will be, as long as like causes produce like effects.

SECTION XIX. — CREATIVE POWER.

The great truth which is at the foundation of this doctrine and system of creation is, that, under the direction of Providence, *stimulus creates organs*, excites them to action, and increases their size, until their capacity for increase, or the power of the stimulus, is exhausted. There are several distinct things here to be considered.

1. What is stimulus?
2. How does it create organs?
3. How does it excite them to action?
4. How does it increase their size?
5. What limits the size of organs?

1. What is Stimulus? It is anything which produces a movement in an organized being, or a change in form or in motion. It is that which makes any organ perform its proper and natural function; and it is that which causes it to vary its usual function, and become changed and modified, so as to appear to be a different organ, or created for a different purpose.

Thus, undulations of light are the stimuli of the eye.

Undulations of air are stimuli to the ear.

Soluble substances are nearly all stimuli to the tongue, producing taste.

Odorous particles, diffused through the air, operate to stimulate the nasal organs, producing smell.

Food is a stimulus to the stomach, and excites it to perform its function, which is to digest the food.

Cold, or hot, or sharp substances, which come into contact with the skin, stimulate to defensive action.

Any desirable object is a stimulus to action, that it may be attained; any disagreeable object is a stimulus to action, that it may be avoided. Thus, friendly society is a powerful stimulus; and enemies, also, are stimuli, though of a different kind.

Applying this to phreno organs, we may consider each organ as capable of receiving a peculiar influence, or stimulus, which excites it to action; thus, —

I. The air entering the lungs is a stimulus to Pneumativeness.

II. The sight of food, or the cravings of the stomach, stimulate Alimentiveness.

III. Any injury of the organs excites Sanativeness.

IV. The sight of a living being whose life is opposed to our happiness, and whose death would be, or appear to be, an advantage, would be a stimulus to Destructiveness.

V. The sight or knowledge of a being opposed to our enjoyment, or whose possessions are desirable, stimulates our Combativeness, to force him to surrender to us the desired object.

VI. The knowledge that the desirable object avoids us and is concealed from our view, or that we are advancing, against the wishes and without the knowledge of others, to the attainment of objects which we desire, but which they wish to retain, — this is a stimulus to Secretiveness.

VII. The knowledge that danger is in our vicinity, and is liable to approach us, — this stimulates Cautiousness.

VIII. The sight of natural productions which are not in

the form which adapts them to our purposes, but which we are capable of forming and constructing to suit us, — these are the stimuli of Constructiveness.

IX. The sight of property which we do not need now, but may hereafter, stimulates Acquisitiveness.

X. The circumstances which oppose our gratification, and which, by some new expedient, may be avoided, excite and stimulate Experimentiveness; so do plans and novelties.

XI. The beautiful, the improved, in art, or science, or manners, literature, religion, or morals, stimulate Perfectiveness; and so does the sight or knowledge of circumstances which indicate a need of improvement.

XII. The distant, doubtful, contingent, future, the expected or promised, — these stimulate Hope.

STIMULI OF THE SOCIAL ORGANS.

1st. The opposite sex, and the proper conditions of the body.

2d. Offspring and their resemblances.

3d. Familiar places.

4th. Those friends upon whom we are dependent for social happiness.

5th. Our inferiors in society.

6th. Those whose influence we need.

7th. Any attempt to change our positions in society.

8th. The claims of our associates and friends.

9th. Our superiors in power or influence.

10th. Any being capable of appreciating our good intentions.

11th. The actions or works of any of our companions.

12th. The assertions, expressed or implied, of any one, and books, and all kinds of writing.

STIMULI OF THE DIRECTIVE ORGANS.

1. *Flavor* — Odorous or sapid bodies, food, drink, air.
2. *Extension* — Forms, perceptible substances.
3. *Direction* — Distant objects.
4. *Weight* — Resistance to the muscles.
5. *Eventuality* — Motion, perceptible changes.
6. *Sound* — Sounds of all kinds.
7. *Color* — Colors.
8. *Order* — Things capable of arrangement.
9. *Number* — Plural objects, divisions of property.
10. *Time* — Chronology, marching, dancing.
11. *Tune* — The lungs and organs of voice.
12. *Comparison* — Classes, resemblances.
13. *Causality* — Everything known.

MEMORY.

I consider that memory is principally dependent upon Comparison and Causality, the classing and connecting faculties; and the greater the experience in difficulty, the greater will be the development of these organs; because, to extricate one's self from trouble, one must remember the lessons of the past, and connect them together. Comparison remembers past analogous ideas, and Causality connects those with the present, and the two processes together constitute memory to guide the future course.

When any organ impresses Consciousness, the impression is radiated to Comparison and Causality, and is reg-

istered there in a way that is at present unknown. When any impression is made upon Consciousness, any similar former impressions are generally repeated, though with less force; this is memory. But we do not yet fully understand the *modus operandi* by which this repetition is produced. The registry and the reproduction of impressions are yet unexplained. But I suppose that the registry is made in the phreno organs, and not in the sensorium, and, of course, their reproduction depends upon the state into which the phreno organs are put by radiations from the sensorium. I am inclined to think that the office of registry and reproduction is performed mostly by Comparison and Causality, and therefore it is that they are necessary to experience, — to avail one's self of the past. Therefore, also, one who has them large, and the perceptives small, will be likely to lack knowledge, but cannot show the power of his reflectives to good advantage without it. The organ of Credenciveness seems to be related to memory, because it is intimately related to literature; for all literature is founded upon the sayings and writings of man, which are so much stimuli to Credenciveness, received through Sound and Extension; that is, words and writing.

One fact in regard to memory ought to be borne in mind, and that is, that we never are impressed with an idea relating to the past but as an accompaniment to the present. When a present impression is made, it rouses in the organs the fibres which were impressed before, and causes them to repeat the old impression. This is memory and its cause; but we do not yet know its mode

of operation. If we could see the impression made, and observe the fibres operate, both the mode in which the first impression is received and retained, and then repeated, in company with a new impression, I doubt not the whole proceeding would appear simple, and easy of comprehension.

The number, the rapidity, and the succession of the impressions, are calculated to confuse and embarrass all calculations and reasonings concerning them; but the general result will, in all cases, be found to be such as to tend to make the actions of the individual harmonize with the whole succession of impressions which preceded the actions. Memory is, therefore, but *stimulus stored*, the stimuli of experience; and, like all other stimuli, it excites and qualifies our actions.

2. We now come to the next question, which is, **How** DOES STIMULUS CREATE ORGANS?

Matter is divided into two kinds; one kind is said to be inorganic, and the other organic, or organized.

Organized bodies are, in all cases, composed of inorganic matter, oxygen, hydrogen, carbon, nitrogen, lime, phosphorus, sulphur, and potash, with a little iron and silex. These inorganic substances combine, chemically, in various proportions, and arrange their atoms in a peculiar manner, and then are said to be organized. Organization may, therefore, be defined as a regular *arrangement of atoms in a peculiar manner*. A crystal may be said to be organized, for it is constituted of particles that arrange themselves in a peculiar and regular

manner, as much so as the particles of vegetables or animals.

The atoms of matter will not arrange themselves in the organic form unless so brought together as to admit of being acted upon by certain causes, which may be denominated stimuli. One of these is heat; another is light; and a third is a species of electricity. Besides these, are the forces of affinity, cohesion, attraction, and gravitation. The operation of these agents seems to produce the organization of crystals, but in a way that is not yet thoroughly understood. It is known that when the proper substances are brought together, under proper circumstances, crystals always become formed; and, when the circumstances are the same, the form, size, and color of the crystals are the same.

The same remarks apply equally to the organization of vegetables and animals; they are composed of particles, arranged in a certain manner by forces, the precise operation of which is not yet well understood. We understand the formation of vegetables and animals as well as we do of crystals, with the exception of one circumstance, and that is, that, in the crystal, no germ is necessary to commence the organizing process, but the unorganized materials may be brought together, and made to commence their process of organization, without a pattern to work by; whereas, in vegetable and animal organization, there must be a germ or pattern for nature to begin with. In all animals, as far as we know, the germ is at first in the form of an egg. In vegetables it is generally a seed, which may be called the egg of the vegetable. Some vegetables seem to have the power to

use any of their fibres as a germ, around which inorganic matter may become arranged, upon the same plan as in the parent fibre.

Some way may yet be discovered of causing matter to combine, and form vegetables and animals without germs, but at present it is not deemed to be practicable. Time was when loadstones could only be produced from a germ. The magnetic property could not be excited in a piece of metal without the aid of a parent magnet to commence the process; but, with this for a germ, however small, the process could be made to continue until a large mass could be made to be magnetic. At length, after ages of observation and experiment, it was discovered that magnetism could be induced, in any piece of iron or steel, without the aid of a magnetizing germ; merely by causing a current of electricity to circulate spirally around the metal, it was instantly made magnetic. This discovery laid the foundation of the science of electro-magnetism. Whether a similar discovery will be made, in respect to vegetable and animal germs, remains to be seen.

