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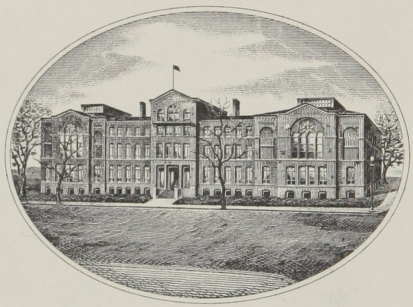

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OUTLINES

OF A

COURSE OF LECTURES

ON THE

INSTITUTES OF MEDICINE.

By CHARLES CALDWELL, M. D.

Professor of the Institutes of Medicine and Clinical Practice, in Transylvania University.

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1823.

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District of Kentucky. } sct.

BE IT REMEMBERED, That on the 1st day of September, in the year of our Lord one thousand eight hundred and twenty three, and in the forty seventh year of the Independence of the United States of America, Charles Caldwell, M. D. of the said District, hath deposited in this Office, the title of a Book, the right whereof he claims as proprietor, in the words following (to wit:)

"*Outlines of a course of lectures on the Institutes of Medicine, by Charles Caldwell, M. D. Professor of the Institutes of medicine and Clinical Practice, in Transylvania University*"

In conformity to the Act of the Congress of the United States, entitled "An act for the encouragement of learning, by securing the copies of Maps, Charts, and Books to the authors and proprietors of such copies, during the times therein mentioned," and also the act, entitled "An act supplementary to an act for the encouragement of learning by securing the copies of Maps, Charts and Books to the authors and proprietors of such copies during the times therein mentioned, and extending the benefit thereof to the arts of Designing and Engraving, and Etching historical and other prints."

JOHN H. HANNA,
Clerk of the District of Kentucky.

CH 1844 MMT

To the Pupils of the Medical Department of Transylvania University, for whose use they are chiefly intended, and to the Physicians generally of the western and southern states, these Outlines are respectfully inscribed, by their very faithful and

Obedient Servant,

THE AUTHOR.

PREFACE.

When invited, in the autumn of the year 1819, to the chair which he occupies in the medical department of Transylvania University, the author of the following Outlines had the misfortune to find *himself* without a text-book, and his *pupils* without a manual, for a course of lectures on the Institutes of medicine.

This want, which other teachers of the same branch, more fortunate, perhaps, in resources than himself, do not appear to have considered an evil incompatible with the satisfactory discharge of their duties, he had immediate reason to lament. To himself it was a subject of no little embarrassment, and to his class, a source of well founded complaint. In this state of things, the alternative presented to him was, to rest contented under the existing deficiency, until, after a lapse of years more protracted, perhaps, than his own life, the desideratum might be furnished from some other quarter, or, with as little delay as possible, endeavour to supply it by his own labours. The former expedient he deemed inconsistent alike with what he owed to himself, to his profession, and to those who expected from him instruction in medicine. To make choice of the latter, therefore, he immediately resolved, and bound himself to that effect, perhaps injudiciously, by a promise to his pupils.

That he did not carry this resolution into effect at an earlier period, will not, he trusts, be imputed to him as a fault. The delay has been occasioned by the pressure of duties of a higher order, devolved on him by arrangements essential to the establishment and permanent interests of the school of medicine of which he is a member. The transactions necessary to the performance of those duties, which compelled him, after having visited many distant parts of his own country, to make a voyage to Europe, occupied the entire intervals of time between his public lectures, for three years.

The present season is the only period of leisure he has enjoyed, since his acceptance of the appointment which brought him to the west. A portion of that he has industriously devoted to the composition and publication of this synopsis.

Although somewhat tardy, therefore, in fulfilling his engagement, he hopes he is not chargeable with the fault of having neglected it.

How far the work may meet the expectations of his pupils, for whose use it is chiefly intended, it does not belong to the author to judge. To time, the great resolver of problems, must the decision be referred.

That it presents a fuller and more comprehensive compendium of the elements of medical philosophy, than any other single volume of the *same*, or perhaps of *any dimensions*, now extant, he ventures to believe. Nor has this belief been adopted, until after a deliberate and faithful inquiry, on the result of which he is privileged to rely.

He therefore persuades himself, that the benefit of these Outlines will not be confined to his own pupils. To all students of medicine, and to most physicians who may take the trouble to consult them, and whose object is to be thoroughly versed in their profession *as a science*, they may serve as both an index and incentive to further researches, in which, without such a guide and prompter, the individuals concerned might not have engaged.

Somewhat confidently, although not, as he flatters himself, presumptuously, the author ventures further to believe, that in this synopsis will be found embraced, either expressly or by implication sufficiently obvious, every subject of real moment, that justly appertains to the Institutes of medicine. A course of lectures, then, presenting a competent exposition of it, can hardly fail to be inviting and valuable, to the youthful votaries of medical philosophy.

In what degree the lectures delivered by himself comprize such an exposition, he leaves to his pupils who have heard them to judge. He is permitted only to say, that he faithfully devotes to them the whole force of his talents, whatever it may be; and that they contain a digest of much of what he deems most valuable of the fruits of his researches, during twenty eight years of close and laborious professional study.

If, in a philosophical point of view, these Outlines and the lectures founded on them, possess any particular merit, it consists, in no small degree, in the unceasing effort which the author makes in them, to guard the subjects to which they relate, from the corrupting influence of chemistry misapplied, and the dregs of humoralism—to expurgate *the science of life* from such doctrines, true or false, as belong exclusively to *dead matter;* and to give a fuller and fairer development, than he has elsewhere seen, of the principles and

laws by which alone, whether in health or disease, all living matter is governed.

The discussions of various unsettled topics which they will tend to perpetuate, and even, perhaps, to invigorate and extend, and the many controverted views which they exhibit, whether correct or otherwise, will not be altogether useless in medicine. Science has its times of awakening and revival as well as religion; and, on such occasions, truth is elicited by intellectual conflict. *E collisione scintilla*, is applicable to every department of knowledge. Better for a writer or a teacher, whose object is to widen the boundaries of knowledge, to discuss frequently doubtful points, and even to broach occasionally startling errors, than to dole out nothing but time-beaten truisms, which, awakening no curiosity, excite no interest. In one case, truth will be roused by the conflict of opposition; in the other, she will slumber amid the calm of indifference. Hence the most distinguished and successful teachers in medicine that the world has produced, have been the most intrepid promulgators of dubious opinions and controverted doctrines. Of the truth of this, abundant evidence may be collected from the examples of Stahl and Boerhaave, Cullen and Rush.

Although often at war with sectarian tenets, and the dogmas of the schools, the author of this synopsis makes no pretension to the imposing character of a reformer in medicine. He will be permitted, however, to observe, that into the customary modes of investigating several medical subjects of great importance, reformation and improvement might be easily introduced. Nor will the case be otherwise, until physicians shall have learnt to apply more generally and rigorously than they have heretofore done, as tests of truth in their profession, those established canons of reason and common sense, without which all science is but conjecture, and religion itself the cant of fanaticism. Although, when considered in relation to former times, medical inquiries are conducted, at present, on an improved plan, they are still, or the author is greatly mistaken, marked by too much loose investigation and easy acquiescence, and too little of severe scrutiny and patient analysis. Were he to specify any one subject, which he considers more deeply obscured than others, by prejudice, superstition, and deference to authority, it would be that of contagion. It is not a little surprizing, while it is much to be lamented, that certain schemes of disjointed evidence, and processes of spurious reasoning, which, as applied to other topics, would be contemptuously rejected, are too often *here* received as conclu-

sive. In relation to this subject, an effort is made in the following pages, and the lectures explanatory of them, to designate more clearly the requisite modes of examination and research.

On the comparative merit of the Institutes, as a branch of medicine, it might be deemed unbecoming in the author to dwell. Knowing, however, that efforts have been made to depreciate them, he will observe in their behalf, that they constitute the true line of demarcation between the empirick and the methodist, the quack and the educated practitioner of medicine. Without them the profession, as a science, would be confusion and darkness, and, in a practical point of view, but little better than a scheme of chances.

They have been charged with the fault of containing more *speculative* than *practical* truths—doctrines rather to be admired for their ingenuity than esteemed for their usefulness. This accusation is self-contradictory. A truth *merely speculative* as opposed to *practical* ones, *does not exist.* When fully understood, *every truth is practical, and applicable, directly or indirectly, to some useful purpose.* That which is not practical is visionary and not true. Truth is the knowledge and interpretation of nature as she is. In every department of nature knowledge is power. Other things, therefore, being alike, he who possesses the greatest amount of truth relating to the human system, in a healthy and a diseased condition, is best qualified to preserve it in the one, rescue it from the other, and alleviate sufferings that cannot be removed.

To the intelligent reader it would be superfluous to observe, that the broken aspect, which, as a literary performance, these Outlines present, is inseparable from the nature of such a publication. Essentially crude and unfinished, as its title denotes it to be, an attempt to clothe it in polished language, or to bestow on it any of the ornaments of composition, would have been highly injudicious, if not preposterous.

The only qualities of style to be aimed at or desired, in a work of the kind, are brevity, simplicity, precision, and perspicuity. If these be attained, the author has been so far successful in all that duty required of him, or judgment and cultivated taste could approve.

Unless he find reason to alter his determination, the general arrangement of this synopsis is the same he will observe in a much larger work, which he meditates on the same branch of his profession. His views, however, in relation to that publication, will be materially influenced by the reception of the present.

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ERRATA.

Page 8, for "Infinenza," read Influenza—23, for "Animalcula Infusoria" Animalculæ infusoriæ—32, for "one" ones—33, for "frost gartles" frogs, turtles—53, for "patati" palati—87, for "Thorracic" Thoracic—93, for "resperation" respiration—97, for "produce" produces—102, for "Anastomasis" anastamosis—103, for "dilation" dilatation—110, for "mucus lacunæ" mucous lacunæ—113, for "to warm and forbid" to warm &c. —118, line 6th from the bottom, omit "there"—137, line 9th from the top, after "fœtal" read arteries—137, for "caverrosa" cavernosa.

OUTLINES

OF A COURSE OF

LECTURES,

ON THE

INSTITUTES OF MEDICINE.

DEFINITION.

By the *Institutes*, is to be understood, the Philosophy of Medicine—A branch of science consisting of an exposition of the principles and laws, necessary to be known to the physician in relation to health and disease, the preservation of the former, and the alleviation and removal of the latter.

The importance of this department in a school of medicine.

Without it, in its full extent, the school is defective.

A knowledge of it distinguishes, in a particular manner, the educated physician from the empirick.

Hitherto, not sufficiently prized in the United States.

Too little time bestowed on the teaching and study of it—This state of things undergoing a change.

Properly considered, it is the soul of the other departments—at once their light and bond of union—Without it, they would be equally lifeless and shapeless.

The Institutes of Medicine comprise the four subordinate branches of Physiology, Pathology, Therapeutics, and Hygiene. To these are added, in some schools, the principles of Medical Jurisprudence—To Hygiene belong those of Medical Police.

PHYSIOLOGY.

The science of life and of living matter, in a state of health—Treats of a vital principle—of life in the abstract—its source—its causes—its continuance—its diminution, and its renovation—of the properties and powers of *living*, as contradistinguished from *dead* matter—of the healthy functions of living matter, as contradistinguished from dis-

eased functions—of diversity of function arising from diversity of *structure* and susceptibility, no diversity of effect ever arising from unity of cause—Embraces also the results or products of these functions.

In extent and complexity, Physiology corresponds with the organization and perfection of the living beings of which it treats.

As applied to vegetables and the lower orders of animals, comparatively *simple* and limited.

As animals rise in the scale of nature, more *complex* and extensive.

In its application to man, the most complex and perfect of beings, expands to its greatest latitude, attains its utmost elevation, and assumes its most diversified and complicated shape.

For this superior elevation and extent in the human subject, indebted chiefly to *intellectual* physiology, or that of the brain and nerves—certain other animals being, in some respects, more complex in their organization than man—Examples.

Divided into *Biology*, and functional or organic physiology.

The first, (*Biology*,) in addition to the general principles of living matter, already alluded to, treats of excitability, or susceptibility to stimuli—The power of organic action—of maintaining native temperature—of preserving existence—of assuming and maintaining native form—of sympathy—and of individual reproduction.

Beginning with that process by which individual being is sustained, the functional or organic physiology of man includes the following topics.

The prehension of food.

at first, purely instinctive.

Deglutition,

at first, also instinctive.

Mastication and deglutition, subsequently.
—Processes of, and their effects.
Functions of the esophagus.
of the stomach.
of the other chylopoietic organs.
of the lacteals, and mesenteric glands.
of the receptaculum chyli and thoracic duct.

Of Sanguification.

Effects of respiration on that process.

Of the Blood.

Natural history of.
Composition of.
Life of.
Harmonies and sympathies of, with the living solids.
Sympathy of the blood with itself.
General uses and functions of.

Functions of the sanguiferous system.

Circulation of the blood.
Arterial circulation.
Capillary circulation.
Remarks on the capillary system generally.
Venous circulation.

Of Nutrition and growth.

Functions of the absorbent system.
Cutaneous absorption considered.

Functions of the glandular or secretory system.

Of excretions.

Functions of the respiratory system.

Vitalization of the blood.
Voice and speech.
Laughing and crying.
Coughing and sneezing.
Animal temperature.

Functions of the cutaneous system.
Perspiration.
Complexion, or matter of colour.
Hair.
Uses of the cuticle.

Functions of the cellular system.
of adipose substance, uses of
Functions of the muscular system.
Functions of the nervous system.
Sensation.
Voluntary motion.
of the external senses.
of internal senses.
senses of hunger and thirst.
sense *of being.*
of well-being.
of ill being.

Functions of the cerebral system.
Of a sensorium commune—remarks on.
Of the brain as the organ of the mind.
Not a simple but a compound organ.
Of the faculties of the mind, as manifested by cerebral organs.
The whole being intended as a developement of Phrenology, a defence of its leading principles, with their applicability to the science and treatment of mental diseases, and a vindication of it againt the charges of materialism, fatalism, and immorality.

Functions of the generative system.
Sexual differences.
Effects arising out of these.
Peculiarities of the male.
Testes, the chief organs.
Powerful effects of, on the general system.
Semen masculinum considered.

Peculiarities of the female.

Ovaria—the chief of her genital organs.

Effects of, on the general system.

Menstruation.

Uses of.

Not confined to the human race.

Of generation.

Various modes of,

Theories of.

Ovum, where formed.

Evolution of.

Of superfœtation.

Of the nourishment of the fœtus in utero.

Of hereditary likeness.

Of congenital marks.

Of equivocal generation.

Of the periods and progress of human life, with their effects on the system in relation to the production and the removal of disease.

Infancy.

Pueritia, (boyhood.)

Youth.

Adult age.

Decline.

Old age.

Natural death.

Dissolution—a chemical process.

PATHOLOGY.

Besides expounding the nature of disease in general, this branch treats of the causes, seats, signs, symptoms, crisis, diagnosis, prognosis and termination of diseases; with the mode of operation of their causes in producing them.

The causes of disease divided scholastically into *remote*, *predisposing*, *occasional* or *exciting*, and *proximate*. Remote and occasional causes sometimes identified.

Remote causes.

Of the atmosphere as a source of disease.

Its *sensible* qualities.

Heat.
Cold.
Dryness.
Moisture.
Vicissitudes.
Pressure or weight.
Chemical mixtures.
Mechanical mixtures.

Its *insensible* qualities.

Matter of Epidemics.

Of Influenza.
Of Scarlatina.
Of measles.
Of Pertussis.
Of Varicella, or varioloid disease.

This affection may, probably, be propagated either epidemically or by real contagion. It is, therefore placed under both heads.

Of the English sweating sickness.
Of oriental cholera morbus.
Of gastric malignant fever.
Of pneumonic malignant fever.

Matter of Endemics.

Of Intermitting and remitting fever.

Matter of Endemico-epidemics.

Of yellow or malignant bilious fever.
Of the oriental plague.
Of the Egyptian opthalmia.

Matter of Typhus fever as an intercurrent rather than an endemic or epidemic disease.

Volatile contagious matter.

Of small pox.
Of measles.
Of Varicella, or varioloid disease.

Contagious matter not volatile.

Of variola vaccina.
Of Lues venerea.
Of Psora or Itch.

Of Frambœsia or yaws,
Of Elephantiasis,
Of Plica polonica. } *

Of the saliva of a rabid animal.
Bite of an animal enraged, but not rabid.
Poison of serpents.
of other reptiles.
of Insects.

Noxious matters acting on the stomach and intestines.
Vegetable poisons.
Mineral poisons.
Worms.
Accidental and anomalous matters.
Diet and drink as sources of disease.
Unwholesome food.
An excess of food.
Food at improper times.
Water unwholesome from temperature or impurities.
An excessive use of water.
Intemperance in the use of other liquors.

*Those three are enrolled among contagious diseases rather in conformity to custom, than from a belief of the author in the correctness of the arrangement. Although not sufficiently versed in the knowledge of these complaints to decide with positiveness, he has reason to entertain doubts with regard to their being contagious.

Mechanical injuries.
Dress.
Fatigue.
Indolence.
Sleeping.
Waking.
Exercise of the intellectual faculties.
Passions and emotions.
Retained excretions.
Excessive excretions.
Peculiar occupations.
customs.
amusements.
Sexual intercourse.
Unhealthy ancestors.
Quackery, or abuse of medicines.
Unhealthy situations.
Unhealthy dwellings.
Light.
Sound.
Odours.
Lunar influence.
Solar influence, other than heat or light.
Electricity, natural or artificial.
Submersion.
Hanging by the neck.
Positions of body.
Particular kinds of exercise.
Famine.
Thirst.

*Predisposing causes.**

Natural deformities.

*Predisposition to disease is general or common, and particular or specific.

Whatever weakens the vis vitæ, and diminishes the resistance

Congenital weakness, hereditary or accidental.
Periods of life.
- Infancy.
- Childhood.
- Puberty.
- Adolescency.
- Adult age.
- Decline.
- Old age.

Different temperaments.
- General.
- Local.

Difference of sex.
Menstruation.
Pregnancy.
Parturition.
Lactation.
Cessation of menses.
Sleep.

The foregoing are natural causes. Others are artificial, viz.

Debility from fatigue.
- from want of exercise.
- from cold.
- from debauchery.
- from inanition.
- from fear.
- from want of sleep.
- from too much sleep.
- from excessive evacuations.

which living matter makes to the deleterious influence of morbific causes, creates a *common* predisposition to disease.

Predisposition to a *particular* disease results from the influence of a *specific* remote cause.

Debelity from passions of the mind.
from the influence of remote causes generally—The latter is a specific predisposition.

Exciting causes.

Whatever makes a sudden and strong impression on the system already predisposed.
A debauch.
A paroxysm of terror, or anger—or any other strong passion or emotion.
Exposure to extremes and vicissitudes of weather.
to sudden and great fatigue, &c. &c.

Proximate cause.

This being considered by many as nothing but a scholastic expression for disease itself, it has been recommended by them that it be stricken from the catalogue of causes.

On this topic our opinion is different. The *proximate cause* is not a *synonyme* for disease.

The proximate cause of fever is that original *topical affection* from which the phenomena that constitute fever arise, without which they cannot take place, and on the extinction of which they cease to exist. A correct knowledge of it, is, in a practical point of view, of infinite moment.

In etiology, then, the term *proximate* designates a reality, and ought to be retained.

Seats of disease.

These are various, according to the nature of the remote cause.

Must, of necessity, be in the solids, and are primarily in
The skin.
The stomach.
The schneiderian membrane, or

The Brain.
Shift, by sympathy, to other parts, as the
Pleura.
Peritoneum.
Intestines—different coats of.
Membranes of muscles and joints, &c.
These latter are secondary seats.

Signs of disease.

Manifested in the state of the

1. Appetite.
2. Muscular strength.
3. Temperature of the skin.
4. Sensation, as to pain.
5. Sensation, as to heat and cold.
6. External senses.
7. Spirits.
8. Eyes.
9. Countenance.
10. Respiration.
11. Positions of the body.
12. Movements.
13. Faculties of the mind.
14. Sleep—Dreams.
15. Thirst.
16. Pulse.
17. Tongue.
18. Secretions and excretions.
19. Desires and aversions.
20. Voice.

Prognosis.

Prescience of the issue of a disease, derived from existing phenomena. Its elements are,

1. Observations on the issue of similar co-existing diseases.

2. Observations on the issue of a previous similar disease in the same person.
3. Vital strength of patient, compared with the strength of the disease, as estimated by symptoms.
4. External appearance and manifestations generally, including,
5. Countenance.
6. Position and movements.
7. Condition as to tranquility.
8. Habits and disposition, compared with the same in health.
9. State of stomach.
10. State of respiration.
11. State of intellect.
12. State of abdomen as to distension—hardness—sensibility.
13. State of the tongue.
14. State of the bowels, and appearance of discharges.
15. Sleep and dreams.
16. Action of medicines, local and general.
17. State of general sensibility.

Therapeutics.

The science of *correct indication* and *prescription*.

Includes the science of medicinal substances, their modes of operating, and the parts of the system on which they act.

The various topics embraced in this branch, can be presented only in a detailed view.

Hygiene.

The art of preserving health, and the science which directs it.

Treats of the influence of

Climate.
Situation.
Exposure.

Air.
Water, or natural drink.
Food.
Artificial drinks.
Cleanliness.
Exercise.
Passions and emotions.
Intellectual operations.
Sleep.
Secretions and excretions.
Habits.
Amusements.
Contagious diseases.
Sexual intercourse.

Medical Police embraces whatever may be calculated to preserve the health of communities.

To this branch belong

The situation and arrangement of cities and towns.
Their police as to cleanliness and public amusements.
public and private burying-grounds.
good water and wholesome provisions.

The removal or destruction of rabid and dangerous animals.

The prevention of contagious diseases.
Vaccination.
Means of resuscitation from apparent death.
Signs of absolute death.

Military medical police embraces the situation and administration of hospitals and encampments, the regulation of marches, clothing, diet, drink, exercise, enlistment, personal cleanliness, and every thing that can contribute to the health of the soldier.

Forensic medicine

Treats of such morbid affections and phenomena, corporeal or mental, as may become subjects of public judicial investigation. Such are

Insanity, and mental incompetency generally:
Infanticide.
Poisoning.
Mortality of wounds.
Simulated and concealed diseases.
Hereditary diseases.
Hermophroditism.
Impotency in men.
Barrenness in women.
Signs of virginity.
defloration.
recent parturition.
Premature and protracted births.
False conceptions and monstrous births.
Evidences of hanging and drowning.

BIOLOGY.

Of the characteristicks of dead matter and of living beings.

Things are known by comparision and contrast—light, by darkness—heat, by cold—sweet, by sour—heavy, by light—white, by black—summer, by winter—virtue, by vice, &c.

In like manner, *living* best known by comparison and contrast with *dead matter—organic*, with *inorganic*.

1. Large masses of matter around us are *amorphous*, and comparatively *simple* in composition and structure.

2. Bounded by straight lines.

3. Have no mutual relationship or similitude, as to a *common mode* of origin—each formed, apparently, in a different way.

4. Nothing definite in their size or duration.

5. Have no desires, sentiments, or wants; nor any powers of resistance except their hardness or consistency.

6. If protected from accidental violence, might be unlimited in the term of their duration.

7. Their species not numerous, yet do they constitute the chief bulk of the globe we inhabit.

These masses of matter are *inorganic* and *dead*. They further differ from living matter, in the following particulars.

8. Their individuality depends on *identity of original molecules*, or constituent parts.

9. Have no cellular tissue, as the basis of their structure.

10. Have no faculties, or operative powers—have properties only.

11. Do not perish by any process of action specifically their own: i. e. going on *within themselves*.

12. Have no powers of assimilation or development within themselves—nor any interior movement produced by excitation.

13. Are subject to no *necessary* waste, or loss of parts, and have no power of *self-restoration*.

14. Have no *sympathy* of parts.

15. Not influenced by habit.

16. Not modified by climate.

17. Are marked by no regular progression through various stages of existence—infancy—youth—prime—old age.

18. May consist of only one kind, or form of matter—solid, fluid, or aeriform; ponderable or imponderable—not necessarily compound.

19. Are not so formed, as to serve as organs, or instruments of specific action.

20. Are held together by *chemical* or *mechanical* attraction only—susceptible only of chemical or mechanical agency.

21. Their species not changed by change of figure.

22. Interior motion in them not necessary to entire and healthy existence.

23. Growth in them is accidental, unlimited, and by deposition or aggregation *from without—stratum super-stratum.*

24. In their growth, there is no change or assimilation of augmenting materials.

25. No nourishment necessary to maintain their size.

26. Made for the use of living matter.

27. Not begotten and born.

28. Cannot die.

29. Do not propagate.

30. Do not require atmospheric air for their subsistence.

31. *Diminished* in size by friction.

32. Not fitted to be recipients of mind.

Of living beings.

Amount of *living*, compared to that of *dead* matter, very small.

Living beings, however dissimilar in some respects, have strong resemblances in others.

The following distinctive characteristics in them, worthy of notice.

1. An insulated *totality* of phenomena exhibited by them, called vital.
2. They are bounded by curved lines.
3. Repair their individual losses, and propagate their likeness.
4. Derive nourishment from surrounding dead matter.
5. Form for themselves the substances of which they consist, and the matters they secrete.
6. Grow or develop themselves from *within*, and acquire, each species, a definite size.
7. Their individuality consists in identity of the *union* and *condition* of the molecules composing them; not in identity of the *molecules themselves.*

8. Are heterogeneous in composition and organization—consist necessarily of ponderable and imponderable matter—Their ponderable portion necessarily solids containing and fluids contained—cellular tissue the basis of their structure.
9. Have interior movements, the result of stimulation.
10. Have wants to satisfy.
11. Change and assimilate the substances by which they satisfy these wants, and augment their bulk.
12. Experience losses and effect reparations unequal in amount.
13. Hence perpetual changes in size, from infancy to *adult*, and from that to *old* age—and ultimately to dissolution.
14. Effect, for a time, from *within*, developments in all their parts. These developments constitute growth.
15. Analogous in their origin and end, springing from living beings like themselves—are born and die.
16. Are influenced by habit.
17. Are modified by climate.
18. Possess faculties or powers of action. These faculties are *common* or *specific*.
19. Their term, and amount of growth, and their duration, definite—Die necessarily from their interior action.
20. Varied in figure greatly beyond dead matter.
21. Their form adapted to specific ends.
22. Identity of figure necessary in them to identity of species.
23. Parts sympathize with each other, and thus, for health, depend on each other.
24. Held together by vital attraction—at least owe their strength to it—Examples.
25. Resist destruction with a power surpassing that of their mechanical hardness or consistency. Illustrations.

27. Repair their injuries by an interior process.
28. Require atmospheric air for their existence.
29. By exercise and friction are augmented in size—Examples.
30. Interior action necessary to their healthy existence.
31. Not the recipients of chemical action—alone susceptible of stimulation, and necessarily so.
32. Made to appropriate dead matter to their wants and uses.
33. The recipients of mind, and sympathize with it.

From the foregoing considera'ions it appears, that, in the principles and laws by which they are governed, and on which their phenomena depend, living and dead matter do not mutually interlock—Each stands insulated, and is separated from the other, by lines of demarcation distinct and broad—The laws and principles of the one cannot be applied to the solution of the phenomena appertaining to the other. The attempt at such application is a most prolific source of error.

Fundamental attributes of living matter, on which its operations and functions depend.

1. A power of self-preservation. Examples.
2. A temperature-preserving power. Examples.
3. Excitability, or a capability of being excited by stimulants—Illustration and application.
4. Sensibility, or capability to feel—Illustration and application.
5. A capability of co-operating in the acts of the mind. Illustration.
6. The attribute of sympathy.

Contractility and *tonicity*, not perhaps in the strict sense of the term, vital properties, but rather such as result from organization or structure.

Of Life—Wherein it consists.

A legitimate object of physiological research.

Theories of.

1. Of a vital principle.

Definition of.

A belief in the existence of, very ancient, and entertained by the most distinguished individuals.

Objection.

Do not, say some, know the nature of this principle; and should not therefore indulge in speculations respecting it.

Answer. True—Nor do we know any thing of the *nature* of caloric—of light—of electricity—of magnetism—of gravitation—of mind—of variolous matter—nor even of common matter.

