No. 316

AN

INAUGURAL DISSERTATION,

ON

The Influence of Soil and Climate on Man

SUBMITTED TO THE

PRESIDENT, BOARD OF TRUSTEES, AND MEDICAL FACULTY

OF THE

University of Nashville,

FOR THE DEGREE OF

DOCTOR OF MEDICINE.

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OF

Nashville, Tennessee

1837.

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(Document B)

The Influence of Soil, & Climate &c on man.

The object of the present Thesis will be to bring forward sufficient isolated evidence to justify us in drawing the general inference that the form, disposition and diseases of the animal world (directing however most attention to man) are modified by, and partake of the same type as, the inorganic materials most abundant where that animal receives its life and early nourishment.

It may be necessary to premise that, as air and water are inorganic substances, any influence they may exert at different altitudes or owing to hygrometrical changes or arising from the solution of certain other solid inorganic bodies, (in short any climatal or atmospheric peculiarities (as well as the varieties produced in diet, beverages &c affecting our nutrition generally by the more or less constant use of substances abounding in some elements, while deficient in others) would legitimately be included in the above proposition now undertaken to be demonstrated.

All Physicians & naturalists, so far as I know, admit the fact that every animal is produced from an egg, originating in glands, called ovaries; and that the human body thus produced, as well as that of animals generally, is composed of developed tissues, the elements of which are cells.

These cells originate within the yolk or vitellus (that essential part of the ovum or egg, in which we find the germinative vesicle and the germinative dot or dots from which the germ, or germinative disc, or blastoderma, or germinal membrane, ~~(formed)~~ develops) and are supposed by some to be made up of simple membrane with nucleoli or of granules (molecules) imbedded in a pellucid substance (cytoblastema)

The yolk is enclosed in the vitelline membrane and nourished by the less important surrounding albumen, which latter however does not form in the ovary like the yolk, but is secreted by the oviduct; the whole being again enclosed in another membrane, and sometimes also surrounded by a calcareous shell.

Already at an early stage, the yolk subdivides & there appears, at least upon the yolk of the Vertebrata, a disc-shaped protuberance called the germinative disc or germ. At first this consists of a single layer, but soon is found composed of three, which are distinct, viz: 1st. The outer or serous or nervous layer, giving rise to the nervous, osseous & muscular systems; 2dly The middle, vascular or blood layer, giving rise to the organs of circulation and respiration, and to the blood; 3dly The inner, mucous or vegetative layer, giving rise to the organs of nutrition and reproduction.

In some animals, the Mammalia, the above developments of the embryo from the ovum, take place in the body of the parent animal, sometimes as among the birds, reptiles &c, the egg is expelled from the parent early & developed by the heat of the parent (incubation of birds) or by the solar rays (reptiles' & fishes' eggs &c) or by the heat of some animals on which they become parasitic (as Gadflies and some other insects, also worms).

In the development of the future animal, from the egg, the

most important organs are observed to make their appearance first, from the layers above mentioned and afterwards the less important.

Thus the nervous & some portions of the osseous & muscular system are perceived before the circulatory & respiratory systems; and these again before the formation of the nutritive system.

In a work, shortly to be published, of which I propose, with the approbation of the Faculty that some portions of this Thesis should constitute a part, I have undertaken to show that our globe was developed on principles homologous to those now laid down for animals.

To render intelligible the inferences here drawn, it will be advantageous to state briefly a few of these terrestrial phenomena & homologies.

Most Geologists admit that the land, previous to assuming its present form, occupied less space than it does now, and was formed, particularly during the later periods, by deposition of successive layers from water.

These layers then probably exist everywhere on the globe, but have been brought to the surface, probably by volcanic forces (in connection with electrical and magnetic phenomena) in a definite manner.

A close investigation & comparison of these layers thus brought to the surface, as laid down on the various maps of detailed geological surveys, has enabled me to arrange them into a system, which shows plainly that the older rocks (the hypogene, crystalline, nonfossiliferous) are chiefly found in the polar arctic and antarctic regions; next to them come the Secondary (although found more or less accompanying every period) (Palaeozoic & Mesozoic Rocks) chiefly in the N. Temperate Zone; while internally, nearer the tropics are chiefly developed the Tertiary & newer Formations. In this particular then, at least, the Hypogene Rocks of the Terrestrial Globe resemble the serous or outer layer of the ovum; the Secondary resemble the vascular or middle layer; and the Tertiary resemble the mucous or inner layer.

