Syllabus of a course of popular lectures on physiology. With an outline of the principles which govern the gradual developement of the faculties of mind and body / by Reynell Coates.

SYLLABUS

OF

A COURSE OF POPULAR LECTURES

ON

PHYSIOLOGY,

WITH AN OUTLINE OF THE PRINCIPLES WHICH GOVERN
THE GRADUAL DEVELOPEMENT

OF

THE FACULTIES OF MIND AND BODY.

BY REYNELL COATES, M.D.

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SYLLABUS.

The principal objects of this course of Lectures are, to diffuse as widely as possible throughout the community a knowledge of certain general principles connected with the developement of the animal frame, with the applicability of these principles to the every-day business of life, the promotion of health and happiness:

To limit the evils of empiricism, whether in medicine or morals, by giving such as have never devoted themselves to the study of the physical nature of man, some idea of the complexity of those vital operations which the most ignorant are ever the most ready *to regulate and amend:*

To point out the sources of certain popular errors in relation to physical and physico-moral education, social opinions, and even criminal jurisprudence:

To explain the physiological limits of certain sciences (so styled) which have attracted vast attention in recent years, but have been pushed beyond reasonable bounds by their enthusiastic advocates; and

To facilitate the studies of those individuals of either sex who wish to become acquainted with the art of promoting health and mental vigour, by giving them such broad outlines of the science of life as will render intelligible and interesting the otherwise dry and seemingly unconnected details contained in most of the popular treatises on anatomy and physiology.

As it is not the intention of the lecturer to *appear* learned, but to *be* useful, the style of most of the lectures is simple and conversational. Technicalities are carefully avoided as far as possible, and when indispensably employed, they are fully explained. The necessary illustrations, whether graphic or in the form of preparations, are provided; but, while the importance of appeals to the eye, and the avoidance of wearisome efforts of memory are duly considered, no superlative ornament is introduced, to distract the mind from the thread of the argument, or draw off the attention from the subject to the speaker.

The discourse opens with a notice of the structure and actions of the simplest living beings, and, proceeding by regular and logical gradation, terminates with the subject of human responsibilities.

The constant attendance of several large and intelligent classes, comprising at least as many ladies as gentlemen, has already given sufficient proof that this course of lectures contains nothing to alarm the most fastidious taste either in morals or delicacy.

The number of lectures constituting the course, including the Introductory, will be at least twenty; but in traversing so wide a range of subjects, orally, and guided only by short notes, it is impossible to premise the exact number.

The publication of this Syllabus, as an assistance to the memory in following the course of so long an argument, has been deemed desirable by the members of former classes, and seems equally necessary to convey an idea of the nature of the subjects discussed, which cannot be conveyed in a title.

LECTURE I.

What are the differences between a Living Body and one that is not Alive?

Apparent inactivity of bodies not endowed with life.

Real universality of motion.

The motions of external things always result from external causes—mistakes of savages and children.

Masses of inanimate matter have no parts capable of moving independently of the bodies to which they belong.

Their particles all resemble the entire mass.

Absence of the inherent power of growth in inanimate bodies.

Seeming exceptions—The alum basket—Natural crystalline ornaments of caves—Efflorescence of saltpetre resembling the growth of mosses—Impression that rocks and stones grow—Enlargement of porous bodies—Rising of bread—Chemical union—Formation of brass.

Deduction.—Living bodies convert other matter into their own nature; but chemical union destroys the identity of an inanimate body instead of enlarging it.

Suddenness of chemical changes. Slowness of vital changes. Passive character of chemical changes. Popular error in relation to the motions of the eye-stone.

Permanent duration of minerals.

Animated beings are subject, like minerals, to motions from external causes; but have *inherent, active, powers of motion.*

The power of adapting themselves to circumstances common to all living things—Habits of roots and stems of plants growing in the dark—The potatoe—Influence of light on leaves and flowers—Hedysarum gyrans—Its motion supposed to be connected with respiration—Influence of temperature on its motions—Habits of Venus's fly-trap or Dionœa muscipula.

First distinction between animate and inanimate things—the power of independent mechanical motion in the former.

EXPLANATION OF TERMS.

Necessity for a machine to produce the independent motions of living beings—APPARATUS.

Necessity of various parts in an apparatus designed to produce various effects—ORGAN.

Animated beings composed of inanimate matter drawn from external supplies.

Saracenia or Bottle-plant raised in distilled water—The air-plant.

But the matter composing a living being must be differently arranged from any kind of inanimate matter—ORGANIZATION.

Organization continues for a certain time after death—longer in some parts and in some situations than in others—Division of all matter into ORGANIC MATTER and INORGANIC MATTER.

Definition of ORGANIC REMAINS and PETRIFACTIONS—Peruvian mummies—Bodies on mountain plains and in polar ice—Siberian elephant—Fossil bones in caves—The mastodon—Coral converted into calcedony or cornelian, &c.