The real *nature or essence* of all things lies beyond the depth of human research.

Must not, *therefore*, decline all inquiry touching their existence, their effects, and their laws.

Gravitation and light, illustrated by Newton.

Electricity, by Franklin.

Mind, by Locke, and others.

Caloric, by Black, &c.—although the *nature* of those agents were unknown to them.

In like manner, may we ascertain the existence and laws of a vital principle, while ignorant of its nature.

To shrink from difficult investigations, merely *because* they are difficult, is the part of intellectual indolence or cowardice.

By such delinquency no progress will ever be made in the science of nature.

To give the subject a fair trial, let us first examine the theories of those who attempt to account for life, without the aid of a vital principle.

I. Life, say some, is the result of organization.

Objections. Blood, not organized, yet possessed of life.

Rudiments of the embryo, as they escape from the ovarium, not organized, yet living—at least we have no ground to believe them organized.

Life is the cause of organization, and cannot, therefore, be its effect.

Organization never appears where life has not pre-existed.

Death and disorganization not synonymous terms.

In many instances, the former occurs without the latter.

Organization the mere instrument of vital action, not its source.

II. Life, say others, consists in the *totality* of the *living* functions—the life of any being in the totality of such functions of that being.

Objection. If one organ cannot give life, neither can a number.

Were life the result of mere organization, then would there be as many kinds of life as there are of organization, it being a physical axiom, that the operation of a specific cause produces necessarily a specific effect and no other—and were it the result of a totality of functions, then, for a similar reason, would there be as many kinds of life as there are of gradations in the animal and the vegetable kingdoms.

Life, the spring and source of all the functions of the body—as much so, as the mainspring is of the movements of a watch—and cannot, therefore, be their effect.

An inversion this of the order and relations of nature.

Might as well say that the steam which moves the engine is the effect of the movement it produces.

Mere organization has no more influence in *giving* life, than the construction of an engine has in producing the steam which puts it in motion.

Steam is the life, the organic structure vitalized and movedby it.

III. Life, say the Brunonians, is a *forced state*—the result of the application of stimuli to organized matter—*Without such application, life cannot exist.*

The lowest grade of life, say they, implies motion.

The highest, *motion, sensation,* and *thought.*

Objection. Life, like caloric, exists in two states, *active* and *quiescent.*

To the *former*, stimuli are essential; to the *latter*, not—yet is *quiescent*, as real life, as *active.*

Instances of active life present themselves in the summer state of vegetables; and in that condition of animals where all their functions are in play.

Examples of quiescent life appear in

1. The seeds of vegetables, before germination.
2. The eggs of animals before incubation.
3. Vegetables, during the winter season.
4. Hybernating animals.
5. Animals inhumated for ages, yet still living—such as toads, frogs, serpents and insects.
6. Animalcula infusoria.

Secure torpid, inhumated animals from the impression of stimuli, and their life will be perpetual.

IV. *Chemical theory of life.*

Next, perhaps, in popularity to the Brunonian; and, if possible, still more erroneous and preposterous.

Chemistry, a science most signally delusive.

Instances of this, in the search after the philosopher's stone, the elixir vitæ, the panacea, &c.

No less so in its application to physiology.

Instances—*Thought* declared by a European chemist to be the result of a chemical process.

By a writer, in our own country, the practicability of "*chrystallizing a man*," by a certain chemical process, openly asserted.

Anecdote of two lovers, one a chemist, the other a barrister, with its result.

Others embrace a half-way doctrine, and allege that *certain functions* only are of a chemical character—viz. digestion, respiration, secretion, absorption.

Objection. If life be chemical, man is degraded to the level of a laboratory.

Theory analyzed.

Chemistry defined.

Is a *circumscribed*, because it is purely an *experimental* science.

Has effected certain things, and nothing more.

Chemists not authorized in asserting a power to achieve beyond what they actually have achieved—Must not thus speculate *in advance*, and call their speculations *science*—They are *loose conjectures*, and nothing more—Because they have made *glass*, must not therefore, declare that they can make a *diamond*—nor assume the power to make living vegetables or animals, because they have constructed the *arbor Dianæ*.

Because, by chemistry *many* changes are effected in the decomposition and recomposition of matter, must not, *therefore*, declare that *all* are.

This is to limit the powers and means of nature, and even to allege that she produces a plurality of effects, by a unity of cause—a doctrine wholly untenable.

Always produces specific effects by specific causes.

Chemistry cannot produce results, without the presence and use of the requisite materials, *in a formal state*. Illustrations.

Carbon, the basis of the food of herbivorous animals.

Azote the basis of the food of carnivorous animals.

Yet has the ox more azote in his muscular substance than the tiger or the wolf—more also than man.

Keeping in view the foregoing principles, proceed to examine chemical physiology.

Chemistry is not only unable to make an animal, or a vegetable; but cannot perform even the simplest animal function.

Digestion.

Chemistry cannot, out of an alimentary mass, form chyme.

Out of chyme, cannot form chyle.

Out of chyle, cannot form blood.

Hence, totally incapable of what may be termed, the *vital liquefying process*.

Of the *solidifying*, equally incapable.

Out of blood, cannot form either muscle, fat, skin, hair, feathers, or bone—from a homogeneous *fluid* cannot produce a variety of heterogeneous *solids*.

The same blood which forms *bone*, forms also *brain*—the complicated and exquisite organ of the mind—Chemistry cannot direct this.

Doctrine of *chemical secretion* equally unfounded.

Most secreted fluids—urine—gastric liquor—saliva—matter of perspiration—pancreatic juice—semen masculinum—come from the arterial blood.

Of these, chemistry cannot form even the simplest.

They are the result of *vital organic*, not of *chemical* action.

From a *homogeneous* fluid, the blood, chemistry cannot form so many other fluids, essentially different from each other.

Absorption, in part also a liquefying process, cannot be performed by chemical means—Does not go on by capillary attraction.

Bone, muscle, fat, skin, &c. cannot, by chemistry, be converted into lymph.

Absorbents said to make this mutation by means of a certain solvent.

Objections. Altogether hypothetical—no such solvent ever discovered.

Were solvents the means of mutation, there must be many of them—one for bone—another for fat—another for muscle, &c.

Further objections.

Chemical formations, *angular*—Vital ones, *circular* or oval—bounded at least by curved lines.

To form compound bodies, chemistry requires the simples in a formal state—Examples.

The vital powers do not. Examples.

Chemical growth altogether *ab externo*.

Vital growth *ab interno*.

Chemistry works with fluids alone.

Vitality with solids and fluids—but most with the former.

Perpetual motion of the fluids, fatal to chemical agency—To healthy vital processes essential.

Putrefaction a predominant chemical process.

In warm blooded animals, the temperature most favourable to it, yet does it never occur, during life, either in vegetables or animals—Vitality the most potent of antiseptics.

No sooner has life forsaken organized matter, than chemistry invades it—not before.

Chemical action destroys muscular strength and substance—*Vital*, preserves and augments them.

Vital action builds up organic matter; *chemical*, pulls it down.

Living matter presents innumerable phenomena, to the production of which chemistry is unequal.

All vegetable and animal odours, the product of vital organic action—formed from sap and blood—Chemical action can produce none of them.

V. *My own views of Life, and of the existence, source, and operations of a vital principle.*

In an enquiry like the present, *absolute certainty* is not to be attained—our aim must be, *probability*, in the highest degree—Opinion will necessarily be mingled with fact, and must be received for as much as it may be considered worth. In such an investigation, where certainty is not attainable, strong probability to be regarded as science.

Life, in all beings, whether vegetable or animal, the same—Illustrations and proofs.

The difference in its phenomena, or modes of manifesting itself, arises from a corresponding difference in organization and susceptibility.

Of the nature of the vital principle.

It must be either *matter*, *spirit*, or an *influence* neither material nor spiritual.

Of no other kind of essence, can we even conceive.

Of such an *influence* can have no conception.

Idle, therefore, to speak of it.

For all purposes of science, a perfect nullity.

Vital principle, not spirit, else must the lowest vegetable be a being partaking of spirituality, as really as man.

Such an opinion, too gross to be admitted.

By fair inference, then, must be material, and may be fitly denominated *materia vitæ*.

Under this view, the theory assumes substance and shape—can be approached, handled, and better understood.

As a further preliminary, the character of matter in general to be considered, and its gradations marked.

First division of matter, into *simple* and *compound*.

Second, into *ponderable* and *imponderable*.

Gradations of *ponderable* matter, in relation to its powers of action.

1. Solid matter, in the form of earth, rock, or otherwise, amorphous, and apparently motionless—Its grade low.
2. Liquid matter—Water, more subtle, elevated, and efficient.
3. Vapourous matter—clouds, mists—more active.
4. Aeriform matter—various—atmospheric air, &c., of activity and power still superior.

Imponderable.

1. Light—Peculiar—belongs, in common, to this and other worlds—Its importance in the economy of nature—An internuncio between distant spheres.
2. Caloric.
3. Electricity.
4. Magnetism.
5. Gravitation.

Can matter, as such, act?—Yes.

All the foregoing kinds of imponderable matter, active *per se*.

So is all matter.

The *vis inertiæ* of matter, although asserted by the schools, disavowed by nature, and contrary to fact.

Matter more energetic and diversified in action, in proportion as it is more subtle.

The imponderable, therefore, most powerful.

Examples.

All ponderable matter gravitates, which implies action.

Illustration.

Water highly operative in the economy of nature—Indebted for this to imponderable fluids.

Illustration.

Electricity, in its agency powerful and extensive.

Illustration.

Light in the range of its operations, vast, magnificent, and splendid, beyond most other known descriptions of matter.

Illustrations.

Caloric more powerful still, in relation to the economy of this globe.

Illustrations.

Gravitation, in its action, all but omnipotent.

Holds together the material universe.

Illustrations.

Hence, to the imponderable fluids all other kinds of terrestrial matter owe their chief action and efficacy.

But not to the imponderable fluids heretofore mentioned.

Living organized matter, by far the most important kind on earth, is indebted for its action to something else.

Still, however, to an imponderable fluid—But to one of singular powers.

The insulated character of living matter illustrated.

Cannot, then, receive its powers of action from either caloric, light, electricity, magnetism, or gravitation, or all of them.

Receives them from a kind of matter altogether *sui generis*, fitly denominated *materia vitæ*, or the vital principle.

This principle common to vegetables and animals.

Must, therefore, be matter.

How prove the existence of a vital principle?

Answer. From its *effects*—precisely as the existence of caloric, electricity, and magnetism is proved.

Neither of these *in themselves* cognizable to our senses.

We feel warmth, see ice melt, and water boil, and attribute the phenomena to caloric.

We feel a shock from a Leyden vial, or see a flash

from a thunder-cloud, and ascribe the phenomena to electricity.

We behold the needle pointing to the north, and attribute its polarity to magnetism.

Similar remarks may be applied to the matter of smallpox, measles, influenza, and bilious fever.

In like manner, we witness the phenomena of living matter, and ascribe them to a materia vitæ, or vital principle.

To act philosophically, must attribute them to something.

But to nothing else, except a vital principle, can we rationally refer them.

Illustrations of this.

What is the nature of this principle?

Answer. Unknown.

How does it act?

Answer. Unites, not chemically, but vitally, to the elementary parts of living matter, properly proportioned and organized, and gives them life.

What are these elementary parts?

Answer. Oxygen, hydrogen, carbon, and azote.

Illustrations of this.

Compound and organize these elements, and unite with them the vital principle, and the result will be living matter.

Illustrations of this.

The vital principle, whence derived?

Answer. Primitively from parental influence, and afterwards from without.

Analogous to nutrition—first from the mother—then from aliment received from without.

Expenditure of vital principle constant—constant acquisition requisite.

This acquisition from the atmosphere, the great

magazine of this principle, through the medium of respiration.

Gives life to the blood, which communicates the same to the whole body.

Thus considered, the doctrine of life tangible and intelligible.

We are told of a "primordial principle"—derived from parents—to last from the commencement of life until death, without renovation—and to be communicated to posterity, while man shall endure.

This hypothesis inconceivable and absurd—lost in the vortex of infinitesimals.

The same with the *inexhaustible* Brunonian excitability.

Plants and inferior animals produce offspring innumerable, each as vital and vigourous as the parent.

By this, the parent's vigour not diminished.

Such could not be the case, did the parent give away a portion of life, without any renovation of it.

An acorn produces an oak, which lasts a thousand years, giving birth to *millions of acorns*, each as vigourous as the *parental one*.

Did the *latter* alone contain as much vitality as all the former? and did the parent-acorn contain as much life as the whole tree which sprang from it?

An affirmative reply quite preposterous.

Each plant and animal has access to a magazine of life, on which it constantly draws to supply its expenditures.

Without such an arrangement, impossible for active life to go on.

Inhabitants of ocean, how supplied with air—storms and tempests minister to this.

Oxygen not the materia vitæ, but appears to be, in

some way, connected with it—Does not itself enter the system.

Adult animals have a much higher aggregate amount of excitability than infantile one—more organs developed—particularly the generative system—Have also more ample replenishing powers.

Irritability, its laws and application to the philosophy and treatment of diseases.

General remarks.

Definition of irritability.

A fundamental and most important property of living matter.

The source of action in automatic or organic life.

The discovery of, and its assignment as the cause of muscular motion, erroneously attributed to Haller—Hence called the *vis insita of Haller.*

Both belong to Glysson, who was anterior to Haller.

Glysson's work "On the stomach and intestines."

The author there discriminates between *irritability* and the *nervous energy.*

Ascribes to the former the action of the heart and arteries, and the peristaltic motion of the intestines.

Also the convulsive movement of muscles excited by the application of irritants, and

The action of muscles during sleep, when sensibility is suspended.

Haller extended and confirmed the theory of Glysson, and gave it currency by the weight of his character.

Theory opposed by Whytt, and others.

Contrary to all evidence, the muscle was said to *feel* the stimulus acting on it.

That whether the stimulus were applied to the muscle or the nerves leading to it, contraction alike ensued.

1. Increase the sensibility of a part by inflammation, or sanguineous congestion of any kind, you increase its irritability also.

Illustrations.

2. We are sensible of the impressions which throw into action the muscles of *involuntary* motion, such as, the stomach, bladder, diaphragm, intestines, &c.

In opposition to this, it was said that we are not sensible of the impression that moves the heart; and it was asked, whence is it, that, in frost gurtles, newts, &c. the muscles continue to contract long after decollation, which must necessarily destroy the *nervous* influence?

To this question it was again replied, that in these cases, the *vis nervosa* is slowly expended, and that contraction goes on while any of it remains.

The controversy touching the *vis insita* and *vis nervosa*, cannot be determined by examining the structure and economy of *perfect animals*.

Illustrations of this.

But by a suitable attention to those of the lower orders of living beings, it may.

It may thus be made to appear, that in beings destitute of brain and nerves, both *irritability* and *a power of motion* exist.

Vegetable kingdom.

Stamina of the Berberis communis,
Leaves of the Averrhoa carambola
Mimosa pudica.
Dionea muscipula.
} Illustrate.

Hedysarum gyrans, acted on by sunbeams.

Oxalis sensitiva, onoelia sensibilis, drosera rotundifolia and longifolia, &c. Explain.

In these instances, irritability and a power of motion exist without nervous matter.

Animals of a low order.

Animalculæ infusoriæ, hydatids, polypi, &c. have neither brain nor nerves, yet are irritable, and move.

Animals more perfect.

In these, sensibility, irritability, and the power of motion, not, in every part, in proportion to each other. Were they all dependent on the *vis nervosa*, the case would be otherwise.

The heart deficient in sensibility, but possessed of great irritability, and facility of motion.

Illustration.

The same true of the iris—Illustration.

Also of muscles generally, which, very irritable, are but moderately sensitive.

In paralytic limbs, the *vis nervosa* is wanting, while the *vis insita* continues.

From the foregoing it appears, that the properties of sensibility and irritability are distinct from, and independent of each other.

All irritable parts of living matter supposed to be muscular.

Incorrect—Vegetables have no muscles, yet are irritable—Eggs the same—blood the same.

In animalculæ infusoriæ and polypi, no muscles discovered—Illustrations.

Even in the higher orders of animals, the iris exceedingly irritable, yet not muscular.

Laws of irritability.

1. After every action, in irritable matter, a state of rest, or cessation from action, must ensue.

Illustrations.

2. Every irritable part has a certain amount of irritability which is natural to it, a portion of which it loses during its action.

3. By a process not well understood, it regains, during repose, the portion it has lost.

The different states of irritability expressed by the terms, *redundance* and *deficiency*. Illustrations.

4. While the excitability of a part is becoming diminished, there *usually* occurs an increase in its excitement.

To this law exceptions exist. Illustrated by the action of

Electricity,
Ardent spirits,
Opium,
Laurel water,
The juice of the *cerbera ahovai*.
Illustrations of these.

Stimulation supposed to wear out excitability.

Incorrect—It is the *action* of the part that exhausts its excitability.

A part attempts to act with a force proportioned to the strength of the stimulus applied, and the suitability of the stimulus to its susceptibility of impression.

5. Each irritable part has stimuli peculiarly appropriated to its susceptibility, calculated to support its natural action.

In relation to this topic, animals to be considered in a twofold point of view.

First. Each irritable part—heart—stomach—gall—bladder—arteries—absorbents, &c. a *distinct* irritable organ, acted on by stimuli salutary to itself, but deleterious if applied to any other part. Illustrations.

Hence the truth of the doctrine of specific stimuli, and the absurdity of that of medicating the blood.

Illustration and practical application.

Secondly. All these parts are so connected by sympathy, as to form a system, in which the action of each stimulus on its own organ, proves salutary to every other organ individually and to the whole.

Illustrations.

6. Each irritable part differs from the rest, in the amount of the irritability it possesses; and perhaps in its power to retain, and its capacity to receive it.

Illustrations drawn from

Muscles of voluntary motion.

Heart and intestines.

Bladder of urine.

Uterus.

7. Stimuli produce action in proportion to their irritating power—A practical principle of great importance—Illustrations. Exceptions drawn from peculiar susceptibility.

8. The action of every stimulus is in an inverse ratio to the frequency of its application. An important practical principle.

Illustrations.

Law in relation to

Cathartics.

Ardent Spirits.

Opium.

Arsenic.

Corrosive sublimate.

Tobacco.

Irritability dormant to one stimulus, awake to another of the same, or even inferior strength. A principle in practice highly important.

9. A part is susceptible of being acted on, in proportion to the accumulation of its irritability. Another principle important in practice. Illustrations.

Famine.

Great abstinence.

Exposure to cold.

Convalescence.

10. Withhold stimuli too long, the process by which irritability is maintained, weakened at first, is ultimately lost.

This true of the more perfect animals—not of the less perfect.

Cause of irritability.

Girtanner's theory of oxygen.

Unfounded and futile.

That of Beddoes the same.

The vital principle, derived from the atmosphere, by the blood, and lodged in parts suitably organized, appears to be the cause.

Sensibility—Existence and laws of.

General remarks.

The power of intellection, which belongs to the brain as connected with the mind, excepted, sensibility is the highest property of living matter.

That property by which we maintain our chief intercourse with exterior nature, and recognize certain impressions *within* our bodies.

Called by a late writer *the faculty of relation.*

Sensation, a function dependent on sensibility—the exercise of sensibility—or rather the act of exercising it.

Sensation supposed to require a *sensorium commune*—requires the existence of mind.

Sensation, perception, and consciousness must coexist —Illustration.

In sensation four things to be considered, the impression made on the nerves, the conveyance of this impression to the brain, or something tantamount to a brain.

the impression on the brain, and its perception by the mind. Sensation—perception—consciousness—necessarily allied.

I. Sensibility improved and rendered more exquisite by exercising it. Illustrations.

Touch.
Vision.
Hearing.
Taste.
Smelling.

In cultivating and improving sensibility, make not the impressions on the nerves too strong. Illustrations.

II. All stimuli which augment vascular action, heighten sensibility.

In the process, sensibility and irritability gradually exhausted. Illustrations.

III. Diminish nervous stimuli, and continue arterial action, nervous fluid and consequently sensibility, augmented. Illustrations.

Theory of sensation.

Dependent on vibration or some kind of motion of solid matter, or on a nervous fluid.

Vibration cannot be the cause.

To vibrate, a body must be

1. Elastic—nerves not so.
2. Tense—nerves not.
3. Free from contact with other solid bodies in the part that vibrates—nerves not.

Nerves, then, have no quality of vibrating bodies.

Existence of a nervous fluid probable.

This fluid imponderable.

Requires no tubes for its movements, any more than electricity, or other imponderables.

Want of tubularity in the nerves, then, no objection to the existence of a nervous fluid.

Nervous fluid probably the same with the vital principle, and that of irritability.

Modified in its action by the peculiar character of nervous matter, and the tissue or structure to which it is attached.

Identity of the vis insita, and the vis nervosa.

Feel with our nerves, and move our muscles, by means of the same principle.

Remarks.

Theory of sensation by Darwin.

Sensibility greatly varied—in degree—and in kind—Causes of this—and the importance of the knowledge of it, in the practice of medicine.

I. IN DEGREE—Varied in this respect by

age,
sex,
temperament,
climate,
condition of body as to strength, debility, &c.
state of society,
idiosyncrasy,
health and disease,
difference of tissue and structure in different parts of the body,
This, a most fertile source of difference in sensibility.
Illustrations.

Comparative sensibility of the
brain.
nerves arising immediately from the brain.
nerves arising from ganglions.
of the skin.
of mucous tissues.
of membranes secreting marrow.
of fibrous structures—tendons, &c.

of the muscular tissue.
of muscular structures subservient to the process of assimilation.
of glands.
of arteries.
of veins.
of the absorbents.
of the serous tissue.
of cellular tissue, bones and cartilages.
of the nails and hair.

II. In Kind.

Sensibility varied in this respect by difference of structure in the various parts of the body.

Most varied by that variety of structure which constitutes the organs of the

External senses.

These are five in number—seeing, hearing, tasting, smelling, and feeling.

Constitute our *faculties of relation*, connecting us with external nature.

The inlets to knowledge—without them the intellect would be a blank—convey food to the mind.

Modified by age—all imperfect at birth.

Taste and smell developed first, because first necessary to the economy of the system.

Touch, vision and hearing developed afterwards, as they become necessary.

Decay in reversed order, seeing and hearing declining first—taste and smell, last—touch, less regular in its decay.

Origin and termination of the nerves—remarks on.

Nerves of sense and of voluntary motion—remarks on—analogous, perhaps, to arteries and veins.

External senses—Why divided into *five?*

Illustration derived from irritative parts.

For the structure of their organs, and their general mechanism, must refer to the professor of Anatomy, and to anatomical and physiological works.

Shall treat only of their philosophy.

Their final causes.

Their adaptation to the properties of matter.

Illustrations.

Can the same nerve convey to the brain two or more distinct impressions, at the same time? Question discussed.

External senses analagous to each other.

1. In their reception of impressions.
2. In their mode of acting on the mind.

Their nerves receive and convey to the brain the figures of impression of the bodies that act on them.

Figure of impression defined.

Of these bodies thus acting on the nerves of sense, some are *proximate*, others *remote*.

Proximate bodies act on the senses of tasting, smelling,* and feeling.

Remote ones on those of vision and hearing.

To these latter, the figures of impression are conveyed by light and air.

The bodies affect the organs of sense by means of these figures.

Nervous impression, what?

Cerebral impression, what?

The senses differ from each other.

1. Each of them impressed by specific bodies, which produce no effect on the others. Illustrations.
2. The same body does not produce the same sensation in any two of them. Illustrations.

*Through the sense of smelling, we receive impressions from bodies that, *en masse*, are somewhat remote. But actual emanations from those bodies, which once constituted a part of them, come into contact with the olfactory nerve.

Causes of this.

Feeling, seated in the nerves of the skin generally.

Differs in intensity in different places.

Divided into *tact* and *touch*.

The latter, of the highest order—its seat in the ends of the fingers.

The former diffused over the skin generally.

Its sensations may be classed. Illustrations.

Touch capable of great cultivation.

Importance of *feeling* illustrated.

Taste—excited by matters soluble in the saliva.

Its sensations may be classed. Illustrations.

Smell—excited by volatile substances coming into contact with the olfactory nerves.

Its sensations very various, but cannot be classed.

No two of them precisely alike. Illustrations.

Taste and smell the least valuable of the senses to man—yet productive of great pleasure, and no inconsiderable advantage.

To inferior animals they are all important.

Hearing—more complex in its nature.

Founded, in part, on the elasticity of bodies.

Sounding body vibrates.

Vibrations of the body do not reach the ear.

Conveyed to it by the air, to which they are communicated.

Hence the presence of air essential to sound.

No body sounds in vacuo.

A series of bodies acted on by the vibrations before they reach the auditory nerve. Illustration.

All elastic bodies—solid, fluid, and aeriform—convey sound.

Practical illustration.

A body, when sounding, has two distinct kinds of movement.

One, common, mechanical, and coarse; the other peculiar and more refined—that specific derangement of its particles which produces the figure of impression.

The first gives to the air an agitation, which is felt by the common nerves of the skin—its violence may even rupture the membrana tympani.

The other impresses the auditory nerve alone—gives to the air no propulsive movement—Hence does not agitate the lightest matters—smoke—flame—vapour—Propulsive movement disturbs these.

Mere mechanical motion cannot produce sound, else would inelastic bodies be sonorous.

Movement of air from mechanical propulsion retarded and checked by a current of wind—The movement of sound no wind can stay.

Intensity of sound proportioned to the intensity with which the figure of impression strikes the ear—proportioned, therefore, to the force of the oscillatory motion.

Theory of sound.

Figure of impression specific—distinguish bodies, therefore, by their sound—Illustration.

VISION.

To understand this sense, study carefully the structure and character of the eye, and the properties of light—These topics belong to anatomy and natural philosophy.

Rays of light decussate.

Image or figure of impression on the retina, inverted.

Produced by actual contact of matter, viz. light.

Two phenomena considered peculiar to vision.

1. *Two* organs, yet vision is *single*.
2. Objects are seen erect, although their images are inverted.

Ans. The first of these not peculiar to the sense of vision.

Two ears—sound single.

Several nerves of touch impressed at once—feeling single.

Same thing true of taste and smell. Illustrations.

Unity of perception—Whence it arises.

The doctrine of *specific* stimulants established by the philosophy of sensation.

The external senses give a knowledge of *external* things only—not of what passes *within* us, in the different parts of our bodies.

Yet such a knowledge we do possess, although somewhat indistinctly, and it is requisite that we should possess it. Illustration.

It is derived from what is considered a *sixth* sense, denominated,

Caenesthesis, or *self-feeling*—called also the sense of *being*, of *well-being*, of *ill-being*.

Furnishes no distinct, and well defined ideas, but merely sensations pleasant or unpleasant.

This sense—of what nerves composed.

Each internal organ might be regarded as a distinct sense, analogous to the organs of external sense.

CEREBRAL PHYSIOLOGY, *or the functions and* INFLUENCE OF THE BRAIN, *in relation to the action of the mind generally.*

Of the unity or singleness of the mind.

Can any created being, material or spiritual, characterized by perfect unity of essence, possess a multiplicity of powers or faculties?—Question discussed.

This branch of physiology divided into Phrenology and Craniology.

The former treats of the reciprocal influence of the *brain* and the *mind*.

The latter of the external manifestations of this, afforded by the cranium.

Phrenology affects no exposition of the nature or essence of the mind, nor of its mode of action on, or connection with matter, or of being acted on by it.

Assumes, *as a postulate*, that man is duplex in his nature, consisting of soul and body, i. e. of simple spirit and organized matter.

Takes as its basis, and attempts to prove,

I. That, in our present compound condition, mind is, in all its operations, connected with matter, and cannot act *intellectually* without it.

II. That the brain is the portion of matter with which it is *immediately* connected—that that portion is, therefore, *the organ of intellect*—the necessary coadjutor of mind in every intellectual process.

Facts and reasonings in proof of this.

Phrenology, then, affects to teach something of mind, which, *abstractly*, is not understood, through the medium of matter, which is.

Objections to this doctrine considered.

1st. Obj. Moral sentiments attributed, as their seat, to certain other viscera.

Refutation of this hypothesis.

Certain viscera alleged to be affected by the passions.

This objection also considered.