But the homology (and probably I should say) analogy, hold good much farther; the serous layer gives rise to the nervous, ~~blood~~ the osseous & muscular systems, as just stated: so also the hypogene layer gives rise, in the plutonic period, to the mountain ranges, which constitute the strength of the earth's crust and more especially gives rise to the great backbone system of the globe, extending from the head of the Rocky Mountains, along the Andes & through Eastern Asia back to the place of beginning. The hypogene period also gives rise to the Ancient and Modern Volcanic Rocks, still moulding & altering the earth's crust under the influence of this active ~~volcanic~~ undulatory agent, producing electrical disturbance & thereby causing also magnetic phenomena. This is the type of the nervous system: while the layers of muscular tissue, separated by their fascia, as well as the cartilages &c, are typified by the Metamorphic Rocks, composed of their various

schists or slates; and it is in these that we find the origin of many of the useful metals, obtained more abundantly from the Ancient Volcanic rocks of the Secondary Period: the gangue being the homologue or analogue of the vascular walls

Thus the greatest amount of mineral wealth is met with, as just stated, when we reach the Secondary Period, when the accompanying Volcanic rocks as Trap (Basalt, Greenstone &c) chiefly in dikes, bring the metallic riches to the surface, amid the yet more valuable carbonaceous & saline deposits: just as we find a large number of veins, arteries & nerves among the organs of circulation and respiration (the vascular system) and a large amount of carbon, salts & iron in the blood.

Emanating from the back bone or Main Mountain range of the earth, we find originating about this period, the Tertiary Lays, which receives many of these secondary products & deposites them in its waters with; giving rise to bituminous & saline lakes & seas,

/

fopil resin (amber) petroleum springs &c; imparting also, even to its vegetable growth at the present day, sap products homologous & those bituminous, as in the Caoutchouc, the Gutta percha, the Camphors, and the resinous & balsamic vegetation of the Tropics.

On this part of the subject alone a whole volume might be written. Suffice it here to call attention to a few facts. that In detritus or soil resulting from hypogene rocks, we find chiefly the cryptogamic algæ, lichens, mosses and similar plants, ~~beside~~ largely abounding in gelatinous starch (mucilaginous fecula) and some of the animals (fopil as well as recent) abounding in gelatin, as the Cartilaginous fishes &c

In the secondary period we find the starch gradually converted into sugar. In the cereals (small grain seeds) starch yet furnishes an abundant supply of food for man, but already many of the dicotyledonous trees contain sugar in their sap (as the maple, hickory, poplar &c) so do many of the berries common in the Palæozoic this period, while the mesozoic is

rich in the sugar of its canes, beetroots &c, indicating at first chiefly grapesugar (glucose $C_{12}\ H_{11}\ O_{11}$) but at a somewhat later period, ~~chiefly~~ when more oxygenated, chiefly cane sugar ($C_{12}\ H_{14}\ O_{14}$) possessing a higher sweetening quality.

In the Tertiary period, vegetation begins to develop the fruits replete with acid (pineapples, oranges, lemons, tamarinds &c) and other products of a more advanced oxygenation or fermentation, well adapted to cool the fevers engendered by the heat of intertropical regions; also the spices calculated if used judiciously, to correct any evil effects from this vegetable, fruit diet; besides the numerous cathartics (muco-incremental agents, as Galap, Rhubab, aloes &c) and the muco-decremental agents (opium &c) designed to furnish remedial agents for the diseases (chiefly of the abdominal viscera) incident to those regions.

Still farther south we again come to the analogues of the later products of the serous layer, dermal, tegumentary & dental, as well as the ~~terminations~~ extremities, the apophyses of the vertebræ

The analogues of these in the vegetable world, we find ~~[illegible]~~ their chief ~~[illegible]~~ power giving rise to enormous leaves or to developments such as are found in the pitcher plant, the Tillandsia America, the lady's slipper, Venus' fly trap ~~[illegible]~~ and the Dischidia of the E. Indian forests; also the tendrils, hairs, prickles &c of epidermal growth.

There are many other points of analogy & homology between the inorganic & organic world, but it would extend this thesis too far to dwell upon them.