Many organs often combined to effect a common purpose—SYSTEM—Errors in the use of the word system.

The peculiar office or power of an organ or system is called its FUNCTION—Errors resulting from the false application of the term, a source of erroneous opinions in relation to the mind and materialism.

Parentage of all living things—Transmission of the peculiarities of the race, and even of the individual, from parent to offspring—Foundation of permanent varieties, and new races—The varieties of the apple from the original crab-apple.

Disposition of accidental races or varieties to return, if neglected, to the original condition.

The garden flower grown wild.

Nature adapts the race to circumstances—Man adapts circumstances to the race—Importance of continued culture.

Nature a foe to revolutions—Limits of the hereditary peculiarities established by culture—Fixedness of species.

LECTURE II.

Subject continued. Active Growth of Living Things compared with the Passive Growth of Inanimate Things.

Diminutive origin and slow increase of size in living things.

They never grow by adding fresh matter from without to their surface like minerals.

Apparent exceptions—Seemingly inorganic character of the outer bark of plants and the scarf-skin and its appendages (hair, horn, nails, &c.) in animals. The constant wearing and growth of these substances. The matter for their growth supplied from within the living body.

The formation of bark—The phenomena of a blister—The periodical shedding of the covering of crabs, snakes and insects—Man seems to shed his scarf-skin annually—A new cover always formed before the old is cast off—Permanent horns of cattle—Temporary horns of deer.

Other apparent exceptions—Many animals deprived of a cuticle or scarf-skin—Mucus substituted—Snails—Fresh water shells—Lymnæa—The internal surfaces of the larger animals lined with mucus, like the external surface of shell-fish—Mucous membranes—Cuticle in man descends to the stomach—Why—Cuticle a sufficient protection for man, but many animals require a harder covering—Insects—Crabs—Domestic difficulties of an oyster—Shells of shell-fish not mere houses constructed of materials collected from without, but formed of matter furnished from within the animal—Numerous shells—Curious habits of the conchologist shell.

Conclusion.—The matter for the growth of living things is exclusively furnished from *within* their proper bodies, though originally obtained exclusively from without, in the form of food.

Proofs of the internal power of growth from the history of wounds—Surprising powers of restoration in many animals—Abyssinian method of carving a beef-steak—Anecdote of a deer—Water newts when deprived of a limb can construct a new one.

Second grand distinction between living and inanimate things. The former independent in actions, but dependent on other

things for existence and support; the latter independent in their existence, but dependent in their actions.

Necessity that food should enter the bodies of living things in a liquid or gaseous state. Hence they possess the power of dissolving solids—Formation of sap and blood.

Conclusion.—Living bodies must be composed in part of solids and in part of fluids—Seeming exceptions—The vibrion—Darwin's moss.

Proofs of the control of life over chemical action—its limits.

Organised beings possess the power of constructing their own particles—Organisation of the fluids. Plants live chiefly on inorganic food; Animals on that which is organised; but this does not furnish a positive distinction between them. Birds employ lime. Manures. Doctrine of the universality of the stomach in animals.

Proofs that all parts of living things possess the power of selecting the materials of their growth from the sap or the blood, or complete the construction of their own particles—This process simple in simple animals, but more complex in others—The fluids constantly changed in character, until converted into solids—ASSIMILATION.

LECTURE III.

Integrity of the Surface in Animals—The Vital Functions all carried on under cover—Stages of Assimilation—Motive Powers, &c.

Explanation of the meaning of SURFACE, as applied in physiology—The surface of an animal or plant may be extended by art—*Illustrations*—Slit ears of Indians—Slit lips in Van Dieman's Land—Boring the ears, &c.—Surgical cases.

Both the inner and outer surfaces of living bodies being covered by a shield or envelope of cuticle or mucous membrane without any openings, how does food enter?—All membranes have the power of transmitting certain fluids—A bladder transmits alcohol much faster than water—Living membranes have a vital power of choosing or rejecting.

Explanation of ABSORPTION.

Some animals absorb by their whole surface—Nature and use of stomachs—DIGESTION, the first step in the process of assimilation—Vegetable stomachs—Dionœa muscipula—Saracenia flava—Pitcher plant—Parasitic plants.

Absorbed fluids are organised from the moment they enter the body—they supply every part with nourishment.

Hence the necessity of a CIRCULATION.

Reciprocal action of solids and fluids—DEPOSITION.

Result of deposition—NUTRITION.

Substances separated from the blood or sap by SECRETION—Examples of the secretions—Saliva, tears, the water in the leaves of saracenia, perspiration, &c.—Nutrition is a form of secretion. Perspiration, cuticle, shells, mucus, &c. are secretions.

Stages of assimilation—Digestion, absorption, circulation, nutrition, and secretion.

