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ELEMENTS

OF

MEDICAL LOGIC,

ILLUSTRATED BY

PRACTICAL PROOFS AND EXAMPLES.

By SIR GILBERT BLANE, BART.

FELLOW OF THE ROYAL SOCIETIES OF LONDON, EDINBURGH, AND GOTTINGEN; MEMBER OF THE IMPERIAL ACADEMY OF SCIENCES OF ST. PETERSBURGH; AND PHYSICIAN TO THE KING.

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BE IT REMEMBERED, That on the eleventh
SEAL. day of May, in the forty sixth year of the Independence of the United States of America, Huntington & Hopkins of the said District, have deposited in this Office the title of a Book, the right whereof they claim as Proprietors in the words following—to wit: "Elements of Medical Logic, illustrated by practical proofs "and examples, by Sir Gilbert Blane, Bart. fellow of the "royal societies of London, Edinburgh, and Gottingen; "member of the imperial academy of sciences of St. Petersburg; and physician to the King. The first American from the second London edition. With additions "and corrections." 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."

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To the King.

SIRE,

SUFFER me to lay at your Majesty's feet the fruits of more than fifty year's meditation and experience, the greater part of which has been employed in the service of the State, and in that of your Majesty's Person and Family.

In the exercise of my professional Duties, it has fallen to my lot to be present in some of the most brilliant and important events which grace the British Annals; and if my humble labours have in the least contributed to the welfare of any

class of your Majesty's subjects, or of the world in general, they have met with more than their due meed in the countenance and approbation of your Majesty, under whose auspices, the civilized world has been rescued from degradation and ruin; and the British Empire raised to an unexampled height of Grandeur and Renown.

Deign, SIRE, to accept this tribute of the homage and attachment of

YOUR MAJESTY'S
most faithful, most devoted,
and
dutiful Subject and Servant,

GILBERT BLANE.

London,
16*th June*, 1821.

ADVERTISEMENT.

THE reception of the first edition of this Work, which appeared in the year 1819, having exceeded whatever the Author's most sanguine expectations could anticipate, he has felt himself bound by gratitude, as well as duty, to use his best endeavours to render the Impression now called for, more worthy of the acceptance of his too partial and indulgent readers. He has therefore bestowed considerable time and thought in corrections and additions, particularly in what is important—the practical applications and inferences. He has, however, greatly abridged that part which relates to the question, regarding the contagious nature of the Yellow Fever, or more properly, that species of it in which a morbid poison generated by the living human body, is superadded to the other causes, and therefore called the Typhus Icterodes, to which, on account of its vital im-

portance, he had allotted a larger space than was due to it as a mere illustration. But having learnt that the fatal delusion regarding it, had been so far done away, particularly in the sea-ports of Europe and America, as to have led to a general system of preventive regulations, which had been attended with the most salutary effects, he does not now deem it necessary to enter so largely and anxiously into this subject.

ADVERTISEMENT

TO THE AMERICAN EDITION.

SEVERAL pages were annexed to the last London edition of this work, designating errors and embracing additions. In this edition, the former have been corrected—the latter incorporated with the work, and the index somewhat enlarged.—This volume, the favourite production of the "most learned and classical physician of the age," has no ordinary claims to the attention of the Medical reader.

CONTENTS.

Page.

Introduction, - - - - 7

SECTION I.

Preliminary Observations, - - 25

Enumeration of the Elementary Principles of Life, 41

1. The Generative, - - 43
2. The Conservative, - - 47
3. The Temperative, - - 53
4. The Assimilative, - - 69
5. The Formative, - - - 84
6. The Restorative, - - 96
7. The Motive, - - - 110
8. The Sensitive, - - 136
9. The Appetitive, - - 140
10. The Sympathetic, - - 142

SECTION II.

The general Principles of Truth and Error, in the Cultivation of Medicine, - - 151

Enumeration of the Sources of Error, - 156

SECTION III.

1st Source of Error—the Fallacy and Danger of Hypothetical and Theoretical reasoning, 159

Examples and Illustrations from the Works of Aristotle, Bacon, Hippocrates, Galen, Sydenham, Boerhaave, and Pitcairn, 160

age
Misapplication of Natural Philosophy, - 166
Fallacy of the Humoral Pathology, - - 174
The Utility of Anatomy and Physiology, questioned and vindicated, - - - 180
Dogmatism and Empiricism compared, - 193

SECTION IV.

2d Source of Error—the Diversity of Constitutions, - - - 201

SECTION V.

3d Source of Error—the Difficulty of appreciating the salutary Efforts of Nature, and of discriminating them from the Operations of Art, - - - 221

SECTION VI.

4th Source of Error—Superstition, - 235

SECTION VII.

5th Source of Error—the ambiguity of Language, 243
Examples of its pernicious Effects in Seascurvy, - - - 244
——— in Yellow Fever, - 246
——— in Dropsy, - - 267

SECTION VIII.

6th Source of Error—the Fallacy of Testimony, 271

CONCLUSION.

Some Remarks on pre-conceived Opinions, and the excessive Deference to Authority and Fashion, - - - 291

ELEMENTS

OF

MEDICAL LOGIC,

&c.

INTRODUCTION.

As medicine has for its object the preservation and restoration of health, it comes under the definition of an Art, a term, the import of which consists in the adaptation of means to ends. These means must be derived from the previous knowledge of the changes producible by them, whether as corporeal agents constituting physical causes, or as affections of the mind constituting moral causes.

The most precise criterion that can be fixed upon for distinguishing rational beings from

brutes, is the faculty of adapting means to ends; and there is perhaps no attribute purely intellectual, to which the term *reason* is so appropriately applicable. It is the first line of distinction between man and the inferior animals: it is this which characterizes his intellectual nature, as that moral agency which renders him an accountable being, characterizes his moral nature, both together forming that insuperable line of demarcation which separates him from the brute creation. To contemplate an end, and to devise the means of attaining it, in other words, Art or Design, is a faculty which does not belong to mere animals, but to a more pre-eminent being, *sanctius his animal et mentis capacius altæ*. Language has very commonly been assigned as the distinctive faculty of rational nature; but it requires little reflection to perceive, that, under this definition of art, language itself is an art, for it consists in the contrivance and employment of the *means*, articulate sounds, for accomplishing the *end*, the interchange of thought between one intellectual being and another; and the logical

process of thought, by which children first catch the import of words, is an example of the same sort of induction, by which cause and effect are ascertained. The same principle explains the improvable capacities of man as contrasted with brute animals.

It follows from this, that as it is physical influences with which we have chiefly to do in medicine, the main and ultimate object in cultivating this art, must consist in ascertaining the agency of external objects, whether salutary or noxious, on the living body, and in applying or avoiding them so as to obtain the desired result, either of preventing the occurrence of disease, or in converting the state of disease into that of health. It is in the extent and correctness of our knowledge of these agencies, that the perfection of the art of physic must consist.

This knowledge has to some persons of a sceptical turn of mind, appeared so unattainable, as not to be worth prosecuting, insomuch that they have raised the previous question, *an datur ars*

medicinæ? They allege that the powers and resources of nature in the human, as in the brute creation, are all-sufficient; that we do not possess such a power over the agencies of nature, nor such a knowledge of their application, as to constitute an art; that the history of this pretended art in all ages, so teems with the fanciful influence of superstitious observances, the imaginary virtues of medicines, with nugatory, delusive, inefficient, and capricious practices, fallacious and sophistical reasonings, as to render it little more than a chaos of error, a tissue of deceit unworthy of admission among the useful arts and liberal pursuits of man.

There is a certain class of the enlightened portion of society who consider the belief in the power of medicine, as little better than a vulgar error, and to be discarded from a liberal mind almost as much as the delusions of superstition. But may it not be said of physic, as Bacon says of religion, that the plain and profound meet, and that the superficially learned are the most un-

believing? A superficial knowledge begets doubt; a thorough knowledge brings back to belief. As these allegations strike not only at the dignity and importance, but at the very existence of the art of physic, an answer to them seems to be called for.

The argument from the brute creation seems plausible enough, and it might have been added, that whole tribes of the human race pass through life without the benefit of any regular art of physic. But though animals are very little subject to disease compared to the human species, it is not strictly true that they use none, for they are observed to swallow certain simples to relieve themselves from disorders. Neither are the untutored tribes of mankind without their valuable remedies discovered by natural sagacity, and some of their greatest sources of misery consist in their having so scanty a stock of remedies, and the want of those means of relief when under suffering and danger, which are known and successfully practised in civilized life. It is also remar-

kable, that savages seldom attain to old age, though their disorders are much fewer, and the mechanical injuries to which they are liable, are much less frequent than among nations cultivating the arts and sciences; and it is incontrovertible, that if the powers of unassisted nature were all-sufficient, whether in the rude or civilized state of society, all mankind, or a very large majority of them, would die of old age, which is far enough from being matter of fact.

The maladies and casualties incident to the human species are more numerous and complicated than those of other animals, in consequence of the artificial habits and practices peculiar to rational beings, and they are still more multiplied, by that superior cultivation of reason which distinguishes civilized from savage life. The exercise of reason has also a tendency to obliterate, or at least to weaken such suggestions of instinct as animals possess, and those dictates of natural sagacity, which are found among savages, and which nature has implanted for the protec-

tion of both ; but even in the rudest state of society much is left to reason, as is observable in the helpless condition of the infant in every situation of human life. From these considerations, it is obviously in accordance with the wise and beneficent arrangements of Providence in other departments of creation, that compensation should be made by reason's proving a corrector of evils which reason had induced, so that artificial ills should be counteracted by artificial remedies. This is presumable *a priori* from the analogy of nature ; but it is not only presumable, but incontestably true in fact, that most diseases are more or less under the controul of art ; and one could be named of such potent malignity as would have gone far towards the extinction of the human race, by striking at the very source of life, had it not been resisted by the power of art. This example is drawn from curative medicine, but instances equally important and convincing, might be quoted from the history of preventive medicine, in the various means which have been devised and practised for obviating and extin-

guishing infections, engendered by the artificial habits of human life, in the more or less cultivated stages of society.

The unbounded number and variety of powerful agents under the command of art, by which the living human frame can be acted upon, afford further ground for admitting, that physic is a real and efficient art. These consist not only in the regulation of diet, of the temperature and purity of the air, and the abstraction of blood, but there is such an ample and beneficent provision made by nature in the productions of the vegetable, mineral, and animal kingdoms, so diversified in their peculiar and respective virtues, as to be co-ordinate with a parallel diversity of human suffering, and such as to leave no hesitation in interpreting their meaning, as a portion of that system of final causes, so expressively displayed in the whole works of creation. Is there an organ, or function in the animal economy, which cannot be either incited or restrained by some natural agent discovered by man; and how few are

the maladies, which, even in the present imperfect state of the medical art, do not admit either of cure, or paliation by some specific remedy, or mode of treatment already found out? It is also highly worthy of remark in this place, that as the diseases and casualties of life are multiplied in the progress of civilization, so are the remedies multiplied by the improved energies of reason, and the extension of knowedge, in conformity to that scheme of consistency and harmony which pervades the universe, particularly in all that relates to organic beings.

Would it not also be an anomaly and blot in the beneficent adjustments of the creation, that human beings, under the extremity of suffering, should, by the impulse of nature, call aloud for relief, without any means being afforded for furnishing it? These calls for relief are indeed so imperious, that inefficient and even pernicious means will be caught at, if those that are efficient and salutary, cannot be procured; so that the dearest and tenderest interests of mankind

would be left at the mercy of ignorance, selfishness and fraud, unless society were protected by the light of experience and knowledge. It is too true, that medical practice has been perverted by fallacious reasoning, and by the misapplication of the powerful resources discovered by superior intelligence; and it has been sarcastically said, that though there is a wide difference between a good physician and a bad one, there is but a small difference between a good physician and no physician at all; by which it is meant to insinuate, that the mischievous officiousness of art does commonly more than counterbalance any benefit derivable from it. This view of the matter takes it for granted, that there is a greater risk of nature being thwarted by professional interference, than by the sick being left in the hands of the uninstructed. But is the uninstructed person more likely to humour or imitate nature, than the educated one; and is not the kitchen as fertile in noxious articles as the apothecary's shop? From all I have been able to observe, the ignorant person is more apt

to counteract nature by pernicious interference with her, than the wildest professional theorist; nay, ten to one he is the greatest theorist of the two, for every old woman has her theory generally drawn from the humoral pathology. The faculty of clearly comprehending and fairly interpreting the ways and aims of nature, is one of the highest efforts of reason, and is attainable only by attentive study, and a happy turn for observation. If it were further necessary seriously to repel by argument this depreciating sarcasm, it might be urged, that no argument is more weak than that which avails itself of *abuse*; for there is no maxim more true, and few more practically important, than that the best things are the most liable to abuse: *Nil prodest quod non potest lædere idem.* And the powers with which medicine is armed, forms no exception to this. It is not meant to deny, that great mischief does not occasionally arise from the unseasonable interference of art with the operation of nature, but as this consists in abuse, it affords an additional reason for the more intense

cultivation of the art, in order to save mankind from the misapplication of it. And this is more particularly called for in the present state of natural knowledge, for the many new and potent tools which have been put into the hands of the profession, by chemical and botanical research, may prove swords and firebrands in the hands of the ill-educated and unskilful.

The following practical reproof of those who disparage the art of physic, occurred to the author. He was called up in the night to visit a gentleman of high character in the literary world, whom he found labouring under an inflammation of the bowels, in its last and incurable stage, and for which no professional assistance had till now been called. Finding himself on the verge of dissolution, he not only expressed a regret on his own account, but a sincere remorse on account of others, who might be influenced by his habit of casting ridicule on the medical art in his gay and thoughtless moments.

To conclude, it is the really enlightened physician alone, who can discern, in each particular case, to what extent art is availing, or if it is at all availing. But at all events he is bound not to desert his patient; and while he himself forbears from doing harm, it is his duty to protect those who are so eminently exposed to the over-active officiousness of others. He will also (if I mistake not) feel it incumbent on him in such moments, to administer the moral remedies of consolation and sympathy, and to assuage the anguish of despair, the most acute of all mental sufferings, unless we except the pangs of remorse. Those who conceive the whole art of medicine to consist in wielding the powers of the Materia Medica, entertain a narrow and unworthy conception of their own duty, and of the value and dignity of their profession.

The scepticism which has here been combated is a disease of the mind, which, like some of those of the body, is the offspring of over-refinement. But the great mass of error with which

medicine has been encumbered, or as it were overlaid, has been engendered by an opposite malady of the mind, credulity. This has generally been held to be the peculiar reproach of rude ages, and of the vulgar and illiterate in more refined communities ; but if we are to include under it, the hasty adoption of crude and fallacious theories, derived from real or pretended principles of science, it will be found, that in the history of physic, there is equal room for the imputation of credulity in the learned and cultivated ages, as in the rude and illiterate.

It seems evident from all this, that physic being an art beset with every species of fallacy, it is of the utmost importance that those who engage in it should be fully aware of this, and that they should so discipline their minds, by a knowledge of the laws of evidence, and the rules of investigation, as not to fall into either of the extremes of credulity or scepticism, to both of which the human mind, in different circumstances, is so prone. And as we are to be guided

more by experience than hypothesis, it is further manifest, that the rules for ascertaining and appreciating facts, and the study of the laws of evidence, ought to form an indispensable part of medical education. Nor let any one think that this is a matter of easy attainment; for Bacon himself, the great author and leader in the employment of inductive reasoning, was so far infected by the prejudices and errors of his predecessors and cotemporaries, as in various parts of his works to give humiliating proofs of childish credulity, in regard to certain superstitious and frivolous practices which then prevailed.