Some late experiments of Messrs. Cross and Weeks have led to the expectation that animals could be produced by currents of electricity, in certain liquids properly prepared and arranged. But the results seem to be, as yet, uncertain. Since vegetables and animals are merely atoms of carbon, hydrogen, oxygen and nitrogen, arranged in a peculiar manner, it does not seem too much to hope and expect that the mode in which this arrangement is produced may be discovered and imitated, as the natural magnetic arrangement is already imitated in electro-magnetism.

Vegetables and animals are produced from parent forms, and are, in every essential respect, like their parents. Through countless ages they would continue to be reproduced like the original parents, provided they always lived in the same circumstances, and were operated upon by the same stimuli. I use the term *stimuli*, and the word *circumstances*, in the same sense; and I mean, by stimuli, anything and everything that affects the thing stimulated in the slightest conceivable degree, or in any conceivable manner. Now, all organs, vegetable and animal, are formed from oxygen, hydrogen, carbon, nitrogen, lime, &c., which have been so affected, stimulated, or moved from their former condition, as to become forced into their present arrangement and combinations. The forces that operated upon these simple elements, to move them into the organic ranks, I call *stimuli*, the sub-creators of organs, without which they could not have existed. These forces constitute the creative powers. The organs continue to exist so long as these forces continue to operate in such a manner as to preserve the organic arrangement of the atoms, and no longer.

The form which the organs assume depends upon the directions of the forces which act upon the composing atoms; in other words, it depends upon the operation of circumstances. Plants and animals that live in the water are affected in a different manner from those that grow in the atmosphere on land, and, therefore, they are differently formed by the operation of those circumstances. Those that fly in the air are affected by those circumstances; those that live in mountainous, in frigid,

in torrid, in barren, or in prolific regions, are affected accordingly, and the atoms that compose them are moved or obstructed accordingly, so as to cause them to assume different forms, to adapt them to the things that affect them.

Everything in existence is bathed in stimuli, and continually buffeted, at every point, by other surrounding things, so that it must necessarily adapt itself to them. If we take a ball and place it where every part of its surface is continually chafed, and every part equally so, it will become smaller, but it will retain precisely the same form to the last. So, also, if the ball is placed in a liquid, the particles of which are continually being precipitated upon the surface of the ball, at every point equally, the ball will continually grow larger, but it will retain its form perfect to the last. But if the surface of the ball is not equally affected, one part receiving much and the other little of the precipitate, — one part being chafed and worn away, while the other is nourished by additions, — of course, under these circumstances, the form will change, until the inequality of action is discontinued.

Now, in truth, almost, if not quite, every plant and animal is surrounded continually by things (stimuli) that affect one part more than another; and, therefore, a constant change is going on in their forms; — a change which, though often imperceptible, may be measured by the inequality of the surrounding stimuli. There is, then, a continual attrition of everything by its neighboring things; so that each tends to conform to its surrounding tormentors. The most perfect conformity must always

necessarily be produced;—this is denominated *adaptation*, and is held up to the ignorant as a sort of miracle; though, in reality, it is the necessary consequence of a very simple operation.

The form of everything is, therefore, created by its surrounding stimuli, and adapted to them. The north sides of trees are rough non-conductors of heat, so as to protect them from the northern storms; but the same storms created that very roughness. The hands of a blacksmith are covered with a hard, horny, callous substance, which protects them from the fire, and enables him to handle, without pain, pieces of iron so hot that they would cause the greatest anguish to a person whose hands are delicate. Now, this beautiful adaptation of the blacksmith's hand to the hot iron was originally produced by the hot iron itself. We know this, by observation, and therefore do not deem it miraculous; but no one can reasonably doubt that the camel's foot received its peculiar form in the same way, by being, for many generations, irritated and stimulated by the loose and burning sands of Arabia. The same is true of the African's skin, the tiger's claws, the beaver's masonic tail, the duck's web foot, the owl's and the fish's eye; and, indeed, of every peculiar form in existence.

The sub-creative power is continually at work around us, forming, changing, reproducing, and destroying. It is idle, then, to regard the adaptation of nature's productions to each other as miraculous, unless we mean to pronounce, as we truly may, that the whole vast creation is one unlimited and incomprehensible miracle. There are many instances of adaptation of one thing to anoth-

er, the original creative causes of which are not understood; and these instances are seized upon with avidity, by sophistical sectarians, to prove that the adaptation, in such cases, is the effect of miraculous creation. They argue that the creation must, in some instances, be miraculous, because we know of no other cause which is adequate to produce the result. Our ignorance is thus made the foundation of our faith, and the progress of knowledge is necessarily at the expense of our belief in the miraculous. The truth seems to be, that some of the marks of design, and some of the peculiarities of form and color, in man and other animals, were produced by causes that no longer operate upon them. Some organs seem to be reproduced with perfect regularity, which are apparently unessential to the functions of man; and others are even useless. For instance, the teats in males seem to be unnecessary, and no useful design can be seen. Shall this be deemed a blunder and an oversight in the designer?

Having determined that organs are created and formed by the influence of the things that surround them, the next question is,

3. How does stimulus excite organs to action?

Stimulus excites organs by coming into contact with them, and *changing the arrangement of their particles*, and *thus forcing a new arrangement.* This definition will apply to all organs, from the crystal to the human brain. Whenever an organ acts, there is a change in the arrangement of its constituent particles, in consequence of external stimulus. Organs act by two modes: 1. By

undergoing chemical changes of constituent atoms, as in the case of crystals, and some parts of vegetables and animals; 2. By fibrous contraction; and the fibrous contractions are, in all cases, produced by chemical changes in the atomic organic arrangements.

Chemistry is at the foundation of physiology; it is the only key to it; and it has been our ignorance of chemistry, and its relation to physiology, which has caused us to adopt so many superstitious and extravagant notions concerning the origin of the functions of human organization.

Light is the stimulus that excites the eye and the optic apparatus to the performance of their functions. We cannot doubt that light produces changes in organic arrangements, since it is the cause of growth in vegetables, and the evolution of oxygen from leaves. Now, if such a delicate agent as light can make impressions upon our organs sufficiently powerful to produce chemical changes, we cannot doubt that any grosser agent can do so. Heat changes the atomic arrangement most effectually, and, of course, is a stimulus. Air enters the lungs, and combines with the blood, and thus produces a movement which sustains all other functions. Food enters the stomach, and enters into chemical combinations, which are equally essential.

4. How does stimulus increase the size of organs?

Since stimulus created the organs at first, and has hitherto preserved them, it is plain that an increase or diminution in the power of the stimulus must be followed by an increase, or at least a tendency to increase

or diminution of the materials upon which it acts; it is an increase or diminution of the creative power in that direction. If there is an increase of the stimulus, and an abundance of material near, there will be an increase in size; but if there is an increase of stimulus, and no more material near, then there will be an increase in the intensity and activity of the organs. When, therefore, we see an animal or man acting with very great intensity, we may know that his race has been placed, for a long time, under stimulating circumstances, with limited resources, and were obliged to do the most with what they had, and thus the intensity of the organization has been created.

Each organ seems to have a vortex, or sphere of influence, which is in proportion to its size and the quantity of its stimulus; and each organ seems to tend to bring as many particles within its sphere of influence as its stimulus will support. An addition of stimulus will, therefore, cause an addition to the number of particles which come within its vortex. It is now capable of receiving still more stimulus, and then more material, and so on, indefinitely. Just as, in a whirlwind, a small vortex is created, which causes the particles of dust and air to arrange themselves in a certain manner; if the wind increases in the requisite direction, the vortex will increase in size and power, and gather more and larger objects within its sphere of influence. Its power and size will tend to perfect harmony and adaptation of the objects to the form of the vortex. It is a common remark, that the increased action of an organ will cause an increase in its development of size; but it should also be remembered, that it will not have an increase of action

without an increase of the power that stimulates to action.

The rule seems to be, that *increase of stimulus causes increase of size, or increase of intensity, in an organ.* If there is sufficient material in good condition near, the excess of stimulus will expend itself upon that material, and thus increase the size of the organ; but, in this case, the *intensity* of action will not be increased; for it is a rule here, as elsewhere, that what is gained in momentum is lost (or not gained) in velocity. Birds are so situated that they cannot conveniently increase their bulk beyond a certain point, without losing the power of flying; they therefore increase the intensity of their action, by having large cerebral and arterial apparatuses; while the elephant bestows the stimulus that he receives upon an immense mass of material, producing momentum, with corresponding want of velocity.

This view of the relation of stimulus and material throws light upon the subject of temperament, and proves that, after the phreno-nervous energy is balanced by a given and proper amount of muscular, osseous, cellular, and fatty material, any excess of such material detracts from the energy of the character, because it is diffused through too large a mass.