I will simply mention a few facts designed to show that the earth, like plants & animals derives materials for its increase & modification from air & water and that certain meteorological phenomena typify respiration & circulation; while others bear analogy to reproduction.

Thus the accumulated humid contents of a cloud, the temperature of which has been depressed to the dew point, descend as a pure deposition of aerated water upon the thirsty earth and filter through the loose soil, very much in the same manner that the sap,

by endosmosis, enters the spongioles of the roots, or moisture
or aërated in the leaves of the plant, of the lungs of the animal, forms cambium
is absorbed by the pores of the animal. While thus filtering
through the soil, it imparts nourishment to vegetation dissolving
certain inorganic materials & conveying them gradually along,
as it collects successively into rills, streamlets, rivulets, creeks,
smaller & larger rivers, finally emptying saline (& other
products held in solution,) into the ocean: segregating
them to form future minerals & rocks, under pressure,
electrical influences &c.

Examining first the Western Continent, we find
the smaller streams thus anastomosing and at last dis-
charging the chief waters of Nt. America by the Mississippi
into the Gulf of Mexico; while the Oronoco, Amazon and
Rio de la Plata and the inosculated waters of South
America also towards the same Gulf through the
currents tending to the Caribbean Sea. Here we have
the type of the venous or vitiated blood th now
thrown into the great central heart & thence pro-
pelled in the Gulf Stream, chiefly north & east

towards those regions where the ocean is less salt, as the Baltic; entering also the Mediterranean bearing there large saline deposits, which it is converted by the heat of the African Sahara again into a pure vaporous state, to be re-aërated & returned in this constant round, as the medium of circulation and conveyance of nourishment to the earth.

Perhaps in the separation of the earth according to fixed ~~laws~~ mathematical laws (as endeavored to be illustrated in the accompanying map marked Document C) we have the type of the various fissiperous, gemmiperous & other modes of reproduction found in the vegetable & animal world; possibly also in the difference between the Western & Eastern Continents a foreshadowing of sexual distinctions.

Not to dwell longer on these analogies, which might be traced much farther (for instance by comparing the electricity-bearing, metallic ramifications to the cerebro-spinal axis & interganglionic branches, carrying the nervous energy) we now proceed, as more practical in its tendencies,

to examine what would be the result arising from an excess of material or from great activity (in any of the ~~organs~~ layers producing the organs mentioned in the early part of the investigation) or on the other hand from a deficiency of material or of vital energy.

Would not the organ last formed from that layer probably be repeated in the first instance and perhaps be shortened or altogether wanting in the second instance?

Thus suppose an excess of serous layer forming bone, muscle, extremities & nerves, might we not have, in the lower animals, monstrosities with double sets of extremities; in man the family peculiarity of six instead of five fingers or toes? Or, on the other hand, might we not have instead of a fully developed anterior extremity, the arm, a short one with the hand near the shoulder; or a short posterior extremity where the feet are near the Knee, as is not very uncommon; or a family deficient in teeth, as sometimes happens particularly when double Cousins intermarry? Or

perhaps the figure of the lip remains ~~unclosed (harelip)~~
unclosed (harelip); or the hermaphrodite appearance
of undeveloped organs of reproduction is apparent; or the
stock dies out entirely, as happens both among plants
& animals continuing too long on the same soil or
connected too closely by ties of consanguinity in union of
sexes. (Note A.)

In this manner too we account for the deficiency
of egg shell, if the fowl is debarred from swallowing
calcareous matter; besides similar phenomena; and
perhaps the effects of fear, excitement &c on the nervous
system of the maternal source that conveys nourishment,
energy &c to the fetus, may thus in some measure
account for peculiar marks, monstrosities &c
exhibited at birth.

Again why should there be such great national

(Note A) Something of the same kind seems to occur when there
is a marked specific difference between those two uniting; thus or among
mules & other hybrids, in which the spermatozoa are wanting. Even the product

peculiarities, if these effects are not produced by the inorganic & organic circumstances surrounding these individuals, in the form of air, water & finally of food?

Thus, in the nomadic tribes we seldom have any monstrosities or peculiarities resulting from excess or deficiency of any material, because they vary the nature of the air, water, nourishment &c entering into their systems.

But in isolated villages or in Islands, where less opportunity of variety occurs in nourishment, crossing of races &c, we have frequent cases of Idiocy, monstrosity & defective organs of sense.