It is the author's intention, with unfeigned diffidence and humility, to endeavour to point out in what medical truth and error consist; what are the difficulties that have obstructed the progress of the art, and what the means of obviating them; in other words (if he may be allowed to adopt professional technology) to expound the physiology, pathology, and therapeutics of the medical mind, as the result of fifty year's obser-

vation, experience, and meditation on these subjects.

SECTION I.

On the general Laws and Principles of Animal Nature.—Enumeration and Exposition of the Elementary Attributes of Life. The number and complication of these a great bar to Theoretical reasoning.

The sound state of the mind in the exercise of the medical art, as in all the other practical pursuits of life, must consist in conceiving clearly and correctly, the reciprocal relations of cause and effect; for as it is upon such knowledge alone, that the adaption of means to ends, in which we have defined *art* to consist, can be founded, it is by the ascertained agencies of nature, and the just application of such as we can

command, constituting skill and judgment, that the cure and relief of disease, are brought about.

These agencies are ascertained by observation and experiment: by the former we may be said to listen to nature, by the latter to interrogate her.

Every reflecting mind must be struck with the admirable correspondence of the structure of the living body as a whole, and of the senses and functions in detail, in relation to external nature, such as the adaptation of the whole frame to the laws of gravitation, and of the eye and ear to the properties of light and air.

In looking still deeper, we perceive a like relation subsisting between the constitution of the mind and the laws of nature. The most essential attribute of these laws, is the *constancy* of their operation, as exemplified in the accuracy and precision of the revolution of the heavenly

bodies, the unvaried, universal, and incessant action of gravitation, and every other circumstance constituting what is meant by the course of nature in the inanimate world. Now the constitution of the human mind has as evident a relation to this constancy of the laws of nature, as the senses have to their respective elements; for from the earliest period of life, there is, previous to all experience, a most unbounded confidence in the present and future constancy of events, manifested in all the actions and attainments of practical life, as exemplified in those expectations and measures of prudence by which human actions are guided, and life sustained. The belief that the sun will continue to rise every morning; that all bodies will continue unceasingly to gravitate towards the earth; that the human beings around us exist, feel, and think, as we ourselves do, may be quoted as instances of this untaught knowledge and exemplifications of final causes, as striking with regard to the constitution of the mind, as the objects of sense with regard to the corporeal organs.

And it is evident that unless both the mind and body were so constituted as to correspond with the constancy of nature, they could not make those faithful reports, by the steadiness and uniformity of which, all our actions and judgments are guided. And it is in this that the sound state of the mind consists ; for false judgments and erroneous conduct, must proceed from the want of a due correspondence between the reality of things, and the apprehension of them by the senses and the mind.

In tracing this still farther, we perceive that by virtue of this correspondence, or co-ordinance of the frame of the mind with the established course of nature, there is in all the changes produced by the action of external bodies on each other, and on our own bodies, a rapid and instinctive connexion between cause and effect, manifested in that part of our constitution by which it is made susceptible of habit and association, and which is indispensible to our well-being, and even our existence, particularly

in early life. This may literally, and without a figure of rhetoric, be termed the mental organ, for it carries a reference to the constancy of nature, just as the eye does to the affections of light, and the ear to those of the air. Thus is every organ and function of the body, and every faculty of the mind, co-relative with, or represents and reflects as it were, not only the *elements*, but the *laws* of universal nature ;* so that the sublime images and glories of the creation are displayed to our sensitive capacities as objects of grandeur and beauty, and to our intellectual capacities and enraptured minds, as irresistible evidences of harmony and design.

To enquire, therefore, how or why the mind connects two events, frequently recurring in

* See this sentiment more fully illustrated in a Lecture on Muscular Motion, page 40, read before the Royal Society 1788, by Gilbert Blane, M. D. It is also ingeniously and appositely alluded to in Mad. de Stael's Account of the German Poetry in the Work entitled De l'Allemagne, 1815.

conjunction, so as to expect the one when the other recurs, and why or how, this connection should suggest the connection of cause or effect, is just such a question, as if any one was to ask how, or why, the *tunica cornea* of the eye is pellucid and not opaque, convex and not plain; the mind of man being as much adapted by the Divine Creator to the laws of the external universe, as are the organs of sense to their respective elements and objects, the affections of matter.

The final cause of all this cannot be mistaken; for if the rudiments of knowledge had not been thus rapidly, spontaneously, and intuitively acquired by that imitative power, which is one of the original and most essential faculties of nature, but had depended on the slow processes of induction, the ends of self preservation, and the acquisition of language, could not have been effected. Moreover, these confident expectations of the future could never have been excited by reasonings *a priori*, inasmuch as we know

nothing of the tie which connects cause and effect; nor could we ever have formed any anticipation of future events, but from the past experience of what may be termed simple *sequence.** In a more mature stage of life, when

* This strain of reasoning is taken from a discourse read by the Author before a literary society at Edinburgh (The Speculative) in the year 1771, in which he endeavoured to refute Mr. Hume's doctrines, particularly that of custom being the only source of our ideas of cause and effect. And he has been in the habit of meditating on such subjects, during the course of a pretty long life, in the intervals of his active pursuits and duties. In the course of this discussion, the reader may possibly meet with some original remarks: but what they are, the Author himself cannot point out. Observations have occurred to him, which have seemed at the moment new to him, but which he found either to have been half-forgotten traces and obscure reminiscences of his own, or derived from the stores of others, particularly Bacon, Locke, Reid, but, above all, Professor Dugald Stewart, the most profound metaphysician, as well as one of the most elegant writers of this age. Some ingenious remarks on the same subject have very lately been published by Dr. T. Brown, Professor of Moral Philosophy in Edinburgh.

reason comes to be developed, the same imitation of the processes of nature, and of the acts of our fellow creatures continue, but assume the form of deliberate purposes ; and it is from discovering that the instinctive associations founded on the arbitrary constitution of our nature coincide with rational experience, and therefore verified or tested, as it were, by reason, that we derive the idea of power, and that we also assure ourselves of the reality of the external world. For let it be granted that the intimations of the existence and attributes of matter are in the first instance merely illusions or arbitrary hypotheses ; in short, mere sensations, proving nothing but the existence of a state of mind, the case is altered when we find that all the suggestions of intuition are confirmed by the acts of reflection, deliberately instituting purposes which are found to accord with the suggestions of instinct, and thereby dispelling all doubts that can be entertained, or pretended to be entertained, regarding the reality of external objects and their agencies.

Some apology seems due to the reader, for detaining him with the refutation of a doctrine so extravagant as that of denying the existence of matter, which is a mere metaphysical juggle, or sophistical logomachy; for if such reasoning were to be tolerated, existence itself would be a word without a meaning: and, besides, the position carries the seeds of its own refutation within itself on the principle of a *reductio ad absurdum;* for let any demonstration be apparently ever so clear, we are sure there is some flaw in it, if the conclusion involves an absurdity. What I would allege in excuse for introducing the subject, and for entering so deeply into the analysis of the human mind is, that medicine embraces by far the widest range of knowledge of any of the liberal arts or sciences; and it is absolutely indispensable to every accomplished physician, deeply to study human nature, whether with a view to fix in his mind the laws of evidence and investigation, or to make himself master of the influence of the mind on health and disease, not to mention, that

a high order of literary and philosophical attainments is calculated to impress the world with that opinion of the dignity and estimation which is due to it.

In prosecuting this subject, therefore, it is to be remarked, that there is a great variety of knowledge in early life, and in the early and unlettered stages of society, which is forgotten in advanced life, and among more enlightened communities. As an example of the first, there may be adduced that judgment of distance and figure which we form by the eye, which never could have been acquired by mere vision, of which the only objects are colour. But in consequence of locomotion, and of comparing the changes of shades and colours, as associated with distance and the properties of touch, the sight comes by a process of experience, though afterwards forgotten, to judge by association of distances, and of the primary qualities of bodies, which are not the proper objects of that sense. This farther proves, that our real

perception of external objects depends on the impression made by them on more than one of our senses, for it is only in so far as objects make impressions on a single sense, that the sensitive change produced, can be considered merely as a state of mind, giving no intimation of any thing external; but when another sense has an impression made on it, from the same source, then it is that a real *perception*, that is, the idea of an external existence, arises.

An illustration of the imperceptible acquisition of knowledge in the rude stages of society, may be drawn from the formation of language. The various subdivisions and distinctions on the import of words, are founded on a most subtle and refined knowledge, or rather secret consciousness in exercising the faculties of the mind among mankind, before they have made any advances in literature, by a sort of instinctive conceptions, which are generally true to nature, and are so copious, that the learned find a sufficiency of ready formed words for most of their

purposes; and requires such a deep research to analyze them, that the words and phrases transmitted from rude and remote ages, can be retraced and unravelled only by the most acute and philosophical minds.

But we have still another remark to make, of the utmost practical importance regarding those early and unconscious associations which have been so much the object of consideration. The same physical constitution, which in infancy and very early youth, leads us instinctively to ascribe causation to the frequently connected events of nature, establishing our habits and associations, becomes, by the same process, the parent of error. For, as it is mere sequence and not idea of the intimate nature of any efficiency upon which these early judgments are founded, the mere connection of events in time and place, frequently repeated, bear the same relation to the mind, and operate upon it in the same manner as those that are founded on the laws of nature. And whether these connec-

tions are merely casual, or are simple accompaniments collateral to the real cause, they prove the greatest and most pernicious sources of error.

It is of the utmost importance, therefore, that these false associations should be detected, and guarded against, being the main engenderers of the most mischievous errors, and most inveterate prejudices, of those numberless fallacies, those nugatory and superstitious practices, with which the political, civil, religious, as well as the medical world are infested, proving the most prolific source of that vice and misery which deform and embitter human life and conduct.

It is the main business of cultivated reason, that is, of genuine philosophy, to unravel (a literal translation of the Greek word to analyse) and tear asunder, as it were, those fallacious and imaginary catenations of cause and effect, distinguishing them from those which are correctly

referable to the physical and moral agencies of nature: in this consists the process of inductive reasoning, the only clue to useful truth and practical knowledge.

In prosecuting researches into the several departments of nature, there is a great difference in the degree of precision of which they are respectively susceptible; and of the degree of difficulty in obtaining satisfactory results. In physic, Hippocrates might well say in the words of his leading aphorism *experimentum fallax, judicium difficile.* It is evident, that those departments in which the subjects of inquiry are most simple and invariable, will be the most easy of investigation, for they will be least embarrassed by complicated and collateral influences. Chemical agency seems of all others the most simple, for it consists merely of those steady affinities which determine all the results. This is so true, that a single experiment well instituted, is sufficient to establish a

general principle.* In mechanics, on the contrary, there a number of co-operating agencies, gravitation, cohesion, impact pressure and friction. Most of these are so steady as to admit of computation, and even rigid calculation: but the difficulty of subjecting them to harmonious co-operation, is such as to render the results much less certain and satisfactory than those of chemistry.

Animal life is not only by far the most complicated department of nature, but the most vague; for, besides being more or less subject to chemical or mechanical agencies, it possesses such a number of attributes peculiar to itself, and those

* From this circumstance, is probably derived the common phrase of *experimentum crucis*, to denote that sort of experiment of which a single instance is conclusive. The crucible being the most important untensil in ordinary chemical operations, derives its name from the figure of the cross stamped upon it in the superstitious times of Alchymy, with a view to bespeak the divine favour to its processes.

of such a various and fluctuating nature, as to put their influences and combinations beyond the reach of all calculation ; and present the most formidable and discouraging obstacles to those who may propose, *a priori*, to predict or controul its operations whether in health or disease.

But it is incumbent on those who allege these causes of difficulty in physiological researches, to prove this by a specific enumeration of the principles peculiar to animal life, as distinguished from inanimate matter ; and this seems to be the more necessary, that it has not hitherto, that I know, been undertaken by any physiologist. It is most manifest, that by no other method can any comprehensive system of theoretical physiology and pathology be constructed ; and the correct construction of such a system can alone prevent that abuse of theory which is the subject of this part of the present work to expose.

The Author, therefore, feeling himself bound to exhibit an enumeration of what may be ter-

med the *elementary principles* of life, that is of those properties and energies which constitute life, and are peculiar to it, as distinguished from inanimate matter, submits to the Profession the following, as the result of long and close meditation on the subject. They may be arranged as follows:

1. The Generative.
2. The Conservative.
3. The Temperative.
4. The Assimilative.
5. The Formative.
6. The Restorative.
7. The Motive.
8. The Sensitive.
9. The Appetitive.
10. The Sympathetic.

This statement differs both in its principle and matter, from any with which the Author is acquainted, inasmuch as it is not fouuded on an enumeration of functions, consisting in the play of the divers organs which constitute the frame of

living organic bodies, and implying compound action and co-operation, but on principles pervading and actuating the whole system, and constituting the simple elements of these functions. It is meant to comprehend all the properties in which the essence of life consists, and which characterize and distinguish it from inanimate matter on the one hand, and from moral and intellectual nature on the other. If the enumeration is complete, it ought to embrace all the principles of disease as well as health, which can be brought under consideration; for if it includes the whole powers of life, all disease must consist in the disorder of one or more of them. In this case, it might be made the basis both of a scheme of nosological arrangement, and of a plan of theoretical and practical instruction. And though this does not fall within the present scope of the Author whose intention it is to state and define these principles as matters of fact in the natural history of life, with a view to render the medical enquirer fully aware of the difficulties which he has to encounter, in deducing practical results

from such complicated data; yet, in following up this plan, he will not consider it as foreign to his purpose, to dilate occasionally on such new and important, and above all such practical matter, as may occasionally fall in his way.

1. The GENERATIVE Principle.—It will not be disputed, that this primary energy of nature belongs purely and peculiarly to animal and vegetable life. Being emphatically named the mystery of nature, and being now admitted, by all correct physiologists, to be inexplicable, it requires in this place, merely to be enunciated. It may not, however, be without use, here to hold out as a beacon to those who may still be disposed to waste their time and labour, in attempting to over-leap the stated boundaries of nature, the fruitless and absurd results they are likely to attain. What, for instance, can be so extravagant and irrational, as that hypothesis, which professes to explain generation, by supposing an infinite involution of embryos? *Obscura obscurioribus.* The doctrine of that most respecta-

ble physiologist, Dr. Blumenbach, who refers generation and growth to what he calls the *formative nisus*, is perfectly consonant to reason; inasmuch as it is to be considered rather as an exposition of facts, than as a theory.*

In attempting to reason upon, or to account for the most plain and familiar *phenomena* in this branch of animal nature, we find ourselves immediately at a stand. What, for example, can be more inexplicable than the equality, or rather the near equality of the sexes, for there is a small majority in favour of males. Hufeland, a German Physician and Naturalist, has been at great pains to collect the relative numbers of the two sexes in all parts of the world, and has found them every where the same.† It seems still more singular, and at the same time most admira-

* See D. I. F. Blumenbach, Abhandlung uber die Nutritionskraft. St. Petersburgh, 1780; and de Nisu Formativo Gottingen, 1787.