We have already seen that, if there was but one kind of stimulus, and that operated equally in all directions upon an organization, such organization would be simple and uniform, — it would be like one of the radiata. When the stimulus was uniform, in the early geologic ages, the animal organization was simple and uniform; radiata predominated. The animal form in no case changed till

the stimuli changed. A modification of stimuli was soon followed by a modification of the organization which it affected. The mollusca seem to be radiata, obstructed and modified by carbonate of lime, which doubtless abounded at that time. The articulata are radiata that are acted upon by stimuli irregularly, not from all directions equally, not with the same force all around, but powerfully from some directions, and weakly from others. Not only so, — the stimulus no longer comes *directly*, but, in consequence of various obstructions and refractions, it requires more complicated movements of the animal to receive the stimulus. This explains why the articulata has limbs of unequal length, and articulated so as to be able to execute more complicated movements.

In the radiata, the mouth is in the centre, and the tentacula, or limbs, of nearly equal length and size, arranged at equal distances around. The articulata is oblong; the mouth at one end, the tail at the other; the limbs unequal in size, length, and complexity. The vertebrata is essentially like the articulata in all these respects, and would probably not be considered superior, if the mammalia had not been founded upon it. Originally it was not superior to the articulata, for both had all the elements necessary for the condition of the earth at that time.

The fish was the first vertebrate, (unless the worm may be classed as vertebral,) and his simplest and first form was such as to make him little, if any, above the radiata; his backbone gristly, and without articulated joints. As he grew more accustomed to hardships and

complicated movements, his backbone became more consolidated, and his joints more perfectly articulated. When he afterwards came into a more oxygenated atmosphere, his arterial apparatus enlarged and expanded accordingly. When he came into a muddy medium, his fins turned to demi-paws, paddles, and claws; and, when he came on land, to feet, — hoofed, toed, heeled, — to hands, fingered, thumbed.

ORIGIN OF THE SENSES.

Every animal, at the very commencement, must have been subjected to the stimuli that produced and employed the five senses.

Light must have impressed his conscious principle, and caused a movement in his nervous fibres. The atmosphere must have vibrated, and communicated its vibrations to his nerves, producing sound.

Sapid and odorous particles must have produced chemical changes, which affected his alimentary nerves.

Contact with existing bodies must have also produced a movement in his nerves, and a consciousness which we call the sense of touch.

Some of these senses, not being much needed, may have been little developed, while others were perfectly developed. The external organs of these senses were produced gradually by the mutual struggle of the light, air, odorous atoms, etc., with the organs which received and transmitted them to the sensorium.

The very lowest animal had the senses in perfection; the polypus had the sense of touch perfect; the eyes of

the trilobite cannot be surpassed, and the eye of the lowest vertebrate is as complicated and perfect as that of man. In this respect there has been no advance. All the nerves necessarily connected with these were also perfect. The spinal cord, the sensitive and motor nerves, and cerebral fibres convergent to the medulla oblongata, — all these were perfect in the first vertebrate. Why? Because the stimuli which created, preserved, and excited them to functional action, existed then, as now, in all its power. The stimuli which now calls the higher organs of the brain into functional action did not then exist; — no needy offspring, no government, no society, no winter, no change of seasons, no land animals, no flowers, no fruits.

In order to clearly understand how the brain received modifications of its form and structure by the various stimuli that appeared to act only on the external body of the animal, we must first have a clear notion of the relation which exists between the external body and the brain. It may be plainly stated thus:

From the external parts of the body there are small white cords, which proceed to the base of the brain. These are nerves of sensation, which telegraph to the brain all impressions made on the external parts of the body. These impressions excite certain portions of the brain, so that an influence is transmitted from the brain, by another set of white cords, to the external parts of the body. These last cords are nerves of motion or volition; the influence which they transmit *from* the brain, is expended, principally, upon certain fibres called muscles; and these muscles contract in a peculiar man-

ner, and thus produce movements in the external parts of the animal body, which movements are well calculated to answer the purposes for which the impression was sent up to the brain.

From this simple statement it will be perceived that the nervous system, the brain, and the muscles of the body, are only parts of one apparatus of motion; and that an impression upon the body is, to all intents and purposes, an impression upon the brain itself, since it is instantaneously conveyed there by telegraph, and quickly is answered by a discharge from the brain, which produces muscular motion, such as is needed by the occasion.

From this explanation it will be evident why any modification of the impressions (stimuli) made upon the body will cause a modification of the action of the brain, and tend to a modification of the structure of both body and brain at the same time. It is now plain why a destructive brain is of course accompanied with a destructive limb, and destructive movements of the limb. Being all parts of one apparatus, so related and dependent that one part cannot move without the consent and participation of the other, it follows that if one part is stimulated to uncommon exertion, so as to draw an excess of nutritive material within its influence, and become larger in consequence, then, of course, all the dependent and connected parts of the apparatus will partake of the same advantages, and become larger, for the same reasons. This idea is at the foundation of the new science of phreno-physiognomy, as I explained in my first publication, and in which I undertook to show

that certain forms of head, of face, and of body, are always found together.

I think that I have thus entirely explained the question at the head of this article, viz., How does stimulus increase the size of organs?

5. WHAT LIMITS THE SIZE OF ORGANS? Why do they not grow to a monstrous size?

The answer is, that the size is limited by

1. The power of the stimulus.
2. Quantity of material to be obtained.
3. By the antagonistic force of rival organs.

1. The power of the stimulus. I mean to be understood that, all other things considered equal, an organ will grow in proportion as it is stimulated to the performance of its functions; because it will thus increase the power of the vortex which causes particles to assimilate.

2. The quantity of material near enough to be obtained. For, if there is an addition of causes of action of an organ, and no additional material to be assimilated, then the organ acts with more energy and intensity, but does not grow proportionately larger.

3. The size of any organ is limited by the rival power of other organs consuming its nourishment. This I take to be the reason why some organs go out of existence entirely, viz., that they have no occasion for functional action, being furnished with no stimuli for that purpose, and the rival organs of the same class divert and absorb all the nutritive material.

The vortex of an organ, or the sphere of its power of

assimilating the nutritive material, is best illustrated by reference to the vast difference in size of a mammoth and a mouse, a minnow and a whale. One is born with a fundamental vegetative power of very great capacity, so that it can assimilate a large quantity of material to its own organization, while the other has a much less capacity; and, as all the voluntary organs are dependent upon the vegetative for material, they must have a regular and definite proportion in size to the vegetative capacity which is at the basis. If you ask me why the mouse and the ox became thus different in size, I would venture to suggest it as probable that originally all vertebrate animals were of one size, but that some have been, for millions of years, limited in the quantity of nourishment, so that, of course, they were limited in the capacity of receiving functional stimuli; while others have been surrounded with both nutritive material and functional stimuli. Ages of continual practice have produced a law of the constitution, and confirmed a certain capacity of receiving nutritive material and stimuli, which does not easily change without requiring another immense period of time. There is no law in man, in body nor mind, which is not the result of long exposure of the organs to powerful external impressions. Therefore, there is nothing in body nor mind that is not dependent for its normal manifestation upon the same causes which produced it originally; consequently, this is a test of the origin of an organ, a sure indication of the creative power that brought it into existence, and must be applied, in detail, to each phreno organ. This is the key to phrenology.

The size of an organ indicates the capacity which it

possesses of receiving stimuli, and it also tells us that this capacity itself is but the result of ages of functional activity in respect to such stimuli as it now needs.

We learn, also, from this subject, that the time which it has taken any organ to acquire its present size, is not indicated; for one organ may have been growing larger, and another smaller; a third may have gone out of existence, and a fourth have come in, during the very same time; while others, perhaps, have continued the same size during the whole of the period.

We learn from this subject, too, that it is by no means true that organs will grow larger merely because they are exercised. They must be exercised in a high degree, and nourished, also, in a high degree, and for a long time, in order to become permanently enlarged. I think it may reasonably be doubted whether a permanent constitutional change can, without violence, merely by normal functional action, be wrought in one generation, sufficient to become obvious to the senses. There is nothing yet properly settled on this point; but it is certain that sufficient stress has not been put upon the long periods which it has taken organization to assume its present form, complexion, and function. And I think it equally certain that organs do not grow in consequence of any duration of *ordinary* functional activity; it will merely maintain them in *statu quo*. If they have less, they will degenerate; if more, and are well nourished, they will increase; otherwise not.

SECTION XX. — PHRENO-PHILOSOPHY OF IDOLATRY.

Stimuli is ordained, by the Supreme Creator, to be the sub-creator of organs. That kind and quality of stimulus which created an organ is its only appropriate stimulus; to apply any other is idolatry. Each organ of man may be the subject of a species of idolatry peculiar to itself. Whenever any organ is excited by an object which bears a deceptive resemblance to the true and legitimate object, but which is not, at the same time, essentially the true object, such action of the organ is idolatry.

Sometimes the objects which originally called the organ into existence, and the objects that now excite it, although apparently different, are really essentially the same in effect and in utility. Thus, plants are probably the first creators of the alimentive impulse, and afterwards flesh was substituted. Since flesh answers the same purpose as plants, by actually nourishing animals, it would be improper to say that the use of flesh is idolatry. But tobacco, opium, alcohol, chalk, slate, and other deleterious or useless articles, which are sometimes swallowed or chewed, — these do not operate as useful substitutes for food, and, therefore, their use is idolatrous. In this sense, the habitual use of camphor, ammonia, perfumes, ether, nitrous oxide, or chloroform, in the lungs, instead of common air, is idolatry, when not used as a proper medicine. Proper medicines are necessary to cure diseases, and Sanativeness prompts us to use them; but all uses of improper medicines are idolatrous.