These vital functions being common to all organised beings, are called THE FUNCTIONS OF ORGANIC LIFE.

In order that the nutritive fluids should circulate, they must be moved by the action of the solids; and in order that the solids should act properly, they must be excited to action by the fluids—IRRITABILITY and CONTRACTILITY—these are organic functions.

Remarks on the nature of respiration—Partakes of the nature both of digestion and secretion.

Why should the same organic functions, all common to plants and animals, produce such an endless variety of beings?—Philosophical ignorance.

Distinction between animals and vegetables—Consciousness and will.

Explanation of the necessity for a constant supply of food, even after the living being has reached the highest perfection of developement. Remarks on the process by which the vital powers accomplish the cure of wounds.

Limited duration of living bodies.

The continuance of life produces inevitable death. Explanation of the reason. The perpetual increase of the solids and the diminution of their irritability and contractility, and the equally constant diminution of the fluids owing to the growth of the solids. Tendency of all living motions to ultimate rest.

Proofs of the perpetual changes of all the particles of living bodies. The death and renewal of the particles necessary to the continued life of the whole being.

Causes of the almost undiminished supply of food after maturity.

Various routes by which particles enter and leave the substance of the body—Insensible perspiration—Experiment with India rubber cloth.

Changes produced by sudden starvation—Cause of death—

Causes of continued life without food in disease—Changes from slow starvation and age.

Time changes our identity while it spares our individuality.

Change of particles most rapid in youth—Why—Hastened by exercise—Effects of too much exercise—Youth and exercise increase the demand for food—Cause of premature old age and decrepitude in over-wrought operatives—The arrest of the secretions ultimately produces death—Why?

LECTURE IV.

Recapitulation, with further Remarks on the Various Steps in the Process of Assimilation.

Every organ has its own mode of life, and its own shield or envelope—Nutritive fluid does not penetrate the substance of the organs—Hence every organ performs all the steps of the process of assimilation, like the entire animal, except respiration—Of which, also, it is capable if properly located.

Constant alternation of the particles from the solid to the fluid state, and the contrary.

Remarks on the nutritive fluid—Its simplicity in simple animals and plants—Coagulation of blood—Its various parts—Globules of blood—Globules of sap.

Definition of a living body.

Variety of results from the single cause—*Life*—not more remarkable than those from *Gravitation*.

Take leave of the vegetable kingdom.

Diffusion of life in animals.

Injuries of any important part affect the health of the whole body—But some parts easily spared—Cutting grape vines to increase fruit—Anecdote of an amputation of the wrong limb—Complex animals die if deprived of the head or heart—Girdled trees.

Power of healing wounds inversely as the complexity of an animal—Earth worm—Cooking frogs—Dog and turtle's head—The shark.

What is the greatest simplicity of structure consistent with the enjoyment of animal life?

Powers of simple living animal membrane.

It permits *digestion*—Alimentary canal of man—*Absorption*—Medicines applied to the skin, and poisoned wounds in amputated limbs. *Respiration*—Back of frogs; animals

throwing away their breathing apparatus; skin in man; effects of cleanliness; speed of race-horse. Nutrition—Proof previously given—Animal membrane constructs itself, and fulfils the circle of the vital functions.

Conditions necessary to the exercise of the functions of living membranes.

Theoretical condition of the simplest form of an animal—A sac of membrane full of a nutritive fluid, and endowed with irritability and contractility.

The simpler animals become, the more nearly they approach this condition—Remarks on Ehrenberg's discoveries—Objections to Cuvier's postulate of the necessity of nerves to animal life—Error of Lamarck in terming the simpler animals apathic—(without feeling.)

How nearly do the simplest animals approach to the theoretical stages of simplicity?—Description and demonstration of a *Medusa*, or sea-nettle.

Type of simplicity—The hydra—Description of its manners, habits, and structure—Composed of CELLULAR TISSUE—May be divided almost indefinitely, without destroying the life of the pieces. A single hydra may be transformed by art into a whole community of individuals with a common life, attached to each other in a common mass.

Cellular tissue—Found in all animals—Where?—Description—Illustrations—Inflating chickens—Consequences of wounds of the lungs.

Powers of cellular tissue. In the Hydra it fulfils all the functions of an animal; even those of *consciousness and will*—without the aid of organs. Amusing proof.

LECTURE V.

Importance of simplest Animals. Of Animals living in Communities, formed naturally into a common mass with a common vitality; Sponge, Alcyonium, Gorgonia, and Coral, composed like the Hydra, of Cellular Tissue without special organs.

This lecture, being almost exclusively demonstrative, and illustrated by impressive drawings and specimens, requires no analysis to aid the memory.

LECTURE VI.

Same subject continued. Depuration of the Ocean. Influence of the Polypi, or Zoophytes on Physical Geography.