† See Journal des Pratische Heilkunst, January 1, 1820, Berlin. The proportion is that of 21 males to 20 females.

ble in the institutions of nature, that this relative number of the sexes should be maintained, though the primordial germs are mixed in different proportions in the *ovaria* of different females; for it is well known that many females produce such a number of children in succession of the same sex, as is utterly irreconciliable with the laws of blind chance, another word for mathematical necessity.* What commands attention in this is, that, nothwithstanding, this inequality and irregularity in the procreative function of

* This might be more familiarly illustrated by stating, that the succession of the births of the two sexes, does not follow the rule which takes place in drawing a lottery. When, for instance, an equal number of black and white balls are shaken together in the same bag or box, it would be contrary to the laws of chance (for chance is subject to mathematical laws) that six, eight, or ten, or more of the same colour, can be drawn successively, as we not unfrequently witness with regard to children of the same sex in particular families.—The final cause of the small plurality of males seem to be, that more male children are still born or die in infancy than females, so that at the age of 14, both sexes are equal.

individuals, the relative number of the sexes is maintained with the greatest and most universal exactness with regard to the whole species. Not only the great curiosity, but deep importance of this fact, seems hitherto to have escaped the notice of physiologists, philosophers, and theologians. Does it not prove that the arrangements of nature are utterly irreconcileable with atheism, either absolute, or that form of it called naturalism? for it must be obvious to every reflecting person, that what has been just stated, cannot be accounted for without admitting the existence of DESIGN, an attribute which can only be predicated of that conscious intelligence which constitutes *mind*. Innumerable questions in this and every other department of nature might be raised equally unsolvable on any other principle,* equally impenetrable to finite under-

* See a remark illustrative of the same principle in the Edinburgh Review of 1807, Vol. XI. in the article Mecanique Celeste, well known to have been written by that accomplished mathematician, philosopher, scholar, and gentleman, the late Professor Playfair, of Edinburgh.

standings, equally commanding our admiration and devotion, being equally demonstrative of the existence of a supreme contriver.

The morbid deviations of the generative energy, consisting in mal-conformations, monstrosities, extra-uterine, and abdominal* fœtations, can hardly be regarded as objects of practice; and it need merely be remarked that the health, happiness, and virtue of the parent, and the perfection of the offspring, can only be maintained by the temperate exercise of it.

2. The Conservative Principle.—By this is meant that power by which the living body is prevented from running into putrefaction. According to the experiments of Dr. Alexander,† the range of temperature most favourable to the putrefaction of dead animal matter, being between 86° and 100° Fahrenheit, includes the

* See Med. Chirug. Tr. Vol. viii. Article 8.

† See Experimental Enquiry on the Causes of putrid Diseases, London, 1771.

usual standard of human heat. There must therefore be some powerful energy in life itself, which counteracts this tendency to spontaneous decomposition. It was alleged by Dr. Alexander, and some of the other physiologists of that day, that putrefaction is averted by constant motion of the fluids and solids during life, together with perpetual removal of effete matter, and the fresh supplies from food. These are evidently quite inadequate to account for this striking phenomenon: and that there is an antiseptic power in life independent of motion, and of the change of matter is proved, by the same principle of self-preservation being found in the quiescent state; for instance, in impregnated eggs and torpid animals. This subject was first set in that clear and interesting view which is due to it, by Mr. John Hunter. (See Observations on certain Parts of the animal Economy, Lond. 1786; also Treatise on the Blood, 1794.) These works are rare and valuable specimens of true inductive research; and for logical precision and vigorous originality of mind have

never been surpassed, nor perhaps equalled, in the history of physiology; and it is not easy to be accounted for, that in the present times, neither the import of his doctrines is clearly understood, nor their importance duly appreciated. We meet with works on physiology, some of them even professing to be complete systems, in which the fundamental law of life is not once adverted to! It pervades also the living organic bodies of a lower order, as is manifest in vegetable substances, which though not endowed with the same degree of heat as animals, are yet in such a state of succulence, as would lead to immediate destruction, unless they were sustained by this principle. This conservative principle was considered by Mr. Hunter as so important an element in the existence of all organized beings, that he deemed it the most essential constituent of what he called emphatically, the *Living Principle*. This principle maintains a constant and arduous struggle against the sceptic tendency incident to the matter in which it is inherent, and it is more or less equal to this

struggle, according to the constitution of individuals, and the operation of morbid causes.

The circumstances in which it shews itself in a state too low to maintain life, are in those local affections in which gangrene takes place, and in those affections of the system in which the whole constitution sinks under them, as in acute disorders, generally produced by a morbid poison, such as small pox, typhus fever, and plague. The propriety of calling these disorders putrid has been questioned, because they do not produce actual putridity before death. This is certainly true, for actual putridity is incompatible with life; but the rapidity with which the dead bodies of those who perish by those disorders rush into putrefaction, is so much greater than that of those in whom life had been extinguished by other diseases, or by external injury, that there can be no doubt, that the conservative principle had been maintaining, before death, an unequal combat with the principle of spontaneous decomposition. The flaccidity of the muscular

fibres, and the fluidity of the blood after death, are also indications of impaired or lost vigour in this principle; and these circumstances are observable in the bodies of those who die of certain diseases, or of certain poisons; also in certain forms of violent death, as from lightning; and in all such cases putrefaction is observed to come earlier than where no such circumstances have taken place. This principle is very strong in the blood, for if the flow of it into any member is obstructed, gangrene ensues.

As there is a comparative deficiency of this conservative energy in some constitutions, so there is an exuberance of it in others. The proofs of this consist in the resistance which some individuals oppose to the causes of gangrene and putrid fevers, either by maintaining an exemption from them, or by restoring themselves more readily than others, when under their action. The superior prevalence of this principle is probably also one of the main causes of the longevity of some individuals.

The difference in the vigour and duration of this principle in different individuals, depends most essentially on the primordial *stamina*, but somewhat also on the habits of life. The spontaneous local gangrenes in extreme old age, particularly in the lower extremities, is an indication of a decay of this principle from time alone. And we may here take occasion to remark, that the various forms in which dissolution approaches, are owing to the relative vigour of the different principles on which life depends. In a subject, for instance, in whom there is an incurable disorganization of the lungs, or any other vital part, the struggle will be longer or shorter, according to the power of this conservative principle: or of the digestive, which maintains life against the decayed state of the vital organs; and the cause of one individual suffering longer, or more intensely, than another in the extremity of life, is owing to one constituent of life being more vivacious than another, which prevents, as it were, the springs and wheels of life from running down in concert, so that easy death or *eu-*

thanasia consists in the simultaneous extinction of these energies.

3. The TEMPERATIVE Principle.—By this is meant that steady degree of heat with which all animals are endowed, and which, in the *mammalia* and birds is higher than that of the atmosphere in any climate or season in the ordinary course of nature. It is extremely uniform in the same species, and in man it is found at 98° of Fahrenheit, with less deviation in different individuals, than in most other points of the animal economy. There is a considerable latitude in the variety of the stature, features, and form of individual men, and in the natural frequency of their pulse and though there is a great variety in individuals with regard to their sensibility to heat and cold, there is hardly any in the healthy standard of their temperature. This seems a presumption of its being an essential constituent of life, and combined with the conservative energy, may be deemed the main basis, or *stamina* of simple vital existence.

The standard of heat is very different in different species of animals. In the amphibia and fishes, it is very little above that of the surrounding medium. But the resistance which these animals give both to heat and cold, by maintaining the specific temperature, in spite of the application of higher or lower degrees of it, contrary to the law of communication in inanimate bodies, is a proof that temperature is both raised and depressed by some power essentially inherent in life. This is most observable in birds; for in those even of the smallest size the natural heat is ten or twelve degrees above the human. When it is considered how immeasurably greater the abstracting power of the atmosphere is in these small bodies, in consequence of the ratio of their surface being as the square of their mass, it is utterly impossible to account for this on chemical principles, and must depend on a specific generating power, furnished in various degrees to the respective species of animals; and it must be astonishingly great in small animals, to enable them to resist the strong power of abstraction

in the external medium. This argument is rendered still more strong by what is found to take place with regard to some insects. Let the bulb of a thermometer be thrust into a swarm of bees, the heat indicated will be 97° or 98°, that is as high as that of the living human body.

The chief facts in favour of the chemical origin of animal heat, are those in proof of the necessity of the application of oxygen, by means of respiration. This is extremely plausible, when it is considered that the specific temperature of different orders of animals, holds a striking proportion to their intercourse with the atmosphere, as is obvious in the gradations of *mammalia*, *amphibia*, and fishes.* But on the other hand, a degree of heat above the external medium remains in torpid animals during their hybernation, though they do not breathe. It is a fact incontrovertibly attested by Portal and other writers, that af-

* The arterial blood was also found to be warmer than the venous, by Dr. Davy.

ter death from apoplexy, the temperature of the body is maintained, even above the natural standard, to a period beyond that in which it would be totally abstracted from the like mass of inanimate matter. Dr. Badenoch, in a work on the diseases of India, ascertained by repeated and accurate experiments, that the heat of those who die by a *coup de soleil*, or insolation, continues for a considerable time, several degrees higher than the natural standard. In one case, twenty hours after death, the heat felt to his hand as if it had been five or six degrees higher than in life and health. If the heat of the body depended on respiration alone, any one might by a voluntary effort of quick, deep, and prolonged respiration, increase the temperature of his body at will. I myself, as well as others, have tried this without effect. However, therefore, the introduction of oxygen may be the occasional means of exciting or supplying heat, it cannot possibly be the exclusive and constituent cause in all cases.

That principle by which the powers of life resist both heat and cold, was proved in the most satisfactory manner, first by the experiments of Dr. Cullen,* and then of Mr. John Hunter,† but most strikingly with regard to heat, by the ingenious and elaborate experiment planned by Dr. George Fordyce, and the account of it which was drawn up by Dr. Blagden.‡ It was found that the living human body maintained its natural heat, under the influence of an external heat, raised to a degree between 211° and 212° of Fahrenheit's thermometer. But without recurring to these and other similar experiments, it is obvious on the least reflection, that a uniform

* The scientific world is much indebted to Dr. Cullen for some of the most important doctrines on the subject of heat. His experiments on the cooling power of evaporation, published in the Physical and Literary Essays of Edinburgh, 1755, is ingenious and original; and he was the first who suggested and illustrated the power of the living principle in producing heat and cold. See an Inaugural Dissertation of his Son, A. Cullen, de Frigore, 1780.

† See Phil. Trans. 1768. ‡ Phil. Trans. 1775.

temperature of the body, such as actually takes place in nature, could not be maintained under the ordinary vicissitudes of the atmosphere, without this regulating principle. The effect of the emotions of the mind also, in generating both heat and cold, is proof sufficient of temperature depending on a vital and not on a chemical cause, such as mixture, fermentation; or a mechanical one, such as attrition.

The affections of the nervous system do without doubt influence temperature,* both by exciting and depressing it. But it does not follow that these affections, any more than oxygen, constitute this power; for heat is known to exist, independently of its propagation by external bodies, not only in cases where there is neither consciousness nor sensation, but where there is no nervous system, and even where there is no

* See experiments of Mr. Brodie, Phil. Trans. 1811; and Mr. Earl, in the Medico-Chirurgical Transactions, Vol. viii.

organization, as in the fluids. Dr. Wilson Phillip* has proved also that galvanism excites heat, not only in the living solids, but in fresh drawn blood; but it is to be regarded like the nervous system and oxygen, as an exciting, not a constituent cause. Farther, Mr. Hunter has clearly demonstrated that there is in living vegetables a power of generating heat. It is by this power that their juices maintain their fluidity in frost; and when through the intensity of cold they are killed, they then freeze, and by their expansion split the tree with a loud noise. There is a curious proof of the increase of temperature by vegetation, in the American Philosophical Register for 1814. It is there recorded by Dr. Brown, of Lexington, that the roots of wheat having shot into ice, thawed it. Is not the heat found to take place in the operation of malting, generated by the powerful germination which goes on?

The experiments of Dr. Crawford, in proof of the chemical origin of animal heat, are generally

* See his Enquiry, p. 243, London, 1820.

admitted to have been of so delicate and fallible a nature, as not to afford any solid ground for deciding this question; not to mention the assumption of the exploded principle of phlogiston which enters into his reasonings. The basis of this theory consists in the supposed extrication of sensible heat from oxygen, which possessing an extraordinary capacity for heat, parts with a large portion of it upon entering into combination with other bodies. Though some heat may be produced in this way, it is quite inadequate to account for the quantity necessary for steadily maintaining, and equally distributing it through the body, which is chiefly done by the action of the vascular system; and it will still less account for that power, by which both heat and cold are resisted. Though oxygen may contribute somewhat to the generation of heat, its chief action is that of serving as a stimulus to the living power in generating it; for it plays an interesting and active part as an exciting power throughout all nature, both animate and inanimate, being a main constituent in water and at-

mospheric air, and indispensible to combustion; and no animal can exist without more or less of its influence, either by respiration or otherwise. Moreover, one of the main purposes of respiration evidently is to invigorate and refresh the vital powers, merely by checking the generating power of heat, as the most familiar experience evinces, and when the air is not sufficiently cool to produce this effect, the utmost distress arises from the accumulation of heat.

The author has deemed it necessary to enter into these details, in order to justify himself in inserting the temperative energy in the list of powers peculiar to life, essentially and fundamentally inherent in every form and degree of life, whether animal or vegetable, solid or fluid.

As the heat of the human body is above that of the atmosphere in almost every season and climate in the world, the generating power, in order to maintain this pitch, must be in perpetual requisition, and must be excitable in various

degrees, in order to supply the consumption of what is carried off by the fluctuating temperature of the external air, and must also accommodate itself to what is retained in unequal degrees by the unequal quantity and quality of clothing. The requisite exertions of this animal energy, becomes therefore a main element of health and disease, of pleasure and pain. Should the temperature of the atmosphere be far below that of the body (98° Fahr.) the disagreeable sensation of cold is excited. When it is carried to such an extreme as to master the resisting power of the generating principle, it extinguishes this vital action, and either destroys life, or produces local gangrene. It is a fact well ascertained that at very low degrees, that is below zero, cold is not proportionably distressing to the sensations: a happy circumstance, and encouragement to those who navigate the arctic seas. On the other hand, should the heat of the atmosphere rise so as to approach the heat of the body, it becomes disagreeable, and still more so should it equal or exceed it; there must therefore be

some point at which the temperature is most agreeable and salutary; and this is found to be about 62° in the human constitution.

These views of the subject, which have hitherto been little attended to by physiologists and pathologists, seem to explain some important points regarding the effects of atmospheric temperature on the human body. For is it not evident, that it is the sudden check which this generating power of heat meets with in the bodies of those who pass suddenly from a cold or temperate to a tropical climate, that produces languor, debility, and various diseases to which the natives, who are habituated to it, are strangers? The application of external heat in an undue degree, therefore, lowers the powers of life. As heat is a powerful stimulant, the contrary effect might be expected; and the actual effects can only be accounted for by conceiving the generating power to be repressed, and thereby constrained in its exertions; and the invigorating effects of cold within certain limits is, in like

manner, accounted for by this power being allowed to put forth a stronger exertion, the excess, defect, and salutary medium depend on the state of actual excitement; a view of the subject which seems conformable to the system of Brown; and according to the same system, what is called direct debility, consists in the want of actual excitement, the excitability remaining unimpaired, and morbidly accumulating. The desirable medium has been stated to be near 62°, at which limit the vigor and alacrity of mind and body may be said to be at their *maximum*.*

This being a fundamental and highly important principle in the economy of life, the deviation from it must naturally constitute some of the chief elements of disease; and as the powers of art have considerable control over temperature, some of the principal resources of medicine will consist in the management of it. It is

* I am the more anxious so be explicit on this point, for being a new idea, it has been misconceived in the foreign translations of the first edition.

manifest that this salutary and grateful warmth consists in such a temperature as excites the generating power in maintaining its genial standard, and that the exertion of this power is in such circumstances invigorating and refreshing; but when the external heat is such as to repress this degree of exertion, it becomes oppressive and debilitating.