This view of phrenology is exceedingly useful and

interesting, as showing the relation which exists between an organ and its proper objects or stimuli. This subject, when viewed in its most comprehensive manner, involves the whole duty of man; for it shows, or rather it aims to show, what are and what are not the true objects at which each organ should aim.

The particular use of this investigation to the science of phrenology, at present, is to enable us to distinguish the true functions of the organs. It has often happened, in the history of phrenology, that the idolatrous action of an organ has been mistaken for its true and primitive function. This error has been promoted by the absence of critical rules by which to ascertain the true from the false objects which excite organs.

We may divide the objects that excite organs into the sub-creative, the useful substitutes, the useless substitutes, and the injurious substitutes. The sub-creative are those that are believed to have originally required the organ to come into existence; and this is, of course, the most natural and appropriate stimulus that any organ can have. The useful substitute is an object which so nearly resembles the sub-creative in its effects, as to be capable of answering nearly the same purpose. The useless substitute is an object that so nearly resembles the sub-creative, as to be capable of exciting the organ, but does not, to any useful degree, tend to the same result. This is illustrated when mackerel bite a piece of red baize, mistaking it for meat: and blue-fish are caught, in Rhode Island, by a bait of lead, which is made in the shape of a small fish, and which glistens like a fish. This is idolatry, — it is following a useless

substitute, and being excited by it. Many of our noblest powers, instead of being excited by their proper objects, are led away by a species of useless substitute, like red baize and pewter fish. Injurious substitutes are those which, like opium, tobacco, and alcohol, excite the appetite powerfully, but only injure the constitution, which the appetite was made to preserve.

With these preliminary remarks, I propose to briefly review the organs, and consider the various stimuli to which they are subject, and by which they are misled to idolatry.

IPSEAL IDOLATRY.

I. *Pneumativeness.* — Common air is its sub-creator; its idols are ether, nitrous oxide, and chloroform, when not used as medicines.

II. *Alimentiveness.* — Nutritious food, vegetable and animal, are its sub-creators; its idols are poisons, opium, alcohol, tobacco, &c.

III. *Sanativeness.* — Those operations and those substances that prevent wounds and disease are its sub-creators; its idols are false or improper medicines and operations. There is an immense amount of this species of idolatry, since it includes all kinds of quackery and injurious medical practice. It will at once occur to any one, that the real reason why people fall into any kind of idolatry is ignorance as to which is the true and which is the false stimulus. It is not to be supposed that any one in his sober senses will prefer to worship at a false shrine, knowing it to be so; no one will injure himself designedly, from the mere preference of self-in-

jury to self-happiness. The use of tobacco, alcohol, and opium, is generally begun in ignorance of its ultimate effects, and afterwards continued in consequence of the insanity which it produces. No man takes injurious drugs with the intent of producing injury, — it is the result of ignorance.

IV. *Destructiveness.* — Its primitive function was to destroy animals for food. It is usefully employed in destroying anything, the destruction of which will advance the happiness of its possessor. The objects thus destroyed are *useful substitutes* for the primitive stimuli. Its useless substitutes are the killing of animals merely for sport, and the exertion of useless severity. The injurious idolatry which springs from this organ, acting in ignorance, is revenge, — murder, and any other kind of destruction which brings a punishing reaction. It is a question whether public executions of our fellow-men are not instances of destructive idolatry, — a species of sacrifice to Moloch. Useless and unjustifiable wars come under the same head.

V. *Combativeness.* — The primitive function seems to have been, to retain or obtain forcible possession of useful objects. All other kinds of contention are idolatry.

VI. *Secretiveness.* — Primitively it assisted Destructiveness in seizing and destroying for prey, or it assisted Cautiousness in avoiding enemies; and this fact speaks plainly as to its true sphere: but deception, falsehood, and intrigue, to injure others unjustly, are idolatry.

VII. *Cautiousness.* — To avoid coming trouble. To fear dangers that have no real existence is idolatry.

VIII. *Constructiveness.* — Its primitive function was

to change the productions of nature from their original forms, to adapt them to useful purposes. Its idolatry is, to expend time and means (that might be better employed) in useless ornaments and embellishments, which are not actual useful improvements.

IX. *Acquisitiveness.* — Primitively, it merely stored provisions for winter, or some useful article for future use. Its idol is the useless accumulation of wealth.

X. *Experimentiveness,* or *Mirthfulness.* — Its primitive function, in my opinion, was to try experimental and novel modes of accomplishing difficult operations. Its idolatry consists in sportive and foolish experiments, — in sacrifices to vain and useless novelties, — in changes and inventions without advantage, and not directed by intellect.

Sport differs from idolatry in this, that it is not excited by false stimuli, — it is not delusion. Sport is useless and surplus action; idolatry is erroneous action. Sport is imitative of true conduct; idolatry is false conduct. Sport depends upon leisurely circumstances, and the possession of active powers, which were originally created for useful and necessary purposes. All animals play when they are young, and are supported by their parents, so that they are not obliged to exert themselves seriously to get a living. The stimulus that excites them to play their powers is the same as that which excites them to serious acts; but, in one case, the stimulus acts upon a hungry animal, and therefore excites to earnest endeavors; and, in the other case, the same stimulus acts upon a satisfied animal, who has no occasion to make any exertion, except to gratify the mere love of action, or to

gratify an impulse to make an experimental trial of his powers.

Perfectiveness. — Its primitive use was to improve operations which grew out of a crowded and complicated state of society. It was ipseal improvement, in the midst of society, for ipseal advantage. It originates the most improved methods of operating in the useful arts, and this constitutes the real essence of the fine arts; but arts merely ornamental, without utility, are idolatrous modes of manifesting this organ.

Hope, or *Migrativeness.* — Its primitive function, I think, was, to migrate when the native home was incapable of affording happiness, which distant regions could furnish. It is usefully employed in many ways. Its idolatrous action produces the extravagant enterprises and superstitious aspirations after happiness, in distant regions and future times, that are unattainable.

SOCIAL IDOLATRY.

Amativeness. — Its primitive function was merely sexual intercourse; its idolatry includes all kinds of amorous indulgences that have not for their tendency and object the reproduction of the species.

Parental Idolatry. — The true function of Parentiveness is, to cherish the young, tender, and helpless. Dolls, pets, and useless house-plants, are its idols.

Inhabitiveness. — Its true and primitive function is to concentrate all the objects of interest and affection in a particular limited locality, which may be denominated home.

What is commonly called Concentrativeness, is an

effect of this impulse, excited by other objects besides home; or, rather, it is an incidental effect of this impulse, — it is a species of idolatry. Some persons seem to make an idol of their own narrow home, and consider all other parts of the earth's surface as barbarous, and unworthy of being ranked with "their own, their native land." This is sectional idolatry.

Imperativeness or *Self-Esteem.* — The primitive function of this organ was to assume authority over younger and weaker members of society; its idolatry consists in pride, and arrogance of authority over superiors. Any one who is imperious towards those who are beyond his power, is an idolatrous worshipper of himself. The subcreator of this organ was the presence of inferiors; and a man who mistakes his equals or superiors for inferiors, seems to have an undue opinion of himself. This is idolatry. The true function leads to a true self-estimation when determining one's social position in respect to authority.

Approbativeness. — Its primitive function was to get the good will of associates, in order to influence them, and thus add to our own consequence: it was at first an auxiliary of Imperativeness. Its idolatrous action consists in seeking applause which will not add to one's influence and power. Vanity, vain-boasting, and love of flattery, — these actually lessen, instead of increasing one's influence. This is idolatry.

Firmness. — Its primitive function was to maintain consistency, and resist attempts to produce changes in one's social position, plans, or opinions. The idolatry of this organ consists in foolish and useless stubborn-

ness, — adherence to views and plans that are impracticable.

Justice or *Conscientiousness.* — The primitive function of this organ was, in my opinion, to deal impartially in governing others, instead of favoring self or friend. It was merely a governing social impulse. The idolatry which this organ commits is in consequence of ignorance and erroneous belief, mistaking the true objects of duty and of right. Ideal gods, demons, angels, various spirits, furies, ghosts, and other supernatural beings, have always been the subjects of supposed duties, claims, and rights, and have received sacrifices of every kind, which were due to actual existing members of society, and to the one only and true God.

Submissiveness. — This is the organ to which idolatry has been generally and almost exclusively ascribed. Its primitive function is precisely the reverse of that of Self-esteem. It recognizes superiors with pleasure, and bows humbly and promptly to the authority of parents, guardians, and magistrates. Its idolatry consists in recognizing beings as powerful, that, in reality, have no power, and sometimes beings that have no existence.