Impurities of the ocean. Influence of rivers, coasts, &c.

Depths at which life may be maintained. Importance of light to the zoophytes.

Depuration of the waters by animals. Quarrelsome fellow-travellers on sea-weed. Sources of lime employed by the polypi of coral animals of the deep sea. Fish. Familiars of vessels and wrecks.

Polypi and other soft-bodied animals floating without support at sea; some with a community of life. *Pyrosoma;* some merely associated by community of instinct. *Salpa.* Origin of false shoals on charts. Submarine lightning.

Great length of coral reefs in the Pacific Ocean. Probable connection with the geological structure of the bottom.

Influence of coral in extending lands. Best observed around volcanic islands. Isle of France.

Circular reefs of Pacific—Are they connected with extinct craters?

New islands built by coral—Their form and progress—Introduction of fresh water—Formation of soil by marine plants—Massive sea-weed of Tristan d'Acunha—Fuci of Rhode Island—Effects of the growth and decay of lichens, mosses, and ferns—*Illustration*—The effects of the rainy season on the appearance of buildings at Calcutta—Destruction of the very ruins of ancient cities by vegetation—Vegetation aids in introducing moisture—The spring of La Pouce Mountain, in the Isle of France—Seeds of trees and shrubs introduced by birds and currents. The new island takes the form of a ring of woods and a central swamp. Becomes fitted for the residence of man. A canoe and inhabitants. Primary agriculture. Volcanic action raises mountains, and the work is complete.

The past. Lyell's Geology. Rise and fall of countries. Changes marked by organic remains. Destruction of races. Temple of Serapis in Italy.

The future. Land and sea may again change places. Man may yet owe the continuance of his species to the labours of the zoophytes. Importance of little things. Political paraphrase.

LECTURE VII.

Of the Gradual Changes that take place in the Cellular Tissue, as we advance toward the more Perfect Animals. The manner in which this Tissue effects the Movements of the Nutritive Fluid, and the first steps by which Special Organs are formed in and by this Tissue.

Cellular tissue strengthened by fibres—How formed—Its influence on the motions of fluids.

Skin thus strengthened—Not classed with fibrous membranes—Why—Its complexity in man—It answers as a substitute for a skeleton in many animals, as in medusa, shell-fish—The snail—Its connection with the shell; its firm foot. Strong adhesive powers of limpits and sea-ears.

Fibres strengthening cellular tissue sometimes capable of being stretched and retracting—Others firm and unyielding—They grow stronger by use—Growth of skin over wens, &c.—Surgical applications of the principle.

These cellular fibres exhibit the first step towards complexity of structure.

History of an animal composed of this complex cellular tissue—Physalia, or Portuguese man-of-war—Its singular manners and habits—Origin of its motive powers—Supposed spontaneous division.

Contractility in medusa—Locomotive power—Pieces swim after being cut off from it.

Universality of contractility—Experiments on the locust—Muscular contractility not essentially different from that of cellular tissue, with or without fibres—Both may be controlled by the will, and both survive in separated portions of the animal—Effects of galvanism—False doctrine of nervous fluid—Muscles not necessary to locomotion—Nerves not always necessary to stimulate muscular motion—Examples from frogs and man.

Contractility the common cause of motion in animals—Common to all, or nearly all parts of them—Cannot act without a stimulant exciting irritability—Irritability different in different parts, requiring different stimulants.

Hence all the motions of life are caused by stimulants—Folly of Grahamism.

LECTURE VIII.

Of Ciliary Movement—Tonicity—the Masticatory Apparatus—the Alimentary Canal and Muscular System.

Wide diffusion of Cilia throughout the animal chain.
Mode in which Polypi take their prey.
Motions of the gemmules of sponge; of the infusory animalcules; of pieces cut from the breathing organs of the mussel shell-fish.
Probable presence of cilia in the lungs and alimentary canal of the more perfect animals.
Cilia of certain plants—The Chara Hispida—Vegetable circulation—Ciliary movements a result of contractility.

Definition of Tone and Tonicity—a form of contractility.
The contraction of contractile parts continues for a time after the removal of the stimulant exciting it. *Illustrations.* The motion of the leaves of the Dionœa or fly-trap. Nature of fainting fits. Mexican sacrifices. This is one of the principles involved in the theory of Habit. Examples of Tonicity.
Importance of tone in promoting vital functions. Effects on absorption. Dr. Pennock's experiments on poisoned wounds. Contraction of skin after long illness. Dropsy from debility. Effects of bandages. Phenomena of sleep, diminishing tone. Late suppers. Similar condition in children growing rapidly, and in convalescence from disease. Dietetic cruelties practised on children, and false kindness shown to the sick and feeble in relation to food.