2d. Obj. Brain greatly injured—yet intellect unimpaired.

Objection answered—brain *double*.

Its duplex character proved.

3d. Obj. In Hydrocephalus, brain said to be dissolved and removed, yet intellect continues.

This objection answered.

4th. Obj. The subject of petrified and ossified brains considered, and the objection deduced from it removed.

III. *That the brain is not a single organ, but an aggregation of organs.*

Illustrations and proofs of this.

Unity of consciousness constitutes no objection to the doctrine of the multiplicity of the brain.

Illustration.

Absolute size of the brain, and its supposed connection with a *proportionate* amount of intellect, considered.

Intellect alleged to be in proportion to the size of the brain to the body—This hypothesis considered.

To the size of the brain to the nerves—This also considered.

Facial angle, as an evidence of the amount of mind considered.

Obj. Anatom. answered.

The *structure* of a part sheds no light on its *function*—We could never have learnt the functions of the stomach, the liver, &c. from an examination of their structure.

Nor can we of the brain, from an examination of its structure—Illustrations.

Under a fair and efficient examination of the subject, then, anatomy presents no objection to the doctrines of phrenology.

Energy of the functions of the brain—on what do they depend?

Ans. On the united influence of the *size* and *tone* of the organ.

Illustrations and proof of this.

IV. *That it is practicable, during the life of man and other animals, to ascertain the developments of their brains.*

Cause of the form and size of the head.

Whether does the cranium give size and form to the brain, or the brain to the cranium?

Ans. The brain to the cranium certainly.

Proofs of this, at large.

In the fœtus, the brain formed first, and the cranium afterwards to cover and protect it—must, therefore, be made to fit the brain; else would it injure instead of protecting it—else would the thing served be made for the use of the thing *serving*—the *superior* for the use of the *inferior*.

The two tables of the cranuim ran equidistant from each other.

Hence the protuberances of the brain must be perceptible on the external surface of the head.

When, in the progress of the growth of the body, hard parts and soft come into conflict, the hard parts give way—Illustrations and proof of this.

Brain, in old age, shrinks, and the internal table follows it, receding from the external.

Cranium in ideots fits the brain.

In hydrocephalic patients, the same.

Brain possesses a resisting and propulsive power.

Hence the form and size of that organ necessarily determine the form and size of the head.

The head is not, as some have alleged, *moulded by muscular action.*—Illustration.

Faculties of the mind, divided into FEELING *and* INTELLECT.

Feeling, divided again into *propensities* and *sentiments.*

Intellect, into *knowing faculties*, and *reflecting faculties.*

The faculties denominated PRIMITIVE are those

1. Which exist in one kind of animals, and not in another, the mind of all inferior animals being supposed to be the same.
2. Which exist in different degrees in the two sexes in the same species.
3. Which are not proportioned to the other faculties in the same individual.
4. Which do not manifest themselves simultaneously with the other faculties.
5. Which may act or rest singly.
6. Which are distinctly propagated from parent to offspring.
7. Which may singly preserve their proper state of health, or alone fall into disease.

The functions of faculties, how ascertained.

Illustrations on this subject.

Phrenology not chargeable with materialism.

Voluntary motion, a mental operation, but cannot be performed without muscles.

Sensation generally a mental operation, but cannot be performed without the various organs of sense.

For thus asserting and thus believing, no one is accused of materialism.

Why, then, should he incur the accusation for pronouncing the brain to be as necessary to thought, as muscles are to motion, the eye to vision, or the ear to hearing!

Every scheme of metaphysics, strictly considered, is as chargeable with materialism as phrenology.

The admission of the agency of a material organ in every process of intellection, necessary to a rational belief in the immortality of the soul.

Illustration and proof of this.

Phrenology does not favour fatalism.

Illustration and proof of this.

Does not legitimate crime.

Nor does it favour any one species of *immorality*.

On the contrary, its moral advantages are great.

Illustration.

In the science of metaphysics, which it simplifies, and renders *tangible*, its advantages are also important.

Nor they are less so in the science of *mental derangement*.

To the true and correct understanding of that affection, phrenology is essential.

In denying or opposing it, physicians do injustice and injury to that department of their profession, by bringing theory and practice in it, into direct collision.

Faculties of the mind.

Propensities.

1. Amativeness,
2. Philoprogenitiveness,
3. Inhabitiveness,
4. Adhesiveness,
5. Combativeness,
6. Destructiveness,
7. Constructiveness,

8. Covetiveness,
9. Secretiveness,

Sentiments.

10. Self-esteem,
11. Love of approbation,
12. Cautiousness,
13. Benevolence,
14. Veneration,
15. Hope,
16. Ideality,
17. Conscientiousnes,
18. Firmness.

} proper to man.

Knowing faculties.

19. Individuality,
20. Form,
21. Space,
22. Resistance,
23. Colour,
24. Locality,
25. Order,
26. Duration,
27. Number,
28. Tune,
29. Language.

Reflecting faculties.

30. Comparison,
31. Causality,
32. Wit,
33. Imitation.

Illustrations, and arguments in proof of the existence and operation of these.

Of Sympathy.

Sympathy, a fundamental property of living matter, essential to its existence and economy, and most important from its relationship to health and disease.

That property or principle, by means of which impression or action in one part of a living body, produces an increase, diminution, or change of impression and action in another part, or in the whole.

The governing principle in physiology, pathology, and therapeutics—All *general* excitement and action grow out of it.

All important, therefore, to the physician, to have a perfect knowledge of it.

The part sympathizing, sometimes near to, sometimes remote from, the part originally impressed, and, in structure, sometimes similar, and at other times the reverse,

In kind, the sympathetic action sometimes similar, sometimes dissimilar, to the original; sometimes stronger, sometimes weaker.

Sympathy variously divided.

1. Local and general.
2. Healthy and diseased.
3. Natural and acquired.
4. Direct and reverse.
5. Physiological, pathological, and therapeutical.—Illustrations.

The author's own division.

1. Mental sympathies, i. e. sympathies of mind with mind.
2. Corporeal sympathies, i. e. sympathies of one part of the body with another, or with the whole.
3. Sympathies of the body with the mind.
4. Sympathies of the mind with the body.

Through the medium of one, two, or more of these, may be explained all the functions and operations of the body whether healthy or diseased.

1. Examples of mental sympathy.

Military chiefs.
Orators.
Poets and musicians.
Dramatical performers.
Contagious nature of the passions.
Propensity to imitation generally.
Certain diseases—Hysteria, epilepsy, &c.

Corporeal sympathies.

Four organs in which the most powerful are radicated.

The stomach.
The skin.
The brain.
The genitals.

Stomach, examples of the sympathies of.

Blow on the region of the stomach.

Draught of very cold water.
Excessive draught of ardent spirits.
Cramp of stomach, from any cause.
Poisons, emetics, &c.
Mania, epilepsy, Chorea St. Viti, &c. from gastric irritation.
Intoxication.
Gastric opthalmia, and impaired vision.
Blindness from visceral irritation.
Flatulency, effects of.
Strength *instantanéously* restored by cordial drink or savoury food, even before it enters the blood vessels.
Tremors from a debauch, how removed.
Gastric head-ache, phthisis pulmonalis, hysteria.
Dyspepsia, effects of.
Inguinal swellings cured by emetics.
Rheumatism and effusions into the joints, in the same way.
Hemorrhages checked by drinking cold water.
Pulmonary affections removed by emetics.
Intermitting fever cured by gastric remedies.

Skin.

Receives all original impressions from the sensible qualities of the atmosphere, and their vicissitudes
A most fertile source of disease—these impressions pass by sympathy, through the solids to the other parts of the system. Illustrated by
A high temperature of the atmosphere.
Burns.
A very low temperature, or intense cold.
A humid atmosphere.
An arid atmosphere.

Sanative agents.

Baths, hot, tepid, and cold.

Medicated baths.
Sulphureous ditto.
Cold applications suppress hemorrhages.
Blisters, sinapisms, frictions &c.
Change of climate.
Appearance and disappearance of cutaneous eruptions.
Metastases from without to within, and the reverse—*Cholera.*
Clothing generally.
Cleanliness.

The brain, sympathies of, manifested in
Mechanical injuries of that organ.
Apoplexy.
Palsy.
Hydrocephalus internus.
Mental derangement.
Intoxication.
Passions of the mind.
Phrenitis.
Voluntary muscular motion.

Organs of generation—sympathies of, numerous and powerful—begin later and terminate earlier in life, than any others—*make the sexes what they are.*

Illustrations.

The boy *before*, and the youth *after*, puberty.
The man and the eunuch contrasted—corporeally and intellectually.
Males of domestic animals perfect,and castrated, do.
Differences of the occiput and the neck.
Effects of castration on the stag.
Female organs of generation, powerful influence of, on the whole female system.
On the throat and the organs of voice.
On the mammæ.

The ovaria, effects of their excision, on the body and the mind.

Cessation of menstruation, effects of.

Pregnancy, effects of.

Sympathies of the body with the mind.

Manifested in the effects of the passions and emotions; and of intense and long continued intellectual labour.

Joy.

Rage.

Terror.

Love.

Effect of maternal affection on the secretion of milk.

Morbi studiosorum.

Voluntary motions.

The mind sympathizes with the body in

Delirium from gastritis.

Enteritis.

Hysteritis, &c.

Madness from gastric, hepatic, and muscular irritation.

In satyriasis, nymphomania, &c.

In hypochondriasis.

In every severe corporeal affection.

Compound sympathy manifested in the impregnation of the female, connected with the communication of parental likeness.

Local or subordinate organic sympathies, and sympathies between particular organs or parts.

Of the hairy scalp, in wounds or injuries of, with the brain.

Of the brain itself.

Wounded, compressed, inflamed or suppurated, effect of on the stomach, muscles connected with the velum pendulum patati, liver, feet, &c.

Of the cerebellum.

Seat of the amatory passion.

Sympathizes certainly with the sexual organs.

Castration, effects of on cerebellum.

Wounds behind the ears, effects of—Hippocrates.

Wounds on the occiput, effects of, (Dict. des Sci. Med.)

Seton in neck, effect of.

Temperature of neck, during sexual orgasm.

Of the spinal marrow.

Alexander struck on the nape with a stone, effect of.

Bidloe's experiment on the spinal marrow of a dog, effects. Vid. Diction. des Sci. Med.

Of the eyes.

Prospects and objects, enlivening, gloomy, beautiful, sublime, fearful, disgusting, &c. Mrs. G.

View of unbecoming nudities, and obscene objects.

Of a person gaping.

One eye sympathizes with the other in disease, viz. inflammation, cataract, &c.

A blister, seton, cautery actual or potential, in opthalmia, &c.

Dazzling light produces sneezing.

Sight of grateful food, effects of.

Contraction of the iris, from light.

Dilatation of pupil from gastric or intestinal irritation from worms.

Sickness at stomach produced by a shattered eye.

A wound on the eyebrow produced blindness.

The ears.

Music, effect of.

Noise of a file, &c.

Whetting of a knife—Boyle.
Sound of Bagpipes, effect of.
Obscene discourse, effects of.
Meatus auditorius, tickling of, do.
Glass ball in the ear, do.

Of the nares.

Odours generally, powerful effects of.
Sternutatories, range of sympathies very wide.
Smell of cathartics, effect of, (Boyle.)
Odour of males, effect of.
Rousseau, experiments of.
Matter of influenza.

Of touch.

Touching velvet, effects of.
Tickling, do.
Touching between the sexes, do.

Of taste.

Sympathies and antipathies of, with the stomach, and digestive apparatus generally.
Do. with the salivary glands.

Of the teeth.

Carious tooth, effects of.
Irritation from dentition, effects of.
Dyspepsia from irritation of dentition.
Salivatio dentitionis.
Otalgia dentitionis.
Extraction of tooth, effects of.
Of the salivary glands and gums.
Sympathies of, under mercurial action, with the rest of the system, wide and powerful.

Of the uvula.

Elongated, effects of.

Of the fauces.

Tickling, effects of.

Of the trachea.

Irritation of, effects of.

Of the lungs.

Irritation and wounds of, effects of. Mrs. R's. case.

Of the liver.

Biliary caluli in gall ducts, effects of.
Hepatitis, symptoms and effects of.
Sympathy of the liver with the brain.
Men of genius, temperament of.
High mental excitement, effects of.
Blow received by a French officer, do.
An insult to an American youth, do.
Jealousy, do. (Horace.)

Of the kidneys.

Inflamed kidneys, symptoms and effects of.
Calculus in pelvis of, do.
in ureter, do.
Sympathize with each other.
Gastric diuresis and diabetes.
Diabetes from mental causes.
Urine altered in almost every complaint.
Calculus in one kidney, the other only affected.

Bladder and rectum.

Irritation of either or both, effects of.
Strangury and tenesmus produce each other.
Stone or ulcer in bladder, effects of.
Rectum and uterus, sympathy of.
and lungs, do.—Fistula in ano.

Of the extremities.

Tight shoes and cold feet, effects of—cartarrh.
Blisters and sinapisms on feet, effects of.
Cold water on the extremities, do.
Tickling the soles of the feet, do.
A grain of shot in foot, do.

Idiosyncrases.

Of two kinds—Peculiar susceptibilities as to things *not medicinal*, and things *that are*.

Odour of a rose, musk, minionet, effects of.
Smell or sight of a cat, or a spider, do.
Pressure of a ring, on the ring finger, do.
Mercury, effects of on some.
Opium, antimony, &c. do.

Sympathy illustrated and proved by metastases.

Metastasis hurtful or salutary.

Hurtful, when centripetal, i. e. from *without* to *within.*

Salutary, when centrifugal, i. e. from *within* to *without.*

Of *Tinea capitis*, produces epilepsy, hydrocephalus internus, opthalmia, defluxion from the mucous membrane of the nares, &c.

Of *gutta rosacea*, produces opthalmia, gastrodynea, sore throat, asthma, apoplexy, &c.

Of *Erysipelas of the head*, produces stupor, apoplexy, anxiety, vomiting, dyspnœa, &c.

Of *Parotidea chronica*, produces asthma, phthisis pulmonalis, &c. &c.

Of *small pox*, produces stupor, gastric irritation, convulsions, and death.

Of *Measles*, produces asthma, croup diarrhea, &c.

Of *carbuncles and bubos in plague*, produces great anguish, tremors, extreme debility, convulsions and death.

Of *Itch*, produces dyspnœa, asthma, mania, vomiting, cardialgia, gastritis, diarrhea, &c.

Of *gout*, produces apoplexy, palsy, angina pectoris, gastrodynea, dyspepsia, asthma, vertigo, gutta serena, &c. &c.—All these hurtful.

Salutary metastasis—The bowels regarded as an external surface.

Perspiration and sweating—cutaneous eruptions—boils—diarrhea—hemorrhoids—increase of urine—mucous discharge from the lungs—hemorrhagy from the nares &c. &c.—all these are often the effects of metastases from within to without.

Metastasis, even among humouralists, presupposes consent of action between parts, else why should the morbific matter be carried with such uniformity from one part to another?

Different kinds of sympathy, referred by writers on physiology to the following causes.

1. Identity of structure.
2. Connection by anastomosing blood vessels.
3. Connection by the distribution of nerves.
4. The continuity of membranes.
5. Connection by cellular tissue.
6. By the sensorium commune.
7. Identity, or great similarity of function.
8. Habit.
9. Association.

Remarks and illustrations.

Different modes in which the sympathies manifest themselves in the different organs.

1. Sensation or irritation in one organ, suddenly and strongly manifested in another.
2. A feeble sensation in one organ, followed by an intense one in another.
3. Sensation or irritation in one organ, exciting action chiefly in another, or several others.
4. Action in one organ or part, exciting action immediately in others.
5. An alteration in the elementary functions of one organ, followed by a change in the sensations of another.
6. An alteration in the elementary functions of one part, followed by a similar change in the elementary functions of another.
7. A slight and transient alteration in the elementary functions of one part, followed by deep and serious derangement in the elementary functions of another.

8. A sudden change in the elementary functions of one part, restoring to soundness the diseased elementary functions of another part.

Laws of sympathy.

1. Sympathies rendered more vivid by debility and indisposition.
2. More vivid in young people than in old.
3. In females than in males—especially the sympathies of the body with the mind, and of the mind with the body—and imitative sympathies.
4. Irregular in children; hence their subjection to convulsions, from slight causes.
5. Medicines add to the strength of prevailing sympathies, and awaken some that did not before exist. This true of mercury in particular.
6. Become stronger by habit.
7. New sympathies awakened by the growth and evolution of the system, and its subsequent changes, and by the changes in life.
8. Different organs or parts, rarely sympathize reciprocally.

Illustrations.

Anomalous sympathies.

Pain in knee produced diarrhea.

Left arm, pain and partial paralysis of, from diseased bladder.

Left hand sympathized with abscess in the brain.

Wound in the knee produced vomiting, purging and fever. Amputation removed them all.

Cause of sympathy considered.

Sympathies supposed to arise from,

1. The continuity of membranes.

2. The universality of the cellular tissue.
3. The connection of blood vessels.
4. The nerves, alone, or as connected with the brain, or the blood vessels, or both.
5. A *sensorium commune.*

Objections.

Sympathies exist where these reputed causes do not.

In the lower orders of animals.

Animalculæ infusoriæ—Polypi, asteriæ &c. &c.

Vegetables also.

Flower of Berberis Vulgaris.

Dionæa muscipula.

The mimosa, and the whole family of sensitive plants.

Sympathy is an *essential attribute of living matter*—as much so as gravity and figure are of *dead matter*—In living matter, sympathy alone constitutes *corporeal unity.*

Blood vessels, nerves, and a brain, render sympathy more acute, diversified, and extensive; but do not create it.

The blood sympathizes with itself as divided into parts, and with the solids.

The existence of sympathy denied, and humouralism substituted in its stead.

Remarks in proof of its existence.

Sympathy the only principle through which to explain the production or the cure of disease.

Agents, whether noxious or salutary, must act either through sympathy, or through the blood.

Noxious agents.

Cold—A very fertile source of disease.

Acts not on or through the blood.

Illustration.

Excessive heat, the same.

Illustration.

Passions and emotions, the same.

Febrile or other poisons do not contaminate the blood, and cannot, therefore, act through it.

Illustration.

Poisons swallowed act too rapidly to pass through the blood.

Ardent spirits in large quantity.

A severe blow on the stomach.

Opium.

Remedial agents.

Of these articles the same is true.

Never found in the blood, in a formal state.

Act in quantities too small, to medicate that fluid—

So do noxious agents, in quantities too small to adulterate it.

Medicate the *whole* blood—and you cannot medicate it *only in part*—you injure many parts to cure one or two.

Illustration.

Medicines cure a diseased part, by acting on a distant one, while they could not cure, but would certainly injure, the part diseased, by acting on itself.

Illustrations.

Tartar emetic

Sulphur.

Opium.

Blistering plasters.

Saline purgatives.

Disease consisting in divided excitement and circulation, that state of things can never be changed by a medication of the blood.

No rational account can be given of the modus operandi of medicines, after they are thrown into the blood.

The specific action of medicines lost by their entrance into the blood vessels.

Nature never medicates the blood, in curing disease.

Vis conservatrix et medicatrix naturæ, i. e. *the power to preserve health, and remove disease.*

Inherent in all living matter, and essential to its existence.

Does not depend on, or arise from, organization—Blood possesses it.

An elementary attribute of vitality—the great principle of self-defence and preservation, in living matter.

Something analogous pervades all nature—the whole material universe manifesting a self-preserving power.

Illustrations.

The harmony of nature preserved, and her economy promoted, by countervailing forces, which seem to oppose each other in a manner similar to the struggle between life and death.

Centripetal and centrifugal forces.

Heat and evaporation.

Freezing and evolution of latent heat.

The vis conservatrix et medicatrix naturæ manifests itself in three ways.

1. In a *conservative and prophylactic power*, in the maintenance of individual existence, and the prevention of disease.
2. In a *curative power*, in the removal of disease.
3. In a *regenerative power*, in the reproduction of lost parts.

For the complete illustration of the first and last of these powers, in particular, must descend, in our observations, to the lower orders of living matter.

1. Prophylactic power.

Living vegetable seeds.

Apples, potatoes, turnips, &c. neither frozen, bruised, nor otherwise injured.

Living perennial vegetables, viz. trees, shrubs, grasses, &c.

Fresh eggs.

Animalculæ and insects in a torpid state.

Inhumed animals, and those inclosed in trees, rocks, &c. viz. toads, frogs, lizards, serpents, &c.

Man, and other warm blooded animals, exposed to intense heat, or severe cold.

Exposed to other noxious causes, external and internal—and to the common impressions from surrounding nature.

Illustrations.

2. *Regenerative power.*

Vegetable kingdom.

Lopping of shrubs and trees, to render them bushy.

Propagation by section, or cuttings.

Inoculation and ingrafting.

Annual fall and reproduction of the leaf.

Illustrations.

Animal kingdom.

This power strong in the inferior orders of animals.

In the polypi.

The asteria, or star-fish.

The lobster.

The crab.

The snail.

The actenia.

The water-newt.

Crustaceous animals.

Snakes, lizards, &c. cast their cuticle, &c.

Lizards' mutilated tails grow.

Quadrupeds shed their hair, and reproduce it.

Birds moult—genitals dwindle—enlarge again.

The horns of the stag.

In man himself, this power exists.
Healing of wounds, and of fractured bones.
Granulation of ulcers.
Reproduction of cuticle, nails and cutis.
Of other parts.
This power weak in advanced life.
Illustrations.

8. Curative power.
A knowledge and observance of this, important to the practical physician, in all cases, but especially in epidemical diseases.
Illustrations.

Manifested also in
Common catarrh.
Paroxysm of intermitting fever.
Peripneumony.
Poison swallowed—phenomena in case of.
Cholera Morbus—phenomena and cause of.
Parturition, phenomena of.
Change and economy of the uterus during gestation.
Morbid irritation of schneiderian membrane.
Coughing, Sneezing, } Mucus secreted in both for useful purposes.
Discharge of urine and fœces.
Irritating substance in the eye—phenomena of.

Healing power most strikingly manifested in surgical processes.
Illustrations.
A common incised wound—process of cure.
A leaden bullet lodged in the flesh—effects of.
Fracture of a bone.
Operation for aneurism—popliteal, for instance.
Pus makes its way towards the circumference.
Adhesive inflammation unites the cellular membrane around an abscess, and prevents the lateral escape of the pus—The secretion of pus relieves the surcharged vessels.

Substitutions of the system.

Contraction of the aorta—case of, reported by Mons. Paris, Hotel Dieu in Paris.

Vena cava obstructed—Its place supplied by Vena Azygos.

Thoracic Duct do.—Its place supplied by enlarged lymphatics.

Temperature maintaining power—Shall treat of this under the article "*respiration and animal heat.*"

Organic or functional physiology.

Digestion, consisting in the functions of the stomach, and the other chylopoietic organs.

These functions all important, not merely to the well being, but to the very existence of the system.

Constitute the foundation of its being, by preparing the materials out of which it is formed and maintained.

Other functions of the body of man tend to its perpetual waste, diminution, and decay.

The functions of the chylopoietic organs, therefore, requisite, to afford a sufficient supply of restorative materials.

By this circle of waste and restoration, the human system is kept in a state of constant revolution.

Out of this necessity of the stomach to the very existence of every other part of the body, arises its strong sympathetic connections with the whole system.

If *it* be, in its functions, deranged, the system must be necessarily, in like manner, deranged.

Several topics connected with digestion requisite to be previously considered.

These are, hunger, thirst, the kind of food most suitable to man, and the prehension, and swallowing of food.

Of hunger.

An internal sense, sui generis—as really so as any o

the external senses.

Called, at times, a sense of inanition.

Food its object.

The *desire* of food arising out of it, denominated *appetite.*

Stomach, the seat of hunger.

Proofs of.

Cause of hunger.

Different theories of.

1. Anima medica rationalis—Plato and Stahl.
2. Mutual frictions of the coats of the stomach.
3. Weight of the unsupported liver acting on the diaphragm.
4. Acrimony of the gastric liquor.
5. Pressure of the nerves of the stomach, by the contraction of its parietes.
6. Salts, ferments, alkalis in the stomach, &c.

Discussion.

Some of these causes imaginary, and the others insufficient.

Action of the stomach too weak for friction.

Were this the true cause, distend the stomach with air or water, hunger must cease.

Dragging of the diaphragm by the augmented weight of the liver, a mere fancy.

Were this the cause, a recumbent posture would prevent hunger.

Gastric juice not secreted, and, therefore, not present, *when the stomach is empty.*

Contraction of the stomach too weak to compress its nerves painfully, so as to prove the cause of hunger.

Did hunger depend on the foregoing causes, it would continue until their removal, by food.

This not the case.

Removed by the passions, severe study, strong sensations, tying up the nerves, and by the influence of habit.

Illustrations.

Hunger, what?

Views of the author—An instinctive sensation of want produced by the exigency of the system—by what the late Mr. Hunter would have called the *stimulus of necessity*—an indication of what the system requires for its well-being.

Thirst.

An internal sense, sui generis, like that of hunger.

Fauces, its principal seat, though probably *sympathetically* so.*

A keen and strong appetency for water constitutes the desire arising from it.

Cause.

Theories of.

1. Anima medica rationalis.
2. A preternatural density of the blood, from a deficiency of its serous portion.
3. Acrimony of the blood, from a want of water, its proper diluent, passing into it.
4. Stimulus of necessity, or the system's sense of its own wants.

The author's own views.

Our systems painfully affected by absences or deficiencies, as well as by present deleterious matter, especially when those deficiencies are, in their effects, injurious—e. g. soreness or aching from too much rest, or a *want* of motion—Hunger, from a *want* of food—Great

*Thirst felt in the fauces, to distinguish it from hunger, that the proper application to remove it may be made.

uneasiness in tobacco chewers, smokers, &c. from a want of tobacco—to men of great activity from a want of employment.

Absence of society painful to the *lovers* and frequenters of it.

Impression essential to pleasant sensation—its absence, painful.*

Thirst, then, a painful sensation, caused by the want of the salutary impression of water on the fauces and stomach; the sensation rendered more acute by the necessities of the system.

Death from hunger or thirst—cause of.

Neither actual inanition, nor a want of fluidity in the blood—but gastric inflammation, giving rise to malignant fever, the inflammation produced by the stimulus of necessity.

Hunger and thirst, then, powerful and most acute stimulants.

Taste, connected with digestion, because it has an influence on the process.

If pleasant, promotes, if offensive, retards and deranges it.

Reason why?

Designates proper food.

Kind of food most suitable to man.

Whether from his nature, is man *phytivorous*, *carnivorous*, or *omnivorous?*

The solution of this question to be derived from inferences drawn from several sources, viz.

1. The structure and character of man's teeth.
2. The motion of his jaws.
3. The size and structure of his stomach and intestines.

*Pain and uneasiness given to us in kindness, to warn us of want and danger.

4. His appetite for food.
5. The effects produced on him, by different kinds of food.

1. His teeth.

Teeth of phytivorous animals, description of.

Of carnivorous animals, do.

Of man, a mixture of the two, or a medium between them.

2. Motion of the jaws.

Of the jaws of phytivorous animals, lateral and grinding.

Of the jaws of carnivorous animals, up and down, or champing and bruising.

Of the jaws of man, a medium between the two.

3. Stomach and intestines.

Of phytivorous animals.

Of carnivorous animals.

Of man, a medium between them.

4. Man's appetite leads him to a mixed diet, i. e. a diet consisting of vegetable and animal food.

5. Man subsisting on a mixed diet, attains the highest perfection of his nature.

Proofs of this.

Vegetable food gives health, but not so much strength as a mixed diet.

Which preferable, a diet exclusively animal, or exclusively vegetable? Ans.

What nations live on vegetable food *exclusively*, and what on animal—Comparison between them.

Imputed effects of food on the temper and disposition of man.

Prehension of food different in different animals.

Some remain stationary, waiting for their food, and when it arrives, suck it up, somewhat as a vegetable,

Illustration.