The morbid excess in the generating power of heat is chiefly exemplified in the system, by this being one of the most prominent characters of fever, and from which the name of fever is derived in all languages; and in local affections, by the cognate term inflammation. The highest degree to which the heat rises in fever is 110° or 112°. It has been alleged that morbid temperature can be carried even to combustion. Narratives of such cases occur not unfrequently in the annals of medicine, and Plouquet* enu-

* See his Literatura Medica, Article Combustion Tubingen. 1808.

merates twenty-eight of them. The greater number, if not the whole of these cases, have been aged females addicted to intoxication by means of spirituous liquors. I believe none of them have been witnessed in the act of combustion, so that doubts still remain whether they have not been caused by accident.

It is by rules founded on this principle, that the regulation of heat and cold, as remedies, is to be studied. Dr. Currie observes justly, that a high degree of morbid heat cannot fail to aggravate the disorder in which it exists, by its noxious *stimulus*, and that it ought to be abstracted by the application of cold water to the surface. In following out this, however, a nice exercise of judgment in the selection of cases, and in the mode of administration, is required; for when the powers of life are strong, as in the case of active inflammation, whether general or local, the application of cold may excite to excess the generating power of heat by reaction; and when they are languid, it may produce such a chill as

to extinguish arterial action, or cause a determination on some vital part.*

The excitability of Dr. John Brown, if the author understands it rightly, seems nearly the same as our principle of simple life, being expressive of the combined result of the conservative and temperative energies. The doctrines of this author led to such destructive practice, that they are now generally and deservedly exploded. The argument of a *reductio ab adsurdum*, may be legitimately employed in physical, as well as mathematical, reasoning; so that whenever a doctrine terminates in a conclusion, which is false in fact, we may rest assured, that it is itself false; and, as it is certainly false in fact, that

* This is well expressed by Cicero in one of his rhetorical similes. "Ut sæpe homines ægri morbo gravi cum æstu febrique jactantur, si aquam frigidam biberint primo relivari videntur, deinde multo gravius vehementiusque affectantur." Orat. I. in Catil. This may be received as a proof of the professional opinion of the ancients on this subject.

depletory remedies are, almost in every case, that is, ninety-seven cases in one hundred, according to Brown's own calculation, pernicious; and that stimulating remedies are, almost in every case, salutary, insomuch that it has been proposed by some of the partisans of this system to destroy lancets, and throw away all purgative remedies, no further refutation need be sought for. The errors of this ingenious person, seem to have consisted in his having erected his system on the narrow foundation of only one or two of the principles of the animal economy, and in pushing that principle to an extreme. Had he referred a larger class of disease to over-excitement, which his system seems to admit of, his doctrines would have been more tenable, and would probably have lived longer. It is doubtful, however, whether they would have spread so far, and been so enthusiastically embraced; for something strikingly new, and even absurd, seems indispensible for giving a popular prevalence to medical, as well as religious sects. There seems, nevertheless, to be in the doctrines

of Brown, as far as their narrow principle will admit, and when received under a fair and temperate interpretation of their import and merits, some suggestions not undeserving the attention and imitation of a sober and candid practitioner.

4th. The Assimilative Principle. This power consists in processes peculiar to life, effecting certain combinations and decompositions, also peculiar to life, and manifesting itself in those operations which are carried on in digestion, sanguification, and secretion, as subsidiary to the growth and repair of the individual, and the perpetuation of the species. When we consider the nature of the changes produced on the aliment in the living stomach and duodenum,* and the shortness of time in which it is effected there will appear sufficient proof, even in this

* I have said duodenum, in consequence of some well deduced remarks on the function of this organ by Dr. Yeats, in an article in the 6th vol. of the Transactions of the College of Physicians. London 1820.

stage of assimilation, that there are agents at work, totally different from those of inanimate matter.* The familiar fact of the shortness of time in which the aliment becomes acid in depraved digestion, is also expressive of the singular powers of animal chemistry, a change being produced in an hour or less, which, out of the body, could not be produced in several days. But this difference becomes still more striking, when we contemplate the ultimate results of these processes, and that by virtue of the living powers, the aliment, whether vegetable, animal, or mixed, is converted into matter of the same chemical character, as existing in the flesh and bones of every animal indiscriminately. The flesh and bones, for instance, of an ox, an animal subsisting on pure vegetable food; a lion, an animal subsisting on pure animal food; and a hog, an animal subsisting on mixt food, though differing in some of their sensible qualities, are

* See Examination of Chyme, by Dr. Marcet, Medico-Chirurgical Transactions, Vol. IV. p. 626.

identical, considered as chemical compounds, and exhibit changes totally different from, and utterly inimitable by any chemical processes, of which dead matter is susceptible. It is one of the curious and inexplicable questions on this subject, how it comes about that azote enters as much into the composition of the flesh of graminivorous and herbivorous animal, in whose food no azote is found, as it does into the flesh of carnivorous animals, in which this principle abounds. As there is none in the food of the former, and as it appears by the very accurate experiments of Mr. Allen and Mr. Pepys, that none is absorbed from the respired air, nay that more is expired, than what is inspired, it would appear that it is elaborated in the assimilating processes of life ; the like may be said of the carbonic acid, with which the breath is so much impregnated. The new, important, and very interesting discovery of the application of voltaic electricity for effecting chemical changes, apparently bears some analogy to animal pro-

cesses.* The changes accomplished by the actions of life, may be conceived to be effected through the agency of some imponderable fluid; such as electricity, light, or magnetism. We can conceive, for instance, that each gland may be furnished with a sort of voltaic apparatus,† for effecting its specific change. That the accumulation and presence of such fluids are not foreign to the animal functions, may be illustrated by the electrical battery of the torpedo and

* The idea of the identity, or rather analogy, of the processes of the voltaic battery, with the processes of animal assimilation, was first broached in 1806, by Berzelius, in his Animal Chemistry; in 1808, by Professor Brandis, of Kiel, in Holstein, in a work, entitled Pathologie oder Lehre von den Affecten des lebendigen Organismus. (See Hufeland's Bibliotek der practischen Heilkunde, 1809, Book I. p. 38, *et seq.*); and the next year, by Dr. Wollaston, in an article in Tilloch's Magazine. See also a paper in the Philosophical Transactions, by Sir E. Home, with experiments by Sir Humphrey Davy and Mr. W. T. Brande.

† See this illustrated farther in Dr. Young's Medical Literature, p. 110, Lond. 1813.

electrical eel, the flashes of light from the eyes of some animals of the feline genus, and from the glow-worm and fire-fly. Some physiologists* seem disposed to refer the assimilating process entirely to nervous power; but the like assimilations take place in animals without nerves, and in vegetables; and the nerves, though they may by lateral influence act as stimulants, vehicles, modifiers, or even disturbers of action, are not to be regarded as the organs, in which the initial action originates. Nervous action is found in some instances even to retard and disturb the assimilating process; for it is matter of observation, that in many cases of hemiplegia, where the nervous power is withdrawn or impaired, digestion goes on better than in ordinary health. This is further illustrated by an ingenious and conclusive experiment described in the Quar-

* See Experiments by Mr. Brodie, Philosophical Transactions, 1814; and Enquiry into the Laws of Life, by Dr. Wilson Philip, London, 1818.

terly Journal,* where, though the nerves of the stomach were divided, digestion and all the processes of chylification went on as before.

The main source of physiological controversies, particularly in what regards the nervous system, seems to be the want of discriminating the *actuating* from the *influential*, *lateral*, or *intervening* agencies of the several organs. The author's meaning will be best illustrated, by an example borrowed from mechanism. In all complicated machines, the purpose or ultimate result, is effected by a number of springs, wheels, &c. accelerating, retarding, or giving new direction to the main action, but every one of them indispensible, or *sine qua non* to the production of the proposed effect, which is the diagonal as it were of these compound forces. Thus by means of the balance-wheel and spring of a watch, the power of the main spring can not only be arrested, but the motion of the

* See Quarterly Journal of Science and the Arts, No. 13, page 165.

whole machine can be accelerated or retarded at pleasure. Here the main spring is the actuating power, the balance-spring the influential agent, which though it modifies, it contributes nothing to the power which puts the whole in motion. In like manner, the efficient, or primary power, in the process of digestion, is inherent in the stomach: but this process may be promoted, impeded, or variously controled and modified, by the influential power of the nervous system.

As a farther proof that the nervous power is not indispensable to the creation of either the fluids or solids of organic being, we may adduce not only the fact of the *placenta*, and the curious case of the monster without brain and nerves, described by Dr. John Clarke,* but that, as above stated, whole classes of animals are without these organs, not to mention the whole vegetable kingdom, in which the formation of solids

* See Philosophical Transactions, 1799.

and fluids is equally an act of vital energy as in animals.

The like reasoning will apply to the experiments and arguments of those, who wish to prove that galvanism is identical with the nervous power. And besides, when we reflect that in the changes brought about by voltaic electricity in inanimate matter, there is a limited number of the combinations of pre-existing principles; whereas those of living organic bodies, present countless varieties of newly created qualities in the solids and fluids of every species of animal and vegetable beings; it must be confessed, that, though these newly discovered processes assist our conceptions and abstract our imaginations from the gross ideas of the humoral pathology, (for it is deducible from what has been said, that all the modifications of animal and vegetable matter must originate in the solids,) they are quite inadequate to account for the transmutations taking place in living organic bodies, and that a gulf is still left between the actions of

24898

living and dead matter, which will probably never be passed.

In the sense which I have affixed to the term assimilation, it is applicable only to matter in a fluid form, whether the product of digestion, chylification, sanguification, or secretion. When these portions of matter pass into a solid form, there is, strictly speaking, an assimilative process; but as new properties of matter take place by virtue of a distinct operation of life, I have distinguished this by the name of *formative*. But in none of the stages of this series of change, is there the least resemblance to any of the changes which are produced on inanimate matter by chemical action. They are all brought about by the action or contact of solid organs,*

* One of the most conclusive proofs of the power of the mere contact of a surface is, that the gizzard of a fowl which is lined with a horny, unsecreting surface, does, nevertheless, produce a sensible change on the quality of the contained food; and that when there are secretions, such as the gastric juice, they produce no change resembling

in the form of glands, or follicles, or of membranous surfaces, indued with the power of animalising the alimentary matter, and giving it those in innumerable properties required for the growth and repair of the body.

It is of the highest moment in physiology and pathology, that correct notions on this subject should be entertained; for there has not been a more abundant source of errors, whether theoretical or practical, than that of conceiving that the various changes above enumerated, are either identical with, or allied to, the chemical changes belonging to inanimate matter. We ought constantly to bear in mind, that all effects produced on the living body, whether in its solid or fluid parts, are referable to principles peculiar to life, and that most if not all the means proposed for controlling their actions, or alter-

digestion when mixt with food out of the stomach. See Experiments by Englefield Smith, M. D. European Magazine, June 1797.

ing their qualities, must be addressed to the properties of vital, and not of inanimate matter. It ought also to be constantly borne in mind, that the fluids of living animals are endowed with life as well as the solids. One of the most obvious and plausible objections made to this doctrine, when first broached by Mr. Hunter, was, that the attributes of life could only belong to organic structure, which implies that degree of cohesion in which solidity consists. To obviate this objection, it is necessary to define in what sense this life of the blood and other fluids is to be understood. And here we find the advantage of having made an enumeration of those elements in which life consists. Some of these elementary properties are as congenial with the nature of fluids, as of solids. Such are the conservative and temperative ; and it is in the possession of these that the life of the fluids of living animals is made to consist. There are other elements of life, such as the Generative, the Formative, and others, which are incompatible with fluidity, inasmuch as they imply the

action of organs; and organic structure can belong only to solid parts. But the resistance to putrefaction, the resistance also to external heat and cold, are as conceivable qualities in fluids ever so quiescent, as in the solids. The fact of blood passing spontaneously into the form of vascular texture, was also employed by Mr. Hunter as one of his proofs of its life. And it is rather surprising, that a fact so obvious and striking as the seminal liquor acquiring organization, should have escaped him as a proof of the same principle.

But as fluids are incapable of assuming an organized structure, while they retain that form, and therefore incapable either of initiating or giving direction to motion, all the initial actions of life, as well as its ulterior processes, must be referred to the solids; and it follows, that the virtues of medicine should be directed to those attributes that belong to solids; that is, excitability, sensibility, and contractibility.

It has been questioned whether there are any medicines whatever which operate on principles purely chemical. The destruction of a morbid acid in the stomach by means of an absorbent, is unquestionably a chemical action; but in those recesses not within the immediate reach of deglutition, the changes seem all to depend on vital action. The action of mere chemical power, may also be maintained with plausibility with regard to the remedies for urinary concretions. There can be no doubt of the relief obtained in these cases by the use of remedies sometimes acid, sometimes alkaline, according to the indications derived from the nature of the concretions. But it may be alleged, that this relief is referable to the alteration and improvement of the digestion, and not to the neutralization of the acid and alkaline bodies, which in such remote mazes of the circulation, seem hardly accessible to remedies thus applied. It is in favour of this that there are remedies of the sedative kind, having a sensibly good effect on gravel, of which the operation can only be referred to vital action;

of this kind are opium and hemlock; and I can say, that in my own practice I have found the most striking benefit in such cases, from combining these with the chemical remedies; and there is nothing I am better convinced of, than that the cure is rendered by this treatment more certain, more expeditious, and more permanent,* than where the chemical remedies alone are employed.

Beside the main purpose of the assimilating process that of creating and maintaining a due quantity and quality of the several fluids necessary for growth and repair, there are some secondary purposes of these fluids too important to be overlooked. By their specific stimulus in the various cavities in which they are prepared, they serve as a stimulus to the healthy action of these organs, namely, the stomach, intestines

* See an article in the 3rd volume of Transactions of the Society for the Improvement of Medical and Chirurgical Knowledge, London, by Sir G. Blane, 1812.

and blood-vessels. The mechanical distention also which they give by their bulk, is not less necessary in supporting their action, and even life itself, as will be more fully explained in another part of this work. The importance of these is no where more conspicuous than in the stomach, the first stage of assimilation; and, as it is the only organ which converts foreign and dead matter into living animal matter, its energy must be regarded as peculiar and eminently powerful. By its universal sympathy, it exercises a strong influence over every other organ and function. A blow upon it is more certainly fatal than upon any other part of the body. Its aberrations, therefore, form some of the most copious sources of disease; and for this reason, as well as from its situation, it is the first stage for all internal appliances, to whatever quarter they may be directed. There seems, therefore, to be rational grounds for the present fashionable pathological doctrine of referring all diseases to the stomach, and of curing them all through it. To this doctrine, there is only that objection to which all

matters of fashion are liable—that of pushing it to an extreme, by following it out to the exclusion of every thing else.