Gradually increasing complexity of the Digestive Apparatus in ascending the scale of animal organization.
Divided stomach of medusa effecting a kind of circulation.
Masticatory Apparatus. Jaws and teeth of the sea urchin, capable of breaking solid shells. (Echinus and Spantancus.) Those of insects.
Internal masticatory organs. Gizzards. Those of a shell-fish capable of grinding coral. Teeth in the stomach of the Lobster. Lining membrane of gizzards. Strength of the gizzard of the turkey, grinding needles.
Use of pebbles instead of teeth by certain birds.
The more highly organised is the food of an animal, the more simple is it digestive apparatus.

Alimentary canal of carnivorous animals. The crane. The shark. Anecdote of a shark.

Digestion slow and difficult in animals living on vegetable food. Long and complex in others. Craw of pigeons—its use. Craw of shell-fish. Four stomachs of ruminating animals. Water vessel of the camel.

Necessity for a MUSCULAR SYSTEM in complex animals.

Definition of MUSCLE. Influence of life on the strength of muscles.

Use of muscles. Muscular contractility—Muscular tonicity.

Division of the muscular system into *Voluntary Muscles*, *Involuntary Muscles*, and *Mixed Muscles*, wisdom and necessity of this division—Technical division of the muscular system into the muscles of organic life and those of animal life.

Structure, uses, and arrangement of FASCIA.

Structure of muscle and of muscular fibres—Actions—Every fibre an organ—Irregular actions—Convulsions—Cramp—Colour of muscles—Uncertainty of microscopic observations on the ultimate fibre.

Muscles are formed *in* and *by* the cellular tissue, and may be reduced to simple cellular tissue by disease or accident—Illustration from the history of fractured limbs.

LECTURE IX.

Of the Alimentary Canal and Locomotive Apparatus.

Structure of the Alimentary Canal.

Alimentary canal an extension of the skin—Its form and length—Layers of true skin—Their arrangement in the alimentary canal—Mucous coat—Fibrous coat, miscalled the nervous coat—Cutaneous muscles—Muscles of alimentary canal.

The stomach—The pylorus—Effects of over-distention from eating or drinking—Intemperance in the use of cold water—Anecdote—Remark on diet in childhood.

Connections of the alimentary canal.

Structure and arrangement of PERITONEUM or serous membrane of the abdomen.

Remarks on serous membranes—those of the chest—PLEURA, PERICARDIUM—that of the head; ARACHNOID or spider-web membrane—Accidental serous membranes—Anecdote.

Secretory glands and ducts connected with the alimentary canal—*Salivary, Bilious, &c.*—Ducts formed like the canal—Universality of the mucous and dense cellular coats—Frequency of the muscular coat.

Accidental passages similarly constructed; hence the proof that the body is every where closed with an envelope of skin, internally and externally.

Transmutation of skin into mucous membrane, and the reverse —Medicinal and injurious effects of India-rubber and oiled silk clothing—Remarks on excoriations and soft corns—Resemblance between man and a zoophyte—Uniformity of the plan of animal organization.

Locomotive Apparatus—Necessity for a solid skeleton in animals of somewhat complex structure.

Cutaneous skeletons of the radiated animals—Sea stars—Sea Eggs, &c.

Cutaneous skeletons of the annulated animals, worms, insects, &c.

Similar appearances in more complex animals, snakes, tortoises, &c.

Explanation of the necessity of an internal solid skeleton in the higher class of animals.

Osseous System of Reptiles, Fishes, Birds, Quadrupeds, and man.

Bones always soft in young animals, originally formed of cellular tissue—Gelatinous deposit—Deposit of gristle or cartilaginous matter—Bending of the bones of children—The skeletons of certain fishes, and certain parts of the human skeleton always remain flexible—Deposit of earthy matter in bone—Phosphate and carbonate of lime.

Manner in which bone is formed *in* and *by* the cellular tissue—Reticulated structure of the earthy deposit—The several deposits shown separately by art—Effects of fire and long boiling on bone—These agents leave the earthy matter alone—Acids reduce bone to the soft and flexible condition of infancy—Perfect bone may be reduced to cellular tissue by art.

Similar changes produced by disease—Brittleness of bones—Cases—Effects of cancer—A case—Flexibility of bone—Rickets, &c. common in Europe.—Why.

Generality of the law that all the organs are formed *in* and *by* the cellular tissue—Mutual convertibility of organs—Ossifications—Resemblance of the young of the more perfect animals to adult animals of lower grade—Remarks on Youth.

Structure of joints—Necessity for articular cartilages—Their structure—Synovial membranes, the serous membranes of joints—Necessity for ligaments—Their structure—Uses—Great strength.

Enveloping membrane of bone, or PERIOSTEUM—Explanation of terms PERICHONDRIUM, PERICRANIUM.

Necessity for the existence of TENDONS—Their nature, structure, uses, and singular arrangement—Further remarks on the voluntary and involuntary muscles.

LECTURE X.

The Circulation.