Others go in quest of food. *it* remaining stationary. do.
Others go in pursuit of food, which flies from them. do.
Food when attained, different modes of prehension of.
Some animals use the mouth alone.
Others the tongue.
Others the mouth and claws.
Others the hand alone, or something equivalent to a hand.
Some swallow their food without mastication.
Others masticate.
Some swallow without mastication, then regurgitate and masticate.
Mastication, a process preparatory to digestion, of great moment; especially in relation to some kinds of food, and to certain stomachs.
Effects of, as a preparatory process.
Mastication in gallinaceous fowls.
In crabs.
Deglutition, a very complicated process.
Parts concerned in it.
A description of.
Food swallowed, and in the stomach, the leading organ in the process of digestion, in which the chief struggle between living and dead matter takes place, and where the ascendency of the former over the latter is most strikingly manifested.
The importance of the stomach proved by the universality of it, no less than by the wide range of its sympathies.
All living matter, with which we are acquainted, the ephemera excepted, possesses some kind of a digestive apparatus, by means of which it is nourished.
Worthy of notice, that, in the lowest orders of living matter, where the stomach is most simple, the force of the digestive process is most powerful.

Vegetables digest inorganic matter, converting it into all their variety of products.

Faculty of digestion exceedingly powerful in certain animals of the inferior orders.

Coralline polypi.
Lumbricus terrestris.
Anobium maculatum.
Common or domestic moth.
Common caterpillar.
Terebellum saxosum.
Terebellum mamoreum.

In the higher orders of animals, viz. quadrupeds, birds, &c. the digestive apparatus complex and extensive, in proportion to the difficulty of digestion of the food used.

Vegetable food more difficult of digestion than animal, and gramineous and herbaceous vegetables more difficult than fruits, nuts, and roots.

Hence the digestive apparatus of phytivorous animals much larger and more complicated, than that of carnivorous; and that of herbivorous, and graminivorous, more so than that of granivorous, frugivorous, nucivorous, and radicivorous.

Illustrations.

Camel, at the head of the family of phytivorous animals.

Description of the digestive apparatus of.
Remarks on.

Bos, entire family of.

Digestive apparatus like that of the camel.
Remarks on.

Ovis, family of.

Digestive apparatus, the same.

Lamb and *sucking calf*, do not ruminate.

Hare and rabbit, semiruminant—i. e. ruminate some kinds of food, and not others.

Digestive apparatus not so large, nor so complex.

Horse, digestive apparatus of described.

Remarks on.

Hog, do. do.

Carnivorous animals.

Tiger, digestive apparatus of.

Dog, do. do.

Man, digestive apparatus of.

Stomach, the chief organ in the digestive process.

Necessity of the retention of food in it.

Arrangements for this purpose.

Analogy between the stomach and a gland—its functions really glandular.

Before giving my own views on the subject, requisite to enable you to compare and judge for yourselves, by laying before you a few of the leading theories of digestion, maintained by others.

Of those theories that have attributed digestion to the processes of "*Coction*, *Elixation*, *Maceration*, and *Trituration*" shall decline to speak—as also of the "composite" or compound theory of Boerhaave.

Shall briefly notice the theories of

1. Putrefaction.
2. Fermentation, and
3. Chemical solution.

1. Putrefactive theory—arguments alleged in favour of.

Many alimentary matters of a putrefiable nature.

Are at rest in the stomach.

Impregnated there with sufficient moisture.

Experience, in warm blooded animals, the requisite temperature.

Saliva a septic agent.

Arguments in refutation.

The action of the stomach the strongest and most efficient of antiseptics—It not only *opposes* and *prevents*, but *removes* putrefaction.

Putrid substances if swallowed, are either immediatly rejected, or sweetened.

Feed a dog on putrid meat—after the lapse of an hour or an hour and a half kill him, and examine the contents of the stomach.

Examine the contents of the stomachs of kites and vultures after feeding on carion.

In serpents that swallow their prey entire, without mastication, that part of the food which has reached the stomach, and received the influence of that organ, sweet, while the part still remaining in the esophagus is putrid, but looses its putridity on entering the stomach. Illustration.

No proof that sativa possesses septic qualities.

Fermentative theory.

Arguments in favour of.

1. Many alimentary matters liable to fermentation.
2. The stomach of warm blooded animals, a situation favourable to the fermentative process.
3. The stomach contains an acid.
4. A quantity of flatus or air set at liberty in the stomach, during digestion.

Arguments in refutation.

1. The food of carnivorous animals, where digestion goes on most rapidly, is not liable to fermentation.

Were fermentation the cause of this process, vegetable food would be most easily digested, which is not the case.

2. In relation to moisture and rest, the stomachs of warm blooded animals are *not* favourable to fer-

mentation—There is a constant renewal of moisture, and the contents of the stomach are in a state of constant agitation sufficient to prevent fermentation.

3. The acid found in the stomach, when in a healthy condition, at which time digestion goes on most favourably, is not the *acid of fermentation.*

If at all, that acid is found in the stomach only in a diseased state, when digestion is very imperfectly performed.

Spallanzani's experiments with vegetable food, on carnivorous animals—In that case found an acid in the stomach, but not when they ate animal food. Reason of this.

The gastric acid no more the result of fermentation, than the acids of apples, limes, or sorrel.

4. In sound stomachs, where digestion is perfect, there is no evolution of flatus—Such evolution, then, is one of the signs of indigestion, or defective digestion.

When flatus is discharged, it is not carbonic acid gas, the only gas evolved in fermentation.

Spallazani and others have examined the stomach, during digestion, and discovered no evidence of the existence of the fermentive process.

Odour of the contents of the stomach exceedingly different from that of fermentation.

Fermentation, in an alimentary mass, out of the body does not produce chyme. Nor will chyme, if suffered to ferment out of the body, pass into chyle.

Chyle always the same, whereas the result of fermentation differs according to the qualities of the articles fermented, as cider, beer, wine, mead, &c.

Chyle is itself *fermentable*, which is not the case with any liquid, the result of fermentation.

Would intoxicate, were it the result of fermentation.

Distil a fermenting mass, the product is ardent spirits.

But no ardent spirits can be obtained by the distillation of chyme.

In a sound and healthy stomach, digestion completed, after eating, before the period at which fermentation could commence.

Were fermentation the cause of digestion, to swallow a quantity of yeast, leaven, or ome other fermenting substance, would be the most powerful auxiliary to digestion when defective—But this is not the case—Juice of the apple and peach in a state of fermentation, effects of—Wort, do.

Those articles that aid digestion most effectually, tend to check fermentation—Wine, brandy, vinegar, bitters, sulphuric acid, &c.

Many cold blooded animals digest vigorously in a temperature too low for the process of fermentation.

Phenomena and general economy of the stomach, during the performance of its part of the digestive process.

Stomach now, preparing itself for its task, becomes a strong centre of fluxion.

Evidences of this.

The *blood*, its principal means of preparation.

Thrown, in an augmented quantity, on the stomach, to increase its energies, and afford the necessary materials for secretion—Spleen aids in this.

Analogies.

The impregnated uterus.

The penis erectus.

Mammæ when secreting milk.

Every gland when excited to secretory action.

The whole system sympathizes with the stomach.

Evidences of this, especially in weakly persons.

Perspiration diminished or checked.

Cutis anserina, paleness and chilliness.

Indisposition to action corporeal or mental.

Drowsiness.

Secretions generally diminished, except those immediately wanted—Urine, saliva, bronchial mucus, &c. diminished.

Vital energies, therefore, diminished in other parts of the system, and augmented in the stomach—rather withdrawn from other parts, and concentrated in that organ.

Central contraction of the stomach, and its apparent object.

Succus gastricus, probable organs of secretion of—its agency in chymification, the first act in the process of digestion.

Remarks on the chemical properties of the succus gastricus—that fluid not employed in digestion as a mere chemical solvent—acts only in subserviency to the powers of life, specifically modified by the organization of the stomach.

In no other organ or place, but the stomach, could it so act on the alimentary mass, as to convert it into chyme.

Stomach employs it, then, as a vital agent, and aids it by its own peculiar action—In evidence of this, severe pressure on the stomach impedes digestion, just as it impedes the secretory action in any other gland.

Chyme, character of.

Assorted in the stomach, that portion which is best prepared, being found nearest the pylorus.

Passes through the pyloris, not so much by the pressure of the stomach and abdominal muscles, as by the spontaneous opening of that orifice—by its taking up the chyme when matured, and passing it onward, somewhat as the lacteals do afterwards, in relation to the chyle.

Pylorus suffers nothing to pass that is not particularly prepared.

Exceptions.

Cherry stones.
Other vegetable seeds.
Pieces of metal.
} These pass from the stomach through the bowels unchanged.

They do not however pass rapidly—Not until, by frequently advancing to the pylorus, it becomes accustomed and reconciled to their touch and impression. Hence they remain in the stomach, perhaps from five to ten times as long as the matter of food does.

Chyme enters the Duodenum, to be there converted into chyle.

Duodenum, structure and character of.

Of larger diameter than the other small intestines.

Muscular coat stronger.

Not, like them, covered by the peritoneum.

More dilateable than they.

Denominated, from its character and functions, a second stomach.

Internal coat strictly villous.

Valvulæ conniventes numerous.

Hence, and from its position and the tortuous course it runs, the passage of the chyme through it is slow.

Receives the bile and pancreatic juice, which are secreted in unusual abundance, while the chyme is passing through it.

From its internal surface, which is much extended by the valvulæ conniventes, arise the lacteals in great numbers.

Duodenum now a centre of fluxion, as the stomach was before.

Receives the bile and pancreatic liquor.

By means of its specific vital powers, uses them much as the stomach did the succus gastricus —as an instrument to work with.

Chyle formed here—mass passes on to the *Jejunum*,

Further matured here by the action of that intestine—Now very thin—much chyle formed.

Lacteals very numerous, and their action vigorous.

The part a centre of fluxion, but not, perhaps, so strong.

Ileum.

Lacteals numerous—absorption active—chyle formed copiously—mass still thin.

Part exerts itself like the preceding.

Great intestines.

Lacteals few—absorption diminished—fæcal matter forming—mass thicker.

Great intestines inactive, while the others were employed—the reverse true, now—*their* turn to labour.

Much mucus on internal coat, because the fæcal mass is becoming hard.

The great intestines, especially the intestinum rectum, constitute the excretory duct of the alimentary organ.

Intestinum rectum closed by the contraction of the sphincter ani, except during the passage of fæces.

Sphincter then relaxes or elongates by its own action, not like a piece of dead matter, nor by mechanical force.

Remarks on sphincter muscles.

Fæces, fetor of, whence arising.

Qu. Is chyle, *properly so called*, formed in the intestines? Point discussed.

Bile, reputed uses of in digestion—supposed difference of action and use between cystic and hepatic bile. Points unsettled.

Remarks on diseases denominated bilious, showing the applicability of our doctrines to practical medicine.

Lacteals.

Functions, and philosophy of.

Not mere conduits—act on, and further mature the chyle.

Mesenteric glands, functions of.

Receptaculum chyli.

Uses of.

Thoracic duct.

Uses and destination of.

Perfect chyle.

Appearance and character of.

Question respecting the vitality of, discussed.

Appears often in *arterial*, sometimes in *venous* blood.

Sanguification.

Means, in the usual acceptation of the term, the assimilation of chyle to blood, and the conversion of *venous* into *arterial* blood.

Difference of these two kinds of blood, in sensible qualities.

Arterial blood, of what elements composed.

Where formed—and by what process.

Hypotheses on this subject.

Commixture.

Aeration.

Decarbonation.

My own views.

Pulmonary absorption, and

Vitalization.

This process can be no where effected but in the lungs, as digestion can be effected only in the stomach.

Action of the lungs, in sanguification, of a glandular character.

Capillaries of the lungs, importance of the action of.

Antagonists to the capillaries of the other parts of the body.

By the former, venous converted into arterial blood; by the latter, arterial into venous.

Large arteries and veins, mere conductors of the blood.

The arteries, to the capillaries of the body generally, for the purposes of secretion, nutrition, &c.

The veins, to the capillaries of the lungs, for the purpose of vitallization.

Remarks, philosophical and practical, on the capillaries generally.

Their great importance, both in the organization, and the healthful and diseased economy of the solid parts of the body.

Possess powers of both circulatory and specific action, independently of the heart.

Proofs of this, manifested in

Blushing.

Topical inflammation.

Erectio penis masculini.

Natural secretion and nutrition.

Secretion of pus, process of granulation, and diseased growth.

Capillaries, the actual seat of disease.

The chief organs with which nature works in the removal of disease.

The real artificers of the system, using, for the various wants and purposes of it, the blood with which the larger vessels supply them, as educated workmen use the materials for building conveyed to them by common labourers.

The blood.

Definition of.

Importance of.

Presents itself to us in an anatomical, chemical, and physiological point of view.

To be thus considered.

When treating of it physiologically, must speak of it not as divided into its component parts, but *as a united whole.*

Knowledge of, all important to the educated physician.

Altered in its character by disease—This alteration a source of practical knowledge to the experienced physician.

Preliminary remarks generally.

Colour of the blood.

Different in different races of animals.

In the higher orders, red, but not equally so in every part of the system—White flesh of fowls—Blood of tendons, colour of.

In others green—white—pale—colourless.

Character and phenomena of blood, when recently drawn

Subsequent changes of.

Fibrina of, how procured.

Without the aid of any chemical process, blood resolvable into four parts, viz. Halitus, Serum, Red globules, and Fibrina.

Paramount importance of the latter.

A topic interesting, and important in Physiology, presents itself, viz. the constitution and character of the blood, when circulating in the vessels of the living system.

Is that fluid perfectly homogeneous? or does it consist of distinct and well defined parts—of a mere mixture of the four component parts already specified?

Topic discussed.

Inferences deducible from the conclusion.

Halitus, composition of, unknown.

Remarks on.

Serum.

Sensible qualities of.

Nature and character of.

Chemical analysis of.

Probable uses of.

Crassamentum.

Composition of.

Red globules of, opinions of Lewenhoek, Haller, Hewson and others, respecting the figure of.

The question of but little moment.

Chemical analysis of the crassamentum. Colour of the globules, not to be accounted for on chemical principles.

Nature gives their hue to these, as well as to leaves, flowers, feathers, and all other coloured substances, not by a process of *chemical dying*, but by a mode of proceeding peculiarly her own.

Subject discussed.

Fibrina, or coagulating lymph.

Sensible qualities of.

Reputed uses of.

Gelatin, albumen, and fibrin, incidental remarks on.

Coagulation or contraction of the blood, cause of.

Hypotheses on the subject.

I. *Cold.*

Subject discussed.

II. *Rest or cessation of motion.*

Do.

III. *Influence of the atmosphere.*

Do.

Vitality of the blood.

The most important physiological topic connected with that fluid.

Antiquity of the doctrine.

Believed in and inculcated by Moses, who was probably indebted for his knowledge of it to the priests, who officiated as the physicians, of Egypt.

Advocated also by Aristotle, who, of all the Greeks, possessed the most accurate and extensive knowledge of nature.

By the poets of antiquity—proofs of this.

By Harvey, of England, whose knowledge of the blood generally very far surpassed that of any other physician of the age in which he lived.

By John Hunter, who, although not, as he believed, the author of the doctrine, was the first to establish it on the basis of experiment.

His inquiries, experiments, and reasonings on the subject.

My own researches.

Considered Mr. Hunter as having left the inquiry defective.

Took it up where he dismissed it.

My own experiments.

Pursued the subject still further.

Abstract reasoning respecting it.

There must be, in the system, some one place where vitality, when declining in vigour, as it evidently must do, is renovated; and some one organ which effects this renovation.

A specific organ for digestion—for thought—for arterial circulation—for the secretion of urine, of bile, of semen masculinum, &c.

Why not one also for the higher purpose of renovating exhausted vitality?

The lungs constitute this organ.

Reasons for this opinion.

The part vitalized must be fluid, not solid.

Reasons for this opinion.

The blood, the only distributor of life to the other parts of the system.

Illustration.

Further evidence in favour of this doctrine.

Is an extraordinary exertion and expenditure of life to be made by any organ or part?—To that part an augmented flux of blood is directed.

Penis masculinus erectus.

Impregnated uterus.

Stomach, during digestion, and all the glands of the body during their most intense state of action.

The healing of wounds.

The filling up of ulcers by means of granulations.

Computed amount of blood in an adult of ordinary size.

This comes into immediate contact with every fibre of the body, passing through the most vital, susceptible, and sensitive parts.

The very conception of such a mass of dead matter thus careering through the body, is gross and shocking—The fact, did it exist, would render us loathsome to ourselves, as well as to each other.

Life-bestowing process acts in a circle.

Illustration.

Respiration.

Effects and uses of.

The new-born infant sustains in its economy two important changes.

Hitherto *nourished* and *vivified* by its mother.

For these two processes must hereafter depend on itself.

Preparatory to this new state of things three changes occur, viz.

1. In the circulation of the blood.
2. In the action of the stomach and chylopoietic viscera generally.
3. In the action of the lungs.

Nourishment derived from the functions of the first set of organs.

Vivification from that of the latter.

Respiration, then, a function of primary importance.

The *most* vital, if not the only *truly* vital process belonging to the system.

The circulation of the blood vital only in a *secondary de-*

gree, and that on account of its connection with respiration.

The importance of respiration deducible from the consideration of its universality.

All living matter respires.

Vegetables respire, and die without air.

All animals, from the lowest to the highest, whether they dwell in the air, in the ocean, on the surface of the earth, or beneath it, have a respiratory apparatus of some kind, and die if excluded from air—They live by respiration.

On the score of *mere life*, the respiratory more important than the chylopoietic apparatus.

Every living being has, and must have, the *former*.

The ephemera destitute of the latter.

Without a stomach, therefore, an animal can live.

Respiration related to the atmosphere, as digestion is to alimentary matter.

Modes of respiration, six in number.

I. In man and warm blooded quadrupeds, description of.

II. In birds, description of.

III. In amphibia, do.

IV. In fishes, do.

V. In insects, do.

VI. In worms, do.

In annimalculæ infusoriæ, mode of respiration not known.

In man, respiration consists of inspiration and expiration.

Atmosphere and *respiratory apparatus* alike concerned in the process—must therefore speak of both, as they stand related to it.

Atmosphere.

Composition of.

The same in its natural parts, in all situations, and at all elevations.

Component parts chemically united, not mechanically mixed.

Factitious atmosphere, wherein different from the natural.

Azotic portion of the atmosphere, uses of.

Imponderable portion, of ditto, of what it consists.

These ingredients essential to the atmosphere—so is a certain amount of humidity in the form of vapour.

The atmosphere contains also many heterogeneous matters, differing from each other in different situations, seasons, and climates.

Atmosphere of the city different from that of the country.

Of low and humid situations, from that of elevated and dry ones.

Atmosphere of winter more pure than that of spring, summer, or autumn.

Of cold climates, than that of warm ones.

Odours of plants and animals, and the effluvia of the earth and certain substances mixed with or reposing on it, those issuing from vegetable and animal decomposition, the matter of epidemics and endemics, &c. all mingle in the atmosphere, and contribute to its impurity.

Mechanical properties of the atmosphere, a knowledge of, essential to a knowledge of the mechanism of respiration.

These are weight or pressure, and a power of expansion, resistance being removed—From these it flows immediately into a vacuum.

Diminution of pressure of, renders respiration oppressed and unhealthful—Illustration.

Exhausted receiver—Lofty mountains—Mont Blanc—Cotopaxi—Chimborazo—Desaussure—Humboldt, &c.

Mechanism of respiration in man.

The lungs, having no muscles to expand them, are passive in inspiration—In expiration, act by their elasticity.

By enlargement of the thorax a vacuum produced—air rushes in, by its elasticity, through the rima glottidis.

Thorracic cavity, how enlarged in respiration.

How diminished again.

Thoracic cavity of females more enlarged in respiration, than that of males—Final cause of this.

Female chest and body generally more round than those of men.

Quantity of air taken in, in an ordinary act of inspiration.

Opinions of Borelli, Hales, Haller, Sauvage, Goodwyn &c. respecting.

Topic not decided.

Effects of respiration.

I. On the air that is breathed.

1. Diminishes its oxygenous portion.
2. Augments its proportion of carbonic acid gas.
3. Augments its temperature.
4. Augments its humidity.
5. Diminishes its vital principle, or capability of sustaining life.

Proofs and illustrations.

Effects of respiration.

II. On the blood.

1. Affects slightly its temperature.
2. Changes its colour, from a modena to a scarlet.
3. Secretes carbon from it.
4. Renders it more fluid, light, and sparkling.
5. Renders it a more congenial and efficient stimulus to the heart.

6. Augments its coagulating and antiputrescent power.
7. More intimately blends and assimilates the chyle.
8. Communicates to it a larger amount of the vital principle.

Proofs and illustrations.

Humidity discharged from the lungs, *a real secretion*—not the result of percolation, nor of water chemically formed in the air cells.

Colour of venous blood, how changed to that of arterial?—By the mere loss of carbon?—No.

Arterial and venous blood essentially different in their nature—and, therefore, in their sensible qualities—each has its native and appropriate colour, in common with its other specific properties.

Whence originates the hypothesis that carbon superabounds in venous blood?

Is it because chemists, on analysis of the blood, discover a superabundance of it there?

Ans. No such discovery has been made.

Is it because chyle, out of which blood is made, contains a large amount of carbon?

Ans. Such is not the case in relation to chyle.

Is it because animals that eat most carbonaceous food yield from their flesh the greatest quantity of carbon?

Ans. The very reverse of this is true—Examples.

Is it because the arterial blood does not, in its circulation, part from carbon, but retains its whole amount, after expending much of its other component parts, to throw it into the veins?

Ans. The arterial blood, according to chemists, expends much carbon in the formation of the fat, urine, saliva, bile, cerumen, perspiration, &c. and no one contends that the veins absorb any.

Is it because the venous blood is so much less in quantity than the arterial, that it becomes more completely saturated even with an inferior amount of carbon?

Ans. The venous blood greatly surpasses the arterial in quantity.

Is it because arterial can be converted into venous blood by the mere addition of carbon?

Ans. No such conversion can be thus effected.

Is it because arterial cannot be made to assume the character of venous blood in any other way than by the admixture of carbon?

Ans. Whatever diminishes the vitality of arterial blood gives to it the venous character—Facts in proof of this.

Stagnation has this effect.

Malignant fever, do.

Sundry poisons, do.

Standing in vacuo, do.—yet, in these instances, no carbon is thrown into it.

Same effect produced on it by exposure to the action of

Hydrogen gas.
Nitrogen do.
Carbonic acid do.
Oxygen do.

What proof exists that the carbon discharged from the lungs comes from the venous blood, and not from that fluid after it has been arterialized?

Ans. None.

Arterial blood exposed to the atmosphere said to produce as much carbonic acid as venous blood—Shall leave this point with chemists.

Carbon said to superabound, in a peculiar manner, in the blood of the vena portæ.

The reverse ought to be true, this blood coming from

parts remarkable for their superabundant secretion of fat—Illustration.

Venous blood returning from the brain, where no carbon is alleged to be deposited, ought to contain a much greater quantity of that article.

Blood alleged to contain most carbon in hot weather, because the air inspired, being much rarified, and containing, in a given volume, less oxygen, carries off a smaller amount of carbon in the form of carbonic acid gas.

Ans. The carbon thrown out in respiration is secreted, not drawn from the blood through the coats of the pulmonary vessels, by its attraction for oxygen. While the vessels possess life, no such process can take place—Dr. Priestley's experiment with a *dead* bladder proves nothing in relation to this point.

Besides, there is more air adulterated by respiration, in a given time, in hot weather, than in cold—Ingenhaus and Spalanzani.

Difference in the rarefaction of atmospheric air under the mean temperature of summer and of winter, not very great.

This appears clearly from, 1st, weighing, under those temperatures, a given volume of air; 2d, observing the length of time an animal will live in such volume; and 3d, the comparative time a candle will continue to burn in it.—Illustration.

Respiration does more than merely secrete a little carbon from the blood.

Lungs too complex, large and important an organ to be made for no other purpose than this.

Convey something into the system, as well as throw something out—Life could not be otherwise supported.

But they receive from the atmosphere neither oxygen nor any other kind of ponderable matter.

Receive from it the vital principle and communicate it to the blood, as heretofore shown.

This, the cause of the change in the colour of the venous blood.

Vitalize venous blood, and it assumes the colour of arterial.

Cause of the first inspiration in a new-born infant, considered.

Opinions respecting it.

1. *Action of atmosphere, and general change of situation, give pain, and the infant cries, preparatory to which it must inspire.*

Object.

All new-born animals not thus pained, yet all inspire.

New-born vegetables not pained, yet they also take in air by a *vital process*.

Why does the infant cry?—What natural or necessary connection exists between pain and crying?

Infant cries by instinct—final cause of this.

May as well, therefore, resolve the first act of inspiration into instinct.

2. *Schneiderian membrane irritated by the air, the infant prepares to sneeze, to remove this irritation. But cannot sneeze without inspiring.*

Object.

Why, then, not continue to sneeze, instead of regular respiration.

But, wherefore sneeze to remove irritation? What natural connection exists between irritation in the nares, and the complicated process of sneezing?—None—Infant sneezes, then, by instinct.

Nostrils closed by mucus—infant struggles to inspire.

Close the mouth and nose of a new-born animal—it struggles to breathe.

The young of all inferior animals do not thus prepare to sneeze.—Yet they all inspire.

3. *Change of position, after birth, changes the situation of the abdominal viscera—depresses the stomach, liver and intestines, thus lowering also the diaphragm, and enlarging the thoracic cavity—Air rushes in to fill the vacuum, and creating uneasiness, must be again, by expiration, expelled.*

Object.

Here, again, expiration presupposes instinct.

Wherefore breath a second and a third time, and thus continue?

Inspiration is the *cause*, and not the *effect* of the depression of the diaphragm, and the enlargement of the thoracic cavity.

Open a pregnant female animal at the proper period—keep the fœtus in its uterine position, it will inspire.

Birds and amphibia have no diaphragm; neither have fish—No thoracic enlargement, then, here, by mere change of position. Yet do they inspire.

4. *A preparatory measure to the change in the circulation, from the fœtal to the adult. Blood not now decarbonized by the mother—Uneasiness created by this—Inspiration a struggle to remove it.*

Object.

Infant inspires before the fœtal circulation is altered—Respiration, the cause of this alteration, rather than the effect.

Respiration not unique, as to the cause of its commencement.

Equally explicable with various other animal processes—Illustration.

1. Sucking.
2. The young aquatic bird, without instruction, hastens to the water, the first time it sees it.
3. The young lamb recognizes its mother, amidst other animals, even of the same species.

4. Birds migrate at the proper season, without instruction.
5. Domestic animals, removed circuitously from the place where they were reared, return by the shortest rout.

Instinct, a primitive mental endowment, the cause of all this.

So do young animals originally breathe by instinct.

Draw in air, as they do milk, or as they take any other kind of food.

Necessary, this, to their existence—Would, therefore, be defectively made, if they had not the propensity, as well as the power, to effect their own preservation.

Of animal heat, as one of the supposed effects of resperation.

Importance and interest attached to the subject.

General remarks respecting.

Theories of Animal heat.

1. The callidum innatum, of the ancients.
2. Attrition of the fluids and solids.
3. Fermentation.
4. Putrefaction.
5. Action of the stomach.
6. Action of the glandular system.
7. Theory of Dr. Black.
8. do. of Lavoisier.
9. do. of Crawford.
10. do. of Lagrange and Hassenfratz.
11. The fluids of the body supposed to give out their heat, in the act of passing into solids.
12. The decarbonation of the venous blood.

The first six theories not worthy to be examined.

Theory of Dr. Black.

Founded on the author's discovery of *latent heat.*

Objections to it.

Theory of Lavoisier.

Objections

Theory of Crawford.

Analysis of.

Objections to.

Theory of Lagrange and Hassenfratz.

Analysis of.

Objections to.

The conversion of the fluids of the body into the solids, the cause of animal heat.

Analysis.

Latent heat becomes sensible, in

The conversion of steam into water.

Do. do. of water into ice.

In the reverse of these processes, sensible, heat becomes latent.

Objections.

Even in relation to dead matter, these positions doubtful in

The freezing of water.

The combustion of gun-powder.

In relation to living matter, palpably erroneous.

Were it true, then ought all living matter to possess a temperature proportioned to the rapidityof its growth, i. e. proportioned to the rapidity of its conversion of fluids into solids.

But this is not the case, as is evinced in the following instances, viz.