May not this abnormal condition be due to the hypernormal or hyponormal amount of the each formative layer in the ovum, as well as of the materials furnished through nutrition particularly in early life?

Thus if by any means fluate of lime becomes deficient may not the teeth be more subject to early decay?

It is ascertained by analysis that the brain of an idiot

and of a child contain less phosphorus than is found in that of a well developed adult.

May not the idiotcy arise from this phosphorus being defective in the family, under the influence first of inorganic causes & then of intermarriage between those in whom the deficiency occurs?

Or again as idiotcy in the progeny is sometimes the effect of conception during parental intoxication, may not the alcoholic stimulus have temporarily deprived the parental brain of some of its phosphorus (by chemical combination of the hydrogen with the phosphorus forming the material, phosphuretted hydrogen, that in extreme cases of habitual intoxication, gives rise perhaps to the combustion of the body) thus producing an embryonic & fetal deficiency?

Again the tendency of wheat, in some soils, to fall is attributed by intelligent farmers to a deficiency of silex in the soil and consequently in the stalk to give it firmness.

Is it possible that Silica Solonica may be occasionally

in Poland & elsewhere, by a want of the necessary amount of silex & albuminous materials to give hair its indestructibility?

If it be admitted that the abnormal state of the adult may have resulted from the previous abnormal state of the germinal membranes or embryonic layers, producing that individual, it remains next to be examined whether these hypernormal & hyponormal states of organic existence correspond with the excess or deficiency known to exist in the Geological periods, which are claimed as the analogues of the germinal membranes & their resultant systems.

To render this more intelligible, let us institute a tabular comparison between Terrestrial or Inorganic and Organic Embryonic & Fetal Existence, thus:

Comparison between Inorganic & Organic Development:

Organic.			Inorganic
Zona pellucida			Atmosphere ?
Albuminous food yolk			Water (the Oceans &c)
Early serous layer and vertebral Endoskeleton	Nervous system; Osseous " including membranes &c	typified by Early Hypogene Rocks	Ancient Volcanic Rocks; Plutonic; Metamorphic
Vascular layer	Respiratory "; Circulatory "	typified by Secondary Rocks	secondary hypogene intervening; Palaeozoic; Mesozoic
Mucous layer	Nutritive "; Reproductive "	typified by Tertiary	extinct volcanoes Tertiary hypogene; Eocene; Miocene; Pliocene; Recent volcanoes Quaternary hypogene
Products of late serous layer: exoskeleton, integument, hair teeth &c and limbs (vertebral apophyses)	(Extremities) Locomotive System; (Teeth) Dental system; Skin hair &c} Dermal system		Post Pliocene

…rm

…olk

… intermeshing of fetal vascular tufts …th maternal Blood sinuses giving …eciduous layers forms the	Placenta (This is thrown off at Fetal Separation or Birth)	typified by Drift Period	Diluvium; Alluvium

As a test of the above let us examine whether the period corresponding to the Mucous layer, aided by late serous development, gives for instance more of the normal & even an abnormal growth of

extremities.

This would be in Tertiary & Quaternary Volcanic Countries such as China, India, Buenos Ayres, Africa &c

In the first named Country families with six fingers are said to be common; in the second we have animals with greatly developed tushes & skin (pachyderms); in the third great tushes & extremities must have abounded, when the Megatherium, Dinotherium, Mastodon &c prevailed; Even now in the Chlamophorus & others we have great dermal development; in the fourth, we have the long necked Giraffes, the thick skinned elephant &c.

In Australia & New Zealand, supposed to have have typified the placenta by forming a connection between South America & Asia, in their marsupial position, we have evidence of the great tendency to an extra uterine pouch or enormous development of the nipple integument (in the Marsupialia) and have also animals forming the link between the oviparous bird & viviparous mammal (the Monotremata).

The last named Countries are chiefly of very recent formation, especially in the western part of, and even the Eastern auriferous upheavals of Australia may be late hypogene.

We might claim, in the difference of latitude, the cause of some visible variations, but surely we cannot deem it sufficient to make three fourths or more of the Mammalia, in any country, marsupials.

It seems probable, however, that these differences are greatly due, in the animal, as in the vegetable, world to the excess or deficiency of some material in the soil (or inorganic structure of that portion of the earths crust) on which they flourish in connection with other modifying causes.