Recapitulation—Further remarks on the transmutations of organs.

Necessity of a circulatory apparatus—What is a BLOOD-VESSEL?—Analogy to alimentary canal—Serous coat the only essential one—Vessels of bone—Cellular coat—Muscular or fibrous coat—Vessels conveying the blood from the organs—VEINS—Vessels conveying the blood to the organs—ARTERIES—Vessels essentially composed of cellular tissue and the architects of their own structure.

Blood-vessels—Their tonicity—Philosophy of fainting—Structure of an artery—Tree-like form of the VASCULAR SYSTEMS—Direction of the current in the arteries and veins—Universal penetration of blood-vessels—*Distribution*—No vessels proper to cellular tissue—Vessels pass to every fibre of muscles—Few vessels in cartilage, ligament, tendon, and other parts approaching cellular tissue in organization—Their vessels seldom admit red blood—Vessels numerous in bone—Vessels of vessels, to supply fibrous or muscular coat, &c.

Necessity for common centres of the circulation—Centres sometimes resemble large blood-vessels—In other cases, they are concentrated into the form of hollow muscles, or HEARTS—Animals have two, three, or more hearts—Man has four—The centres and the arteries are the motors of the circulation.

Forms of CIRCULATORY APPARATUS—In perfect insects—In larvæ—In worms—Circulation in the earth-worm.

Of arterial hearts, and venous hearts—Heart of the tadpole—Use and structure of hearts.

Universal serous lining of the whole vascular system—The cavities of the blood-vessels have no direct communication with the organs of the body—All the vital functions are carried on through their coats—The vascular system a great ramified cell—The solids of the body are external to the vessels as well as to the alimentary canal.

LECTURE XI.

Of Respiration, and the Human Circulation.

Necessity for valves in blood-vessels. The valves of the arteries found only at their origin from the heart. Those of the veins seen throughout their course.

Effects of the valves of the veins on exercise and health. Effects of stature on the veins. *Varicosity.* Cold feet. Deficient nutrition. Similar injury from tight ligatures.

Explanation of the good effects of exercise on the circulation. Remarks on walking, dancing, &c. On passive exercise. Riding, swinging, sailing, a sea voyage, &c.

Philosophy of rest in disease.

History of the nature and effects of respiration. Conditions essential to respiration. Respiration in insects. *Tracheal respiration.* Respiration in spiders, certain shell-fish, and in man. *Pulmonary respiration.*

Respiration of animals permanently resident in water. *Bronchial respiration.* Varieties of bronchial organs. The glaucus. Fishes. Combat of gold and silver fish at the Capitol.

Imperfect respiration of reptiles. Circulation of blood in the tadpole and frogs.

Perfect respiration in fishes, quadrupeds, and man. Energy of organs dependent upon the activity of their nutrition, and hence, on respiration.

The most perfect animals continue to breathe by the skin. Cutaneous respiration of frogs; of man. Effects of air on wounds attributable to respiration.

Of the human respiration.

Cavity of the chest. *Bony walls.* The spine, ribs, breast-bone; collar-bone; shoulder-blade. *Fleshy walls.* Intercostal muscles, diaphragm. Muscles of the neck. Muscles of the shoulder.

Contents of the chest. The two lungs. The two pleura. The heart. The pericardium.

Structure of the lungs. Trachea. Bronchia. Air-cells. Remarks on organs of voice.

Mechanism of breathing. Practical exemplification. Condition of the air on its entrance and exit. Condition of the blood on its entrance and exit.

Evils of compression of the chest and abdomen. Remarks on errors of dress. Effects of lacing on health and on beauty.

Distortion of features. Inflammation of the eyes. Headache.

Evils of exercise in close rooms. False notions of the duty of woman.

Effects of anthracite fires on health and beauty. Means of correction.

The human heart. Man has four hearts; two venous and two arterial: The RIGHT AURICLE and the RIGHT VENTRICLE, are venous hearts. The LEFT AURICLE and the LEFT VENTRICLE are arterial hearts.

Structure of the human hearts. Their valves. Muscles of the valves.

Description of the route of circulation. Blood passes from the organs to the right auricle; from the right auricle to the right ventricle; from the right ventricle to the lungs; from the lungs to the left auricle; from the left auricle to the left ventricle; from the left ventricle to the organs.

Vessels of pure blood supplying the nourishment to the lungs and the heart itself, unconnected with the pulmonary vessels.

LECTURE XII.

Apparatus of Circulation—continued. The Absorbent System.

Position of the Heart in the Thorax.

Proximity of the gullet, the bronchia, the great vessels, the diaphragm, the stomach and the heart; hence confusion in the symptoms of disease. Importance of the stethoscope and other modern means of observation.