In the growth of vegetables, generally, especially the mushroom, the temperature of which is unusually low—In proportion to their size, vegetables grow more rapidly than animals—Consequently, convert fluids more rapidly into solids.

In that of cold blooded animals—the shark—the alligator—the crocodile, the boa-constrictor, &c. which

grow as rapidly, and therefore convert fluids into solids as rapidly as warm blooded animals.

This theory further invalidated by the phenomena of

Fever, where the process is liquifying; yet is heat generated.

Famine, do. do.

Diarrhea, do. do.

Diabetes, do. do.

Marasmus, do. do.

Phthisis pulmonalis, do. do. &c. Illustration.

Also by the phenomena exhibited by

The seeds of vegetables.

The eggs of animals.

Blood newly drawn.

Hybernating animals.

Illustration.

Further instances in disproof of this theory, viz.

The uniformity of the temperature of the human body in,

Cold and hot weather.

Cold and hot climates.

Individuals becoming fat.

Illustrations.

In persons who are neither gaining nor losing flesh, the liquifying is a perfect counterpoise to the solidifying process.

Explanation and illustration.

Decarbonation of the blood, the cause of animal heat.

This the obsolete hypothesis of Crawford, substituting *carbon* for *phlogiston.*

Decarbonation a mere creature of fancy.—Might just as well say, that the secretory process of the kidneys *de-urinates* the blood, that that of the liver *debilitates* it, that that of the testes *deseminates* it, &c. &c.

Carbon discharged in respiration, as real a secretion,

as urine, bile, saliva, or any other fluid formed by glandular action.

Proof of this.

Hence that process does not augment the *specific* temperature of the blook.

Cannot, therefore, on the principles contended for, be the cause of animal heat.

No more caloric liberated in the lungs in respiration than is sufficient to raise the temperature of the air that is expired—this air often inspired *at zero* or below it, and expired at or near the *temperature of the blood*—To produce this effect, much caloric necessary.

The temperature of the *systems* of animals supposed to be in proportion to the extent of their *respiratory organs*, and that of *particular parts* in proportion to the quantity of *blood flowing* to them.

This hypothesis untenable.

First branch of it not supported by the temperature and respiration of birds, which constitute its strong hold.

Invalidated by the comparative temperature and respiration of

Infants.

Adults with lungs unusually large.

Pregnant females.

Individuals in cold weather and cold climates.

Patients affected by,

Phthisis pulmonalis.

Pulmonary abscess.

Asthma.

Peripneumony.

Typhus fever.

The latter branch of the hypothesis invalidated by the phenomena of

A limb on which the operation for aneurism has been performed.

The temperature of the limbs of a dog, whose iliac arteries were obstructed by ligatures.

Animals resist heat as well as cold—and *even possess* a *cold-producing or temperature maintaining power.*

This proved by,

Mr. Hunter's experiments on a dead and a living penis.

The immersion of the feet into hot water.

The experiments of Fordyce, Blagden, Banks, Tilset, Duhammel, and Delaroche.

Explanation and illustration.

Anomalous facts.

Mr. Hunter's experiments on the temperature of the dormouse.

Irregular flushings in sundry diseases—hysteria—palsy—apoplexy—epilepsy, &c.

Dog's nose always cold.

My own views of the production of *animal* or *vital* temperature.

The lungs have no more specific agency in the *immediate* production of animal or vital temparature, than the stomach, the glands, or any other organ.

The heat set at liberty in the lungs, by the formation of carbonic acid gas, is not, in any case, as already stated, more than sufficient to convert into vapour the humidity, and raise the temperature of the air, that is expired—None of it, therefore, can enter the blood—If it did, it would be felt in passing through the parietes of the bronchia, for it must enter, if at all, as sensible heat.

Nor have the blood vessels any *necessary* specific agency in the production of vital temperature.

Living matter possessing neither lungs, blood vessels, nerves, nor even organization, produce heat—This position established by the phenomena of

Seeds.

Eggs.
Plants, and
Blood recently drawn.

As already observed, those animals that do breathe, do not possess a temperature corresponding in degree to the size of their lungs, and the extent of their respiration—Some of them, moreover, produce heat, when in a state of hybernation, in which they do not breathe at all—Marmot, dormouse, &c.

There exists no single specific organ for the production of heat, any more than for the production of nutrition and growth. These functions are all performed by the capillaries, under the influence of the vital principle—each part producing its own heat, and effecting its own nutrition and growth.

Every animal and vegetable has its specific temperature, which is as essential to it, as its specific form. Deprived of this temperature, it perishes—Its preservation of it, is, therefore, only an instance of that resistance of destruction, which belongs essentially to living matter, and without which it *could not live*; all dead matter being at war with it.

Like digestion, sanguification, and secretion, then, the *production of temperature* is to be regarded as the result of a fundamental and indispensable function of living matter, having no dependance on chemical affinities, but being governed exclusively by the laws of vitality.—It is as free from the controul of chemical agency, as *thought* itself.

Motion of the blood.

Necessary alike to *nutrition* and *vitalization*, that the blood should move throughout the system.

Receives the vital principle from the atmosphere, to communicate it to the solids.

Two things, therefore, requisite—that it have access to

the atmosphere—and afterward visit every point to which it is destined to carry life.

Must, therefore, be fluid.

Holds intercourse with the atmosphere universally through the medium of respiration, by means of lungs, gills, stigmata, &c.

Analogy between respiration and digestion.

Circulatory apparatus marked by great variety in different classes of animals.

Insects.

Fish—Explain, as illustrative of circulation in other animals.

Frogs, serpents, &c.

Mammiferous animals, at the head of which stands man.

Circulatory apparatus in the latter class of animals, composed of heart and blood vessels. Heart double—pulmonic and systemic.

In this class, circulation two fold—a *long* and a *short* one.

In the course of the latter, the blood *receives* the vital principle; in the former, *imparts* it.

Illustrations.

For a perfect knowledge of the circulatory system in man, I must refer you to the anatomical department of the school.

Of the heart I shall only observe, that it is muscular and tendinous.

Parietes of the ventricles thicker and stronger than those of the auricles.

Parietes of the left ventricle, stronger than those of the right.

Final cause of this.

Valves of the heart, and their uses.

Blood vessels divided into arteries, veins, and capillaries.*

*The capillary system also is composed of arteries and veins.

Arteries two in number, arising from the two ventricles of the heart—Pulmonary artery, and aorta.

Description of.

Structure, muscular and tendinous.

Irritability belongs to the former coat.

Elasticity to the latter.

Muscularity of the capillaries.

Capillaries collectively much more capacious in diameter, than the trunks of which they are ramifications.

Arterial system, therefore, resembles a cone. The heart, its apex. The capillaries, its base.

Proportion of the aorta to the capillaries variously estimated.

Velocity of the blood different in different parts of its course.

Veins terminate in two trunks in the two auricles.

Resemble the arteries, in general form and distribution.

Larger and more numerous than the arteries.

Relative capacities of, as two to one or three to two.

Structure of, different from that of the arteries.

No muscular coat—or if any, very inconsiderable.

Irritability of, scarcely perceptible.

Parietes thinner than those of the arteries, and but slightly elastic.

Yet more difficult to rupture.

Lose their vigour earlier than the arteries.

Valves of the veins, uses of.

Most numerous in superficial veins.

In deep seated ones, very few.

Anastomases of veins, exceedingly abundant.

Mode of communication between arteries and veins.

By the division here laid down, then, I only mean, that between the functions of the capillaries and the larger blood vessels, there is a difference as radical and great, as that which exists between the functions of the arteries and veins.

different opinions respecting—Nothing conclusive known on the subject—most probable opinion, what.

Many arteries terminate in glands, and secreting surfaces.

The blood vessels thus distributed, divided into five systems—the aortic system, the system of the vena cava ascendens and descendens including what some call the portal system, the system of the pulmonary artery, the system of the pulmonary vein, and the capillary system.

Circulation of the blood, description of, beginning at the commencement or capillary portion of the Vena cava.

In this circuit, it twice washes the interior of the heart —or once the interior of *each* heart—forming in its course the figure of 8.

Thus far of warm blooded animals.

In cold blooded animals the heart and circulation single.

Of the longer or systemic circulation, in warm blooded animals. That being explained, the shorter or pulmonic will be easily comprehended.

The leading organ, the heart, motion of.

General movement denominated *systole* and *diastole*.

In the performance of this, the action of the two ventricles, synchronous. So is that of the two auricles —But in relation to each other, the movements of the auricles and ventricles are alternate.

Movements particularly described.

Is the heart at all times of the same size?

Cause of the motion of the heart.

Heart contracts from stimulation by the blood.

But from what cause does it dilate again?

Mere relaxation not sufficient to account for the phenomenon, because it implies an absence of action.

No antagonizing muscle to delate it.

Heart, according to Harvey, forced open by the propulsive movement of the blood.

Left ventricle, by the force it communicates to the blood, dilates the right auricle—the right auricle, the right ventricle—the right ventricle, the left auricle, &c.

An estimate of the force of the contraction of the heart attempted by

Borelli—180,000lbs.

Keil—from 8 to 5 oz.

Jurin, Hales, &c—forces intermediate.

Objection to the foregoing opinion.

1. Left side of the heart the strongest. Admitting, then, that it could force open the right; the latter being the weakest, could not dilate the former. The two sides cannot reciprocally force open each other.
2. The heart, when out of the body, and when, of course, there is no blood flowing into it to open it, contracts and *dilates* as before.
3. The heart cannot communicate to the venous blood its circulatory motion, its momentum being equal to that of the arterial blood.

Reasons for this opinion.

1. Viscidity of the blood.
2. Friction against the vessels.
3. Frequent anastomases of the vessels, by means of which two columns of blood meeting, from different and somewhat opposing directions, almost neutralize each other's motion.

These causes first weaken, and ultimately destroy all impetus received from the heart.

Again. That the blood may move by a *vis a tergo*, *the vessels must be perfectly full.*

But the veins are *not full*, in as much as any obstruction

of the blood in them by mechanical pressure, causes them to swell.

Were no other cause but a *vis a tergo* instrumental in moving the blood, every hemorrhagy of any extent, would check the circulation, by destroying the entire fulness of the vessels.

Did the blood circulate by the heart alone, that organ would bear, in size, some given proportion to the volume of blood destined to be moved by it—ox—dog—monkey—sheep.

After death, arteries *empty*, veins *full*—This not effected by the heart, which has ceased to act.

Prevailing theory of arterial systemic circulation.

Contraction of the left ventricle of the heart, aided by the alternate and successive *dilation* and *contraction* of different portions of the aorta and other systemic arteries, constituting a kind of peristaltic motion.

This supposed action of the arteries effected by the properties of *irritability* and *elasticity*, the latter making amends for the deficiency of the former.

Object. In the *healthy and unobstructed* circulatory process, no dilatation of the arteries occurs—*certainly none occurs in the large arteries.*

This assertion supported by direct and reiterated observation.

Arterial systemic circulation effected solely by the action of the left ventricle of the heart, and the *tonicity* of the arteries.

Explanation and illustration.

Capillary circulation effected chiefly by vascular action.

That the capillaries act by an inherent and independent power, appears from the phenomena of

1. Blushing.

2. Topical inflammation.
3. Secretion, healthy and morbid.
4. Nutrition.

The action and general economy of the capillaries, both in health and disease, exceedingly important.

Those vessels constitute, at once, the seat of disease, and the organs by whose sanative action disease is removed.

Future improvements in the philosophy and practice of medicine, will arise, in no small degree, from a more correct and thorough knowledge of the susceptibilities, sympathies, powers and actual condition, of those vessels.

They are to the larger blood vessels, what the artificer in architecture is to the common labourer, who carries to him the raw materials for building.

Thus far of the circulation of the blood through the arteries and capillaries, a process, comparatively speaking, not difficult to be understood.

That fluid now enters the veins, constituting, as already stated, a system of vessels exceedingly different—scarcely either irritable or elastic—very dilatable, but having no perceptible reaction.

Their figure or position in relation to the motion of the blood, the reverse of that of the arteries, their aggregate caliber becoming narrower instead of wider, in their progress towards the heart—For they, like the arteries, constitute a cone, the base of which is formed by their minutest branches, and its apex by the heart.

By this state of things is the resistance to the motion of the venous blood materially augmented.

The quantity of the venous blood nearly double that of the arterial.

This, another conclusive reason, why the heart, or *vis a tergo*, cannot keep it in motion.

Reputed causes of venous circulation.

1. *A vibratory motion* in the veins.

Obj. None such perceptible. Cannot, therefore, be legitimately infered.

Besides, such a motion, did it exist, would tend to throw the blood *from* the heart, instead of *towards* it; i. e. from the apex to the base of the cone. Venous valves could not always prevent this, especially in deep seated vessels, where they do not exist.

2. Muscular compression supposed to be the cause.

Object.

1. Muscles press on veins unequally; and must, therefore, retard the circulation in one part, while they accelerate it in another—must, thus, destroy its equability.

This argument corroborated by the phenomena of spasmodic diseases—Hysteria—Epilepsy—Chorea, &c. Here no acceleration of the venous blood; but often an obvious retardation of it, muscular action being great.

Illustration.

2. Muscular exertions, even the most powerful, do not, especially if long continued, always accelerate venous circulation.

Illustration.

3. Many veins situated out of the reach of muscular action, yet does their blood flow freely.

4. In fevers, where, from debility or choice, scarcely a muscle is moved, venous circulation preternaturally rapid.

5. In sleep, when the muscles are at rest, the blood still circulates without impediment.

6. Venous congestion often occurs, previously to any cessation or flagging of muscular action.

7. Blood circulates in catalepsy.

In paralytic limbs, also, where no muscle moves.

Hence, venous circulation has no dependence on mere muscular action.

To have left a process so important, to a cause so precarious and inadequate, would have argued signal inattention, and want of wisdom.

3. *Pulsation of the arteries considered as a cause of venous circulation.*

Object.

As already stated, in a healthy and natural condition of action, the arteries do not expand and pulsate laterally.

But admit that they do expand, still is the cause insufficient.

Expansion too inconsiderable to have any material effect—Vein or artery, or both, would recede from the impulse, and no circulatory effect be produced.

Two or three veins to one artery, and some at such a distance from arteries, as to be entirely beyond their reach.

To have their blood forced onward by arterial impulsion, veins must be *perfectly full and distended*, which is not the case.

Were the venous blood moved by arterial action, it would, on the opening of a vein, flow per saltum.

Instance, a vein in contact with an artery.

Arterial action, like muscular pressure, would destroy the equability of the blood's movement, by retarding that of the hindermost part of the column.

Venous circulation, then, by what powers effected?

Ans.

1. By the proper action of the veins themselves, although not visible.

Analogies confirmatory of this.

The vessels of vegetables.

The lacteals and lymphatics.

The ureters.

The bile, pancreatic, and lachrymal ducts.

The blood vessels of animals without a heart.

Proof that the veins act.

Blood circulates in them, in opposition to the power of gravitation, in the lower extremities, and in the jugular veins, when the head is in a depending position.

Suction of the heart.

Instead of being forced open by the impulse of the returning blood, the heart opens by its own action, creating, thus, a tendency to a vacuum, into which the venous blood immediately rushes.

In this, the heart is analogous to the sphincter muscles of the body.

Thus, by contraction, the left ventricle of the heart forces on the arterial circulation, while, by dilatation, the right auricle invites it back through the veins.

Proofs that the blood flows towards a vacuum.

The process of cupping.

Hemorrhages from the lungs, on the tops of lofty mountains.

Illustrations and practical inferences.

From the foregoing considerations, the circulation of the blood through the arteries and capillaries is comparatively a plain and simple process. That through the veins more complex and difficult to be understood.

In the latter, perhaps, three powers are concerned.

1. The proper action of the veins.
2. The suction of the heart.
3. A vis a tergo.

Secretion and nutrition.

Shall consider these two processes under the same head, because they are closely allied in their nature and character.

Of primary interest and importance in physical science.

Two of the cardinal results of vital action.

Essential to every active form of living matter.

A correct understanding of them, beyond most other kinds of knowledge, purifies and liberalizes the mind of the physiologist, and qualifies him to see things as they actually are.

A true definition of the term *secretion* compared with the *nature* of the process designated, demonstrates clearly the erroneous notions that have prevailed on the subject.

The term, which means the *act of separating*, grew out of the corruptions of humoral pathology.

Illustration.

Shall retain it, from a reluctance to unsettle medical phraseology by an introduction of new terms.

Secretion divided into healthy and morbid.

Examples.—Bile, urine, saliva, &c.—Pus, the matter of adhesive inflammation, the fluid of arthritic concretions, &c.

Not a separating, but a *generative* process—i. e. a compounding or decompounding one.

Exceedingly extensive in its range, and multiplex in its effects.

Fully to understand it, must look through the entire world of living matter; not merely through the higher orders of it.

It is the source of all vegetable odours, tastes, colours, gums, resins, poisons, and juices, whether healthy or

diseased, other than the blood or sap-juice.

Illustrations.

The source also of all animal odours, of all animal fluids other than the chyle and blood, and indeed of all *peculiar productions*, whether solid or fluid—Among the latter are included animal poisons.

These are either natural or morbid.

To the former belong the poison of the serpent, the scorpion, the asp, the spider, the wasp and other noxious animals.

To the latter, the poison of small pox, kine pox, lues venerea, rabies canina, &c.

The source of animal secretion is the blood—except in two instances, the *arterial blood*.

Of vegetable secretion, the sap juice, which may be regarded as the blood of vegetables.

The science of secretion embraces the following topics, viz.

1. A knowledge of the fluid acted on, (the blood,)
2. Of the apparatus acting, (i. e. glandular structure.)
3. Of the fluids secreted.
4. Of the effect of secretion on the blood.
5. Of the destination and uses of secreted fluids.
6. Of the modus agendi of glandular structures, in the formation of the various fluids produced.
7. Of the sympathetic action and influence of the glands on each other, and on the system at large.

The first topic (the nature of the blood) already discussed.

Some of the others shall now receive attention.

Of secreting organs.

These are widely different from each other, and in structure, more or less complicated, according to the change they are to produce in the blood.

Glands divided into various classes.

Conglobate and conglomerate—Definition of.

Of these, some are individual, i. e. relate exclusively to the economy of the individual possessing them.

Others are sexual or specific, i. e. relate to the propagation and preservation of the species.

Of individual glands.

1. Perspiratory and serous glands.
   Description of, with illustrations.
2. Cryptæ, glandular follicles, and mucus lacunæ.
   Do. Do.
3. Conglomerate glands.
   Do. Do.
4. Liver, a gland beyond others specific and worthy to be classed by itself.—Illustration.
   Pre-eminent importance of.
5. Sebacious and ceruminous glands.
   Description of, and illustration.
6. Lungs—office of—in part glandular.—Illustration.
7. Glands of colour, i. e. which secrete the matter of complexion.
8. Glands which secrete the humours of the eye.
9. The stomach.
10. Glands secreting certain peculiar substances.
    These belong to animals inferior to man, as the musk animal, the beaver, the pole cat, the torpedo, &c.

Of sexual, or specific glands.

In the male.
  The testes.
  The prostrate gland.
In the female.
  The ovaria.
  The uterus.
  The mammæ.
    Illustrations.

Although the brain possesses many of the characters of a gland, it need not, at present, be so considered, the more especially as its physiology has been already treated of.

Of the fluids secreted, their uses and ends.

1. To facilitate animal motion generally—of the articulations—the muscles—the eyes, &c.

Illustrations.

2. To moisten and lubricate certain parts, external and internal.

Of the peculiar aptitude of these moistening and lubricating fluids to the situation of the parts over which they are spread.

Close cavities lubricated with a serous secretion.

Those having an external opening with a mucous one.

Illustrations and final cause.

3. To aid in the performance of certain important functions.—deglutition—digestion—generation—vision—hearing—smelling—tasting—feeling, excretion, &c.

Illustrations.

Secretion of oil and fat.

Observation on the uses of.

Of the menstrual secretion.

Proofs that it is a secretion.

Derived from the amount of blood the uterus receives.

Remarks.

From the nature of the fluid discharged.

Not coagulable—odour peculiar.

From its periodical occurrence—all glands acting *periodically.*

Uterus then in a state of congestion, like other glands when secreting.

From the fact, that every healthy evacuation from the vascular system, is and must be the result of secretory action.

Supposed uses of the menstrual secretion.

To depurate the blood of the female—Remarks.

To obviate female plethora—do.

To convey to the uterus the part which the female contributes towards generation—genital particles—semen fœmininum—homunculi, &c.

Real uses of this secretion.

To sustain the vigour of the female organs of generation—prevent the decline of the sexual appetite—and fit the parts for the business of impregnation.

Illustration and proofs.

Human female alone menstruates *regularly and often*, and admits *at all times* the sexual embrace. (Females of the monkey tribe perhaps excepted.)

Other female animals menstruate, i. e. have congestion in the organs of generation, *only during the season of love.*

The cow—the mare—the sow—the bitch, &c.

In many small animals, as rats, mice, birds, &c. the sexual organs almost imperceptible, except during the season of love—then become injected and large.

Hence a palpable connection exists in females of every description, between the sexual appetite, and the injection of the generative organs with blood.

At the close of each menstrual period, the sexual appetite in woman stronger than at any other time.

From the same source arises the fitness of the female organs for conception.

At no other period, but that of their loves, can the females of the inferior animals be impregnated.

Women most readily impregnated soon after menstruation.

Women who do not menstruate, rarely prolific.

Cease to be prolific when they cease to menstruate.

Connection between menstruation and the existence and condition of the ovaries.

During menstruation, the female organs of generation a centre of fluxion, and seat of augmented energy, and their general sympathies greatly heightened.

Illustrations and inference.

Further uses of secretion in the inferior orders of living matter.

In vegetables.

Odour, taste, colour—To delight, attract, inform, and also to warm and forbid—Illustrations.

In animals.

Odours—Here also, these give information to enemies, convey to animals warning of their danger, and bring the sexes together, in the season of love—In these respects odour operates even on the human race.

Illustrations.

Colours and luminous appearances, the result of secretion, operate also in the intercourse of the sexes.

Illustration.

As means of defence and annoyance.

Examples.

In poisonous animals generally—also in the polecat, the cuttle-fish, torpedo, &c.

Probable effects of secretion on the blood.

Urine—Bile—Matter of perspiration—Remarks on.

Of the modus agendi of the glands in secretion.

Various hypotheses have been instituted on the subject —usually tinctured by the prevailing scholastic philosophy of the times.

Divided into *mechanical*, *chemical*, and *vital*—or those of the humoralists, those of the solidists, and, such as partake in part of the opinions of both.

1. The *mechanical* hypothesis, which stands equally related to the solidists and the humoralists.

Illustration and refutation.

2. The *chemical* hypothesis, subdivided into

That which attributes secretion to a fermentative process.

An effervescence between acids and an alkalis.

A certain undefined play of chemical affinities independent of either acid or alkali.

Illustration and refutation.

3. The *vital* hypothesis, or that of the solidists, which, regarding secretion as a vital process, attributes it exclusively to the action of the solids on the fluids —of the secreting structures on the blood.

Illustration and confirmation of this.

Of the sympathy of the secreting structures or glands, with each other, and with the system at large. This includes the sympathies of membranes of every description.

A most important consideration, both in the preservation of health, and the removal of disease.

Its practical application.

Glands act not all at once, but periodically, as their action is required in the economy of the system.

Each gland has an associate circle of parts, which its action, healthy or diseased, influences—This circle, as *a sub-system*, influences another similar one, and that another, until the *entire system* feels the effect.

Illustrations.

From the foregoing considerations it is not extravagant to say, that to natural secretion we are indebted for our *existence*, our growth, the *preservation* of our health, and its *recovery* when lost. Morbid secretion, on the contrary, is an abundant and powerful source of disease.

Hence the imperious character of the obligation imposed on us, both as philosophical and practical physicians, to study the process attentively and faithfully, as well in a sound as an unsound condition.

Of nutrition.

A process of infinite interest to the philosophical inquirer—One of the most curious within the scope of physiology.

Very defectively and unsatisfactorily treated by physiological writers.

Its close relationship to secretion.

A compound process, consisting of *secretion* and *apposition* or *fixation.*

Effected by the capillary vessels, which, in all parts, therefore, perform a secretory function—They constitute the real mechanicians and architects of the body.

Like secretion, nutrition is a generative process.

Illustrations.

Nutrition effected entirely from the arterial blood.

Differs however from secretion in this, that it produces from the blood vital matter, while all secreted matter is dead.

In bestowing substance, then, on the various parts of the body, nutrition communicates to them also the attributes of life.

Is there, in different portions of the blood, peculiar aptitudes for nourishing particular parts of the body?

Ans. No—Illustrations.

Of the philosophy of nutrition.

This like the philosophy of secretion, tinctured by the reigning philosophy of the day.

Hence the existence of sundry hypotheses on the subject.

1. Chemical hypothesis, which represents nutrition as a kind of animal chrystallization, arising from the play of chemical affinities—The mere conversion of a fluid into a solid, by chemical agency.

Illustration and refutation.

2. The hypothesis founded on what is denominated *animal appetency.*

Of these, both are of humoral origin, and therefore, erroneous.

Illustration and refutation.

Half truths in science there are none.

Like secretion, therefore, nutrition is a purely vital process, the result of specific organical action.

Illustration and confirmation.

Of absorption.

Definition of the term.

Proceed in the order of nature--have shown how man *is built up*—shall show how he is pulled down.

Universality of absorption.

A counterpoise to secretion and nutrition.

Maintains its vigour until later in life.

Even, as some believe and assert, after the other functions have entirely ceased.

Gives evidence of the *constant gradual* death of the body—Should serve, therefore, as a valuable *memento mori*.—Illustrations.

Balance of the system, in relation to nutrition and absorption, different at different periods of life.

This balance connected essentially with leanness and obesity.—Illustrations and remarks.

Excessive obesity, no less than excessive leanness, a mark of disease, and why?

In cells and cavities lined with serous membranes, absorption a counterbalance to secretion.

The derangement of this balance results in dropsy.

Illustration.

Proceed to a more detailed view of the uses and ends of absorption.

This process divided into several different kinds, expressive of the different effects it produces, viz.

1. Nutritive absorption.
2. Cellular do.
3. Interstitial do.

4. Formative do.
5. Excisive do.
6. Ulcerative do.
7. Disjunctive do.

Of these in order.

But first, of the absorbents themselves.

The existence of this system of vessels, a modern discovery—The ancients ignorant of it.

Reserved to illustrate the science of medicine in the eighteenth century.

The discovery of vast importance—scarcely inferior to that of the circulation of the blood.

Without a knowledge and application of it, many of the most interesting phenomena of the animal economy inexplicable.

Absorbent vessels small, incalculably numerous, and so minutely and universally dispersed, as to be *omnipresent* in the human body.

Their presence, a *conditio sine qua non*, in the natural structure of every organized part of the system—To prove this, an actual discovery of them, by injection or otherwise, not necessary, as will be shown hereafter.

Nature doing nothing in vain, the high importance of the absorbents fairly deducible from their universality.

Their action as universal as their presence—Destined to remove gradually every molecule of the body, as it becomes, by exhaustion or decay, unfit for the healthy purposes of the system.

Hence, as there must be *vasa vasorum*, for the process of nourishment, so, for that of absorption and removal, must there be absorbentia vasorum, and even *absorbentia absorbentium*—absorbents which prey on the absorbents themselves.

Lymphatic glands constitute a part, not unimportant, of the absorbent system.

Observations on their probable uses.

The several branches of the absorbents, having diversified functions to perform, in the removal of substances differing not a little in composition and texture, possess different susceptibilities and powers of action.

Illustrations and remarks.

1. *Of nutritive absorption.*

Performed, after birth, by the *lacteals alone*, of which I have already treated—Probably no other branch of the absorbents, except those of the umbilical cord, in the fœtus in utero, contribute to *actual nutrition.*

Nutritive injections, as they are usually denominated. ——Observations on.

2. *Of cellular absorption.*

Performed by absorbents originating from the various cells, cavities, and hollow organs of the body—abdomen—thorax—stomach—uterus—bladder—ventricles of the brain, cellular membrane, &c.

Those absorbents carry off serum, mucus, &c.

Remarks on.

3. *Interstitial absorption.*

Performed by absorbents arising from the interior of all the solids of the body.