Should the above inorganic differences be considered capable of producing diversity & peculiarity in the physical configuration of the and moral & mental power of the fetus, it requires but little argument to show that the individual animal, young or matured, (even whose bones are known may be colored, if fed on madder &c) should have the system modified

for health ~~&~~ strength, or for disease of certain organs, by the nature of the nourishment taken, which nourishment chiefly vegetable, must necessarily partake to a considerable extent of the inorganic materials in which it grew.

Thus the fungus-perverted rye, ergot, produces fearful epidemics affecting the nervous system; mercury, introduced & left too abundantly in the system, might cause too much of the bone & muscle-forming fibrin to slough; while some of the saline or other purgatives might purge away the mucous lining of the intestines.

The modifying materials may be in very minute quantities in our food, which renders their effects little perceptible, but yet, becoming important, when continued through a long series of years.

For instance, dogs raised near the lead furnaces (according to the testimony of Col. Kennett, the well known owner of the Shot-towers not far from St. Louis) seem to thrive well until the pups are grown & trained perhaps for hunting, but the first time they are taken out, they fall exhausted by a disease having symptom

like those of animals suffering from the so called milk-sickness, also resembling paralysis from lead poison.

Intelligent dental surgeons have informed me of the great difference they find in the perfection of the teeth in different districts of country and even between the inhabitants of town & country in the same region, which they attribute to those in the country using milk freely, which furnishes the necessary phosphates for dentine (worn), & enamel. To this probably we should add the effects of fresh air & exercise on the general health.

The africans of the Tertiary & Quarternary periods have usually very sound teeth.

Persons using water or eating seaweed (fucus) & other eatable products impregnated with Iodine, would, all other things being equal, be less liable to goitre (Bronchocele), than those residing in districts & using water totally devoid of those elements.

Thus the disease is much more common in inland snow-water drinking Switzerland (where other causes powerfully

aid) than in Great Britain, where some sea weeds are used as food & other vegetation no doubt imbibes Iodine; or in the western United States where Iodine ~~occurs~~ as well as Bromine occur not unfrequently in our springs.

For the purpose of examining this subject more minutely, I subjoin a tabular view of the chief diseases which for our purposes may be classed into those arising from excessive action & those from diminished action in any organ. I also present a tabular view of remedies arranged as they have power to increase or diminish that action.

Here it is necessary for me only to call attention for a moment to the well known fact that, after all excessive action, there is reaction or deficient energy; that therefore after too great action of the brain & nervous system, for instance, as when apoplexy takes place, deficient action or energy as Paralysis is a frequent consequent; also that many remedial agents may first incite to action, possessing stimulant & afterwards diminish that action possessing sedative, as opium &

Indeed all diseases might be resolved into abnormal action, usually at first too great + afterwards too little action of the an organ, caused generally by an inordinate circulation of material to that organ from stimulus or irritation. (Note B)

In the same manner almost all remedies might be considered either as ~~[illegible]~~ irritants, stimulants to greater action, by causing an unusual flow; or as sedatives, by causing a diminished amount of material to reach the suffering organ.

[Here please examine the large Tabular Chart which, in consequence of the small size of the Thesis-paper, is presented on a separate sheet marked Document "D" also two smaller tabular views marked Documents "E" + "F"]

By a careful examination of the Compendium of the Mortality Statistics derived from the elaborate census in the U.S. for the year 1850, it will be readily observed, (after making such allowance as to equalize the aggregate inhabitants in any two states compared, and taking only those

Note B. Thus we find even in a healthy tree agitated constantly by [illegible]

deaths of those born in the State) that the relative proportion of cerebral, & other, diseases of the organs of the head, are more frequent in northern latitudes than in southern; also that in the latter, diseases of the abdominal viscera are more frequent; while abnormal action of the lungs & heart is found to be most abundantly in Middle latitudes.

Thus compare the diseases of the extreme northern & extreme southern U. States, after equalizing the population; although the comparison would be much more satisfactory if we had minute statistics of countries further south.

In making this comparison, I have placed Alabama & New Hampshire in juxta position; New York & Louisiana; Mississippi & Vermont & finally Massachusetts & Tennessee, without any other choice in selection than the distances apart & facility of multiplying the aggregate population in one State to make it nearly equal to that of the other. In the last case, the population in each was so nearly alike as to require no multiplication or other modification.