Effects of foul air, ill-regulated exercise and confinement on the health and intellect. Further remarks on domestic discipline, and amusements. Management of parties.—Errors of social intercourse. Little men and women.—Rowdyism. Shopping. The regulation of public amusements incumbent on the statesman. Influence of woman. Her duty to humanity superior to her obligations to fashion. Respectability is *above* fashion.

Evils of the modern method of warming rooms in cities.

Invigorating effects of cold. Alternation of seasons necessary to vigour. Remarks on hot climates, natural and artificial. Ill effects of exercise in hot apartments, and of sleeping in warm rooms.

Air may be too pure for an invalid. Illustrations—A fish in

the air—Animals in oxygen gas. Mountain and sea air in disease. Necessity of temperance in all things.

Further remarks on cutaneous respiration. Effects of swamps on consumption. Miasm. Exposure in the morning and evening. Means of preserving health in sickly districts. Choice of upper rooms in cities. Summer complaint of children. Effects of vegetation around dwellings. Blessings of taste.

Description of the ABSORBENT SYSTEM.

Influence of the veins on absorption.

In the most complex animals the food is not taken from the alimentary canal by the blood-vessels.

Intermediate system of vessels called LACTEALS. Their structure. The CHYLE. Its globules. MESENTERIC GLANDS. Their functions and structure.

Of the LYMPHATICS. Their structure and functions. Action of poisoned wounds. Bathing at sea. Food taken by other routes than the alimentary canal.

Reticulated character of all the vessels. The importance of this arrangement. Surgical illustrations. The effect of tying a large artery. Double sets of veins. Lacteals and lymphatics governed by similar laws.

Mechanism of secretion. Blood as it passes through the arteries, moves slower and slower. As it returns through the veins it flows faster and faster. Why. Effect of this fact upon nutrition and secretion. Slowness extreme in the capillaries.

Contrivances for retarding the blood in particular organs to favour secretion.

SECRETORY GLANDS. Their structure. Examples.

Structure and functions of the liver.

Multitude of organs employed in effecting simple purposes in the more complex animals.

Consequent necessity for a common bond of union or medium of intelligence between the different systems and organs. THE NERVOUS SYSTEM. Illustration—Multitude of actions concerned in digestion.

From this point it is impossible to arrange the precise extent of each particular lecture, or the exact number composing the course. The heads are therefore noted without such division.

What is a NERVE?—Its appearance and structure—Its charac-

ter in the simplest animals that have nerves—In medusa—in the earth-worm.

Origin of nervous fibres in GANGLIA.

Nervous system composed of cineritious, or gray matter, and medullary matter.

Nervous fibres all naked at their extremities, but generally enveloped in a coat of cellular membrane elsewhere, called the NEURILEMA.

Mode in which nerves form branches.

Difference of the globular structure of cineritious and medullary matter—Blood-vessels of nerves.

Functions and structure of ganglia—In the leech—In man.

Position and structure of SPINAL MARROW—Six long ganglions associated into one—Its membranes—The PIA MATER furnishing each spinal nerve with its neurilema, the serous or ARACHNOID MEMBRANE and the DURA MATER furnishing an internal periosteum to the skull and spinal canal.

Mode in which the BRAIN is formed upon the spinal marrow—Fibrous structure of the brain—arrangement of its corticle, or cineritious, and its medullary matter—Membranes of the brain—Its blood-vessels—Its cellular tissue.

Nervous system formed *in* and *by* the cellular tissue, like all other systems—It forms one complete system, though divided by physiologists into several sub-systems—Consequent reasonings upon its functions.

Nerves may re-unite after wounds, and may be transmuted like other organs.

Basis of the principal errors of Phrenology—It is unphilosophical to attribute any totally new function to the nervous system—Complexity of organization separates, perfects, or heightens the vital or animal functions, but does not add new ones—The zoophyte has all the organic powers of man, only in less degree.

What is the peculiar function of the nervous system—Nerves compared to post-roads, ganglia to distributing offices—Effects of dividing the nerves of motion—or those of feeling—Part of the nervous system from which the mind usually receives intelligence of external things.

Proofs that every nervous fibre is a distinct organ, with a distinct function—Phenomena of amputated limbs—Sensation resides in the whole fibre—Grafting a nerve—Taliacotian operation—Singular anecdote.

Of the ganglionic system of nerves, and other sub-systems—PLEXUS.

All the parts of the nervous system associated by the sympathetic nerves.

The Brain a collection of ganglia and nervous systems.

Argument to show that CONSCIOUSNESS and WILL are not the functions of any portion of the animal organization.

Review of the nervous systems, showing that consciousness and will, in their successive stages of developement, do not follow the common laws of organization—These powers *seemingly* resident in the brain exclusively, among the nobler animals.

They do not reside in the nerves of motion, of sensation, or organic life.

Proof that consciousness and will do not reside in the brain as a whole.

Question whether consciousness and will reside in any part of the brain.