The action of this branch essential to nutrition, removing the old effete matter, to make room for that which is fresh and vigorous.

Wherever the matter of nourishment is deposited, there, by the action of vessels destined for the purpose, absorbents *do* and *must* exist.

Illustrations and remarks.

4. *Formative absorption.*

This modification of absorption closely connected with the preceding.

Related to growth, as interstitial absorption is to nutrition.

Models and preserves in proper shape and proportion, the various parts of the body, as they progress in growth.

Illustrated by reference to the growth of the cranium, of long, cylindrical and hollow bones, of the heart, of blood vessels, &c.

All parts that grow, then, and retain their shape, must possess absorbents.

5. *Excisive absorption.*

So called, because it removes entirely, as if they were extirpated by the hand of a surgeon, certain parts of the body, as they become useless or offensive.

This process connected alike with parts of natural, and of diseased, growth.

The first illustrated in the removal, in the human subject, of the thymus gland—membrana pupillaris—ductus arteriosus—alveolar processes—fangs of the infantile teeth, &c.

In inferior animals, in the removal of the membrane closing up the eyes of puppies, kittens, &c. the tails of tadpoles—the stomach of the grub of the ephemera, &c.

The latter mode of action illustrated, in the removal of tumors both acute and chronic, the diminution of cicatrices, enlarged callocities at the place of union of broken bones, &c.

Action of absorbents, different modes of exciting and invigorating it.

6. *Ulcerative absorption.*

Ulceration, an absorbent process.

Theory of.

Beautiful exhibition of the vis medicatrix, in the economy of a deep seated abscess.

Secretion of pus—adhesive inflammation—absorp-

tion of the external parietes of the abscess.

7. *Disjunctive absorption.*

That process of the function, by which parts are separated from each other.

Illustration.

In cases of sphacelus, the living separated from the dead substance, by this variety of absorption.

Theory of ulcerative absorption, Mr. Hunter's views of.

Evidences of absorbents in the brain.

Growth of the organ.

Ulceration of do.

Diminution of do. in hydrocephalus.

The foregoing considerations demonstrate the importance of the lymphatics, as well in the preservation of health, as the removal of disease.

Philosophy of absorption.

Different theories.

That of capillary attraction—remarks on.

Of specific appetency—do.

A vital organic process, the vessels acting in a manner peculiar to themselves.

Digestive or assimilating power of the absorbents.

Observations corroborative of.

Do the absorbents take up, and convey into the circulation, and thence to the various parts of the system, in a formal and unchanged condition, either deleterious or medicinal substances?

Remarks in answer to this question.

Application and practical uses of the preceding doctrines of absorption.

Having finished the consideration of internal absorption, I proceed to that of absorption *from without.*

This denominated *cutaneous absorption*, and means the drawing in through the cuticle matters *exterior to it.*

Does such a modification of absorption exist?

Belief in the affirmative at one time universally, and still very generally, entertained.

Even antecedently to the discovery of the absorbents, matters supposed to enter the system from without through the skin.

Avenues of admission supposed to be the common pores, which were considered as alternately discharging matter from within, and imbibing it from without.

After the discovery of the absorbent vessels, a belief in the existence of cutaneous absorption, still entertained for the following reasons.

Analogy.

Vegetables absorb from without.

Worms and animalculæ infusoriæ, do.

Insects, do.

Certain amphibious animals, do.

Other more direct reasons alleged.

1. By exposure to a humid atmosphere, man augmented in weight.
2. By the application of moisture externally, thirst extinguished.
3. Nourishment derived from supposed nutritious baths.
4. Dropsy, diarrhea, diabetes, &c. rendered worse by exposure to external humidity.
5. Certain febrile poisons, in an aeriform state, supposed to enter the system through the skin.
6. Many remediate agents believed to act through the same channel.

Notwithstanding the confidence with which these reasons were urged, the opening of the mouths of the absorbents without the cuticle was assumed as a postulate, not proved as a fact.

Doubts, at length, arose respecting the truth of cutaneous absorption.

In 1783 Dr. Currie, of Liverpool, ascertained, that the weight of the body is not increased by immersion.

On the contrary, rather diminished.

In 1790, experiment repeated and further confirmed, in a case of diabetes.

In 1795, he performed another series of most excellent experiments, with the same result.

Had previously experimented on his own person, with similar effect.

In 1792, Dr. Seguin, of Paris, turned his attention to the subject of cutaneous absorption.

Published an able memoir on the subject, corroborative of the opinions of Dr. Cunie.

Mercurial baths, experiments with, and result.

Applied to the skin mercurial ointment, and other articles both solid and fluid, none of which entered the system, when the cuticle was unbroken, i. e. *they did not produce their specific effect.*

Became persuaded that the poison of epidemics never invades the system through the skin.

In 1800 Dr. Rousseau, of Philadelphia, published on the subject an Inaugural Dissertation.

His experiments, with various well selected substances, numerous, well conceived, and ably conducted.

Account of.

Result unfavourable to a belief in cutaneous absorption.

In 1805 Drs. Dangerfield and Klapp, published each an Inaugural Dissertation on the same subject, and with a similar result.

These dissertations contain nothing new, but the general subject is ably treated in them.

Dr. Dangerfield pushed his experiments with mercurial ointment beyond those of any previous writer.

Medicines supposed by these writers to be absorbed by the lungs.

In 1809 Dr. Mussey, of Massachussetts, published, in

Philadelphia, an experimental paper on the other side of the question.

Madder, the subject with which he experimented.

Experiments well conceived and carefully conducted.

An account of them, and the result—Not conclusive.

Further experiments by Drs. Rousseau and Smith.

Result—To enter the system, by absorption, articles must either pass through the cuticle by maceration, or be forced through, or rather under the laminæ of that covering by mechanical pressure.

This most easily effected on those parts of the upper and lower extremities where the laminæ or scales of the cuticle are largest and most loosely connected.

Reasonings on the preceding experiments.

Conclusion unfavourable to absorption *from without.*

The cuticle a perfect panoply to the body.

Intended to constitute, and does so, a wall of complete separation between living matter within it, and dead matter without—Such separation essential to healthy existence.

Absorbents, on what principle does their contained fluid move?

Ans. By means of their own organic action—as in veins, and the sap vessels of vegetables.

On generation.

An exclusive attribute of living matter—and belongs alike to all living matter, whether vegetable or animal—But not to minerals.

In the vegetable and animal kingdoms, individuals die from the very condition of their existence.

Generation, serving as an antidote or power counter-vailing individual death, preserves the species from extinction.

Stands related to the species as food and the process of nutrition do to the individual.

The species decaying daily, is renovated by generation—the individual, in like manner, decaying daily, is renovated by nutrition.

In the mineral kingdom, no death occurring, no generation requisite—Hence, in that department of nature, would prove injurious.

Definition of generation, according to the foregoing principles—That process, by which, from the substance and by the energies of one living being, another of the same species is produced.

In all the higher orders of animals, including man, generation connected with a difference of sexes.

A knowledge of this difference essential to the satisfactory understanding of generation.

For this knowledge must refer to the professors of Anatomy and Midwifery.

From the delicacy and exquisite sensibilities of woman, her sympathies are of a higher order than those of man.

This true more especially of the generative system, which, although composed of various parts, is constituted a perfect whole by sympathy.

Generation common to all living beings; but its modes exceedingly different in different races.

The result of a superabundance of life and substance in the parent being—Hence, both animals and vegetables propagate chiefly in the prime and vigour of their existence.

Different modes of generation.

1. By spontaneous division, or accidental or intentional section—Examples.
2. By pullulation, gemmation, or sprouting—Illustration and examples.
3. *Individual* hermophrodite impregnation. Do. do.
4. Double or sexual hermophrodite impregnation. Do. do.

5. Distinct sexual impregnation, without copulation. Do.

6. Copulation, without sexual coition. Do. do.

7. Semi coition.—Do.

8. Perfect coition—Do.

Use to the female of sanguineous fulness and augmented sensibility, during the act of coition.

In generation, as in other processes, some phenomena more, others less, difficult of explanation.

Some of the most difficult.

Transmission of *individual* parental likeness, corporeal and mental.

Do. of mixed do.—Under this head fall hybrid animals.

Of collateral likeness, as of cousins, &c.

Of likeness to remote progenitors, passing by immediate parents.

Of Diseases of remote progenetors.

In relation to generation, some topics *settled*, others not.

Settled topics.

The ovarium is the seat of conception.

Is marked by numerous vesicles, each containing pellucid lymph.

After fruitful coition, one or more of these vesicles undergo a change.

Change described.

Vesicles pass into *corpora lutea*—description of.

Proof that conception occurs in the ovaria.

Fœtal rudiments found there.

Also in the fallopian tubes, and other extra-uterine situations.

Influence of semen masculinum the cause of conception.

Unsettled topics.

The mode in which this influence is communicated to the ovaria.

Various hypotheses on this subject.

1. *Semen masculinum deposited, vi jaculationis, in the uterus, and conveyed thence, unchanged, to the ovaria.*

Projecting power of the penis masculini alleged in support of this—Urine ejected in a stream.

Object.

Ejaculating power of penis much weakened, in coition, by pressure.

From its weight and viscosity, semen masculinum unfit to be projected.

Even admitting the projection of the semen masculinum, how can it gain admission into the uterus?

Mouth of the uterus, especially the virgin uterus, very small.

Not situated in the axis of the vagina.

Passage through the neck of the uterus, especially the part called the strait, still smaller than the mouth.

Canal lined with a rugous membrane.

Obstructed by a secreted mucus.

The cavity of the uterus itself so small that its parietes are, perhaps, in contact.

The parts being in a natural and healthy condition, these impediments to the entrance of the semen masculinum into the uterus exist.

Unnatural state of things.

1. Penis impaired in its projecting power by,

Truncation.

Strictures in the urethra.

Irregular openings in the course of the urethra.

Debility.

2. Vagina closed by adhesions, tumours, or membranes natural or adventitious.

3. Os tincæ impervious originally, or by inflammation; or rendered inaccessible to the semen

masculinum by some deranged position of the uterus.

That impregnation can be effected in these unnatural conditions of the generative parts, appears from cases reported by Harvey, Morgagni, Hildanus, Ruysch, Simpson, Haller, and others.

It must, then, take place, without the entrance of the semen masculinum into the cavity of the uterus.

Experiments by Harvey, De Graaf, Lewenhoek, Haller, and Haighton, on various animals, viz. The cow, the doe, the ass, the ewe, the bitch, and the females of rabbits.

All these animals inspected at different periods after coition, and no semen masculinum ever certainly found beyond the vagina.

Mr. Hunter reported to have found semen masculinum in the uterus of a bitch—Erroneous.

Even admitting semen masculinum to gain admission into the uterus, there it must stop.

Could not thence find its way to the ovarium.

Neither the uterus nor the fallopian tubes calculated to convey the fluid in that direction.

Must, from their form and organization, act in the contrary direction.

Cannot act both ways—Nothing in the systems of animals analogous to such a phenomenon.

Fallopian tubes could not convey any thing from the uterus to the ovarium, without experiencing an erection, or orgasm.

That nothing such takes place during coition, proved by the experiments of Haighton.

These experiments performed immediately after the act, and at every hour from the first until the ninth.

No orgasm during this period—a turgescency of

the vessels just beginning to appear.

But impregnation now completed.

This event, therefore, had taken place previously to any orgasm in the tubes.

2. *Semen masculinum supposed to be carried from the vagina to the ovarium, by a set of absorbents specifically appropriated to that office.*

Objections.

3. *Semen masculinum supposed to be conveyed by absorbents into the blood, and thence through the sanguiferous system to the ovarium.*

Objections.

4. *A fecundating aura supposed to arise from the semen masculinum in vagina, and make its way to the ovaria.*

Objections.

5. Hypothesis of Harvey—Semen masculinum effects impregnation by an influence or power analogous to that of contagion.

Objections.

In relation to the mode in which the semen masculinum throws its influence on the ovarium, there exist various other hypotheses or conceits too ludicrous in themselves, and too humiliating to the intellect of their advocates, to be recited.

In the solution of the process of impregnation, no facility is gained by admitting the semen masculinum into actual contact with the ovarium.

Illustration.

Further hypotheses.

1. Germs or homunculi pre-exist in semen masculinum, which, making their way into the uterus, there develop and grow.

2. Germs pre-exist in the ovarium of the female, which, by the influence of the semen masculinum, in contact or remote, are excited to development and growth.

3. The male and the female furnish, each, a seminal fluid, which, uniting and commingling in the uterus, make a formative effort, and produce a fœtus—or do it by means of atomical affinities.

4. There exist *already formed*, in the female ovarium, certain portions of matter, capable of being, by the influence of the semen masculinum, so quickened and endowed, as to assume the formative action requisite for the production of a fœtus.

5. The hypothesis of Count De Buffon, which alleges the existence of generative organic particles, which, by uniting in the uterus, produce an embryo.

—Illustrations and objections as to the preceeding notions.

Of the theory which attributes to stimulation and sympathy the work of impregnation.

Of this theory, Dr. Haighton, by his experiments, a distinguished supporter.

Semen masculinum, deposited in vagina, specifically stimulates that organ, which is possessed of specific susceptibilities, and the remainder of the process is performed by sympathy.

For the better understanding of this theory, a few general observations requisite.

Impregnation, like every other vital action or process, the result of stimulation.

This, a first truth in physiology—immediate, general, irresistible.

In vegetables, and many animals of the lower orders, the common stimulants of heat, light, moisture, electricity, &c. sufficient to give rise to a generative effort.

In animals marked by sexes, stimulus of a seminal secretion alone adequate.

Some part of the system of the being, whether vegeta-

ble or animal, thus stimulated, forms, by a new and specific *secretory action*, the rudiments of the future offspring.

Generation, therefore, as literally the *work of secretion*, as the formation of bone, or the production of bile.

Illustrations.

Remote stimulation as powerfully operative as *proximate*. —Examples, derived from various glands.

1. Salivary glands.
2. Lachrymal do.
3. Liver.
4. Kidneys.
5. Testes.
6. Skin or the cutaneous glandular tissue.

Embryo, a secretion from an ovarian gland.

If other glands be excited to action by remote stimulation of parts not belonging to the same *immediate systems* with themselves, much more may the ovarian glands be thus excited, by such stimulation of a component part of the generative system, to which they belong, and which, as already stated, is connected as a whole by the strongest sympathies.

Illustration.

Place of stimulation, and order of sympathy.

Vagina specifically stimulated by semen masculinum.

Course of sympathies.

1. Ovarium.
2. Fallopian tubes.
3. Fundus uteri.
4. Cervex uteri.
5. Mammæ.
6. Vagina and external organs of generation.

In all these parts semen masculinum cannot be present, yet is it the cause of the changes they sustain.

Through sympathy, then, alone it must operate.

Further proof that the whole process of generation is sympathetic.

The experiments and reasonings of Dr. Haighton—Recital of.

Further proofs drawn from generation in *fowls*, *birds*, *aphides*, and *vegetables*.

1. Fowls and birds.

Here the embryo or rather ovulum formed before the sexual embrace—Like the bud of a tree.

Embryo or ovulum situated high up the spine, at a great distance from the vulva, in which the semen masculinum is simply *deposited* by a penis that does not project.

Uterus and infundibulum long and tortuous.

Many ovula, sometimes upwards of twenty, impregnated by one embrace.

These ovula, being in different stages of growth, semen masculinum cannot, through the uterus, come into contact with all of them—does not indeed, with any.

2. *Aphides*, several generations of, impregnated by a single embrace—i. e. mother, daughter, grand-daughter, great-grand-daughter, &c. for in this descent, while viviparous, they are all females.

Become again oviparous, when males and females are once more produced—Impregnation here, certainly by sympathy.

Illustration.

3. *Vegetables.*

In many of these, ovarium very remote from the stigma.

Style, connecting stigma and ovarium, long and impervious.

Pollen applied to the stigma, but cannot possibly be conveyed to the ovarium, the style not being tubular.

Must, therefore, extend its influence to the embryo by sympathy.

Pollen not being fluid, but a dry powder, renders its conveyance along the style to the ovarium absolutely impossible.

Specifically stimulates the stigma, and all that follows is the work of sympathy.

Impregnation of fish and frogs, where the semen masculinum comes into actual contact with the ova, supposed to constitute an objection against the sympathetic theory of generation.

Not so—Semen comes into contact only with the *outside* of the egg—But impregnation implies an *internal* effect—The seminal fluid of the male, then, not entering the egg, must operate by sympathy.

Same thing would be true, in woman, did the semen masculinum gain admission to the ovaria.

All animal actions and processes are the result of susceptibility, impression and sympathy.

This theory of generation, erected on the susceptibility and the sympathy of the solids, much more intelligible and satisfactory, than that arising out of the mixture of the fluids.

The latter participates of the corruptions of humoralism; the former has the freshness and purity of solidism.

In every species of animal, the semen masculinum possesses a power of stimulation sui generis.

Supposed to be instrumental, at puberty, in giving form and character to the male.

An error—This effect not produced by the stimulation of secreted semen, but by the awakened sensibility and energy of the genital system.

The secretion of the seminal fluid a concomitant effect of the same general cause.

Illustration.

Of superfœtation.

Not twins; but one conception succeeding another, at some distance of time.

In woman, correctly organized, can this occur?

Feasible, where there are two vaginæ and two uteri.

A case to this effect recorded in the *opuscula pathologica*, of Haller.

Similar cases related by Purcell, Lobstein, Pole and others.

In any case, superfœtation very rare, and ought to be admitted with great caution.

Too much credulity indulged in relation to it.

That it can scarcely occur in the case of a single uterus and vagina, appears from the following considerations.

On conception being effected, os tincæ and fallopian tubes closed, by a tenacious mucus secreted for the purpose.

Membrana caduca also formed, as essential to the fœtus.

Uterus thus completly occluded, against the entrance of any thing from without.

Another fœtus must have another membrana caduca, which could not be formed without the removal of the first.

In the progress of gestation, at a later period, uterus enlarged so much, and the general position and relations of the parts so changed, that the fallopian tubes could not reach the ovaria.

Conception occuring now, fœtus must be extra-uterine.

Could a second fœtus reach the uterus at this period, great disorder would ensue—most probably disorganization, and destruction of the gravid state.

Existing uterine action must be suspended, to admit of another kind, forming a new placenta, &c.

Two kinds of action cannot coexist in the same organ.

Thus pregnancy and *true menstruation* incompatible—

The co-existence of any two different kinds of action

in the same organ, contrary to the laws of nature—The same thing as *to be*, and *not to be*.

Sanguineous discharge from the vagina during pregnancy, not menstruation—not a true secretion—dissimilar in smell, colour, and all other sensible qualities.

Uterus cannot nourish a fœtus, and menstruate, at the same time.

Same vessels which menstruate, have formed and now support the membrana decidua.

In proof of this, the membrana decidua exists in obstinate cases of amenorrhea.

In pregnancy, the condition of the uterus too much changed, to admit a second conception.

Those subject to amenorrhea seldom prolific.

To fit the genitnl system for conception, entire harmony in susceptibility, and concert in action between all its parts must prevail.

Attempted defence of Superfœtation.

1. Multiparous animals, as the bitch, bring forth, by promiscuous coition, a terrier, a cur, a hound, a bulldog, a mastiff, &c. each resembling its male parent.

Object—Not conclusive—these are instances not of superfœtation, but *contemporaneous conception*.

Ovarian vesicles all ripened and their contents conveyed to the uterus during the same process, not during two or more successive ones.

Birth contemporaneous, and all the offspring alike mature.

Besides, the uterus of the bitch divided into cells—no membrana decidua—and the fœtal rudiments do not so early attach themselves to the parietes uteri—Each cell a kind of independent uterus.

Here, then, analogy gives no evidence of weight, in favour of superfœtation.

Human infants born differing much in size, and ap-

parently also in age—this, either at the same time, or at some interval from each other.

Ans. An occurrence exceedingly rare; if, indeed, the event has ever occurred.

In former times of great credulity, believed in—at present, much discredited.

Some cases of the kind lately reported.

Ans. Fœtus had perished prematurely, and was still retained in utero.

Rendered diminutive by original defect, disease or accident.

Fœtus, it may be said, if dead, likely to putrefy.

Ans. Not if the membranes be entire.

Example.

Black and white children, both mature, at the same birth—from immediate successive connections with a black and a white man.

Few cases of this kind reported—know of only three or four, and the evidence in favour of their existence not conclusive.

Characterized by inherent marks of fallacy.

The offspring of a black person and a white ought to be a yellow—a mulatto.

At best, these must be instances of cotemporaneous conception; not of superfœtation.

Such a phenomenon unnatural, and supported by neither fact, reasoning, nor sound analogy.

Of the ovum—Where formed, and how?

Observations on.

Of the nourishment of the Fœtus in utero.

Only two sources of nourishment ever referred to,

1. The liquor amnii.
2. The umbilical cord.

Liquor amnii supposed to be taken in, in two ways.

By the skin, acting like a spunge, or by means of absorbents.

Erroneous—Skin of the fœtus often so incrusted by thick mucus, as to prevent absolutely any thing from entering in that way.

Notion of Democritus.

Liquor amnii not the source of nourishment; because,

1. That fluid *is not nutricious.*

Often, towards the close of gestation, exceedingly impure—acrid—putrescent—feculent—bloody.

2. It usually exists in an inverse ratio to the size of the fœtus, and its demand for nourishment—sometimes entirely wanting—dry births.

3. Fœtus often born without a passage to the alimentary canal—sometimes acephalic.

4. Antecedently to the third month, its chylopoietic viscera soft, pulpy, and incapable of the alimentary function.

Circulation and nutrition the only functions that go on in the fœtal system—Brain, lungs, liver, &c. quiescent.

Condition of fœtus perfectly parasitical—Food prepared exclusively by the mother, and the maternal portion of the placenta.

Theory of nourishment by the umbilical cord.

First inculcated by the Stoics—Became extinct—Revived about the time of Harvey's discovery—Since that period, the prevailing doctrine.

Of this theory, several modifications exist.

1. Direct vascular communication between mother and fœtus.

Incorrect.

Proofs of this.

Injections never pass from the maternal to the fœtal system—nor the reverse.

Pulsations of the maternal arteries and the umbilical cord discrepant.

Fœtal and maternal blood dissimilar.

Difference specified.

Did the maternal blood pass *immediately*, this could not be the case—There would, then, be transmission, without assimilation or adaptation.

Powerful propulsion of maternal blood, the heart and arteries being strongly excited, would injure the tender and feeble system of the fœtus.

Maternal blood supposed to be deposited in placental cells, and thence absorbed, by the fœtal veins—fœtal blood agian deposited by the fœtal, and absorbed by the maternal veins.—Erroneous.

Placenta composed of two parts, fœtal and maternal.

These parts made up respectively of vessels from the fœtus and the mother.

Those vessels intermingle, but never anastomose.

Demonstrated, in the early placenta, by maceration.

Illustration.

Effusion of blood by one set of vessels and assumption by the other, has no existence.

Arteries of the umbilical cord have no exhalent extremities—run immediately into veins.

Uterine arteries have secretory terminations, which, preparing fœtal nourishment, deposite it in placental cells—But the main current of blood returns to the uterus by veins.

In the fœtal placenta, circulation of the blood like that in the lungs.

In the maternal placenta, circulation like that in the corpora caverrosa penis.

Between mother and fœtus, then, no direct vascular communication.

Proof.

Best injections, by umbilical arteries, return by umbilical vein.

Injections, by uterine arteries, return in part, by ute-

rine veins, and p: ss, in part, into the cells of the maternal placenta.

Fœtus delivered, and umbilical cord c t, no hemorrhagy from maternal vessels—from the end of the divided cord only.

Fœtus not affected by maternal hemorrhagy.

Mother dies of hemorrhagy, child healthy and vigorous.

Converse equally tru —child, in embryotomy, dies with great hemorrhagy; mother, although exceedingly weak, not affected by the accident—did the blood flow from her vessels, the case would be otherwise.

Child and placenta simultaneously expelled, unless the infant breathe, circulation continues a considerable time—if placed in warm water, from fifteen minutes to half an hour—A remarkable and conclusive case in point.

In inferior animals, the monkey tribe excepted, the maternal portion of the placenta not deciduous, but an adherent growth of the uterus—Here the fœtal portion falls off, without hemorrhagy.

In some of these animals, the doe, and the female rabbit, the discrepancy between the fœtal and the maternal portions of placenta, still greater.

Illustrations.

Experiments corroborative.

1. Side of a pregnant bitch laid open, and umbilical vein divided—hemorrhagy copious, and fœtuses exhausted of blood—In another similar experiment, a ligature passed around the umbilical arteries, hemorrhagy trifling.

2. A pregnant bitch killed by hemorrhagy from the divided carotid arteries—fœtuses alive and vigorous—Fœtal portion of placenta full of blood—maternal portion empty and flacci .

3. Feed a pregnant animal with madder—Bones of

mother coloured—those of fœtus not.

Congenital small pox and syphilis afford no evidence of any immediate vascular connection between fœtus and mother.

Perfectly explicable on principles of sympathy.

Fœtus, then, fabricates its own blood.

Analogy from the egg—chick certainly fabricates its own blood from the contents of the egg.

Fœtus has an equivalent apparatus—why not, then, do the same?—Vegetable seeds, bean, pea, &c. the same.

What, then, are the uses of the placenta?

Ans. Twofold—That organ serves both as lungs and stomach, i. e. vitallizes the blood of the fœtus, and secretes a fluid for its nourishment, from the blood of the mother.

Maternal portion of placenta, the stomach, fœtal portion, the lungs.

Analogy of the placenta to the lungs.

1. Blood of fœtus passes through it, as it afterwards does through the lungs—i. e. a part passes through, as in the case of amphibious, or single hearted animals.
2. Texture cellular, somewhat like that of the lungs.
3. Compression of the umbilical cord strangles, in like manner with compression of the trachea.
4. In passing through the placenta, the blood becomes arterialized, i. e. exchanges its modena for a scarlet colour—Remarks.

Does the fœtus in utero produce its own temperature? Question discussed.

Whence comes the vital principle or materia vitæ, to the blood of the fœtus?

Ans. From the blood of the mother, which derives it from the atmosphere.

Decarbonation of fœtal blood—Remarks on.

No conclusive evidence of the existence of.

Placenta, in its maternal portion, analogous to the stomach, in preparing a chyloid fluid for the nourishment of the fœtus.

This opinion by no means new—Entertained by various writers of former and remote ages.

In relation to certain inferior animals, manifestly true.

Evidence to prove its existence in the human race, not wanting.

Seen by Harvey, Haller, Blumenbach, Burns and others.

Harvey denominates it, an "albuminoid fluid."

Most easily detected in those animals, the two portions of whose placentæ are united on the principle of papillae and cotyledons, or socket and ball.

Here the secreted fluid has been seen oozing from the papillœ into the cotyledons.

In the human female, secreted by the glandular action of the uterine arteries.

Sympathy between uterus and mammæ exceedingly powerful—Mostly direct; but sometimes reverse.

Examples of reverse sympathy.

During lactation, catamenia suppressed.

Conversely—secretion of milk suppressed during a flow of catamenia.

Further—Uterus and Mammæ interchange functions.

Illustration.

Secretion of milk checked by cold—a similar fluid issues from the vagina.

After parturition, secretion of milk late in appearing—lochial evacuation more copious, and changed in quality, colour, consistence &c. by the admixture of a milk-like fluid.

The fluid secreted by the placenta, how conveyed into the fœtal system?

Absorbed by veins, said Harvey.

—Not true. Veins do not absorb nutrimental matter.

Fluid taken up by regular absorbents, and by them conveyed into the fœtal circulation.

No matter whether these absorbents have been seen or not. Placenta and umbilical cord are nourished and grow, and must, therefore, be supplied with absorbents—No absorbents found in cartilages; yet must be there.

These absorbents said, however, to have been seen by Mickel, Waltherus, Ludwig, Moscagni, and others.

Two sets of them—Lacteals and common absorbents—analogous to the arrangement of things in the intestinal canal.

This theory of fœtal nourishment confirmed by the analogy of the incubated egg.

Third day of incubation, umbilical cord of chick begins to pullulate, and advance towards the *folliculus aeris*—On the eighth day reaches that chamber—Recurrent blood brightened in colour.