5th. The Formative Principle.—This may be called also the organizing or plastic. It has not usually been stated as a principle distinct from the last. In so far as the simple change of matter is concerned, an act of assimilation does indeed take place in the the formation of organs: but this is the smallest part of the Formative process, the essence of which consists in the construction of the various organs, and differs from the Assimilative, as an edifice does from the materials of which it is constructed; nay, more so, for the fluid particles, in assuming solidity, undergo a change in their chemical nature, none of the forms of the matter composing the solid parts having any pre-existence in the fluids. It may be said of the solids, in their relation to the animalised fluids, what has been said at page 77 of these fluids, in relation to alimentary matter, namely, that they are

created by the animal process. This cannot be better illustrated than by the example of calcareous earth; for are there not such immense strata, and mountains of it, composed of the remains of testaceous animals, the existence of which can no otherwise be accounted for? The creation and application of these materials to the rearing of the wonderful fabric of the living body, is one of the most astonishing phenomena which the human mind can contemplate. It is stated by the ingenious and profound Blumenbach, as a continuance of the Generative energy. And it is certainly not less mysterious; for what can be more incomprehensible in the whole compass of nature, than the act by which that conversion and accretion of elementary particles is effected, by virtue of which, bone, cartilage, muscle, membrane, and every other form of organized animal substance is created, at the very point of time and space, in which this conversion and accretion is called for, and there and then moulded into the form of the respective organs which they constitute; that

these organs should be precisely adapted to the ends of nature, the growth of each keeping pace with all the others: and that these unceasing processes of growth and repair should go on with such harmony on both sides of the body, as to produce that correspondence and symmetry which we behold! This is a subject, the nature of which eludes the keenest research, and overwhelms the mind of man with astonishment and despair, from which it can find no refuge, but in resting on it as an ultimate fact, and referring the whole to Supreme intelligence. Should any one attempt to scan it farther, by ascending higher in the scale of natural causes, he will either find himself baffled, or will be in hazard of falling into some extravagance; such as that of Van Helmont, who held that there is in living beings an intelligent principle, which he called Archæus, presiding over and directing the secret movements of the animal machine; or of Stahl, who referred it to the rational soul. In that early stage of science, these were not unnatural notions to spring up, on a subject so dark

and unfathomable, in ingenious and contemplative minds, endowed at the same time with a warm imagination; and they are notions certainly not less venial, nor less abhorrent to reason, than the theory of the sun and planets, conceived by their cotemporary and countryman, Kepler, to whom the palm of high genius and intellectual excellence will not be denied. This very celebrated mathematician and astronomer, who first ascertained that the ratio of the mean distance of the planets to their periodical times of revolution, was as the cubes of the former to the squares of the latter, and solved other important and abstruse problems in physical astronomy, conceived that the sun and planets were animated beings, that the rocks were to be considered as the bones of the earth, the seas and rivers as her blood, the metalic veins as abscesses, and that she performed her daily and yearly revolutionary journey in the ecliptic, by an act of her will, in concert with that of the sun.

The proper function of the formative faculty, is growth and repair. The long and universally received mode of conceiving the progress of growth, was that of a constant accession of organic matter, giving additional length and breadth to the parts nourished. But it is evident, that this mode of accretion would render the preservation of shape utterly incompatible with the enlargement of dimension; and it was first clearly demonstrated by Mr. John Hunter, that the only process by which the growth of solid parts, particularly bones, could be carried on, was by a constant removal and replacement of particles. The effete substances, the *ramenta* or *detritus* as it were of the living body, after being detached by absorption, and set afloat in the circulation, are conveyed through the mass of blood, and eliminated by the excretory glands and emunctory outlets, such as the kidneys, intestinal glands and salivary glands, and the exhalants of the skin and lungs.

The absorption and replacement of solid parts goes on in the adult, as in the adolescent state; for the actions of life making an incessant consumption of the solids, as well as of the fluids, require an incessant repair by new supplies of aliment. One of the most curious problems that could be proposed in animal science, would be to ascertain how much of the identical matter of which the body is composed at birth, remains at any given period of future life. This question, besides being too difficult for me to grapple with, seems more curious than useful; and I shall leave its solution to those who have more ability and leisure. But some other remarks on this absorption of solid parts will not be out of place here, being closely connected with the subject, and throwing light on some of the most important parts of physiology, and pathology.

The matter of which the urine is composed seems to be the effete parts, not only of the fluids, but of the solids; for the solid substances

found upon evaporating this excrementitous fluid, seem to contain not only those particles detached from the various organs in the processes of health, but also the morbid concretions so incident to it, and which probably form a part of that *detrius* of these organs, which are removed in order to make room for fresh accretions. The salivary glands are also one of the outlets for the *ramenta* of the bones; for the phosphate of lime, with a small excess of lime, the materials of bone are found in analysing the *saliva*; and it concretes on the teeth, and sometimes on the salivary ducts, in the form of what is called tartar. Does not this, in some measure, account for these glands being the parts upon which determination is made by the operation of mercury, which consists in exciting an active absorption of solid parts, as I have elsewhere observed.* It may here also be remarked, that

* Transactions of a Society for the Improvement of Medical and Chirurgical Knowledge, vol. iii. page 119, London, 1812.

one of the active effects of mercury is to alter the natural sensibility of the lacteals, which under its influence absorb feculent matter, as is discovered by the smell of the breath; the fetid particles being carried into the circulation, and thrown off in the *halitus* of the lungs, or by the salivary glands, in consequence of the mouths of the lacteals losing that selecting tact, whereby, in their sound state, they reject whatever is offered to them except the chyle.

Were this the time and place for pursuing this research farther, many similar illustrations might be adduced. I shall conclude with only one more. It is evident that the incessant friction in the play of the joints would very soon wear out these organs, were there not a copious supply and active transformation of matter by the Formative process, to compensate for what is abraded by such strong attrition. And were it not for the same operation of this process, the superficial parts of the body would be exposed to rapid destruction, as may be familiarly illustrated by the

shortness of time in which dead skin, in the form of a glove is worn out; whereas the natural integuments of the hands are so constituted and repaired as to last for life.

It is also conceivable that these solid particles when set afloat in the blood, in order to be eliminated by their respective emunctories, may be detained, or by an *error loci*, may be determined on a wrong outlet, thereby proving a source of disease. May not urinary concretions, and various cutaneous disorders be produced by such a cause? There seems to be a like *error loci* in diabetes* and dropsy; for certain portions of the blood, destined for the repair of the frame, are blended with the recrementitious matter, and

* *Error loci* alone seems not adequately to account for it, for there is no saccharine matter created by the natural and healthy power of assimilation. This power itself, therefore, seems depraved in its action.

eliminated along with them. In dropsy,* the interstitial fluid is thereby both increased in quantity and endowed with a preternatural quality; and in consequence of the latter circumstance, the absorbents being deprived of their specific stimulus, become inert. Were I to form any conjecture regarding the proximate cause of the sea-scurvy, I should say that it is owing to an interruption of that salutary renewal of the organic parts, so necessary for maintaining their respective functions in their natural vigour. However this may be, there can be no doubt that the disease called *Mollities Ossium*, and emaciation, are owing to a deficiency in the formative energy, as tumors, exostosis, and obesity are examples of its excess.

The operation of healing, also, by the creation of new parts in cicatrization, and the formation of callus, for the repair of injuries, is another

* See Medico-Chirurgical Transactions, v. 11. Article 30, by Dr. Marcet.

manifestation of the same energy by which these organs were originally formed and moulded. Inflammation therefore, in so far as it is necessary for producing vascular texture, adhesions, and other new organic parts, is an act of the same energy, and is to be deemed morbid only when excessive, or misplaced.

As human life advances into old age, the same quantity of matter required to replace that which is removed, becomes less and less necessary ; for that decay which limits the duration of life, consists greatly in the vessels becoming more and more rigid, and from minute ramifications being obliterated altogether; both absorption and accretion become more slow and languid. There is therefore, less demand for the assimilated fluids which furnish the materials of growth and repair; consequently, a redundancy of blood is extremely common in old age, when the assimilative powers remain unimpaired, as is frequently the case, and is most likely to happen in those constitutions calculated for longevity. It is con-

formable to my own observations, as well as that of others with whom I have conversed on this subject, that, in consequence of the plethora produced from the cause above-mentioned, aged people are frequently subject to spontaneous hæmorrhages, which are not only innoxious, but salutary. I was lately called to a lady aged 82, emaciated and weak, labouring under a profuse hæmorrhage from the nose, by which nearly a quart of blood was lost. It was followed neither by faintness nor weakness, but by an improvement in health, in point of vigour and alacrity, evidently proving that there was a redundancy of blood, the removal of which gave relief. Other similar cases have not unfrequently occurred to me. Lately, I had occasion to know of a female, aged 100, who, in an attack of pneumonia, had been freely and successfully bled in the arm. Sydenham gives very strict cautions against bleeding aged people, without assigning any reasons, and without any exceptions or qualifications, resting, no doubt, on the plausible notion, that old age being a state of exhaus-

tion and debility, a loss of blood, must always be detrimental. This is perhaps true in a majority of cases; but I am well convinced that practitioners will fall into frequent and fatal errors by adhering to it as an invariable rule.

6. The RESTORATIVE Principle.—It is well remarked by Dr. Gregory,* that the animal machine differs from all others in this, that it carries in itself the means of repairing the injuries and disorders incident to it. A species of restoration, consisting in the repair of solids and fluids, rendered necessary by their perpetual waste and depravation, has just been mentioned. This has reference to the support of the material fabrick of the body; but what is further meant here to be designated, consists of laws belonging, and indispensible, to the principle of life itself. The first is, "Nature's sweet restorer," SLEEP. The state of excitement, of sensation, thought, and voluntary motion, by which all living beings

* See Conspectus Medecinæ Theoreticæ, V. i. p. 5.

subsist in their ordinary existence, cannot, by the constitution of nature, be maintained, without a daily suspension of several hours. It is evident from this, that vital power is a *quantity* exhaustible by the exercise of its own energies. Sleep being one of the universal and indispensable wants of nature, is highly important, and one of the most prominent features in the natural history of life; and being indispensable, nature, with her usual wisdom and kindness, has provided great powers of accommodation, suited to the emergencies of human life. With a view to this, it is observable, that the refreshment of sleep is not in the simple ratio of its duration, the principal share of this act of restoration being found to take place in the beginning of it. If a person be at any time deprived of one half, or more of his usual portion of it, the inconvenience experienced is by no means in proportion to this privation; and habit will bring persons, whose affairs require it, to subsist in health and vigour with a small allowance of sleep. General Pich-

egru* informed me, in the course of my professional attendance on him, that, in the career of his active campaigns, he had for a whole year, not more than one hour of sleep at an average in twenty-four hours. According to my own experience, I find, that when I have been called out

* The singular exertions and alertness of this leader of the revolutionary armies of France, need not excite surprise, when we reflect that he performed what I believe is not to be met with in the ancient or modern annals of Europe. In a climate, in which, during all former wars, it was deemed impracticable to carry on the operations of a campaign through the winter, he kept the field for two successive winters, that is, from the time at which he stormed the lines of Weissemberg in the end of 1793, and drove the Duke of Brunswick across the Rhine, till he over-ran Holland in January and February 1795. He informed me, that in all that time his armies had no camp equipage, and that their only substitute for tents, was an occasional light hutting of turf and boughs which could be erected in a few hours. On enquiring respecting the health of his armies, he answered, that sickness never prevailed among them, except in a detachment which he sent against Sluys, in Dutch Flanders, which suffered severely by the intermitting fever incident to that marshy district.

of bed, after an hour's sleep or less, I feel a very great difference in my feelings next day, from what I have felt when I have had no sleep at all. The powers of the *sensorium* seem to be wound up, as it were, at the most rapid rate in the first period of sleep; and great part of the refreshment in the later hours, seems more imputable to the simple repose of the organs, than to the recruiting power peculiar to sleep.* There are some persons, to whom more or less sleep has become habitually necessary in the course of the day, particularly after dinner; and they find that a few minutes of it satisfy nature. But the most striking illustration of this principle, which I have met with, is what I learnt from a gentleman of great observation and intelligence, who had been long in China, and had an opportunity of seeing

* It is perhaps an obscure perception of this that has given rise to the old English Apothegm, "one hour's sleep before midnight is worth two after," and is an example of that popular sagacity and just observation discernible in proverbs.

the habits of the Missionaries. These pious and conscientious persons felt themselves bound to abstract as little time as possible from their duties, and took the following method of abridging the period of that sleep which habit had made necessary to them, in the middle of the day. They threw themselves on a couch, with a brass ball in the hand, and under it a brass bason. The moment they dropped asleep, the ball dropped from their hand, and ringing on the bason, waked them. This they found afforded all the recruit which nature required.*

This principle admits of a valuable practical application; for in the business of human life,

* Since the first edition of this work, the Author has met with a somewhat similar remark in Q. Curtius, regarding the private habits of Alexander the Great, Somni natura parcissimus, etiam vigilantiam adjuvabot si quid occurrisset quod seria meditatione dignum videretur; comprehensa pila argentea, brachium extra lectum porrigebat, ut in subjectam pelvim illapsa, exicato sonitu torporem in somnum deficientis discuteret.

particularly in circumstances of fatigue and long continued exertion, short intervals offer which are well worth being taken advantage of for the purpose of refreshing nature. Persons so circumstanced may, for want of knowing this, think, it not worth while to compose themselves to rest for so short a time, only to be disturbed when their pleasing oblivion had just begun. The only other remark which occurs to the Author to make on this subject is, that there are many persons so constituted by Nature as seldom to enjoy an undisturbed night's rest in their best health, but who nevertheless find all the refreshment they could wish for in the practice of their daily duties. And it must have occurred to every practitioner, even of moderate experience, to have observed occasionally that persons labouring under indisposition, feel sometimes more refreshed in their powers and spirits after a restless night, than after one which had been passed in profound sleep. It would appear, therefore, on the whole, that the wisdom and beneficence of the Creator have been displayed in so constitu-

ting animal existence, that such a latitude is allowed with regard to this Restorative principle, as is compatible with the unavoidable calls and indispensible duties of life.

There is reason to believe that sleep is necessary to the existence, not only of every species of animal, but of vegetable. The periodical diurnal collapse in the leaves of plants, is referred by Linnæus, and other naturalists to sleep.*

The other branch of the restorative element which has been stated, is the spontaneous cure of diseases and accidents, or what is commonly understood by the *vis medicatrix naturæ*.

It may at first sight seem not natural to class this with sleep; but as the epithet *restorative*, applies strictly and literally to both, and as both

* See an article in the Hamburgh Magazine of 1759, by Professor Zin, of Gottingen, entitled, Von dem Schlafe der Pflanzen.

are attributes exclusively applicable to vital existence, they come under one head when considered under this aspect. Fatigue may in some sense indeed be reckoned a disease or injury, of which the means of restoration is sleep. The main difference consists in this, that the one is as indispensible as food towards the daily support of life, whereas the other is so only contingently and occasionally.

The energy of nature displayed in combating and subduing diseases and wounds, are so undeniable, and so obvious to the most cursory observation and reflection, as to need no proof. A cut finger affords sufficient evidence of it. Artificial remedies can seldom be considered in any other light, than that of auxiliaries to the spontaneous principle of restoration : and if such a principle did not exist, the human species would long ago have been extinct.