Comparison of Diseases in N. & S. States.

Diseases of Head (cephalic) organs		of Thoracic organs		of Abdominal organs	
Apoplexy	13	Consumption	109	Dysentery	224
Brain	17	Heart	16	Bilious fever	73
Brain fever	52	Lungs	18	Jaundice	11
Head	10	Pleurisy	26	Kidneys	4
Paralysis	12	Pneumonia	340		
Insanity	3				
Suicide	1				

For practical purposes it is near enough to multiply by 2 1/3, which has accordingly been done for these cha

Apoplexy	56	Consumption	766	Dysentery	1186
Brain	35	Heart	165	Bilious fever	30
Brain fever	70	Pleurisy	11	Jaundice	9
		Pneumonia	221	Kidneys	3
Paralysis	165				
Insanity	18				
Suicide	33				

The proportions of head & lung diseases in the north is striking; but let us compare yet several more to be more certain of our results.

Comparison of St. York & Louisiana (multiplying pop. in latter state by 6)

	Cephalic		Thoracic		Abdominal	
N. York	Apoplexy	184				
pop.	Brain	93	Consumption	4531	Bilious fever	249
97,394	" fever	366	Heart	335	Kidneys	28
	Paralysis	235	Pleurisy	78	Jaundice	46
	Insanity	39	Pneumonia	1139	Dysentery	2991
	Suicide	51			Bowels	171

Fatal Diseases among those born in State, multiplied by 6 gives the following:

Louisiana	Apoplexy	200	Consumpt.	1332	Bilious fever	192
17,762	Brain	48	Heart	126	Kidneys	90 (90)
	" fever	312	Pneumonia	834	Jaundice	30 (30)
× 6 =	Paralysis	42	Pleurisy	3824	Dysentery	5246
	Insanity	18			Bowels	824
	Suicide	18				

The above result, as regards Dysentery, presents an unexpected anomaly, but may perhaps be partially accounted for by the imprudence of those residing in large cities

In N. Orleans (excluding the transient residents) the proportion of citizens is small compared

Comparison of Mississippi & Vermont (relative ag. popul. nearly as 2 to 1) thus:

	Mortality from		
diseases of Cephalic organs;	Thoracic,	Abdominal organs	
Mississippi	apoplexy 12	Consumpt 120	Bowels 64
No. popul.	Brain 12	Heart 19	Dysentery 165
66,526	" fever 13 (137)	Lungs 7	Bilious fever 44
	infl. brain 112	Pleurisy 20	Inflam. stomach 98
	Insanity 3	Pneumonia 295	Liver 18
	Paralysis 6		Jaundice 8
	Suicide 0		

In comparing diseases in Vermont the deaths are divided by 2, No. of deaths undivided, population being only half

Vt	apoplexy 11	Heart 19	Bowels 5½
	Brain 2½	Consumpt 277	Dysentery 123
Vermont	Infl. " 17 (24½)	Pleurisy 2½	Bilious fever 8
No. popul.	Brain fever 7	Pneumonia 33	Inflam. bowels 9½
291,334,120	Insanity 1	Lungs 2½	" stomach 1½
8.4	Paralysis 0		Jaundice 1
	Suicide 3½		Liver 5

The same general result is obtained, only Vermont seems less to dispose to diseases of the nerves than N. Hampshire.

As the population of Massachusetts & that of Tennessee are about equal,

Comparison of Massachusetts & Tennessee:

	Mass.	Tenn.		Mass.	Tenn.		Mass.	Tenn.
Apoplexy	64	27	Consumpt.	2548	603	Bowels	364	10
Brain	252	0	Pleurisy	37	49	Dysentery	2091	154
" fever	391 121	20 238	Pneumonia	475	296	Bilious fever	61	64
Inflam. brain	18	218	Heart	288	23	Infl. bowels	117	89
Insanity	40	1	Lungs	175	1	Liver	64	44
Paralysis	198	27				Jaundice	10	11

As a whole we perceive in Tennessee it is more healthy (that is, when disease occurs it is less fatal) than in Massachusetts; and, as before, the diseases of the head, lungs & heart prevail in the north while Bilious fever & Jaundice are comparatively more prevalent in Tennessee.