Kindness or *Benevolence.* — The primitive function was to be courteous to strangers or slight acquaintances. The idolatry is mistaken philanthropy, and projects and plans for benefiting others, when, in fact, the contrary effect is produced in consequence of ignorance.

Imitativeness. — The primitive function was to adopt the manners of associates and superiors. It is a social impulse, and its stimulus social beings. It produces sympathy. Its idolatry is to imitate improper actions,

to sympathize with distress which we cannot relieve, and thus make ourself unhappy, without benefiting others. Imitation, in the ornamental arts, is often merely a worship of idols that have no power for usefulness.

Credenciveness. — The primitive function was to act upon the assertions of others who had superior opportunities of information concerning the things whereof they make the assertions. The idolatry of this organ is immense in amount and in importance. Its very nature predisposes to error, even in its legitimate operations; that is, when we believe those who have had opportunities to know, and are desirous to testify truly. But when we believe improbable things which others cannot know better than we ourselves, we resign ourselves to the most shameful idolatry.

Novel-reading is a species of credencive idolatry, for it is a powerful exercise of the brain, a pleasing titillation of the mind, and generally without any real use.

INTELLECTUAL IDOLATRY.

Intellectual idolatry consists in all false views and erroneous systems of philosophy.

Perhaps it may be said that all idolatry originates in the errors and imperfections of intellect; that is to say, that when the directive organs misdirect the impulses to improper objects, — to idols, — they are the causes of idolatry. Thus ignorance is the real cause of all idolatry, and knowledge is the only cure.

Superstition is an erroneous theory of the causes of phenomena, and can only be cured by a true theory.

Knowledge is true stimulus, sent from surrounding objects, and properly modified by the organs through which it passes to the central consciousness.

Superstition is idolatrous philosophy. It is peculiar to man, and arises from his unsuccessful attempts to explain surrounding phenomena. An intellectual people will possess an intellectual system of natural philosophy, or, in its place, they will substitute an ingenious and plausible system of superstition. If they do not know the cause of thunder, they will create an imaginary deity, and endow him with the thunder for his voice, and arm him with the lightning for an instrument of vengeance. If they do not understand the cause of rain, they will be likely to explain it by saying that there are windows in the sky, far above our sight, and that an imaginary being opens and shuts them at his pleasure, and thus pours down upon us the rain, which is there reserved in exhaustless fountains. Thus it is with all natural phenomena that are not understood; they are at once explained by being attributed to the operation of some invisible being, whose character is often a mere caricature of those whose imagination creates him. Cruel people believe in gods like unto themselves, revengeful and tyrannical. The Chinese, being a vain and contemplative people, believe in a deity who spends eternity in contemplating his own perfections. The gods of the ancient Greeks were as various as the genius of that remarkable people. The most popular gods were warlike, and so, also, were their most popular public characters. Jove was a thunderer; Mars, and Bellona, and Apollo, and Vulcan, and even Juno, were warlike.

Whatever a man would himself be, if he had unlimited power, that is just what he supposes his supreme idol to be. Such is human nature, that man must be, like a brute, insensible to the whole matter, or a profound philosopher, explaining all phenomena by referring them to natural laws, or he must depend upon his genius to create invisible beings to preside over the mysterious operations that puzzle him. The history of superstition is almost identical with the history of true philosophy. The explanation of things which satisfies the mind of one leading character, is by him given to his family and neighbors, and becomes the superstition of his tribe. If this tribe becomes powerful, by success in wars of conquest, their superstitions become more extensive and popular; the conquered nations worship the gods of their masters. Church and state being united, the extent of their peculiar religious influence is equal to their political power. Hundreds of millions are now taught and guided by doctrines, concerning the origin and destiny of man, which, but for the power of the sword, would never have spread beyond some obscure village. A peculiar set of doctrines, once established, naturally become interwoven with all the institutions and customs of society, and cannot easily be eradicated. If some man, possessing more intellect and independence than his cotemporaries, discovers their errors, and proclaims some novel truths concerning the laws of nature, he is met, not only by the superstitious prejudices of his times, but by their interests and their love of power, which depend upon their maintaining existing institutions. Reformers can only succeed by being "wise as serpents, and harmless as

doves;" and, even then, they pursue a perilous path. The success of a reformer will depend upon the degree to which his people are enlightened, and the adaptation of his new system to their peculiar condition. Savages cannot be suddenly transformed to savans. The progress of nature, in her reforms, is ever by the gradual work of ages. From a state of brutal stupidity, man first arose to superstition. Philosophy first appeared in the world in the form of a superstition. As knowledge increased, new sects arose, with new creeds, the results of experience, observation, and reasoning. These new creeds were merely advanced stages of embryo philosophy. The priest and the philosopher wore the same robe. In all ages, science has been studied by priests more than by any other class of men; but they have taught it under superstitious forms, adapted to the intellectual condition of the people. The Reformation of Luther and Calvin was merely intellect advancing in disguise, and declaring its independence of the opinions of former ages. The Reformation, indeed, commenced long before Luther was born, and has extended over all Christendom as well as heathendom. The Catholic Church, without abandoning any of its doctrines, has modified its practices, to harmonize with the more enlightened spirit of the times. The practices of the Romish Church are as mild and tolerant, at the present day, as those of the English, Scotch, or the Greek Churches. The Catholics of the United States are much more tolerant, republican, and forbearing of persecution, than some of their professedly reformed opponents. This is owing to the progress of knowledge. The Catholic Church is governed by men

of superior minds, who have the sagacity to see the signs of the times. The Pope himself is now the great reformer of the Romish Church. The Pacha of Egypt, and even the Grand Turk, is among the ranks of modern reformers. The Romish Church holds the same doctrines which it held in the times of Luther and the Inquisition; the English Church teaches the same creed as when, by its authority, martyrs were publicly burnt for heresy; the Calvinistic Puritans and Covenanters of Geneva, Scotland, and New England, hold fast to their ancient faith, but their stern tyranny has abated. Human sacrifices are no longer offered up to the Christian God, upon Romish, English, nor Genevan altars. Witches are no longer burnt, Quakers are no longer hung, nor Baptists banished, to appease the conscientious vengeance of the Pilgrims of New England. What has produced these changes? It cannot be the influence of the Christian religion, for they had that, in their day, as pure and perfect as it exists at present. There has been no new revelation. We have the same Bibles, the same creeds, the same temples, the same sermons, and the same cruel natures. Nothing has changed but the state of science. That has advanced, gradually but continuously modifying all the institutions of man.

Superstition is the vague dream of a mighty mind, half awakened from its midnight slumbers. Science is the perception of that same mind awake to all the realities of noonday. Superstition is a giant, naked and ignorant, struggling in a darkened cavern, amid enemies and friends, whose forms are but imperfectly seen, and whose powers and designs are dreaded but not understood. Sci-

ence is the same giant, clothed in modern refinement, standing amid the full blaze of knowledge, with the press, the steam engine, and the telegraph at his command, and clearly perceiving that God is his Father, and all mankind his brethren.

Some men are constitutionally fitted to become the leaders of intellectual advances. They are the Knight Templars of science. Naturally bold, independent, ambitious, and clear-headed, — when such men are in a situation favorable to the acquisition of knowledge, but not too much tempted to sacrifice truth to policy, — when, at the same time, they have the good fortune to be surrounded by a people who can understand them and sympathize with them, and who will follow, though they have not the ability to lead, — then they achieve immortal deeds, and carve their names upon the memories of mankind. These are the acknowledged reformers of the world, — the Aristotles, Galileos, Newtons, and Franklins of mankind. Whoever else may have obtained titles and swayed sceptres, these are the true heroes and actual princes of our race.

SECTION XXI. — OBJECTIONS TO THE "VESTIGES OF CREATION."

The author of the "*Vestiges of Creation*" has attempted to establish several propositions in relation to the origin of things, and the laws of nature and of humanity, which deserve to be considered.

1. He first introduces the nebulous theory of Herschel, and fortifies it by all the arguments in his power. I shall not attempt to controvert it; on the contrary, I am inclined to consider it as probable, though not proved.

2. He next adopts the igneous theory of Liebnitz concerning the origin of the primitive rocks. This, also, may reasonably be admitted; for it is in accordance with the opinions of the most eminent geologists.

3. Next he considers the origin of animals, and adopts the notions of most geologists concerning the great outlines of paleontology.