Observations on folliculus aeris.

Vessels concerned in circulation, the only ones issuing from the umbilicus, never enter the vitellus or albumen.

Vitellus, the food for the chick, conveyed to it, not by the umbilical cord, but by a small duct, in the character of a lacteal.

This duct, which issuing from the intestinum Ileum, enters the vitellus, called *ductus intestinalis Stenonis*. By this duct is the vitellus absorbed, and carried as food into the intestines of the chick.

Albumen, like liquor amnii, not nutricious, and never, in a healthy state, mixes with the vitellus.

These two substances inclosed in distinct membranes, which separate them from each other.

Albumen serves, perhaps, the purposes of the liquor amnii.

A portion of vitellus reserved for the uses of the chick after its escape from the shell. This drawn into the

abdomen through the umbilicus—A too sudden contraction of the umbilical ring sometimes excludes this residuary portion of vitellus, and the chick dies.

The analogy between the mode of nutrition of the fœtus in utero, and the chick during incubation, very striking.

Umbilical vessels in both carry venous blood from the embryo, and return arterial.

Vitellus, as food for the chick, conveyed by a duct, in the nature of a lacteal.

Food for fœtus secreted in the placenta, and carried to its place of destination, by means of lacteals.

Contrivance in both, analogous and beautiful.

Equivocal generation.

The production of a living organized being, vegetable or animal, without the influence of *specific parentage.*

When properly understood, this doctrine, whether true or false, not at war with either morality or religion. Nor is it, in its nature, as some have very thoughtlessly and intemperately pronounced it, either unreasonable or absurd. On the contrary, it does appear to be the legitimate inference from a fair process of inductive philosophy. Stronger still, a belief in it, is forced on us by observation and the result of experiment.

This doctrine not favourable to the hypothesis of the *self-creative power* of matter.

On the contrary it refers to the Deity both the creation of matter, and the endowment of it with all the properties and powers it possesses.

It maintains the Deity to be the original cause of all other causes, and regards *matter*, whether dead or living, as well as *created spirit*, as acting, by *derivative powers*, a subordinate part in the economy of the universe.

If an animal begets its own likeness, it does it by a power *derived fr m its creator*—whether directly or indirectly, it matters not.

If a vegetable begets *its* likeness, its power to do so must be refered to the same source.

This doctrine, then, recognizes the Deity as the fountain of being, power, and action. In this there is nothing atheistical, irreligious, immoral, or irreverend.

Dead matter must have been created *before* living, the former to serve as the habitation, and for the subsistence, of the latter. Such also is the declaration of Holy Writ.

Dead matter having been created, how was living matter formed out of it?—by the *immediate* hand and act of the Deity, or *in a secondary way*, through the instrumentality of powers which he had already bestowed?

The latter hypothesis most probable in itself as well as by far most creditable to Deity, and conformable to the views we entertain of his supreme efficiencies.

That mechanician who invents and constructs a self-moving and self regulating system of machinery, manifests more genius, and higher capabilities, than he who erects a machine that moves only while he himself is turning the crank.

The calling of matter into existence, and the endowment of it with principles and powers for its future government, constituted the only *really creative* act of Deity. All subsequent arrangements, forms, modifications, and performances of matter, were the immediate result of those principles and powers.

Equivocal generation, *of two sorts.*

The first derives given kinds of living beings from the combination, according to certain established principles and laws, of *elementary matter*, capable of uniting with the vital principle.

The second derives such beings from diseased action occurring in the systems of other living beings of different species.

Illustrations.

Examples of the first found in the production of

1. Conferva fontinalis.
2. Mucor or mould.
3. The rust or smut on wheat, oats, &c.
4. White clover in many places.
5. Timothy do. do.
6. Strawberries, in some places.
7. Certain new species of timber, &c.

Illustrations.

8. Mushrooms, do.

Such examples found also in the production of,

1. Animalculæ infusoriæ } Illustrations.
   Mites in cheese. }

Examples of the second kind of equivocal generation, found in the production of.

1. Hydatids, in various parts of the body.
2. Intestinal worms.
3. Worms of a nondescript character found in the liver, the brain, the eye, and other parts of the bodies of animals.

Objects or final causes of the preceeding modes of generation, interesting and important.

1. The mischief attendant on putrefaction prevented.
2. The fatal result of diseased organic action prevented.
3. The earth suitably and usefully peopled with *truly native* vegetable productions.

Illustrations and examples.

Death and life nothing but reciprocal mutations of matter—Illustration.

General and concluding remarks on the commence-

ment, progress, and changes of vital action, from birth, until natural death.

Philosophy of these changes, or their causes and consequences.

Philosophy of growth—of maturity and strength—of decline and old age—and of death from old age.

Description of death from old age.

Signs of absolute death.

PATHOLOGY.

Have hitherto contemplated the system of man in a state of general vigour and harmony. By the healthy and natural performance of its own functions, have beheld each organ contributing essentially to the soundness of the functions of other organs, and, in this way, to the welfare of the system at large.

In this state of things there is a well adjusted balance of power and action—an equilibrium of excitability, excitement, and circulation—Nothing defective, nothing excessive, nothing deranged—the play of every organ easy, natural and pleasant—*This is health.*

In this state of things, the body resembles a well constructed system of machinery, where each wheel, in moving correctly itself, contributes to the correctness and efficiency of the whole—or

An army so skilfully arranged in order of battle, that each column, in performing its own duties, gives aid to others and strength to all.

We have now to reverse the tablet, and take a view of man in an opposite condition, his functions deranged, the harmony and reciprocal good offices of his organs suspended, the general balance of his system, in relation to excitability, excitment, and circulation,

broken, and the parts, instead of aiding, doing injury to each other—This is disease.

Thus, in a system of machinery, one wheel out of order deranges the whole; and

In an army thrown into confusion, that confusion becomes more disastrous, by the mutual collisions of its disordered columns.

Pathology—derivation of the term—definition of—an account, descriptive and philosophical, of the causes, seats, nature, signs, crisis, diagnosis, and prognosis of disease.

Divided into *general* and *particular*—or that relating to disease, in the abstract, as contradistinguished from health, and that relating to *particular* diseases, as distinguished from each other.

General pathology appertains exclusively to the Institutes of Medicine.

Particular, in part to the Practice of Physic.

The teaching of the *former* in this school, belongs to the chair alone which I occupy.

Subject, equally important and difficult.

In an attempt to treat it *correctly* and *systematically*, but little aid to be derived from existing publications.

Every treatise corrupted by humoralism, chemical philosophy, mechanical philosophy, or all.

Arrangement also exceptionable.

Instead, therefore, of depending, for information, on written books, am compelled to look into the book of nature, and endeavour to interpret for myself.

This, the richest, purest, and most accessible source of knowledge.

Cannot be too highly recommended to the attention of physicians, especially those who are ambitious to improve their profession.

CAUSES OF DISEASE.

All things, material or immaterial, that can, by abuse or otherwise, engender disease.

Exceedingly numerous.

Exist around us—within us—Things most essential to our being—air—aliment—drink—the products of industry—industry itself—exercise—rest—sleep—watching, &c.

Intellectual agents—study—passions—emotions.

Technical division of.

1. Remote—2. Predisposing—3. Occasional or exciting—4. Proximate.

1. Remote cause, what?
2. Predisposing, do.
3. Occasional or exciting, do.
4. Proximate, do.

Illustration, derived from bilious fever.

In relation to this catenation of causes, great inaccuracy prevails in medical writings.

Exciting cause not always necessary to produce disease—Instance, in small pox, &c.

This cause less specific in character than either of the others—Remarks.

Enumeration of exciting causes that are very generally operative.

Predisposing cause determines the nature of the disease—An individual predisposed to any one disease, not liable to another. Illustration.

Diminution of vital energy, a general predisposing cause of disease.

Diminution of Do. in any particular organ, a particular predisposing cause.

Proximate cause, defined to be "*ipse morbus.*"

Error.

My own views of.

Remote and exciting causes are *agents from without.*

Predisposing and proximate causes, *conditions within.*

Although not first in the order of arrangement, nor indeed in that of nature, shall treat first of the predisposing causes of disease.

Correctly divided into *congenital*, *hereditary*, and *adventitious.*

Distinction between congenital and hereditary, as here applied.

Predisposing cause synonymous with *predisposition.*

Congenital predisposing causes, enumeration of.

Hereditary do.

Particularly exemplified in predispositions to

Phthisis pulmonalis.

Mania.

Scrophula.

Gout.

Rheumatism.

Epilepsy—and a few other diseases.

Diseases resulting from hereditary predisposition attack ancestors and descendants at about the same period of life—Illustration.

Philosophy of hereditary predisposition.

Liability of descendants to hereditary diseases, proportioned to their likeness to ancestors—Illustration, and application.

Idiosyncrasy, as a predisposing cause of disease.

Term explained.

Exemplifications.

Of temperament, as a predisposing cause of disease.

Term explained—a deficiency in the balance of the system.

Former opinions on this subject.

General and original temperaments, four in number.

1. Sanguineous. 2. Bilious. 3. Phlegmatic. 4. Melancholic.

Why so denominated.
Can be extinguished by external personal appearances.
1. *Sanguineous temperament.*
Marks of.
Philosophy of.
Diseases to which it predisposes.
This, the temperament more particularly of
Youth.
High latitudes.
Hilly and mountainous regions.
The vernal season.
Intellect connected with it, character of.
2. *Bilious temperament.*
Marks of.
Philosophy of.
Diseases to which it predisposes.
This, the temperament more particularly of.
Adult life.
Males rather than females.
Warm climates.
Low, flat, and marshy regions.
Summer and autumn.
Intellect connected with it, character of.
3. *Phlegmatic temperament.*
Marks of.
Philosophy of.
Diseases to which it predisposes.
This temperament attaches to every period of life, and *every* season of the year—strongest, perhaps, in winter.
Prevails most in low, humid, and cold regions.
Intellect connected with it.
Subjects of, debilitated.
4. *Melancholic temperament*—a higher degree of the bilious.
Marks of.

Philosophy of.

Diseases to which it predisposes.

This, the temperament more particularly of.

The decline of life.

Warm climates.

Summer and autumn.

High life and opulence, or at least, easy circumstances, where leisure and idleness prevail.

The foregoing are the temperaments most generally recognized and spoken of, because certain external marks render them obvious to common observation.

There exist various other conditions of the system, which may be regarded as temperaments of a subordinate character, and as constituting predispositions to diseases.

Cephalic temperament, in certain children, until their eighth or tenth year—Illustration and remarks.

Pectoral or tracheal temperament in other children, until near the same period. Do. do.

Glandular temperament, in others, until the tenth or twelfth year. Do. do.

Hemorrhagic temperament, in many individuals about puberty. Do. do.

Nervous temperament, in adults of each sex, more especially the female. Do. do.

Pulmonic temperament, in males and females, more especially the former. Do. do.

Muscular and membranous temperament. Do. do.

Intestinal temperament. Do. do.

These minor or subordinate temperaments not to be discovered by external marks.

Menstruation as a predisposing cause of disease.

Remarks.

Cessation of do. do.

Pregnancy, as a predisposing cause of disease.
Lactation, do.
Of different periods of life, as predisposing causes of disease.
Term of life divided into six epochs.
I. *Infancy*, extending from birth to the seventh or eighth year.
II. Childhood (Pueritia) extending from the close of infancy to puberty.
III. Adolescence, from puberty to manhood, i. e. from the 15th to the 25th or 30th year.
IV. Prime of life, from manhood to the 45th year.
V. Decline of life, from the 45th to the 60th year.
VI. Old age, from the 60th year to the close of life.
First epoch—Divided into three periods.
1. From birth to the 7th or 8th month, when the first teeth begin to appear.
Predisposition of this period.
2. From the 7th or 8th month, until the close of the second year.
Predisposition of this period.
3. From the 2d until the 7th or 8th year, when the first are exchanged for a second set of teeth.
Predisposition.
Second epoch.
Predisposition.
Third epoch.
Predisposition.
Fourth epoch.
Predisposition.
Fifth epoch.
Predisposition.
Sixth epoch.
Predisposition.
Practical uses of the foregoing remarks.

The foregoing predispositions to be considered natural.

Adventitious predisposing causes of disease, are produced by the operation of remote causes. They vary, therefore, in their nature with the variation of these causes. Hence, an account of the latter will sufficiently designate the former.

Of the remote causes of disease.

These produce their effect by operating from without.

They are all *stimulants*, and operate by *impression.*

Their impressions are *sensitive* or *irritative*—Definition of these terms.

Sensitive impressions produce disease most suddenly; but irritative ones not less certainly. and generally of a worse character.

Of agents productive of disease by sensitive impressions, the principal are heat, cold, mental affections and mechanical violence. Light, sound, and taste rarely engender disease. Smell, more frequently.

Causes producing disease by irritative impressions, are variolous matter, matter of typhus fever, the poison that gives rise to bilious fever, in all its variety, and many others to be specified presently—Illustrations.

Of the non-naturals as remote causes of disease.

These are six in number, viz. 1. air—2. meat and drink—3. sleep and waking—4. motion and rest—5. retention and excretion—6. the passions of the mind.

1. Air—Not, *per se*, a cause of disease, but on account of its adventitious qualities, *sensible* or *insensible.*

Sensible qualities that prove deleterious. Heat, cold, moisture, dryness, pressure or weight, and vicissitudes.

Heat, diseases proceeding from—Remarks.

Carried to the extent of burning, do.

Cold, do. do.

Moisture, do. do.

Dryness, do. do.

Pressure, do. do.

Vicissitudes from one sensible quality to another, diseases proceeding from—Remarks.

Suspension by the neck, and submersion, as causes of disease. Remarks.

Electricity, do. do.

Modus operandi of the foregoing sensible qualities of the atmosphere.

Act exclusively on the skin—or slightly, perhaps, on the schneiderian membrane.

Cannot possibly act otherwise, neither heat, nor cold, nor moisture, nor dryness being able to come into immediate contact with, or act proximately on the interior of the body.

All parts beneath the cutis vera possess the same temperature, whether the atmosphere be hot or cold, and the same degree of succulency, whether it be moist or dry.

These causes, then, in the production of disease, *act locally*, in the first instance, and extend their influence to a *general issue*, only through the medium of sympathy.

Illustration.

The same thing true of every other febrile cause, producing a sensitive impression.

Hence every fever proceeding from such impression, has a *local origin*.

Touching this point, no difference of opinion can exist.

Illustration.

That fevers resulting from irritative impressions are also necessarily local in their origin, will appear hereafter equally obvious.

Hence the error of dividing febrile diseases into *idiopathic* and *symptomatic*.

Correctly speaking, all febrile diseases are symptomatic, the phenomena which constitute fever being nothing but symptoms arising from a local affection.

Important practical uses of this doctrine—Illustration of.

Have, for more than twenty years, been labouring to establish it.

While the sensible qualities only of the atmosphere have been hitherto spoken of, as causes of disease, that fluid has been regarded as in a state of purity.

We shall now consider, as sources of disease, certain impurities with which it is occasionally impregnated, some of which are denominated *insensible* qualities, because they are discoverable only in their effects, no tests yet devised being adequate to their detection.

Of deleterious gases as causes of disease.

1. Carbonic acid gas—Remarks.
2. Hydrogen gas, do.
   Carbonated and sulphurated do.
3. Carbonic oxide—Remarks.
4. Nitrous gas, do.
5. Nitrous oxide, do.
6. Oxygen gas, excess of.

The preceding gases not very abundant in the atmosphere—Hence to dwell on them not important.

Of marsh miasmata, as a cause of disease.

Prevalence of, exceedingly extensive.

May be generated wherever man can reside.

Circumstances necessary to its production, viz. moisture, heat, light, atmospheric air, and dead vegetable and animal substances.

Nature and composition of, unknown.

Its existence detected only by its effects on living matter.

First designated as a cause of disease by Lancisi, an Italian physician of great celebrity.

Creates a predisposition to abdominal diseases, to the alleviation, very often, of diseases of the thorax.

Strikes with most certainty in the evening or at night.

Probable height to which it rises in the atmosphere, and distance from its source to which it throws its influence.

The remote cause of bilious fever, in all its varieties of form and violence.

Four varieties of bilious fever, viz.

1. Intermitting fever.
2. Remitting do.
3. Ardent continued fever.
4. Malignant pestilential or yellow fever.

Immediate seat and pathology of those diseases considered.

Pestis vera, source of, the same—Remarks.

Marsh miasmata instrumental in the production of other affections.

Dysentery.
Cholera morbus.
Bilious colic.
Hepatitis.
Jaundice.
Splenitis.

By its influence, in determining disease to the abdomen, the poison we are considering modifies peripneumony, influenza, small pox, measles, rheumatism, puerperal fever, and other diseases.

A superabundance of carbon in the blood, especially the venous blood, supposed by some humoralists to be the cause of bilious fever.

Considered by the same as the cause of excessive obesity.

This hypothesis may be most satisfactorily tested by its practical application and result.

Bilious fever, in its various forms, is known to be the endemic of warm seasons, and warm climates.

The cause of this disease, say our humoralists, is a superabundance of carbon in the blood.

Vegetable food, say the same pathologists, throws into the blood much more carbon than animal food.

From these premises the inference is plain—If, in warm seasons and climates, you wish to escape bilious fever, *use animal and reject vegetable food!*—a sentiment at open war with common sense and universal experience. The use of vegetable, to the exclusion almost entirely of animal food, is an essential expedient in the prophylaxis of warm climates.

In those unfortunate individuals called *blue boys* and *blue girls*, the defect of whose circulatory and respiratory systems is well known, the entire mass of blood is *venous* and, therefore, according to the doctrine, highly carbonated. Yet are they *always* exempt from obesity, and usually from bilious fever—But this could not be the case did those affections arise from blood of this description.

To a superabundance of carbon, the venous blood is said to be indebted for its dark colour.

But it is well known to all observers, that the venous blood is *more florid* in hot weather than in cold, and that, in attacks of bilious fever, it sometimes assumes a *hue almost arterial*. To the humoralists it is left to reconcile this with their favourite doctrine.

The bear and other animals said to become fat during hybernation, because their blood is not then decarbonated by means of respiration.

Obj. The assertion unfounded, and the reasoning incorrect. During actual hybernation, no animal does or can increase in obesity.

Charcoal said to be highly efficacious in fattening domestic fowls.

Obj. Charcoal affords to animals no nourishment. If, therefore, it aids in fattening them, it must be as a digestive of other food.

Certain kinds of poultry said to be speedily fattened in heated air.

Remarks on the alleged process.

Do all the varieties of bilious fever derive their origin from the same poison, existing in different degrees of concentration and strength?

Or does yellow fever arise from a poison specifically different from that producing intermitting fever' both resulting from the putrefactive process?

Question discussed.

Analogy between yellow fever and pestis vera.

On what part of the system do marsh miasmata act, in producing bilious fever? Question discussed.

If on the stomach, how does it gain admission there? do.

Intermitting and remitting fever. why intermit and remit? do.

Yellow fever believed not to be contagious for the following reasons.

1. It prevails only during a certain season of the year, and under a given temperature and constitution of atmosphere—This not a characteristic of a contagious disease—Examples.
2. Its commencement can never be traced to a contagious source; but always to a source of foul exhalation—Illustration.
3. In a pure atmosphere, it is never communicated from the sick to the well—do.
4. It is under the controul of the weather, and suddenly ceases to prevail, on a change of season—do.
5. It cannot be communicated by inoculation, nor by any other mode of employing the secretions of the sick, nor by inhaling their breath, provided the ex-

periments be made in an uncontaminated atmosphere. Examples.

6. Those physicians, who, from talent and opportunity, are best qualified to judge, disbelieve in its contagion.

7. When it has made its appearance, it spreads too rapidly to be propagated by contagion.

8. Nor, in overruning a city, does it pursue the *regular* march of a contagious disease, but spreads in a desultory manner, appearing in sundry remote and disconnected situations at the same time.

9. The same remarks are applicable to its mode of spreading through a family. It does not pass gradually from one individual to another, but attacks several at the same time, or in a succession by far too rapid to arise from generated contagion.

10. When the disease is prevailing, those who become its subjects can rarely trace their attack to any intercourse with the sick.

11. Living persons, without cleansing them, wear the clothes, sleep on the beds, and occupy the habitations of those who have died of yellow fever, with impunity.

Illustration and examples.

12. The disease having appeared, its course can never be arrested, by the most rigorous separation of the healthy from the sick—It is extinguished only by a change of season.

13. Yellow fever, when it prevails extensively, is always preceded, accompanied, or followed, by certain phenomena, in the vegetable or animal kingdom, or in the heavens, which testify to its essential connection with the constitution of the atmosphere, and therefore proclaim it a genuine epidemic—Illustration and examples.

14. In the true epidemic character, it either banishes

all other diseases, during its prevalence, or gives to them many of its own features.

Not a reason can be rendered in support of the notion of the contagious nature of yellow fever, which may not be applied with equal force to establish that of the contagion of intermitting, or any other form of bilious fever.

There are no *half-truths* in medicine. Disease *is* contagious, or it is *not*. A disease contagious only "under certain circumstances" according to the usual phraseology on the subject, is not contagious at all.

To pronounce a disease contagious in foul air and not in pure, in hot air and not in cold, in a city and not in the country, in the atmosphere of the autumn and not in that of the winter, is to advance a notion wholly unsupported either by fact or analogy.

Contagion is a secreted animal poison, deleterious *per se*, in its relationship to man. As well may it be contended that oxide of arsenic, which is also deleterious *per se*, poisons, or even that fire burns, only "under certain circumstances." Every thing must act, *at all times*, in conformity to its nature. And it is the nature of poison to produce disease, else it ceases to be poison—If, then, yellow fever be truly contagious, it is always so, and not so only "under certain circumstances." But it is universally acknowledged (indeed it would be folly to deny) *that it is not at all times contagious*. Hence it is not contagious at all. A disease which can prevail only *at a given time, in a given place*, and *under a given condition of the atmosphere*, is indebted for its existence, not to an inherent power of self-propagation, but to season and temperature, topographical situation, and atmosopherical constitution. If this be not sound sense as well as sound science, I have no knowledge of either.

As far as authentic facts have come to our knowledge,

the foregoing remarks are as applicable to "*pestis vera*," as they are to yellow fever. Hence the oriental is as free from contagion as the western pestilence.

Of the matter of perspiration as a cause of disease.

Not so, when it first issues from the body, especially in a state of health.

Becomes so by subsequent changes of a chemical character.

Circumstances necessary to produce those changes.

Examples.

Converted thus into a most deleterious febrile poison.

Nature and character of the fever produced by it.

Name of—Typhus. Why so denominated?

Seat and pathology of.

Examples of—Jails—Hospitals— Prison-ships— Black Hole of Calcutta.

Poison formed from the matter of perspiration, often innocent in relation to those from whose bodies the perspiration issues, while it disseminates disease and death among others.

Examples—Black assizes—Old Bailey—and other places.

Time and circumstances of the prevalence of the complaint—subjects of.

Contagion of Typhus fever.

Subject discussed.

Spreading of the disease prevented by general cleanliness, i. e. by the proper employment of pure air and water.

Strictly speaking, therefore, its contagious nature doubtful.

In some cases the matter of perspiration takes on the putrefactive process more readily than in others.

Of other deleterious impregnations of the atmosphere, as causes of disease.

Matter of Influenza, or influenzic constitution.

Reasons for denominating it *matter*.

Its nature not understood.

Nor the sources whence it is derived.

Supposed sources.

Volcanic eruptions.

Earthquakes.

Emanation from the surface or bowels of the earth.

A specific but temporary change in the elementary combinations of the atmosphere.

Seat and pathology of the disease it produces.

Is Influenza contagious?

Ans. No.

Reasons for this opinion.

General remarks, philosophical and practical.

Matter of Scarlatina, as a cause of disease.

Three forms of the disease.

Simplex.

Anginosa.

Maligna.

Reasons for believing that they all arise from the same poison.

Scarlatina, a disease of youth, usually attacking the same person but once.

Causes of this.

An epidemic disease, not contagious.

Reasons for this belief.

Seat and pathology of the disease.

Materia Rubeolosa.

Not generally considered as a poison taking possession of the atmosphere, and creating there an epidemic contamination; but regarded exclusively *a secreted poison—a genuine matter of contagion.*

That it is an atmospheric and not in every case a secreted poison, the more probable opinion.

Subject discussed.

Seat and character of the disease.

Matter of Pertussis or hooping cough.

Reasons for believing it an atmospherical poison, producing an epidemic disease.

Seat and character of the disease.

Subjects whom it attacks.

Matter of Varicella.

Reasons for believing it also an atmospherical poison.

Analogies with small pox.

Seat and character of.

Matter of typhus grăvior, or peripneumonia typhoides.

Reasons for believing it an atmospherical and not a secreted poison, and that it creates an epidemic constitution.

Seat and pathology of the disease.

General remarks on.

Of diet and drink, as a cause of disease.

A very extensive and important subject.

Must examine it briefly.

The abuses of diet and drink only, deleterious.

Four reasons why they prove so.

1. The idiosyncrasy of individuals—Illustrations.
2. The use of diet and drink, or either of them, in undue quantities—i. e. gluttony or drunkenness. Illustrations.
3. The use of both or either, unwholesome in quality. Illustrations.
4. The use of these articles, at unseasonable times. Illustrations.

Of sleeping and watching, as causes of disease.

Abuse of, only, injurious—Illustrations.

Of motion and rest, as causes of disease.

Abuse of, only, injurious—Illustrations.

Peculiar kinds of motion, effects of.

Sea-sickness, remarks on.

Various trades and occupations, deleterious effects of.

Sedentary habits, injurious effects of.

Illustrations and remarks.

Of retention and excretion, as causes of disease.

Exceedingly powerful in the production of disease.

Suppressed or diminished evacuations, effects of.

Suppression of perspiration, effects of.

Do. of menstruation, do.

Do. of urine, do.

Do. of bile, do.

Do. of saliva, do.

Do. of the discharge from old ulcers, do.

Do of gleet, hemorrhoidal flux, epistaxis, &c. do.

Retention of fœces, effects of.

Do. of semen masculinum, do.

Profuse evacuations, injurious effects of.

Illustration and remarks.

Of improper clothing as a cause of disease.

Unsuitable qualities of the materials, out of which clothes are made.

Remarks and illustrations.

Unsuitable size and form of certain articles of dress, do.

Of the passions of the mind, as a cause of disease.

In the consideration of this subject, the terms, passion, emotion, and affection, will be regarded as synonymous.

Mental affections exceedingly powerful in the production of disease.

In some individuals much more powerful than in others—In females more so than in males.

Perhaps no other morbific cause operates so unequally on different individuals.

Such is the constitution of man, that mental affections are usually most potent in those who are least able to sustain their effects.

Passions are all stimulants, and like other stimulants, divided into *friendly* and *unfriendly*, or *salutary* and *morbific*.

The former prove noxious only *when in excess*, the latter are noxious *in their nature*.

Hurtful passions—Fear, grief, despair, remorse, avarice, hatred, envy, jealousy and revenge. Like actual poisons, these, independently of quantity, are *deleterious per se*.

Friendly or salutary passions, love, joy, ambition, courage and hope.

Anger, equivocal in its character—Remarks on.

Malignant or deleterious passions, denominated *sedatives*—Reason of this.

Passions, however opposite in their nature, very similar in their effects, when they prove injurious. Illustrated by anger and joy—Both excite high vascular action, and determine blood to the head.

Fear, as a cause of disease.

Description of.

Philosophy of.

An exciting cause of disease, as often as a remote one.

Effects of, in the actual production of disease—extensively and practically considered.

Deranges often the organ of intellect.

Produces appearances of premature old age.

Illustration and examples.

Of grief.

A more chronic passion than fear.

Description and philosophy of.

Effects of, in the production of disease.

Throws disease on particular organs.

Illustration and examples.

Of despair, remorse, avarice, hatred, envy.

Similar in their effects, yet not very highly operative in producing disease.

Act very particularly on the organ of intellect.

Remarks.

Of jealousy.

Character of.

Description and philosophy of.

Most formidable to the system of woman.

Effects of, in producing disease.

Of anger and rage.

Description of.

Character and philosophy of.

Effects of, in the production of disease.

A powerful *exciting* cause.

Has been known to produce sudden death.

Throws its action very strongly on the organ of intellect.