It is manifest that in the diseases excited by morbid poisons, such as the plague and small

pox, there is brought about in the course of the disease, an insensibilily of the whole system to the action of the poison, for convalescence commences at a period when the poisonous matter is accumulated to the utmost; and the event, instead of proving fatal in a certain proportion of cases, would necessarily terminate fatally in every case, unless provision had been made against it by this insensibility, which arises in the course of its action. And what is farther remarkable is, that in the case of specific poisons, such as the small pox and measles, this insensibility to the virulent impression of the infectious matter continues, with very few exceptions, through the remainder of life.

In the case of those morbid poisons, the nature of which is not to excite febrile commotion in the system, such as the *virus* of the syphilis and itch, this insensibility to future attack does not take place. It would appear from this, that fever is a salutary process, by which a spontaneous cure is effected, by bringing the system into

a state of insensibility to the poison. It may be farther inferred, that in those infectious disorders in which fever does not arise, there is no room for artificial cure, nature not having made the like provision as in the other class.

But though fever may be an operation referable to the *vis medicatrix naturæ*, it may require the repressing hand of art when too impetuous; for many of the phenomena of disease seem to consist in the struggles of this self-healing energy; and it is one of the greatest difficulties of medical philosophy so to interpret nature, as to ascertain and determine what symptoms and suffering are referable to positive disease, and what to the warfare of the restorative with the noxious principle. It might plausibly be maintained, for instance, that all the leading phenomena of fever, consisting in a regular series of movements, producing crisis and types, is the campaign which nature carries on with various success in waging war against the hostile invasion of disease. This has been properly enough

called the re-action of the system; but this re-action, though in its nature salutary, may exist, either in excess or defect. For instance—if one of the morbid poisons exciting fever, should assail life by attacking one of its fundamental principles, the generating power of heat, this principle may re-act with such violence, as to make it one of the main objects of practice to repress it, either by internal remedies, or by the external application of cold; and the converse of this will happen, should the re-action be too feeble. This however probable, is not to be considered as an adopted theory; but merely as a matter af hypothetical illustration.

With regard to the spontaneous cure of wounds, it may be viewed, as has been already remarked (page 78.) as one of the manifestations of the pre-existing or sustaining powers of nature; for what is the spontaneous cure of a wound, but an example of the same assimilative and formative processes, upon which nutrition and growth de-

pend; and what are these but a continuation or emanation of the generative energy?

In all solutions of continuity by violence, there is a spontaneous tendency to what is called union by the first intention, in cases where parts can immediately be brought into contact. This power remains even for some time after the parts have been separated, as has been proved by some late examples of small members adhering after a considerable interval of separation.* When this resource has either not been practicable or has been neglected, there is a resource provided through the medium of inflammation and suppuration. Union by the first intention, seems to have been much overlooked by the earlier improvers of surgery, and they preferred the method of throwing the injured parts into large suppurating surfaces, whereby cures were rendered both more painful and more tedious.

* See Medical and Surgical Journal of Edinburgh for 1814, p. 421, and the same work for the year 1815, p. 450.

Modern surgery pays more regard to the method by the first intention: and we have in this an example of the practical advantage of entertaining correct physical ideas, and true conceptions of the resources of nature.

It may be further remarked, that it is on the operations of the sanguiferous system, and the changes producible on it by art, that this restorative faculty, practically considered, chiefly depends. It is the unremitted motion of the blood which sustains life from the first moments of conception, as discoverable in the *punctum saliens*, till the last moments of vital existence; and whenever it is stopped but for an instant, sensation, consciousness, and all the active functions of life are suspended, as is clearly exemplified in syncope. And it not only sustains life, but is the instrument of restoring all lesions and assaults made on its integrity, from a cut-finger to the most dangerous accidents, and the most formidable operations of surgery. It also supports in an eminent degree the Conservative and

Temperative energies ; for if the circulation is stopped in a limb, it loses its heat and passes into gangrene. The artificial means of relief also consist chiefly in such agents as have a tendency to incite its action if too languid, or to restrain it if too impetuous.

I shall conclude with one remark more on this subject. As artificial means of restoration, are called for, only while nature is in a state of disorder from disease or accident, in order to assist her in converting the morbid into the sound state, these remedial agents must be pernicious in a state of health ; for as every thing in a state of health is already as it ought to be, any change, such as every active remedy must cause, cannot fail to be for the worse. And it follows on the same principle, that the virtues of medicines cannot be fairly nor beneficially ascertained by trying their effects on sound subjects ; because the particular morbid condition which they are calculated to remove, does not exist.

7. The Motive Principle.—By this is meant muscular action, in its most extensive sense. The motions taking place in the living animal body, for carrying on its various functions and actions, are strikingly distinguished from those of the external world, inasmuch as they are not referable to gravitation, chemical attraction, mechanical impulse, nor any of the other causes by which the particles of inanimate matter are put in motion. All the attempts that have been made to explain muscular motion, by referring it to any of these principles, have been grounded on gratuitous hypothesis, and have therefore terminated in abortive speculations. It is stated here among the ultimate and inexplicable attributes of animal nature.

The living motions are manifested in the action of the voluntary and involuntary muscles of the vascular system. The voluntary muscles are excited to action by the will: the involuntary muscular organs, consisting chiefly of the heart, the circulating and absorbent vessels, and

the intestines, are excited by their contents, which partly by their bulk act mechanically in distending their containing tubes and cavities, partly by the peculiar qualities of their contents acting as specific *stimuli*. A certain degree of mechanical tension is indispensible also to the action of all muscles. No muscle, whether voluntary or involuntary, can act unless the fibres are previously in such a state, that if divided they would shrink by their resiliency, leaving an interval between the cut extremities. The same may be said of the vascular system in all ramifications, in order to give play to their contraction in grasping and propelling their contained fluids. This state of permanent tension is indeed necessary for the existence of life itself, as is exemplified in the fatal effect of profuse hæmorrhage, particularly if it is sudden so as not to give time for contraction. In short, no muscle can otherwise make that contractile exertion necessary for the performance of its function, excepting the sphincters and the orifices of the exhalants, for the essence of the functions of

these consists in such a state of permanent contraction as to obstruct their orifices. In short, there is perhaps no character of life more expressive of its nature than the universal state of tension of every fibre, and that state of pressure in which every particle of living matter, whether solid or fluid, must consequently be found in every living being; nor is there any more certain token of the extinction of life than the absence of all tone and pressure. The mere surface of the body is an exception to this. It is pressed indeed by the whole weight of the atmosphere, but purely mechanically, and not by any thing peculiar to life.

If this state of tension in the arterial system were to cease suddenly from any other cause beside hæmorrhage, such as the operations of a poison, life would equally be extinguished; and it is conceivable and not improbable, that such is the operation of some of those poisons which produce a momentary effect in destroying life. This may be farther illustrated by the effect of

the lessened pressure of the atmosphere on the surface of the body in ascending high mountains. This is accurately stated, and well reasoned upon by M. de Saussure,* who describes the sort of distress arising from a very light atmosphere, as producing a species of muscular debility and syncope, quite different from that which occurs either from fatigue or from the defect of oxygen, but resembling exactly that which is felt from profuse hæmorrhage, the vessels being so relaxed as not to be able duly to grasp their contents: nor is this to be wondered at, when it is considered that the pressure on the surface of the body at the level of the sea was 22033 lb. 12 oz. the barometer standing about 29.9 inches, while it stood at the summit of the mountain at 16 inches, so that the pressure was little more than one half of what it usually is.

From these physiological facts regarding the influence of tension and pressure, some impor-

* See Voyage dans les Alpes, Vol. 1. p. 486.

tant practical inferences are deducible. It is upon this principle that a certain degree of vigour is produced by swarthing and lacing where debility occurs from relaxation of the fibres whether in the trunk or extremities of the body. The support afforded to persons who have been tapped for the dropsy, and to weak and exhausted females immediately after child-birth, who would otherwise fall into syncope, or expire, is accounted for in the same manner. It is on the like principle, that that most excellent method of treating ulcers by strapping, first introduced by Mr. Bainton, produces its beneficial effects. The effect of tension is also very remarkable on the stomach. Nature has wisely provided, that along with the pure nutritious matter of the food, there should be a certain admixture of unassimilable matter, in order to give it more bulk, and thereby more tonic energy to the stomach. The most invigorating articles of food, accordingly, are such as are introduced into the stomach in a solid form; and not only devoid of fluidity, but possessing a certain degree of hardnes and tenaci-

ty, so as to excite the powers of the containing viscus to stronger action. It is found, therefore, in the human species, that plain solid food, combined with a certain proportion of unassimilable matter, is infinitely more efficient for the purposes of health and strength, than that which consists of pure alimentary matter, whether gelatinous, albuminous, oily, or saccharine. And with regard to animals, it is a well ascertained fact, in horses, that their strength is much better sustained by hay than by grass ; for the stomach being an organ of universal sympathy, does, by the exertions on which it is put in digesting hard food, confer vigour on the whole frame.

But the most obvious and common, as well as the most fatal effects, observable by the removal of tension from the cavities of living animals, are those which arise from the abstraction of the circulating fluids, more especially by the sudden depletion of the vascular system by hæmorrhage, as already observed. Hæmorrhages are either spontaneous, in which case they are

generally salutary efforts of nature to relieve repletion, or they arise from violence, as in wounds. Spontaneous hæmorrhage is very seldom fatal, and if left to itself, so as to induce syncope, the progress of it is stopped by the suspension of the circulation ; and leave being given for a *thombus* to form, it does not return on the revival of the person so affected. The case is different with regard to hæmorrhage from external injury, for this is not brought on like the other, as the means of relief to excessive repletion. In loss of blood, therefore, by external accidents, not only compression and ligature are required, but in extreme cases, the aid of stimulant cordials, and of opiates. It is well ascertained by surgeons, whose duty it has been to attend to recent wounds in battles by sea or land, that the most successful method of saving life endangered by profuse hæmorrhage, is by the free use of brandy or laudanum, or of both.

But great discrimination seems required here; and in order to establish a principle by which

the judgment is to be guided in these important points, it is necessary that we should be aware of the distinction between *active* and *passive* hæmorrhage. In the former, the discharge of blood is, I apprehend, to be referred to the elastic tone of the vessels, in the latter, to their relaxed state. It is evident, therefore, that in an hæmorrhage, while the vessels are under the strong action of their tonic contractility, there could not be worse practice than to administer stimulants and opiates. But when the discharge has advanced so far as to exhaust the powers of life, and even to subdue the arterial tone itself, it is, then, that these remedies are imperiously called for.

There is a very interesting class of cases in which hæmorrhage constitutes the most alarming symptom, and in which there has existed considerable ambiguity, with regard to the treatment. Perhaps a candid attention to the principles here adverted to, and a fair application of them, may afford the grounds of settling the difference of opinion which has arisen on this subject. The

cases alluded to are those of flooding, particularly after child-birth, and frequently attended with syncope and convulsions. When convulsions occur before or during labour, they are attended with lethargy, and other symptoms of pressure on the brain, which clearly indicate the necessity of depletion; and there can be no doubt of the propriety of blood-letting, local or general, even though there should be syncope and hæmorrhage, the latter being, under such circumstances, of the active kind. But the case to which the author alludes, and to which he has occasionally been called as a general physician, are where great alarm arises from the occurrence of these symptoms immediately *after* labor. His experience is certainly limited; but he finds five cases in his notes of this description. One died from pure exhaustion and depletion: no active means were taken to save her. In the four others he was induced, from the fatal event of the former case, and by the success which he had heard of, in a similar one, from the use of strong cordials, to make trial of this treatment in the

subsequent cases, which he did with the most satisfactory results. Such cases are undeniably of the passive kind above described, for they occur after the strength has been exhausted by the severe throes of labor, by the loss of blood, beyond that which takes place in the course of nature, from the contraction of the uterus, and by the sudden removal of tension from the expulsion of the child; besides the alarm and agitation of mind at such perilous and painful moments. The vigor acquired by cordials at this crisis, may also be naturally supposed to assist the uterus in the expulsion of the placenta and secundines, of which the adhesion, bulk, and irritation, are the most common causes of hæmorrhage. One of the cases which the author alludes to, was that of a young lady in her first labor, whom he found in a state, apparently, of extremity. She was recovered by a quantity of brandy, which it was computed would have intoxicated three or four men; yet she felt no such effect from it, nor any inconvenience whatever, the stimulus being merely sufficient to restore and

sustain life. In another case of very profuse flooding, the patient took two hundred drops of laudnum, and half that quantity, several times at the intervals of four hours. The author has been induced to state these cases from his having found by the language of respectable practitioners and authors, that the practice in such cases is held to be very ambiguous, with a reluctance among some of them to admit that there are *any* cases whatever which admit of such treatment. It would be presumption in the author, from his limited experience, to deny that there may not be cases even *after* labor, which require to be treated like active hæmorrhages. But if he is correct in what he has stated, his observations will be deemed of some utility, not only in this particular branch of practice, but (what is more suitable to the scope of this work,) it will serve as an exemplification of a point of medical reasoning, which he has already adverted to at page 66, and which he will again have occasion to elucidate, namely, the great danger in the practice of physic of laying down rules so rigor-

ous, as to admit of no qualification and exception.*

One of the most difficult and important points in this part of our subject, and in the whole compass of physiology, is to determine what is the value and extent of that connection which subsists between the muscular and nervous system. That motions peculiar to life can exist without the acompaniment of brain and nerves, is proved by the existence of those animals which are destitute of them; and by the phenomena of fetal life, particularly by the absence of nerves in the placenta; also by those monstrous produc-

* Some judicious remarks on this subject are to be met with in a Treatise on Uterine Hæmorrhage, by Duncan Stewart, M. D. Lond. 1816. There is an Article on the same subject by the same author, in the Medico-Chirurgical Transactions, vol. ii.; also Observations on the Prevention of Abortion, by Suppositories of Opium, in the same work, vol. v. It may be added, that cool air, and the local application of ice, have been highly beneficial in uterine hæmorrhage.

tions* without brain, spinal marrow or nerves. The economy of vegetable life furnishes a farther proof of the same principle. The actions taking place in growth, the impulse given to the sap, from the extreme roots of a tree to its summit, and the clasping of tendrils may be instanced as motions not referrable to any of the causes of motion in inanimate bodies, and as examples of vital energy, as genuine as those which take place in animal life. In the complex animals the sensorium and the system of nerves are indispensable for the purposes of sensation and voluntary motion, and are never wanting except in cases of montrosity, in which life cannot subsist beyond the fetal state.

With regard to the influence of nervous energy on the involuntary motions in general, some additional light has been thrown on it by the recent

* See Dr. Clarke's case above quoted; also cases in Phil. Trans. vol. xix. and xxi.

experiments of Dr. Wilson Philip,* confirmatory of my opinions delivered in the Croonian Lecture,† read before the Royal Society, in the year 1788, and published separately the following year. Upon the whole, it appears, that the irritability and excitability of muscular action are not *constituted*, *created*, or *imparted* by nervous energy, but that this energy incites, restrains, and regulates these organs, and connects them with each other, and with the organs of sense in carrying on the purposes of life. Mr. Hunter, by a happy turn of expression, calls the function of the nervous system *internuncial*. The purpose of nerves, therefore being that of acting as *stimuli* to contractile fibres,‡ there are no

* See Experimental Enquiry into the Laws of the Vital Functions, &c. by Wilson Philip, M. D. London, 1817.