The professed object of the work is to establish two theories. One is the uniformity of nature's laws, and their jurisdiction over moral subjects, to the exclusion of all miracles and special providences. In regard to this, it is only necessary to say, that it is by no means novel, either in its positions or its arguments. It is the same doctrine that has been always maintained by anti-revelationists, in all ages, from the times of Zeno, the stern stoic of Greece, to the present day. Some Christians, even, — especially the Calvinists, — have been accused of favoring it, though they generally deny such intentions. The other idea, which the author of the "Vestiges" aims to establish, is *a theory of progressive organic*

development, by changes in embryo. This is new to me, though it may have been advanced before in some treatise which I have not seen. This theory must not be confounded with that of Lamark, which is, that animals changed to adapt themselves to circumstances, and that it is the movements of the animal against external things that gradually produce the change from one species to another. The author of the "Vestiges" refers to Lamark's views, and says, distinctly, that the organic advancement certainly does not take place in the way that Lamark supposes. The author of the "Vestiges" does not charge the changes of animals upon the stimulating influences of surrounding things, after birth. His notion is, that an animal of one species produces an animal of another species, in consequence of some mysterious change which a mysterious *law* produces upon the embryotic egg, before the new animal is born. I cannot admit this theory of the embryotic origin and development of species. I find no solid reasons in its favor, and many against it. I consider the external circumstances of animals as the causes of their changes, and the subcreators of their species. The changes which any animal undergoes during its lifetime, before it becomes a parent, — these changes are impressed upon the organization of its offspring, because the offspring resembles its parents as they were constituted at the time that they became parents. Thus, if a man becomes insane, the children begotten afterwards might have a slight tendency to insanity, while the children begotten previously might be free from such a tendency. So, also, a man may live exclusively upon meat, and thus acquire a

strong appetite for it, and his children may consequently be born with a stronger love for meat than if the parent had fed exclusively upon vegetables. This is merely combining the well-known doctrine, that "like produces like," with another, which is equally well established, that external circumstances change and modify organization. I admit that important impressions may be made upon the embryo through the nervous system of the parent, producing deformities and idiosyncrasies which may be perpetuated and constitute a new species; but this is not an exception to the rule, but rather a confirmation of the general principle, that external impressions are, under Providence, the sole creators of new developments and new forms of organization.

The most serious objection to the "Vestiges," however, is the implied atheism it inculcates, by attributing every movement in the universe to the operation of a law which is immutable, infinite, and eternal; thus denying the existence of a special Providence, who superintends the operations of nature and humanity, and who suspends or modifies the laws of nature at his pleasure. I acknowledge that all science teaches that the laws of the universe seem to be unchangeable, as far as human experience and research extend. But science does not and cannot prove that the laws of nature are in themselves unchangeable, if the Deity pleases to change them to accomplish an important moral result. And who shall say that the universe is not governed by a Being who has the power to exercise parental and discretionary attributes? What science is there that can show at what moment and by what means a *new* law of nature goes

into operation, at the will of the Great Lawgiver, which may modify or repeal any previous law? To say that the Deity governs nature by laws that cannot be changed, is the same as to deny the existence of a Heavenly Parent altogether. Is it not equivalent to atheism, to teach that, when God created the universe, he established certain laws for its operations, and then left it to move on through all eternity, a perpetual machine, whose every and minutest movement was foreseen and unalterably predetermined? Why should we pray to such a being? — a Deity who, eternal ages ago, became the slave of his own immutable laws, and who, through all succeeding ages, can do nothing but execute the decrees by which he bound himself at first! He is, of course, incapable of a miracle, or any other discretionary act. He is merely an impotent omnipotence!!

No! we cannot admit such a doctrine, without at once abandoning every religious idea. We must either believe in a God who possesses moral freedom, and who bestows a certain degree and kind of freedom upon some of his creatures, and holds them responsible for its exercise, or we must abandon ourselves to atheism. There is no alternative. I confess that I cannot understand nor explain the moral freedom of the Deity, nor of man. I know it is mysterious, but I nevertheless embrace the doctrine with pleasure, as the only refuge of humanity, — the only foundation upon which its noblest virtues can be raised, and its highest objects attained. We escape no logical difficulties by adopting the theory of immutable law, but we stultify our consciences and paralyze our energies with a hopeless and reckless fatalism.

SECTION XXII. — INSTINCT IS HEREDITARY MEMORY.

It is admitted that impressions made upon the organism of the parents are not only retained by the parents, but are afterwards transmitted to the offspring. This being so, it should seem that the offspring are thus placed in the same condition to recall (recollect, repeat, or remember,) the state of mind which the impression produced as are the parents; and any state of causes which would make the parent think of the same thing again, would make the offspring also think of the same thing again, with this difference, that the parent might think that he had once before had the same idea in his mind, but some of the offspring would have a similar idea, without recollecting ever having had it before.

What we call instincts are certain inherited states of organization, which cause certain peculiar mental effects to follow external impressions.

Why does a kitten, that has never seen a mouse, start and growl, under great excitement, the instant she smells one? Why does a puppy smell the blood of a chicken, and track it, and bark after it, though he never saw one, when a piece of beef produces no such effect upon him? Why does a horse start on smelling a lion or tiger in a caravan, or the skin of one of these animals, though he does not see, and has never seen one? We call it *instinctive* perception; but we do not explain it as produced by any known process. To my mind, the reason is plain and obvious. The progenitors of the

horse, the cat, and the dog, were frequently excited and frightened by the animal, — by the sight and smell of him, — and their organization was put into a peculiar and permanent state by the frequent and powerful impressions which he thus made. This state of organization was such, that the sight or smell of him again, years afterwards, would instantly be followed by the same ideas. Now, the offspring, inheriting the same organic peculiarities, would have the same capabilities; and, therefore, would (when the sight or smell of the object was present) possess and experience a state of mind similar to that which was formerly produced in the parent. Like produces like, and like causes produce like effects.

The *smell* of a thing not only rouses the organ of Flavor to perceive what it is, but it rouses Cautiousness, Sanativeness, Destructiveness, or any other *impulsive* organ also, if the peculiar smell has, on other occasions, been roused in association with it. The odor operated directly on the organ of Flavor; this sent an impression to the phrene or sensorium, producing a consciousness of the flavor; this impression was radiated or reflected to all the other phreno organs, from the central phrene, and excited those impulsives that were previously in the habit of being roused by the same cause, either in the present or in previous generations. Being thus roused, they impelled to actions that, in the parent, were called reasonable, but, in the offspring, were called instinctive. We have here a good illustration of the doctrine, that stimuli create organs, preserve them, and excite them to their functions.

Insanity, being hereditary, is another proof that the powerful impressions made on the brain of the parent are often transmitted to the offspring. All hereditary states of mind are of the nature of instincts.

According to this view, instinct is the memory of the race, — a species of hereditary history of the experience of the whole race for ages past, impressed upon the brain, and transmitted thus to posterity for their guidance, when placed in circumstances similar to those in which this wonderful history was written.

Take this conclusion in connection with the idea that some animals have a clairvoyant power of receiving and of communicating ideas, so that they can, at pleasure, impress upon the minds of their young their own ideas, and we are furnished at once with a beautiful key to the philosophy of instinct, and its harmony and analogy with the powers of human nature.

The perceptive power of dogs when smelling their game or their master's footsteps, and the perception of direction manifested by carrier pigeons, and all the superiority of perception manifested by the lower animals, are they not indications of an approximation to clairvoyance? or, rather, are they not remnants of the clairvoyance which animals of still lower grade, in earlier times, possessed in perfection? Are not the sympathy among polyps, the electric power of fishes, the mesmeric power of serpents, and the susceptibility of birds, still further evidence that, in earlier times, the mesmeric influence was greater? Is not Credenciveness a higher substitute for clairvoyant communication? Is it not the communicative impulse, excited by the communications of

others? Is not what is commonly called "natural genius," identical with instinct? Has it not the same cause and the same effect?

Phreno-Geology seems to furnish explanations of the causes of instinct, genius, eccentricity, insanity, and all other traits of character in animals and men, which are exceedingly satisfactory, and which cannot otherwise be explained at all.

SECTION XXIII. — HEREDITARY DESCENT.

I have read all that I can find in the books upon hereditary descent, but can learn very little that is satisfactory. It would seem that the ancients knew about as much upon the subject as we know at present, namely, that qualities and diseases are transmitted from one generation to another; that like generally produces like; and that intermarriages with near relatives are injudicious. It is a matter of universal observation that some children of a family resemble one parent, and some another; and some resemble both, though in different degrees and in different features. Some children seem to resemble neither parent so much as they do some grand-parent, or great grand-parent, or some brother or sister of one of the parents.

Diseases, also, are sometimes transmitted immediately from father to son. But, again, diseased parents have strong, healthy children, without any appearance of disease, yet the grandchildren are born with all the dis-

eases of their grand-parents, aggravated in a fatal degree. We see a fine-looking man, living with great prudence, and marrying a wife, who seems to be the picture of health, with the hope to see his children blest with good constitutions; and, from some cause yet unexplained, the sins of past generations are visited upon him, and his brightest jewels are torn from him. The children which are spared are generally those which seem least likely to do credit to his name.

We see the greatest men in the nation, in some instances, with children that disgrace them by their vices, and show an utter inability to follow in their footsteps to distinction. We see clergymen whose sons seem determined to be mechanics; and mechanics, whose sons are bent upon some learned profession, and look upon the employment of their fathers with utter aversion.

All the plausible theories that have been invented fail to account for these facts in a reasonable manner; and it is plain, to my mind, that we have yet something more to discover before we can unravel the mystery.