Of the salutary passions, as causes of disease.

Love.

To prove deleterious this must be unsuccessful, in which case deleterious passions co-operate with it; or it must be indulged to excess.

Character and philosophy of.

Favourable to poetry and music.—Examples.

Illustrations drawn from inferior animals.

Effects of, in producing disease.

Joy.

Description and philosophy of.

On what subjects it operates most powerfully.

Effects of, in producing disease. Examples.

Hope, courage, ambition.

These rarely, if ever, produce disease, but often aid in its removal—Examples.

Hope, a cordial to sustain life, and render it tolerable.
Illustration and examples.

Of study as a cause of disease.

Injurious only when excessive.

Pursued in due degree, contributes to health, and perhaps to longevity.

Effects and philosophy of, in producing disease.

Acts primarily on the brain—by sympathy on the stomach and other parts.

Of poisons as causes of disease.

Definition of.

No absolute and universal poison exists.

All only relatively so.

Poisons divided into *animal*, *vegetable*, and *mineral*.

Animal poisons, into *morbid* and *natural*.

Both, the result of secretory action, in the one case *diseased*, in the other *healthy*.

Examples of morbid poisons—Virus of small-pox, kine pox, lues venerea, &c.

Of natural poisons—venom of the rattle snake, the mockason, the viper, the scorpion, the asp, &c.

Of morbid poisons.

Virus of small pox.

The cause of a well known and most formidable disease.

History of small pox.

Description of.

Seat and pathology of.

Casual or natural, and *inoculated*, small pox.

Difference of, and cause of that difference.

Small pox attacks the same individual but once during life.

Exceptions to this.

Why, as a general rule, it attacks but once.

Modus operandi of virus,

Never enters the blood to contaminate it.
Reasons for believing so.
Congenital small pox constitutes no exception—Reasons for this opinion.

Virus of cow pox.

Origin and history of.
Perhaps a modification of small pox.
Same thing possibly true, in relation to chicken pox.
Reasons for this conjecture.
Which of the two, variolous or vaccine matter, has the strongest affinity for the human constitution?
Ans. Case in point.

Virus syphiliticum.

The cause of a loathsome and most formidable disease.
Two kinds of venereal virus believed to exist.
Reasons for this opinion, with practical remarks.
History of lues venerea.
Reputed origin of—the new world.
Objections to this opinion.
Known long before the discovery of America; perhaps even to the ancients.
Once a much more formidable disease than it is at present.
Matter of psora, frambœsia, plica polonica, lepra Græcorum, tinea capitis, and the various kinds of herpes, as causes of disease.
Each of these supposed to produce a disease capable of self-propagation—Remarks on.

Matter of rabies canina.

Cause of a most formidable malady.
This poison belongs exclusively to the canine race.
Other animals, not excepting man, susceptible of its deleterious influence, but not of secreting it in their own systems.
Reasons for this opinion.

The bite of a dog not mad, as well, no doubt, as that of other animals, capable of producing hydrophobia.

Irritation of a punctured wound giving rise to tetanus, somewhat analagous to that which often produces hydrophobia—Remarks on tetanus, and its pathology—a distinguished proof of the sympathetic doctrine of disease.

Supposed length of time the rabid virus may lie in the human system before it produces disease. Remarks on this.

Seat and pathology of that disease.

Of native animal poisons.

Venom of the rattle-snake.

To prove deleterious must be introduced into the blood.

Effects of, when thus introduced.

Acts potently on the abdominal viscera.

Modus operandi of.

Venom of the mockason.

Similar to the last, only less powerful.

Venom of the viper, do.

Do. of the scorpion, and of the spider tribe, less potent still, yet capable of great mischief when introduced into the blood.

Poisons of the insect tribe.

Of the wasp.

Of the bee, and others—Remarks on.

Poison of the asp.

Peculiar effects of.

Rendered famous by the death of Cleopatra.

Poison of the tarantula.

Reputed effects of, and mode of cure.

Of vegetable poisons.

All of them are secreted substances.

Probable uses of, to the plants themselves, to certain

tribes of inferior animals, and generally in the great economy of nature.

Tribe of poisonous vegetables exceedingly extensive.

Forests of the United States abound in them.

More numerous, and their poison more active in warmer, especially intra-tropical regions.

Juice of the Cerbera ahovai, a plant of South America.

Some account of the effects of.

Indians of Oroonoko empoison their arrow points with it.

Juice of the Upas tree of Java.

Some account of, and its effects.

Of the mancinella.

Some account of.

Of the Cashu nut.

Some account of the effects of.

Of the juices of some of the poisonous plants of our own country.

Solanum lethiferum, aconitum, rhododendron, Calmia latifolia and angustifolia, datura stramonium, rhus radicans, rhus vernix, &c.

The two latter known by the common names of poison vine, and poison ash.

Nature and effects of these.

Juices of the poppy, the hop, the lettice, &c. as causes of disease—Remarks on.

Of mineral poisons.

Oxid of arsenic, Muriate of Mercury. } as poisons—Remarks on.

Lead, oxid and acetate of.

Deleterious effects of, manifested in colica pictonum.

Seat and pathology of that disease.

Aqua toffata, account of the effects of.

Of worms, in the alimentary canal, as a cause of disease.

Various kinds of, and their effects.

Do they ever subserve any useful purpose in the human economy?

Observations in reply.

Of lunar influence as a cause of disease.

Abstract question discussed.

If the moon acts on the ocean, *a fortiori*, must act on the atmosphere.

Her influence most powerful at certain periods, viz. at her syziges, or full and change, and her apogee and perigee. Illustration and proof.

Atmosphere the source of many diseases. Whatever therefore, very materially affects it must have an influence on human health.

Universal belief, which has generally some foundation in nature, favourable to this view of things.

Effects of the moon on the weight of the atmosphere, as indicated by the barometer.

Experiments on this subject by Luke Howard.

Do. much more important and satisfactory, by Dr. Balfour.

Particular account of the result of.

Dr. Moseley's opinion in relation to lunar influence.

Earthquakes and eruptions of volcanoes, occurrences of, connected with the same periods of the lunar month.

Illustration and proofs of.

Lunar influence on vegetables, and the lower orders of animals. Illustration and examples.

On the vegetable and the animal kingdom, then, as well as on the earth, the ocean, and the atmosphere, the moon exerts an obvious influence. It follows, therefore, as a thing of course, that in relation to diseases, she cannot be impotent.

Evidences of lunar influence we must look for, in the systems, not of the vigorous and the strong, but of the delicate and the feeble. In relation to many other

morbific causes, the same thing is true. Their effects are confined almost exclusively to the enfeebled.

Of diseases subject to lunar influence.

1. *Hemorrhages.*—Illustration and examples.
2. *Verminous affections*—Do. do.
3. *Nephritic affections.*—Do. do.
4. *Mania*—Hence the subjects of it denominated *lunatics*—Illustration and example.
5. *Asthma*, do. do.
6. *Plague*—do. do.
7. *Yellow fever*—do. do.

Persons already sick injured by a solar eclipse.

Instances of.

Very old persons usually die, about the full or change, or the quarters, of the moon.

Illustration and examples.

Most of the distinguished dead, respecting the period of whose decease we possess an accurate knowledge, have died about the full or change of the moon. Illustrations and examples.

In the whole range of medical science, there are but few points more satisfactorily established, than that, in the production and modification of disease, the moon exerts considerable influence. Such influence, then, is legitimately regarded as a morbific cause.

Of the seats of disease.

This topic may be differently understood, according as reference is made to the part on which the morbific cause originally acts, and makes its *first* impression, or to that in which the complaint becomes ultimately fixed.

There are four surfaces or parts only, which morbific agents can actually reach, and on which, they, therefore, can *primitively* act.

1. The alimentary canal generally, more especially the stomach.
1. The schneiderian membrane.
3. The skin.
4. The brain—This acted on only by intellectual causes.

These premises afford conclusive evidence of the original locality of every disease, and subvert the notion of idiopathic fever.

Analysis of the subject.

Diseases become ultimately radicated in one of the four principal membranes, of which the body is, in such a great measure, composed. These are

1. The mucous membrane.
2. The serous, do.
3. The fibrous, do.
4. The cellular, do.

To this but few exceptions exist.

The situation of the membrane, and the nature of the topical affection, unite in giving character to the disease.

To designate the particular seats of particular diseases, falls within the duties of another chair.

Analysis of the rise and progress of disease.

1. Local impression, produced by the morbific cause.
2. This is irritative or sensitive, according to the nature of the impression, and of the part impressed. In case of an extremely powerful or malignant impression, paralysis and even death may ensue, without either actual irritation or sensation.
3. Congestion.

Meaning of the term.

Difference between it and inflammation.

Congestion more an affection of the veins.

Inflammation of the arteries.

Three grades of congestion and their effects, specification of.

May be denominated, *irritative—inflammatory—paralytic.*

One of these grades essential to the production of *fever, inflammation, pyretic hemorrhagy, dropsical effusion*, &c.

These latter, so many different forms of sanative action—indubitable and strong mainfestations of a vis medicatrix naturæ.—Illustration.

4. Reaction and inflammation.

Difference between the states of action designated by these two terms.

Requisites to the production of inflamation, what?

Inflammatory action, character of—wherein it differs from healthy action.

Final cause, or uses and intention of—effects of on the blood.

Comparative amount of blood in the vessels of an inflamed part, what.

Motion of the blood through the vessels of an inflamed part, whether is it more or less rapid than through those of a healthy part?

Question discussed.

Elements of discussion.

Congestion essential to inflammation.

Remora, or diminished impetus essential to congestion.

Equability of motion must produce equability of amount of blood in a part, and the reverse.

Illustrated, by the current of a river—the march of an army, &c.

Position further proved by experiment and observation.

By the nature of the causes which produce inflammation.

These causes and their effects specified.

Inflammation, summary analysis of.

5. Effusion.

6. Suppuration.
7. Induration.
8. Schirrus.
9. Ossification.
10. Gangrene.

Such is the course of the *local impression*—The sympathetic effects show themselves according to circumstances and laws, on the developement of which it would be useless to dwell, unless we should descend to a minuteness of analysis, far beyond what our limits permit.

Of the signs of disease.

Definition of the term.

Stands related to symptoms, as genera to species, or as general to special pathology.

Signs indicate merely the *existence* of disease, symptoms, its *kind* and *character.*

Signs of all diseases, nearly the same; symptoms very different.

We judge and prognosticate by signs; distinguish and practice by symptoms.

The doctrine of symptoms belongs more particularly to another chair.

Of the signs of disease, as they appear in

I. Debility, parial or general—Illustration.
II. Pain, do.
III. Temperature of the body, do.
IV. The eyes, do.
V. The countenance, do.
VI. Respiration, do.
VII. Decubitus, or mode of lying, do.
VIII. States of the faculties of the mind, do.
IX. Thirst, do.
X. Appetite, do.
XI. Secretions and excretions, do.
XII. The pulse, do.
XIII. The voice, do.

XIV. The tongue.

Of the crisis of disease.

Origin and definition of the term.

Designates an event in the progress of disease, by which its issue may be determined.

If favourable, usually marked by some evacuation, denominated a critical discharge.

This manifests the existence of a centrifugal state of action—Meaning of *centrifugal* as a term in medicine.

Is the doctrine of crisis true? Question discussed.

Favourable crisis indicated by

1. Sweating.
2. Purging.
3. Increase of urine.
4. Vomiting sometimes, but rarely.
5. Hemorrhagy.
6. Augmented flow of saliva.
7. Augmented discharge of mucus from some portion of the schneiderian membrane.

Illustration and examples of the foregoing.

In case of a favourable critical evacuation, is the benefit experienced to be attributed to the mere escape of the matter discharged? Ans. No—but to an equalization of excitement and circulation, by a translation of action.—Illustration.

A proof of the sympathetic theory of disease.

Crisis more strongly manifested in equable climates, and in cases where but little medicine is given—Where, of course, the march of disease is but little interrupted.

Critical days—Remarks on.

The more acute the disease, the earlier the crisis.

The more vigorous the constitution of the patient, the earlier the crisis.

Occurs earlier, then, in young persons, than in old.

Of the prognosis of disease.

The knowledge of, to be derived only from observation

and experience—principle acting as an auxiliary—Influence of climate considerable.

Art of prognosis to be practised with great caution, especially by young physicians.

Regulated by the following considerations.

1. The usual issue of similar diseases; and by the known character of the prevailing disease—Illustration.
2. From the previous issue of a similar disease in the same person.
3. From the existing amount of the patient's vital strength, and its proportion to the violence of the disease, as indicated by the strength of the mobific cause, the *state of the symptoms*, &c.—Illustration.

Vital strength, how known.

Prognosis drawn somewhat from the treatment the disease has received, and its perceptible effects—Illustration.

The more phenomena indicate an event, the more likely is that event to occur.

In acute diseases, prognosis less certain than in chronic ones.

Epistaxis, as a critical evacuation, how foretold.

Sweating, do. do.

Vomiting, do. do.

Purging, do. do.

Augmented discharge of urine, do. do.

Diseases in which prognosis must be always unfavourable.

Internal cancer—aneurism of large, and deep seated vessels—Phthisis pulmonalis glandular and hereditary—Extensive ossifications and some others—In hereditary diseases, prognosis less favourable than in self-contracted ones.

Diseases of doubtful prognosis—Peritoneal inflammation generally—croup—hydrothorax—apoplexy—palsy—hydrocephalus, &c.

Diseases of less doubtful prognosis—Acute pneumonic

Inflammation generally—Erysipelas—Scarlatina—common bilious fever, &c.

Diseases of favourable prognosis—catarrh—diarrhea—cynanche parotidea—varicella, &c.

Advantages of disease.

We live in a system, or general and well balanced state, of things, where nothing is ultimate but good and happiness. Every temporary, local, and apparent evil, more than countervails its own effects, by some lasting, general, and real advantage.

Is this true also of disease? and if so, what are its compensating benefits to man? I answer, they are as follows.

1. Disease alone has led us to a knowledge of the structure and functions of the human body. 2. It has led us also to the study and attainment of the science of nature, generally, especially of chemistry, botany, and certain branches of natural history. 3. It has led us to an acquaintance with the science of intellect. 4. It ameliorates our nature, by giving employment to some of the best and noblest affections of the heart—charity, benevolence, generosity, firmness, &c. 5. It imparts to us a higher relish for health, and inspires us with gratitude for the enjoyment of it. 6. It moderates, and ultimately extinguishes, at least to a sufficient extent, our love of life, and our attachment to the world. 7. It reconciles us to the *death* of our friends, by converting that event into an escape from suffering. 10. It creates in us habits of resignation and piety. 11. Pain often premonishes us of the approach of disease.

OF THERAPEUTICS.

Therapeutics, derived from a Greek word signifying to cure, may be defined, "*The science of indication and prescription*, a knowledge of both those points being essential to the rational and successful treatment of disease.

This branch of science, then, rests on a twofold basis, a knowledge of the animal economy in health and disease, and a knowledge of the properties of medicinal substances.

A few observations amounting to general rules applicable to the treatment of every disease, will constitute all that our duty requires of us, or our leisure permits us to attempt, on those two topics.

By *indication* is to be understood, the expression or manifestation of the change requisite to be produced in the action of the system, or any part of it, in order to cure or alleviate disease. Or we might mean by it a manifestation of the immediate impression necessary to be made by remediate substances.

By *prescription*, a designation of the remedies calculated to effect the change required.

1. The science of therapeutics has reference to the body in a living state, possessed of the four vital properties of *irritability*, *sensibility*, *sympathy*, and the *vis medicatrix naturæ*, or power to attempt the removal of disease. Without these, at least two of them, no general disease can be either produced or cured.

2. The system, unless prostrated below the point of reaction, resists the agency of the mobific cause, and struggles to remove the effect.

3. If it appear to be *alone* competent to this, the indication is, to do nothing, but enjoin suitable diet, drink, and general regimen, and allow nature to do the work herself.

4. But if she appear herself insufficient for the task, mark her progress, and aid her by suitable means.

Are her exertions excessive? moderate—feeble? invigorate—suspended? awaken—altogether wrong?—change or suppress them. But keep them always in view—Illustrations and examp les

To prescribe with effect, attend faithfully to the following considerations.

The combined influence of the nature and force of the morbific causes, and of the susceptibilities, importance and sympathies of the parts affected—the period of the disease, the age, sex, and temperament of the patient—his individual or peculiar susceptibilities, his appetites, antipathies, habits, trade, profession or walk in life—the state of society in which he has moved, his mode of living, &c.—Nor must the climate where he was born and reared, as well as that in which he resides, and the season of the year, be neglected.

Observances such as these, distinguish the enlightened physician from the empiric.

If the moral and intellectual character of the patient, especially the existing state of his passions and emotions, be attentively studied, this will more effectually aid the physician in his therapeutical views, and tend still further to the elevation of his profession.

Facts and reasonings in illustration and confirmation of the foregoing principles.

6. That morbid impression may be cured, let it be divided—a principle vitally important, in the practice of medicine.—Illustration and examples.

7. Impression on one organ reaches another by sympathy—another principle altogether indispensable in practical medicine.—Do. do.

8. An attention to the antipathies and appetencies of the sick is peculiarly important, in the science of therapeutics—Without this, medicinal substances fail to operate, or operate injuriously—Do. do.

9. An attention to the *habits of the patient, corporeal and mental*, must never be neglected by him who aims at distinction in therapeutics—Do. do.

10. Before puberty, the difference of sex is not a point of much moment.

But after that period, a vigilant attention to it is eminently important—Illustration and proof.

Climate, in the full signification of the term, is exceedingly influential in modifying the susceptibilities and constitution of man. An attention to it, therefore, is not to be dispensed with. Illustration and examples.

11. State of the atmosphere in which the patient resides, demands the most serious consideration of the physician.—Illustration.

The time of the administration of remedies, is a point of no inconsiderable moment in the science of therapeutics—Illustration and proof.

An attention to preceding and co-existing diseases which the patient may have experienced, is of great importance—Such diseases influence, not a little, indication and prescription.

The foregoing considerations, although highly important, are only collateral, and therefore, not alone sufficient.

A point of superior moment remains to be determined.

The immediate seat and nature of the disease.

But a knowledge of this falls within the compass of *particular pathology*, a branch which, as already observed, it does not belong to my province to teach, but to that of the professor of the practice of physic.

Having finished his investigation as to the seat, the general nature, and the particular state and character of the disease, the practitioner, must next put into requisition his knowledge of the properties of medicinal substances.

This conducts him into another very interesting field of research.

Through the *whole* of it we are forbidden to accompany him, the greater portion of it belonging to the department of Materia Medica.

Circumstances prohibit us, at present, to do more than take a general but succinct view of the modus operandi of medicines.

This subject, which must be justly regarded as both curious and important, may be comprehended within five distinct questions.

1. Do medicinal substances *really act at all*, or do they only sustain the action of the living matter to which they are applied?
2. Whether do they act on the solids or the fluids?
3. Whether do they, in their original impression, act locally or generally?
4. Do they act as stimulants alone, or as stimulants and sedatives?
5. Do all stimulants act alike, differing only in the degrees of their strength; or are all stimulants specifically different from each other?

Question first—Covers an extensive field of subtle and curious investigation.

Embraces the scholastic dogma, touching the *vis inertiæ* of matter.

Can matter, *as such*, act *of itself*; or does it move only in obedience to impulse from without, and does that impulse necessarily proceed from spirit?

Ans. Yes, matter, even that usually denominated *dead*, acts as certainly and palpably as spirit itself. Of this we find ample proof in

1. The gravitation of matter—Illustration.
2. Currents of air, in whatever direction they move. Do.
3. The pointing of the needle to the pole—do.
4. Combustion, and its effects—do.
5. The reciprocal action of acids and alkalis.
6. Clouds of every description, more especially the thunder cloud.

These several phenomena are the result of action, yet over neither of them does a spirit *immediately* preside.

Nor can we admit the agency of spirit in every department of living matter.

In the vegetable kingdom there is much action, without a presiding spirit to excite it.

False impressions in relation to these facts, led the ancients into the errors of polytheism—to a belief in Gods of the air, of fire, of water, of light, of agriculture, and innumerable others.

If, then, dead matter can act on dead matter, it can act also on that which is living.

But it acts on different principles, and in a different way.

On dead matter it acts mechanically, chemically, &c.

On living matter, as *a stimulant* or *an irritant*.

Illustration.

On the application of dead matter to living, the latter re-acts in a peculiar way.

Hence the phenomena that arise, result from a twofold source, the action of the dead, and the re-action of the living.

Did not dead matter *really and specifically* act, whence comes the difference of result, on the application of different kinds of dead, to the same portion of living matter?—Examples.

Different tastes, odours, and *sensations* generally.

Illustrations.

Different *irritative* actions, on the application to the stomach of different articles—do.

In some cases dead matter acts feebly—Reaction is then also feeble, and the commotion slight—Examples.

In every instance, then, of the exhibition of medicinal articles, the medicine and the living body both act.

Hence the truth, that medicinal properties exist only, at least they can be recognized only, in their relationship to living matter.

Question second.—Medicinal substances are believed to act *primarily* on the solids, and on the fluids only *secondarily*, for the following reasons.

1. Never found, in a *formal state*, in the *living* blood. Illustration.
2. Inject them into the blood vessels, you either produce no effect, do mischief, or kill. *Benefit never results from the practice.* Remarks.
3. The lacteals and absorbents receive and convey to the blood nothing which is not subdued, and assimilated to the nature of their usual contents. This is certainly the *general rule.* If exceptions exist, they are *but exceptions*, the result of some forced or preternatural state of things, and to be so considered in the discussion of the question. Illustration.
4. Medicinal substances, entering the circulation, in their crude and formal state, *would injure many parts to benefit one.*—Illustration and proof.
5. Apply a remedy to a part remote from the diseased one, it will cure the affection—apply it to the diseased part itself, it will render it worse. Illustration and examples.
6. Remedies act, in many cases, too suddenly to do so through the medium of the circulation. Do. do.
7. Opium and other vegetable poisons, found in the stomach after death produced by their action, undiminished in bulk. Examples.
8. No difficulty, in relation to their *modus operandi*, removed by admitting the entrance of medicines into the blood. The operation and effects of *distant stimulation*, as easily understood, as those of *proximate.* Illustration.
9. The very idea of a substance being medicinal, precludes the belief that it can be assimilated and received into the blood. Do.
10. Medicate the blood, and you so stimulate every part by its circulation, as to destroy all chance of equalizing excitement. On the contrary, you incur a hazard of rendering it still more unequal, by

exciting *most powerfully* the diseased organ. Do.

11. Introduce medicinal substances into the blood, and you destroy entirely their specific action. Illustration and examples.

12. Diseases never cured nor even alleviated by the transfusion of blood. Could the blood be medicated and were this the usual channel for the introduction of medicinal influence, the case would be otherwise.

13. No rational and intelligible account can be given of the progress and operation of a remedy, after it has gained admission into the blood, supposing the event practicable. Remarks.

14. Nature, unassisted, cures many diseases. Yet she never medicates the blood. Illustration.

15. The operation of the passions and emotions often cures diseases. But in this way the blood is never medicated. Illustration and examples.

16. The action of all medicinal substances, whose operation is clearly understood, can be fairly traced to the solids. Do. do.

Question third.

The first impression of medicinal substances is *local*, and the effect becomes general through the medium of sympathy. This is believed to be true for the following reasons.

1. Medicines, like all other substances, cannot *immediately* act where they do not *proximately* exist—they cannot act *immediately* on that with which they are not in *actual contact.*

2. But they can come into immediate contact with but four parts of the system. These are, the *skin*, *the alimentary canal*, *the schneiderian membrane*, *and the brain.* The latter constitutes the immediate seat of action of all mental agents. Illustration.

3. Of all medicinal substances or agents whose course

of action we can correctly trace, the original impression is local. Illustration and examples.

Question fourth—*Stimulant* and *sedative*, definitions of.

I am not to be informed that, by some writers, whose opinions are entitled to every consideration, this is pronounced a question about words, and worthy, therefore, of but little attention.

My own views on the subject are very different. It is not a question about words, but about *things*, of serious concernment to medical science. It involves a knowledge of the true relationship between living and dead matter, with which every physician should be intimately acquainted.

It is, moreover, essentially connected with an important principle of the animal economy, to which no member of the medical profession should feel indifferent. It is, indeed, itself a principle, embracing a multitude of facts and phenomena, which, without a correct knowledge of it, can never be either reconciled or understood.

My duty, then, commanding me to make every effort in my power for the elucidation and defence of correct principles in medicine, I shall, without further preface, proceed to the discussion of it.

All medicinal substances act *by impression*—Impossible for them to act in any other way—action on living matter being synonymous with impression.

But every impression is necessarily a stimulus—sedative impression, would be an expression self-contradictory.

Whatever acts on living matter, must do it through *irritability* or *sensibility*. But these properties can be acted on by stimulants alone.

The phrase, *sedative agent*, is self-contradictory and therefore absurd.

By reverse sympathy, the *secondary* or *remote* effects of a medicinal substance may be sedative; but nothing can render the *primary* and *immediate* one so. But the nature of a remedy must be determined by its *immediate* action, not by its *secondary*, else can the most potent stimulants be proved to be sedatives—opium, ether, alkohol, heat itself.

Illustration and proofs of the foregoing propositions, in which the stimulating powers of *cold*, and of what are usually denominated the sedative passions, are demonstrated.

Question fifth. Are all stimulants alike, differing only *in force*; or do they all differ from each other specifically *in their nature?*

Stimulants are such only in relation to living *irritable* and *sensible* matter.

To reduce the grounds of inquiry, then, to the narrowest limits, it will be sufficient to ask,

Do all substances produce the same kind of impression on irritable and sensible matter?

In terms still more specific, do all substances, when brought into contact with irritable matter, produce the same *action*, and the same *sensation*, when acting on sensible matter?

To this question a negative answer will be returned by every one.

In relation to *sensibility*, the subject is free from all obscurity.

Impression on that property produces *sensation*. But throughout the whole compass of nature, no two *different* substances excite in us the *same* sensation. If they did, they would cease to be different. For by our senses alone do we recognize difference.

Minerals present themselves to us under *different figures* and *colours*, and make different impressions on the sense of touch. To our sensibility, therefore, they are stimulants specifically different.

The same thing is true in relation to vegetables. Neither in colour, nor taste, nor odour, are any two species of them alike. Even between two individuals of the same species a perfect similarity rarely, perhaps never, exists.

To our sensibility, then, they also stand related as so many stimulants specifically different.

So do animals. Between different species of them an essential difference exists, in colour, and figure, and odour, and voice. To our sensibility, therefore, they are stimulants specifically different—Further illustrations and proofs.

Of the relationship of substances to our irritability.

Here our evidence, although not perhaps so palpable, is sufficient to enable us to decide with confidence.

Analogy fully authorizes the belief, that substances which, by their diversified properties, produce on our nerves of sense impressions specifically different from each other, must produce impressions equally different on our irritable organs.

Corroborative of this analogical inference, facts present themselves from every quarter.

Purgative medicines act chiefly on our irritability, yet no two of them operate alike. They make different impressions because their properties are different.

Diaphoretics, diuretics, sialogoques, and expectorants address themselves to our irritability. Yet so different are the impressions they produce on the stomach that one excites perspiration, another urine, a third saliva, and the fourth, a discharge of mucus from the bronchiæ.

Tonics and astringents act on our irritability; yet the impressions they make, and the effects they produce, are widely different.

Calomel and arsenic both act on the stomach; yet I need not say how different are their effects. Nor can any one be at a loss as to the cause of this dif-

ference. The two substances impress differently the irritable organ to which they are applied.

Indeed the most scientific and rational, and, therefore, the best, classification of the articles of materia medica now extant, is founded on the difference of effect produced chiefly on the *irritable* parts of our bodies, by the various families of medicinal substances.

In relation, then, both to our sensibility and irritability, it clearly appears, that all different remediate articles are to be regarded as stimulants specifically different.

Illustration and further proofs of the foregoing opinions.

Further to pursue the subject of therapeutics, would be an encroachment on the limits of materia medica.

Having already transgressed the intended boundaries of this outline of my lectures, I here conclude it, reserving for the enlargement of another edition, should one be called for, a synopsis of Hygiene, and Medical Jurisprudence.

THE END.

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