† This tract has been long out of print, but the substance of it will be found in the Encyclopædia Britannica, under the article Muscle.

‡ See lecture on Muscular Motion, page 26.

grounds, but rather the contrary from this to infer, that they have any thing more in common in their nature with these fibres, than any other stimulus, however foreign, whether chemical or mechanical. There is no more difficulty in conceiving the nervous power to be distinct from that by which muscular contraction, secretion, and heat, are effected, than in distinguishing between the power of the helm which guides the vessel, from the power of the wind which impels it; and in following out the parallel, it may be affirmed, that if a ship were never to steer but one course, with a wind of the same power and direction, the helm would be useless, just as a nervous system would be useless in a simple animal. It is accordingly found only in complex animals.

In considering the matter in a view still more abstract and comprehensive, it seems absolutely necessary, than in complex and sensitive animals, there should be a minute, universal, reciprocal, and prompt connection and intercourre establish-

ed between every part and every other part; and the anxiety of nature to do this, is sufficiently manifested by the intricate intertexture of the nervous ramifications in the various ganglions, plexuses, and innumerable communications, like the anastomosis of vessels running between one branch and another in every spot. Is it not by virtue of this universal, accurate, and close connexion and instantaneous intercourse that the consciousness of individuality and personal identity is created and kept up? Let the integrity of this system, and the reciprocal intercourse of its parts be broken down, as in the case of hemiplegia, the members of the affected side are felt as something foreign to the rest of the body. The hallucinations in some species of delirium* and mania, by the person referring his own sensations and actions to another person, also seem to depend on a like disjunction of the free intercourse between the several parts of the nervous system. There is this important inference therefore to be gathered from the great difficulties of unravelling

* Diseases of Seamen, 3rd edition, page 343.

and interpreting the influences of the nervous system with the other functions, and the interminable controversies, to which it has given occasion, namely, that nature in establishing their intricate and intimate connexion, has shewn how necessary the reciprocal influence of every part of the system on every other are, in carrying on the purposes of life as a whole. This controversial contention of physiologists may therefore be viewed as a physiological fact in itself.

There is a function which seems to belong to this regulating and internuncial influence of the nervous system on the motive organs of complex animals, which appears not to have been duly appreciated and attended to by physiologists and pathologists. I mean that by which fluids of a particular quantity and quality are distributed or determined to particular parts in health and disease. This may be excited even by a thought in the mind, as in blushing, and the occasional afflux to the organs subservient to the appetites and to the *Mammoæ*. The blood contains not

only the alimentary matter necessary for the support of the various organs, and for the supply of the several secretions, but for the conveying of heat, and for supporting the tension required for maintaining the activity and even existence of the different functions, as is strikingly exemplified when the circulation is suspended in the brain. It is indispensible to health, therefore, that a fair portion of blood should be distributed to each member of the body according to its exigency; and it is evident, that either an excess or defect of this must produce disorder.

But this is not all. There is a provision evidently made by nature for conveying specific portions of the fluids to corresponding glands. It is not meant to apply this to the secretions in general, as if the secreted matter pre-existed in the mass of blood, and were not generated in the gland itself. The observation here stated applies only to the effete, extraneous, or acrid matters which are to be expelled by the emunctories, as noxious or redundant, such as the urine,

and matter of perspiration. In no other manner can the rapid transmission of fluids from the stomach to the kidney be accounted for. It seems to be for want of this selecting power, whereby the useful and recrementitious fluids are kept separate, and transmitted to their respective destinations, combined with a vitious assimilation and depressed state of the powers of life, that dropsy arises. It is curious to contemplate with what precision fluids are transmitted through the common mass of blood in health, and conveyed to their respective glands or outlets. As a farther proof of the useful and recrementitious fluids being blended in dropsy, it is observable that albumen is found in the urine of hydropic patients. There is, therefore, a selecting and conveying power peculiar to life, not less unaccountable than the operations of the Formative process already adverted to, as an ultimate and inscrutable attribute of vitality. It is a common manner of speaking to say, that the matter of a secretion is produced in greater or less quantities, by the greater or less energy of the respective glandular

organ. It seems clear, however, that no exertion of these organs could augment their product without a co-operation, a secret understanding or concert as it were, with the general store-house, the mass of blood, which alone could supply the additional afflux necessary for the increased secretion: as well might a mill produce meal without a continued and adequate supply from the hopper.

Fluids of a particular character seem to make their way through the general mass of fluids to their appropriate glands, as an acid does, even through a solution of alkali, from one extremity to the other of the Galvanic wire. It is not meant to say, this is an exemplification of the same process in nature, but only, as before mentioned at page 76, to state a comparison or parallel between the operations of life, and those of the chemistry of inanimate matter, in order to assist our conceptions of the vital energies. It is sufficiently conceivable, that by virtue of that constant pressure which must take place in

the sanguiferous system, considered as one great cavity bounded by the sides of a vessel in a constant state of tension, that glands might be supplied from the general mass in proportion to their wants and discharges ; but this will not account for the supply of the selected fluids.

These processes of specific determination open new views in pathology, agreeably to what has been said at page 89 ; for as there are certain glands and exhalant vessels of which the proper function is to eliminate the effete solid parts that have been absorbed, or such noxious and acrid fluids as may be floating in the mass of blood, an excess or defect of these, or a wrong determination of them, will be productive of disease, as was exemplified with regard to the urinary concretions and cutaneous defedations. A redundant determination of the blood itself to certain organs, is also one of the frequent constituents of disease ; but we cannot

concede to a late pathological writer,* that all diseases whatever, with a few exceptions, are referable to this cause, there being so many other ways enumerated in this work by which deviations may be made from the sound state.

When this circumstance in the animal economy first attracted my attention, I was about to enlist it as a distinct head in the catalogue of vital energies, under the title of DETERMINATIVE; but on further consideration, it appeared to me to be one of the manifestations of that universal influence, concert, or sympathy established between all the organs and functions through the instrumentality of the motive power.

The morbid actions incident to the voluntary muscles, to the heart, and the muscular part of the stomach and intestines, consist chiefly in convulsive and spasmodic contractions. The most

* See Elements of Pathology and Therapeutics, by C. H. Parry, M. D.

ordinary morbid condition of the motive part of the vascular system consists in inflammatory affections, and in excess or defect of tone, altering its capacity beyond or within the healthy standard.

The want of the habitual exercise of these powers, is also a source of disease extremely important to be attended to. There is no institution of nature more evident than the necessity of the actual exercise of all the organs and functions of animal as well as rational existence for improving them, and for maintaining them in a healthy state. A due degree of labour strengthens, and even multiplies, muscular fibres; and the want of it produces various chronic diseases not only of the muscles themselves, but of every organ and function of the animal frame. The healthy and vigorous action of the muscular fibres of one organ communicates firmness and strength to another. The action of the stomach required to subdue hard articles of nourishment, as already observed, communicates firmness and

strength to the voluntary muscles, which the same alimentary matter in a soft or fluid form does not give. The indulgence in indolent habits and excess of sleep in which those ranks of life who do not depend on bodily labour are enabled to indulge, contribute no doubt to create those diseases, particularly the gout, which are peculiarly incident to the affluent. During the twelve years in which I was Physician to one of the largest hospitals in London, not one case of gout occurred in several thousands which came under my care, an irrefragable proof that as labour (I ought to say habitual and unremitting labour) with simple diet infallibly prevents gout, so its remote cause must be sought for in the reverse of these. Of the manner in which this was brought about, that is, the proximate cause, I have never seen any rational conjecture, nor am I able to form one myself: but such is the fact. The share which excess of sleep has in creating chronic disease, has probably not been sufficiently attended to, unless we are to except the common popular observation that, all long

livers have been early risers. Ought not a superfluous share of sleep to be deemed a debauchery, as much as an excess of food and drink? If the proximate cause of gout and hypochondria should ever be discovered, it will probably be found in the relation in which defect of muscular motion and excess of sleep, combined with a redundancy of aliment and the habitual stimulation of vinous liquors, stand with regard to the symptoms which characterize these maladies.

Let it never be forgotten, then, that the perfection and health of all the organs of motion, can be promoted and maintained by that exercise alone, which Providence has ordained as indispensable to the practical duties of life. The painful and dangerous diseases decreed as the sanction annexed to the violation of this law of Nature, furnish proof enough that such violation cannot be committed with impunity.

But here, as in all human affairs, whether natural or moral, extremes on either side are pernicious. Fatigue, that is the over-exercise of the motive powers, is also a cause of disease. Excessive labour strains and wears out the powers of Nature, and tends to shorten life, particularly if combined with privations, that is, an insufficiency of wholesome food, clothing, and fuel.

The following practical remark arises out of these observations. It occurred to me in a great number of instances, particularly in the early part of my practice, before I was sufficiently aware of what I am going to mention, that when I had occasion to recommend air and exercise, I found that the patient, from misapprehension, in almost every instance injured himself by fatigue and exposure. Let me therefore admonish young practitioners always to subjoin the appropriate cautions in the like cases.

8. The SENSITIVE Principle.—Sensation being a simple idea, does not admit of definition; but its import may be understood by a reference to some of its descriptive attributes, such as pleasure and pain, and to the several perceptions conveyed through the organs of sense adapted for receiving the impression of their external objects. To these might be added consciousness and volition; but as the elements of the intellectual operations and mental emotions, they belong to man as a rational and moral being, and they are foreign to the present subject, which professes to embrace only his animal nature. It belongs to this place, however, to advert to this aspect of the human character, in as far as it exercises an influence over the corporeal frame, thereby adding to that complexity of agents, that obscurity of effect, and that difficulty of analysis, which it is the purpose of this rapid sketch of the animal powers of man to elucidate.

Sensation and voluntary motion, also appetite, in so far as it is referable to sensitive beings, in the language of M. Bichat, a modern French physiologist of considerable fame and great industry, compose (if I understand it aright) what he calls *Animal* life. The other faculties, by which must be meant the Generative, Conservative, Temperative, Assimilative, Formative, Restorative, and Sympathetic, as enumerated and defined in this work, none of which imply sensation, volition, or consciousness, he terms *Organic* life. By the latter is meant (if I mistake not) what some other physiologists term *Automatick* life.

It is deducible from what has been said, that all the elements of life as enumerated at page 41, are independent of the Sensorial or Nervous System, except the Sensitive, that part of the Motive which is subject to volition, and that part of the Appetitive, which implies sensation and voluntary action; for though they are all influenced, and more or less guided by the brain

and nerves, they possess an independent existence, as is exemplified in the lower animals, and in vegetables.

It has already been remarked, that all the senses carry a reference to the material world, each having a corresponding object in external nature, to which its structure is adapted. Were it not for the great familiarity of the subject, the adaptation of the eye and ear to the properties of light and air, would strike us with the most intense delight and astonishment. The same may be said of the other senses, and of the conformation of the hand, and of the whole body in its stature, and the relative position of its limbs and viscera, as adapted to the laws of gravitation, and the mechanical properties of matter.

The perfection of the sensitive principle therefore will consist in its fidelity to nature, and this fidelity will consist in the uniform identity of the sensations excited in each individual. This identity is not necessary in separate individuals ; for

though the same corporeal affection of matter which excites a red color in the eye of one person, were to excite that of yellow in another, all the purposes of intelligible intercourse would still be answered, provided this continued constant in the individuals respectively : nor could the one ever discover that his sensation was different from that of the other.

It would appear from some recorded and well authenticated cases, that there is some subtle sub-division and distribution of the nervous filaments, whereby those of sensation are rendered distinct from those of motion.*

It has also been remarked, how essential it is that the human mind should likewise be physical-

* See a case related by Dr. Yelloly, Med. Chirurg. Transactions, vol. iii., another by Dr. Brown, in the American Repository, and a third by Lamark in his Zoologie Philosophique, in all which, there was a total loss of sensation, while the muscular powers and circulation remained perfect.

ly adapted to the constancy of nature. It is on this constancy that all our experience and judgments are founded, whether in operating upon matter, or in our intercourse with our fellow-creatures, the one having relation to that reliance which we have in the invariable course of nature in the physical world, and the other in the moral world. It follows, that the morbid state of the senses will consist not merely in simple excess and defect, constituting over-acuteness or hebetude, in the corporeal frame, but in those false references in what may be called the rational and moral frame, in which depraved judgment delirium and mania consist.

9. The Appetitive Principle.—Under this is comprehended not only that attribute of adult man, by which the species is propagated and perpetuated, and that by which the individual is sustained by aliment; but those instinctive properties of mere animals, and of the human species in the infant state, by which alone their existence can be maintained. To the same principle be-

long also those instincts, if they may be so called, pertaining to vegetable life, by which they bend and extend themselves towards air, light, and heat, and that most astonishing instance of what may be called automatick appetency, by which their roots extend themselves under ground through incredible obstacles to that quarter where alone the water necessary for their sustenance is to be found. And to the same principle belongs also that faculty by which the seeds of vegetables, when buried in the ground, feel or judge as it were, whether their germinating organs can reach the surface in seeking light and air, and when they are at a depth at which this is unattainable, they do not attempt to germinate, but retain the power of doing so for ages, possessing an excitability which can be roused into action in case there should ever occur the requisite proximity of light, air and heat.*

* See an article on this subject in the first volume of the Transactions of the Royal Society of Edinburgh.

With regard to the morbid state of the animal appetites, medically considered, much more is to be feared from their excess, than their defect; for their inordinate indulgence is one of the most fertile sources of disease in the human subject: and, morally considered as the subjects of self-control, the author must leave to moralists, the due enforcement of this, as one of the main constituents of virtue, dignity, and happiness.

10. The Sympathetic Principle.—This is the last in the catalogue of those cardinal attributes which have been stated as peculiar to life.

The term sympathy has been much objected to, but as I apprehend, rather fastidiously and unreasonably. It is like most other terms belonging to the science of life, figurative, being a metaphor taken from an affection of the mind. The import of the words, according to the most correct and received rules of philology and rhetorick, is not at all to be deduced from etymology, but either to be assumed conventionally accord-

ing to a definition, or to be adhered to in the sense affixed to it by established usage. By animal sympathy, is not meant the intelligent principle of Stahl's hypothesis, but that mutual influence of distant parts, so subtle and rapid as in some instances to be compared to thought or to lightning: in other instances, it is an action more tardy and habitual. If this term is to be rejected, some other must be invented to express what actually takes place in those operations of the living body, by which, without the transmission of ponderable matter, or the intervention of any of its properties, the most indispensable functions are carried on in health; and some of the most striking phenomena of diseases, such as their translation and conversion, can no otherwise be explained. It sometimes consists in the transmission of mere sensation, without any perceivable change of the sympathising part. Such is the pain which is felt in the shoulder in hepatitis and that which is referred to the fore part of the thigh in the inflammation of the hip joint. The medium of this communication is probably some

imponderable fluid; but it would here be out of place to discuss this, since we have only to do with a fact referrable to an ultimate and inexplicable law of life.