I announced, in 1839, a discovery which I had made, that persons who greatly resembled the parent of the same sex as themselves were generally smaller than that parent in brain and body, and possessed somewhat less of the qualities that distinguish the opposite sex. Thus, a masculine-looking woman, whose daughter resembles her very much, and not the father nor his family, will generally be smaller, and shorter, and more feminine in features and character, than her mother. Her chin will be narrower, her nostrils smaller, her complexion less florid, her chest less developed, and her firmness and

courage less. On the contrary, a son resembling the same mother will have a large head and body, with most of the gentle traits of his mother, and even more than her energy. He will be likely to be a superior character, especially if her father was so; for superior women generally resemble the father, and superior men the mother. This same mother may have another son who resembles neither his brother, nor his sister, nor his mother, in appearance or character, but to his father he bears a striking resemblance; and, if his father is a superior man, hopes are entertained that he will resemble his father in his traits of character; but the chances are that these hopes will be disappointed, for he will be smaller than his father, though more active and sprightly. His head will be smaller, and his literary tendencies less; for he is deficient in the feminine points which are necessary to give a literary bias to the mind.

These rules are only *generally* true. Causes, which are not yet understood, seem to operate to produce exceptions, which I cannot explain.

Mr. Alexander Walker has published a work in which he labors to show that every person derives all his locomotive organs from one parent, and his nutritive organs from the other; that the back of the head is derived from one parent, and the front from the other. But I have not seen an observing person who agrees with him, and my own observations, certainly, do not confirm his doctrines. I have seen many persons whose organizations seem to be a perfect mixture of the peculiarities of both parents. The mulatto is, almost always, a nearly equal compound of the characteristics of the whites and

blacks, not only in color, but in feature, in brain, and in everything else. I have seen a man who resembled his father in nothing, that I could perceive, except in the singular manner in which his hair grew around his forehead. I have seen a man resemble his mother in nothing that could be perceived, and yet inherit her constitutional diseases. I have seen persons, born of weak and diseased parents, whose health and constitutions were sound and powerful; and I have seen miserable and diseased constitutions descend from parents and grand-parents of uncommon health and vigor.

Notwithstanding the universal prejudice which exists, and has always existed, in regard to the intermarriage of cousins, we often see persons of the most splendid qualities whose ancestors have committed this error. The laws of hereditary descent are yet but imperfectly known; and, in respect to those rules which are best understood, it would seem that the exceptions are so numerous and important, that we ought to be exceedingly careful how we adopt them as a guide in practice.

It has always been acknowledged, even by the most widely separated tribes of men, that physical, moral, and intellectual qualities are, in general, hereditary. But the most enlightened philosophers know very little more on the subject than the North American Indians did when they were first discovered. Who can tell why or how a disease, a feature, a talent, or a moral trait, is commonly transmitted from the father through his daughter, rather than his son; and why it sometimes passes by one or two generations, and reäppears in a third or fourth? It would seem that a man is made up of all the capa-

bilities of all kinds that were possessed by his ancestors for several generations, and those which he cannot manifest, he can transmit to his offspring.

If I might suggest a theory of hereditary descent, I would say that each person is composed of an immense number of organs, and that each organ is constituted of a number of germs, each of which is capable of being developed into a distinct organ. An equal number of the germs are received from each parent; and, though only one of the germs is actually developed in one person, the others continue to exist in a dormant state, and are transmitted to the offspring, and developed in them; so that one of the germs of an organ may be developed in the parent, another in his child, and a third in his grandchild; and, as each of these three germs may have been originally created in three different ancestral constitutions, they may, when placed in the circumstances which develop them in the offspring, produce three different kinds of constitutions, one of which may be healthful, another diseased, and a third marked by some striking peculiarity, which distinguishes it from all the family except the one from whom it was originally derived. Assuming this hypothesis to be correct, we can understand how it is that a person may have about an equal number of the germs derived from each parent developed, and thus resemble both parents; or, he may have most of his developments from the germs of one parent, or from a grandparent. Whatever may be the objections to this theory, it has at least the merit of including and explaining all the known facts relating to this subject.

SECTION XXIV.—RELATION OF THE TEMPERAMENTS TO GEOLOGY.

The first created animals were, unquestionably, nearly allied in character to vegetables. They had no red blood; the lymphatic vessels and the cellular tissue greatly predominated. Their temperament was cellular and lymphatic. This is the lowest and least intellectual temperament that can be conceived.

I consider vegetables as but a lower order of animals; and it would not be difficult to establish several degrees of approximation of vegetables, from their simplest forms, gradually ascending, till they assume undoubted animal functions; and then, from this lowest animal point, we may proceed by regular steps, such as a good physiologist alone can appreciate, to the dignity of humanity.

There have been many attempts to show that there is a succession of links which connect, in a regular series, the lowest organized beings with the highest. These attempts have been only partially successful, for the reason that respect has been had principally to the *external forms* of animals, while the essential *internal functions* ought to have been the main consideration. If we confine our investigation to the *functions* of organized beings, we shall indeed find that there is an actual and true chain, which, in regular and successive links, does connect the first created and lowest organized beings with the most exalted specimens of human genius. The temperaments of the lowest animals are almost identically the same as of vegetables, namely, cellular and lymphatic. The very lowest, first created, and simplest

of the fishes had regular muscles and a small quantity of dark venous blood, but the colorless fluids still predominated. The reptiles had more colored blood, in proportion to the quantity of the other fluids, than the fishes had, for the reason that they respired more air. The first created birds surpassed the reptiles in regard to the quantity of colored blood, and also in the size of the brain. Man does not surpass other animals in the quantity or quality of any of his fluids, or his muscles; indeed, he is surpassed by birds in the aëration of the blood, and by many insects in the delicacy, the number, and the complication of the muscles; but man is believed to be superior to all animals in the size of the brain compared to the rest of the nervous system, and also in the number of his higher phreno powers. I am, therefore, disposed, in view of the above facts, to arrange the temperaments in the order of their creation, as follows: —

1. The cellular and lymphatic.
2. The muscular and venous.
3. The muscular and arterial.
4. The arterial and phreno-nervous.
5. The phreno-nervous, or human temperament, which is developed in man more than any other animal, and most of all in the most intellectual men.

SECTION XXV. — RELATION OF PHYSIOGNOMY TO GEOLOGY.

In the year 1839, I published, in the city of Buffalo, a volume of three hundred pages, illustrated by eight pages of lithographic plates, entitled "A New System of Phrenology," and devoted one small section and one of the plates to some original observations which I had made upon the relation of the forms of the face to the developments of the brain. This relation I denominated *phreno-physiognomy*. I found that animals and men may be divided into three classes, — carnivorous, herbivorous, and rodentia; or, flesh-eaters, plant-eaters, and fruit-gnawers.

The *carnivorous* have large Destructiveness, with short jaws, short noses, and short ears; the central front teeth short and small, and the centre of the lip deficient, thin, or turned up towards the nose; the tearing teeth (bicuspid) large and strong, and the jaw much developed where these teeth are inserted. In mankind there is a tendency of the chin to be prominent, short, and slightly turned up, in carnivorous characters.

The *herbivorous* have small Destructiveness, long jaws, at least four long front teeth, rather wide mouths, long noses, (long from the eyes to the teeth,) the tearing teeth either entirely wanting or comparatively small, and the jaws narrow at the part where the tearing teeth are inserted; long chin, and not remarkably prominent; the lips long in front, and pouting in the centre.

The *rodentia* have small Destructiveness and large Acquisitiveness; the two central front teeth long, and

the next two shorter or absent, while the tearing teeth are wanting or diminutive.

The lips, in all animals and men, have a tendency to be most developed over the largest teeth; and the jaws, also, are most developed where the largest teeth are inserted. The expression, that is, the movement, of the lips is such as to favor the predominant trait. In the carnivorous, the movement, or expression, is principally with the corners of the mouth, and is such as to be favorable to tearing flesh. In the herbivorous, it is such as is favorable to grazing, or gathering in leaves with the front lips, and to drinking water by suction. The carnivorous animals are all so deficient in front lips, that they are forced to use the tongue to take up their drink; but the herbivorous animals can use the lips to suck up the water which they require. The movement of the rodent lips is such as to favor the act of gnawing.

When a man has jaws, teeth, and nose like one of these classes of animals, it may be observed that he has a head which approximates, also, to theirs in its outlines; and he has a tendency to move the muscles of his face in expression, so as to resemble them. The manner in which the hair grows around the face of a man will also be found to resemble the manner in which it grows around the faces of the class of animals that he most resembles in other respects. The females of all animals are less carnivorous in their characters, forms of head, and forms of jaw, lips, teeth, and chin, than the males are. Among the quadrumana (monkeys and apes) there is quite as great a variety of forms of face as among men; but I have not had an opportunity to study their faces sufficiently to class them correctly.

I consider these various forms of face as the results of the various circumstances which have operated upon different tribes and races of men. I have no idea that these differences have been produced in historic times. It is much more probable that most of the peculiar forms originated at a time when men lived in a more rude manner than at present; when, in short, men were no higher than the most intelligent brutes are now. These forms of faces were produced then by the manner in which they lived and procured their food, and by the peculiar nature of the food which they were accustomed to feed upon. Some, probably, were for ages carnivorous in their habits; others, living in a different country, became herbivorous, and others rodents; and thus acquired physiognomies analogous to those of the animals whom they resemble. They adopted the habits of a particular class of animals; and, of course, as a natural consequence, they acquired similar expressions at first, and similar anatomical forms of face after a number of generations.