Internal nerves of the brain, like other nerves, are mere media of communication.

The mind, through consciousness, receives intelligence from certain nerves. By the will, it conveys orders to distant parts through other nerves.

Effects of slicing the brain. This does not destroy the mind until it destroys life.

We have every physical reason to believe that the mind is not a function of any part of the organization, though it is placed in relation with the nervous system in the higher orders of animals, and, *in health*, obscurely, with the brain.

Folly of the mind endeavouring to comprehend itself.

Consciousness and will awakened, but not created by the nerves. Mind receives all impressions from *without*.

Two routes of communication with external things,—REVELATION and THE SENSES. The latter only belongs to Physiology. The nerves are the instruments.

Proof that the mind regards the body, and consequently the nervous system and brain, as things external to itself.

Phenomena of self-judgment. Reflective persons sometimes speak of themselves in the third person.

Phenomena of nervous fever, seeming detachment of mind and body. Anecdote of a lady. Other illustrations.

Both physics and metaphysics prove the mind not to be a part of the organization.

The obvious phenomena of mind, nevertheless, depend on the organization; because the nerves alone convey physical intelligence to, and commands from, the mind. Apparent energy and results of mind dependent upon the perfection of the organization.

Basis of rational phrenology.

On the variety of the functions of different parts of the brain.

Senses of colour, time, sequence, causality, justice, &c.—Reasons for believing them seated in the brain. Their nature.

Fundamental error of the fathers of phrenology.

Phrenology a purely physical science totally unconnected with materialism.

Notice of the discoveries of Gall and Spurtzheim.

Remarks on the cranium and brain.

Follies of the opponents of phrenology.

Value of the pretended and real objections to the art of cranioscopy.

Two neglected difficulties in cranioscopy, and their results.

Exercise developes the functions of an organ faster than its bulk; and rest diminishes power faster than size. Philosophy of habit. An organ may have a different temperament from the entire frame.

Easier to estimate the balance of the physico-mental powers of an individual than to compare one individual with another.

Preliminary remarks on the changes of physico-mental power from infancy to age, from savage life to civilization. Order of the developement of the functions. Differences of the sexes. Advance of governments. Youth of communities. Communities should provide for the proper exercise and regulation of all the physico-mental faculties, instinctive, sentimental, and rational. Consequences of neglecting this course. Eccentricity, insanity, folly, and vice.

Grand object of education. Dangers of mismanagement in infant schools.

Mutual dependence of the different systems upon each other.

Nerves cannot act without arteries, and *vice versa*. Surgical and medical illustrations.

Balance of vital powers:

Increased vital energy cannot be directed to one part without weakening others. Singular illustration. This principle applied to the mind. Repose necessary to the student.

Balance of vital powers varied in classes, races, or individuals to a certain extent. TEMPERAMENT—IDIOSYNCRASY. Effects on the constitution.

Such peculiarities hereditary. May become peculiarities of races or nations. Illustrations. Albinos; military propensity; theft.

Command of the will and personal responsibility modified, but not destroyed by these peculiarities of organization. The mind not accountable for mistakes of the senses.

Treatment of disease by counter-irritation, by blood-letting, cold, &c.; by remedies lessening the excitability of the nerves. Limits of the propriety of these modes of treatment.

Preposterous doctrines of the Thomsonians.

Amusing fundamental principles of Homœopathy.

Counter-irritation by other than medicinal means, applied to the change of temperaments and idiosyncrasies, and to the promotion of health and morals. Effects of muscular exercise on the body and mind.

Mental counter-irritation.

Vicarious actions. Vicarious actions of the nervous system.

Examination of the physiological principles involved in the explanation of the strange phenomena ridiculously referred to animal magnetism. Epilepsy, catalepsy, hysteria and somnambulism. Perception of distant objects, illustrated by the habits of animals. Seeming transfer of the mind to a relationship with portions of the nervous system distant from the brain. Criminality of the practice of what is called animal magnetism.

Phrenological distinction of the sexes.

Further remarks on the youth of society. The code of honor. Lynch law. Picture of a patriot.

Peculiarities of individual organization influencing the cognisance of external things too numerous and occult for human cognizance.

Man may judge his own motives, but cannot accurately judge those of others. Judgment belongs to a superior power.

Law shares the imperfection of the existing stage of organization. Harsh judgments of communities improper. The Mosaic and Christian law adapted to different stages of advancement.

Evils resulting from the principle of punishment in criminal law.

Rights of society. Society a great individual, and possessed, as such, of no rights but such as belong to the individual.

Application of these principles to the question of the accountability of man to society. Duties of society to supposed criminals. Pennsylvania penitentiary system adapted to a more perfect state of society than are the systems of other countries. Certain imperfections in it pointed out.

Right of society over human life. Question of war. Capital punishments in weak communities, and the military code.

Finale.