In conclusion, I desire to draw attention to two other facts: first the similarity or repetition or typical formation visible in organs at first dissimilar in appearance; and secondly to the similarity that exists between the organs & function of lower animals & the less perfect structures in man.

To prove the first fact or operation, let us compare the brain, with its two cerebral hemispheres, divided by the reduplicature of a membrane,

(the falx cerebri formed from the dura mater)
and the cerebellum, the Spinal cord nerves, with
the double lungs, partially separated by the mediastinum
(reduplicature of the pleural lining) and the double heart, nerves
and arterial, with its arteries & veins: the first set of
organs distributing the nerves, the latter the hæmal
fluid.

Even the stomach, situated between its biliary and
pancreatic organs, continued into vermicular appendages
of absorption & secretion, is not altogether unlike the
previously mentioned systems.

Perhaps even the formative fluid, accompanying
the nucleoli may typify the zona pellucida & albumen
surrounding the Embryo in ova; as well as later the
aërating fluid (air) and the albuminous exoskeleton
of the adult ostracoderm & other animal, & the
ganoinous scale of the fish, and the scaly epiderm of the
higher animals; while the granular cell-forming
yolk material, the cellular tissues with its deposition

of fatty material for sickness, accidental abstinence or long continued periodical abstinence (hibernation) and the sero-fibrin-forming blood may be compared with each other.

To prove the second fact or assertion, let us compare the homoganglionic nervous system of the Articulates with the thoracic intercostal ganglionic system in man; or the heteroganglionic nervous system of molluscs with the abdominal solar plexus; the aganglionic radial nervous filaments with the interganglionic communications of the great sympathetic, or even the insensible ~~nervous matter~~ of the brain itself with the neurine of some Radiates, the only nervous system, if they have any, of these Invertebrates: the whole being the analogues, or even homologues, of our involuntary nerves, presiding over the vegetative functions, while the voluntary are found among the vertebrates.

Again compare the lowest breathing apparatus (where the white corpuscles is simply aerated in a large cavity by contact with water in a general cavity) with man's

areolar or connective tissue with serous fluid, which permeates every interspace, as shown in emphysema when external air is admitted. In animals somewhat higher in their organization, the investing membrane furnishes the trachea with elastic spiracles; next the investing palliare or mantle (as among the Brachiopods) forms a breathing cleft, which afterwards we see in more distinct branchiæ among the dorsibranchiate and tubulibranchiate ~~annelidous~~ worms, the lamellibranchiate mollusks, the fishes and some batrachian reptiles (menobranchus &c) while the true pulmonic sack is first observable among the pulmonate Gasteropods, the pulmonic insects (viz some spiders) among some Reptiles, the Birds and the Mammalia.

In the circulatory system perhaps the white blood of some inferior animals may find its type in the chyle, destitute of red globules, which circulates through the lacteals to mingle in the left subclavian vein with the venous blood; and be, with it, sent to the right side of the heart, the equivalent perhaps of the

single auricle & ventricle found in Fishes.

The osseous system is chiefly found as an exoskeleton (the homologues of ~~of which~~ our dermal & tegumentary appendages) ~~are the homologous~~ in the lower animals, (such as the deciduous covering of the Crab &c) although we find even in the higher Radiates (the Echini) also in the Brachiopods & in some Teuthidean Cephalopods (the Cuttlefishes) the rudiments of an internal or Endoskeleton, which internal osseous system is afterwards more fully developed in the cartilaginous Fishes (sharks, sturgeons &c) and perfected in the Birds & Mammalia, with their extensive locomotive organs

Perhaps too the exacerbation of the circulating fluid (felt periodically even in health and very decidedly in intermittent and remittent pathological conditions of the human system) as well as the catamenial discharge ~~flow~~, may find their type in the periodical flow of sap in vegetation and even in the ebb

and flow of the liquid materials (on the exterior of our globe (tides) and in the interior of our earth (volcanic waves) which have modified & still modify the external crust probably at intervals of time, periodical or secular in their character. (Note C)

Much more might be added in elucidation of these subjects; but the purpose here being chiefly to call attention to these investigations, probably enough has been written to effect the desired object.

Note C. Possibly (in the same manner that electricity promotes vegetation) these volcanic electrical & magnetic forces, themselves, as well as light & heat, being only modified undulatory motion emanating from the sun, bear upon the marked secular epochs of historical importance, affecting individual & national rise, progress & decay.