Civilization, also, has its own peculiar physiognomy: the forehead high, wide, and prominent in the upper part; deficient perceptives; small and weak jaws; poor teeth, but regular; prominent eyes; straight and regular nose, and slender nostrils;—in short, a highly intellectual head, light complexion, fine, silky, curly hair, and beautiful, small, regular Grecian features, indicating variety of talent and genius, but not much strength or animal force. Such a face and head would be the legitimate result of ages of refinement, and the use of artificial means of living. Contrast this face with the powerful

jaws, dark complexion, coarse hair, and forehead retreating and deficient in width at the upper part, which distinguish the New Holland savage. I do not hesitate to say that it would require a hundred thousand years, at the ordinary rate of progress, to bring this savage to the condition of an ultra-refined genius of civilization, such as Shakspeare.

This subject requires an immense volume of scientific illustrations; but I must content myself, at present, with indicating the general principles which should guide future investigations.

SECTION XXVI. — CAUSES OF THE SUPERIORITY OF MAN.

In what does the superiority of human organization consist? Gall and Spurzheim contended that it consists in a superior organization of brain, — in the possession of certain cerebral organs, which no other animal enjoys. Sir Charles Bell wrote a beautiful treatise upon the superiority of the human hand, and insisted that it contributed, in a high degree, to the superiority of human skill. Some other philosophers have argued that it is the power of using articulate speech to which man is most indebted. A majority, however, attribute man's peculiar eminence to the possession of an endowment of mind which exists independently of organization. This last idea will never be admitted by any man who is well instructed in the elements of phreno-physiology; for it is now well established, that every manifestation of mind depends upon

the condition of the brain, the nerves, the muscles, and the blood-vessels, which are concerned in the operation. It is evident that no condition of the bodily organs, — no degree of perfection in form, delicacy, or strength, — will be of any avail, if the brain is imperfect. This is illustrated in the cases of many idiots, whose brains have become weakened or paralyzed by disease, while every other organ in the constitution is perfect. It is equally clear that the most highly developed and perfect brain would be of no advantage to a man who had the limbs, head, and vocal organs of a horse. It would be impossible for him to manifest the powers of mind peculiar to man. He would only be a sagacious and teachable horse. He could not even let us know that he possessed a mind superior to a horse. The superiority of an ape consists not in his possessing a brain superior to other animals, but in the approximation of his bodily organs to those of man. I have seen dogs that surpassed, in sagacity, any monkey whose habits I ever had the means of studying; but the organization of the monkey gives him the means of imitating man so nearly, as to make him appear to be more intellectual than he really is.

The great defect of the monkeys, and of all the quadrumana, is, that they cannot use articulate speech. They are so dexterous in the use of their hands, that man has not much advantage of them in that respect; but it is in speech that man takes an immense stride beyond all other animals. This enables him to cultivate his mind, and thus causes his brain to expand in the highest parts. I am much inclined to think that the mental superiority of man was, under Providence, in a great measure a

consequence of the endowment of articulate speech. We see some savage men, whose brains are not a whit superior to those of some monkeys; yet, by means of language, we can unquestionably improve them gradually, from generation to generation, until they can equal the highest philosophers which civilization has produced. I have no hesitation in saying that nothing is wanting but sufficient time and proper circumstances, to transform the lowest negro savages to the highest degree of intellectual and moral refinement which the Caucasians have ever attained, or can attain. The defect, in savages, is in the organs of the brain, and not in the organs of voice, nor in the limbs, nor in the want of an erect position. The lowest and meanest human organization, provided it is normal and healthful, contains the germs from which every noble production of humanity can be developed. This subject is worthy the attention of those philanthropists who look forward to the future with hope for the perfection of humanity. An acquaintance with these principles is also calculated to excite a charitable feeling towards the worst members of society, and to lead us to inquire whether the sins for which they are punished did not originate with their ancestors, and whether an application of the proper stimuli, in youth, might not have saved them from the fate of criminals. How high the human mind is still destined to soar, in its future developments, it is impossible at present to determine; but it may be set down, as a settled and established result of science, that the highest point to which any man has attained, in any respect, may be reached by the posterity of the lowest, the darkest, and the worst

of the human race. But how much of this can be accomplished in one generation, can be judged best by considering the rate of progress, during past ages, when circumstances were most favorable for advancement.

It is natural, in this connection, to inquire whether it is now possible, by any artificial means, to gradually cultivate the most intellectual of the apes, so as to elevate them to humanity. Can they be made to speak articulate language? It is difficult to answer these questions. It may be that the peculiarity of the human vocal organs, upon which articulation is founded, was acquired immediately after our progenitors abandoned the ocean and began to breathe with lungs. Perhaps that was the very period most favorable for the creation of articulating vocal organs, and that the progenitors of man alone were so circumstanced as to have their vocal organs stimulated to this change. The other animals having passed that important reptilian stage in their progress without undergoing the necessary modification, it may now be nearly impossible to acquire it, even with all the aid of human ingenuity, without a more perfect knowledge of the modus operandi of nature than we at present possess. There is, however, in the articulations of parrots some ground of encouragement; and when we consider the wonderful progress of discovery and invention during the last century, who shall say how much may yet be done that now seems impossible, except by miraculous means? The full extent of the power of cultivation is not yet known; but enough is understood to excite the strongest hopes, and raise the most sanguine expectations, concerning future achievements in creating

and modifying the organization of men and animals. The transformation of the most intelligent and moral brutes, to raise them up to an equality with the most brutish men, would not be much more wonderful than the elevation of such men to the highest rank of human excellence.

Before mankind were sufficiently advanced to build monuments and write hieroglyphics, they had no means of transmitting to posterity the history nor the means of their progress. A race of savages might have lived on earth millions of years before any of them learned to communicate the fact of their existence to their posterity. New Holland is an immense country, which, when first discovered by the whites, was inhabited by a race of men who may have been there but five hundred years, or they may have been there since the commencement of the tertiary period. They could give no history of themselves which extended more than three generations back. They had no monuments, not even villages; no arts, no clothes, no religion. They were too low in the scale of intelligence to be capable even of an intelligible superstition. They were quite as low as brutes, though they had human capabilities of improvement, which entitled them to fraternal sympathy and Christian benevolence. If we wish to carry our imaginations back to the time when all men were mere brutes, we have only to picture them to ourselves in the precise condition in which the New Hollanders actually were when first discovered. We have no evidence that they were ever higher; and if we wish to trace the steps by which mankind arose to their present eminence, we have only to

survey the earth, and arrange its inhabitants according to their different stages and degrees of refinement and social elevation, from the groves of Australia to the temples of New England.

The first circumstance which contributed to the superiority of man, was his walking on two feet, thus acquiring the liberty of his hands, and redeeming them from the degrading employment of sustaining the weight of the body. No longer rendered callous by being brought into contact with the ground, they could now become delicate and sensitive instruments of apprehension and mechanical execution. This enabled man to excel all other animals in mechanical structures. The development of the thumb enables man to hold an instrument in his hand, and use tools with a degree of dexterity which no other animal can. Then the use of articulate speech enabled man to communicate his ideas and experiences in a way much superior to other animals, so that he would soon become lord of the earth as a natural consequence of these advantages. The faculty of speech laid the foundation of the art of writing, of history, of literature, of mercantile accounts, and of the modes of transferring the experience of one generation to the next, and thus accumulating the experience of ages upon all subjects. It laid the foundation for the Christian religion; for, without it, revelation could not have been received and recorded. The mind of man, without this mode of expression, would have been "cribbed, cabined and confined," so that it could not have expanded, in any degree, beyond that of an ape. But this stimulus of articulation, being created for man's use,

became in its turn the creator of a thousand elevating points in human character and society. Take away human speech, and the human mind would gradually descend from its proud eminence to brutality, with the most inevitable certainty; nor could it ever reäscend until its noblest instrument was restored.

NOTE.—The preceding pages on Phreno-Geology were published thirty years ago. In several passages the idea is expressed that the cooling of the globe modified the constitutions and instincts of animals. Further investigation has changed this opinion. It now seems more probable that it was the gradual elevation and extension of the continents, and the consequent diversities of climate and scenery, that produced many of the changes in the various species of animals.

To those who object to this essay because it is founded upon phrenology, the author would reply that, after forty-five years of almost constant phrenological practice, he considers himself more competent to form a correct opinion concerning that science than those who, by their scepticism, betray their ignorance, and, consequently, their inability to pronounce a just and intelligent verdict. Modern science is founded upon observation and induction. No science has had more numerous or more competent observers; and, however much they may differ in regard to minor and unessential points, they all, without exception, agree that at least twenty-five of the organs announced by Gall were correctly located and defined by him. If phrenology were not true, such unanimity would be impossible.