It is through this energy, that all the preceding faculties act and re-act upon each other, in carrying on that harmonious play of the animal system, in which its sound state, and its perfection as a whole, consists. The most descriptive character of a healthy state, being the quietness and imperceptibleness of the operation of the various functions and organs, this intercourse by sympathy is but little observable in health, and is only manifested in morbid actions, or in the operation of medicines. Every such action must therefore carry a reference to a corresponding action, or previously existing habititude in the healthy state. The connection of the stomach with the head, the heart, the surface of the body and the kidnies, and the reciprocal action of all the functions and organs of the skin, may be adduced as

some of the most striking and important examples of sympathy.*

Sympathy seems in general to be carried on by the instrumentality of the nerves; but to this there are important exceptions. The species of sympathy, called by Mr. Hunter the *contiguous* takes place not only in the relations of mere proximity and continuity, but by the influence of the containing on the contained parts, as that of the integuments on the subjacent *viscera*, in none of which does there seem to be any reference to the distribution of nerves. This may be exemplified by the relief afforded to the lungs and intestines, by bleeding, blistering, or fomenting the nearest external surface. We find in some old anatomical books, an attempt to trace sympathies

* See Observations on the Diseases of Seamen, by G. Blane, M. D. page 565, 3d Edit. London, 1798; also Dr. Webster's work, entitled Facts tending to shew the Connexion of the Stomach with Health, Disease, and Recovery.

to the ramifications proceeding from the common trunk of a nerve; but better observation has proved, that sympathies have little or no dependance on the connection and distribution of nerves.

There are also evident indications of sympathy in vegetable life; for, not to mention the effect of the irritation of a single leaflet* of the sensitive plant, in making the whole leaf and its foot-stalk contract, there is undeniable proof of it in

* My friend Dr. John Sims, so well known for his excellent taste and great knowledge of botany, was so kind as to communicate to me, the following interesting and hitherto unpublished experiment of his own. A leaflet of the sensitive plant being irritated, and the greatest pains being taken to avoid moving any other part of the leaf, the whole of it nevertheless contracted, and the foot-stalk dropped. But in order to be sure that mechanical motion, communicated by this irritation, had no share in this contraction, he threw a sunbeam concentrated by a glass lens on one of the leaflets; the whole leaf contracted, and the foot-stalk dropped.

the excitement of the roots of trees, in sending up the sap in consequence of an influence from the trunk, branches, and leaves, on the return of the vernal warmth. The temperature of the earth, at eight feet deep, is lower in April when the sap is ascending, than in January, according to experiments related in the 59th Number of the Edinburgh Review, p. 6 and 7, in an article of which Professor Leslie is said to be the author. And if in the winter time the branch of a vine be introduced into a hot house, it will produce a luxuriant crop of leaves, blossoms, and fruit, the materials of which could only be derived from the excitement of the roots propagated by sympathy with the parts in contact with warm air. This fact is stated on the authority of that eminent professor of Botany, in Edinburgh, Dr. John Hope, whose Lectures the Author attended in the year 1771, at the Botanical garden in Leith Walk. This will take place even during a frost, in which situation, these roots would have been in a torpid state, had it not been for the sympathetic influence of the parts above ground,

brought into action by warmth. The action of the roots, therefore, must be excited from what Mr. Knight, in treating on the same subject, calls "a vehicle of irritation, arising from an intrinsic power of producing motion in vegetable life."*

It is evident how much processes of health must be deranged from an excess, defect, or total suppression of the sympathetic faculty; and this opens a wide scope to the speculation of those who search deeply into the proximate causes of disease, the operation of remedies, and the sources of error from the false reference of the seat of disorders.†

* See a series of ingenious Papers on Subjects of Vegetable Physiology, in the Phil. Transactions, from 1801 to 1806, by T. Andrew Knight, Esq.

† Though remarks on moral subjects are here not quite in place, yet the reader will perhaps forgive the following one, as it is closely connected with the subject of sympathy. There is a maxim to be met with in the works

of one of the Greek sages, but more cogently laid down in the Christian doctrine, namely, the reasonableness of our doing to others as we wish others to do by ourselves, a maxim, which of all others, comprises in the fewest words, the largest portion of practical morality, and depends on that sympathy with the feelings of others by which we put ourselves as it were in their place; a habit the most to be cultivated and fostered of all the moral duties. See Smith's Theory of Moral Sentiments.

SECTION II.

On the General Principles of Truth and Error in the Cultivation of Medicine.—Enumeration of the Sources of Error.

The Author has endeavoured in the preceding Section to enumerate and define the primary elements, or ultimate facts, which belong exclusively to animated nature, and are as it were the alphabet of physiology. In an attempt which is new, on a subject of which he has taken a view peculiar to himself, he does not dare to think that he has attained any thing like perfection. It is evident, however, that it is only by following out an analytical scheme of this kind,

that a foundation can be laid for the genuine principles of theoretical medicine; for the elements of disease can only be expounded by a thorough knowledge of the elements of life and health. But it is not his intention now to apply it synthetically by building upon it a formal system of nosology, physiology, or pathology; far less to bewilder himself, or his reader, by agitating the mechanical question, whether life consists in the play of these principles, or whether it is something superinduced on them. His main object in this analysis, is to convey an adequate conception of the great difficulties which those have to encounter, who would found practical medicine on a knowledge of the animal economy, and to bespeak a liberal indulgence for the errors of those, who, in attempting this, have had to grope and wander in more dark and intricate mazes, than what has fallen to the lot of any other class of inquirers into the various departments of nature. We have seen that the animal nature of man, besides being subject to the mechanical laws of inanimate matter, and

to the influence of the passions, consists of a number of principles, which must all act in harmony in a state of health, and that the disorders will be multiplied according to the number of combinations of which these requisites of health admit. It is not from physiologists not being aware of these difficulties, and from their not clearly perceiving that animal processes are quite inexplicable on mechanical and chemical principles, that the abuses and errors of theory have been engendered and accumulated in this department of knowledge above any other, deforming and discrediting medicine as a science, obstructing and retarding its advancement as an useful art ? I shall accordingly place the abuse of theory, foremost in the enumeration which I am going to make, of the causes which have corrupted and impeded the art of medicine.

It is only by addressing ourselves to these principles of life, that rational physic can be cultivated and practised. Under this aspect of the human frame, the various morbid conditions of the

body might be classed ; 1st, as they consist in the simple excess or defect of these several principles ; 2dly, as discordant states of the reciprocal influence which they exert upon each other ; 3dly, by a depraved action* of some of these principles ; 4thly, by the want of that due exercise which preserves all the organs and faculties in their natural perfection and soundness.

We have also endeavoured to demonstrate that the fundamentnl laws of life are essentially distinct from those of inanimate matter. In the beginning of last century, almost all medicines were conceived to operate either chemically or mechanically. Those who are conversant with the works of Boerhaave and Mead, must be well aware of this. But except in so far as some of the circumstances of digestion are concerned, such as that of the morbid excess of acid, and perhaps in what relates to the secretion

* This may be exemplified in the false reference of the Sensitive Principles alluded to at page 121.

of urine, and the cure of urinary concretions, there is no fact either in physiology, pathology, or practice, but what is referable to the vital processes.

An accurate and comprehensive knowledge of the principles upon which the diversified springs of animal agency hinge, has also a tendency to obviate one of the most common sources of medical error,—that of laying an exclusive or undue stress on one or more of those principles or elements, which have been enumerated. Some of these have been already alluded to: such as the narrow views which form the basis of the doctrines of Dr. J. Brown, embracing only the Conservative and Temperative elements of life; the theory by which almost all diseases, and their cure, are referred to the stomach, embracing only one of the elements of life, the Assimilative; also the theory adopted by a late eminent pathologist, referring the proximate causes of almost all diseases to an undue determination of blood to the respective seats of disease.

The comprehensive view which is here taken of the constituents of life, will, it is humbly presumed, when they have been carried to their utmost extent by abler hands than those of the author, lead to a clearer view of many branches of the animal economy, and of the history and treatment of diseases.

We now proceed to the proper object of this work, which is to enumerate and elucidate the various causes which have most materially obstructed the improvement of medicine.

The order in which it is proposed to consider them, is as follows:

1. The fallacy and danger of hypothetical or theoretical reasoning.
2. The diversity of constitutions.
3. The difficulty of appreciating the efforts of nature, and of discriminating them from the operations of art.
4. Superstition.

5. The ambiguity of language.

6. The fallacy of testimony: with some remarks on the excessive deference to authority and fashion.

SECTION III.

1st. Source of Error. The Fallacy and Danger of Hypothetical and Theoretical Reasoning. Examples and Illustrations from the Works of Aristotle, Bacon, Hippocrates, Galen, Sydenham, Boerhaave, and Pitcairn. Empiricism and Dogmatism compared and appreciated.

PRACTICAL medicine seems more indebted to the sagacity of those who, in a rude state of society, discovered active and useful medicines, than to the early labours of the learned. From what we know of Democritus, and his followers, of whom Hippocrates was the most eminent, it appears, that the cultivation of science in the early ages of Grecian philosophy, was undertaken on

the soundest principles, namely, the observation of nature, and the collection of facts. Aristotle himself, was a most diligent observer of nature, and collector of facts; but unfortunately, his logical and metaphysical writings, caught preferably the notice and taste of the learned world, and engrosed its attention for many ages, to the exclusion of all other useful and liberal knowledge. For more than a thousand years, the syllogistic logic of Aristotle usurped the place of all literary and scientific pursuits. In those dark times, however, it was better than no knowledge at all; and I am one of those who are of opinion, that this logic, though it affords little or no assistance in the discovery of practical truths, and the interpretation of nature, is yet an excellent discipline of the understanding, tending to give precision to language and thought, and to induce habits of close attention, and patient application of mind; and that some knowledge of it can hardly be dispensed with in a liberal education. I am thankful, therefore, that it made part of the academical education which I received. The

error has been in suffering that to obtain a predominant rank, which ought to hold a subordinate one, and in substituting the means for the end, that which was only one of the organs of knowledge, being exalted to the station of its main and almost sole constituent.

It is to Bacon that the world is chiefly indebted for dissipating the clouds of false philosophy, and for pointing out the road which led to solid learning and the discovery of interesting truths. He himself, however, affords a proof how necessary it is, that the mind should be subjected to a long course of discipline, in order to bring it into correct habits of thinking, on matters depending on that inductive principle of observation, in the recommending of which his own chief merit consisted; for there are in his works evidences of his being not a little infected with the credulity of the times in which he lived. He did not entirely disbelieve in the virtues of amulets and charms; and when treating of the interpretation of Nature, he certainly fell into

a great error, in excluding the consideration of final causes, as one of the keys for unlocking her secrets.

Bacon, with that exhuberance of imagination, with which he was so richly gifted, and not without some savor of the quaintness of the age in which he lived, says, that final causes, like the vestal virgins, are devoted to the service of the Divinity; but like them too, are unfruitful, the consideration of them not leading to scientific improvement and natural discoveries. Nothing is more certain, however, than that we are entirely indebted to the consideration of final causes for the discovery of the circulation of the blood, for it was a close attention to the use of the valves of the veins which led to it. Is it impossible, that the discouragement thrown out to the consideration of nature under this aspect, in which Bacon perhaps was not singular, may have retarded this discovery? If the anatomists, who lived prior to this era, had contemplated the structure of the heart, with reference to final

cause, they could hardly have failed to have made out the circulation. It is a principle fully recognized by modern anatomists and physiologists, as may be seen in Sir E. Home's late articles on the digestive organs, in the Philosophical Transactions; and the Germans have invented a word, *Zweckmassigkeit*, expressive of that property of organs by which they are adapted to their ends, which cannot be translated but by circumlocution, into any language with which I am acquainted. If a modern anatomist were to find in a new animal of uncommon structure, just brought from New-Holland, a large muscular organ, the function of which was not obvious, he would not merely conjecture, but decide with the most confident certainty, that it performed some important function requiring powerful mechanical action, and would not rest till he found out to what purpose it was destined. A moment's serious reflection on the materials and structure of the heart, ought, in like manner, to have revealed the circulation to physiologists, many ages before it was detected by Harvey. Upon the

whole, if the subject of final causes, as an index of the operations of nature, be duly considered, it will no longer be deemed unphilosophical to avail ourselves of them, as a clue for tracing some of the most secret operations of nature.

Philosophers of the present age, infinitely inferior to Bacon, are in no danger of falling into the like error; for there is a certain maturity of the human mind, acquired from generation to generation in the mass, as there is in the different stages of life in the individual man, in which respect the ancients are the young, and we are the old, as is justly remarked by the author in question: so that he who in these times so clearly sees the defects of Bacon, and well knows how to improve and extend his views, may be compared to the dwarf on the giant's shoulders, who sees further than the giant himself. Hippocrates too, though one of the most chaste and accurate observers of nature, and collector of facts, was by no means exempt from that spirit of system, originating in the innate propensity of mankind

to assign causes, however lightly and hastily, manifesting itself in hypothetical and gratuitous assumptions of general principles. And there cannot be a more flagrant exemplification of this, than in this great man referring all diseases to excess, defect, or vitiation of the four humours, blood, phlegm, black bile, and yellow bile. Equally absurd and gratuitous, equally disavowed by nature and observation, is the theory of Galen, grounded on the cardinal qualities of heat and cold, moisture and dryness. Nor can we quite acquit Sydenham of a like aberration from reason, in ascribing the different species of fever to the respective humours; and that the principle of cure consisted in expelling these humours; not indeed, in what he calls their *crude state*, but after they had been elaborated and prepared for expulsion by *coction*. These ideas are perfectly visionary or gratuitous, and in the present state of knowledge it would be held unworthy of a schoolboy to entertain them, unless indeed they were to be considered as a sort of metaphorical or allegorical terms, expressive of that pro-

cess through which the animal economy must march in its road to health; and if it is hereby meant that nature ought not to be hurried nor put out of her way, by the over-officiousness of art, but to be left to the operation of time and the self working of nature like boiling and fermentation, a useful rule of practice is deducible from this theory. We derive from these aberrations the benefit of an example, at least, for they serve as a beacon and safeguard against that premature generalization of facts, which, in our times, is considered as one of the most sure criterions of an inferior capacity, or untutored mind.

After the revival of genuine philosophy in the 17th century, it might naturally be expected, that medical science would immediately avail itself of its light, and partake of its benefit; but this was so far from being the case, that, in the first instance, it proved a new source of error, and threw fresh impediments in the road which was supposed to be thrown open to the improvement of rational medicine. The discovery of

the circulation of the blood, may indeed be considered as one of the first fruits of the enquiries into nature begun in that age. But though this is a fundamental element in the economy of the living body, it throws little or no light on the principles peculiar to life, being purely of a mechanical nature; and abstractly considered, hardly admits of any application to the practice of medicine. On the contrary, this discovery, by its perverted application, tended to corrupt and mislead, by a loose adoption of the principles of mechanical philosophy, so well laid down in that age, by Galileo, and others. Borelli, in investigating the force of the heart by experiment, estimated it at 180,000 pounds; Hales, at 51 pounds; Keil, at 1 pound. The mechanical powers of the stomach were, about the same time, subjected to experimental research, by Pitcairn, who gravely gave out, that he found this viscus in the human subject exerted a force equal to 12,900 pounds, in compressing food in the process of digestion. Others conceiving that chemical power had the chief share in this function,

endeavoured to evince, that the change in the food was brought about by means of heat and fermentation. Sounder principles have referred these changes to powers, which have nothing in common with the mechanical and chemical powers which characterize inanimate nature.*

But the most singular, the most celebrated, and I will add, *pace tanti viri*, the most mischievous abuse and misapplication of the principles

* Dr. William Hunter, whose peculiar sagacity and precision of mind, detected at a glance the hollowness of such delusive hypothesis, and saw the danger which theorists run in trusting themselves on such slippery ground, was heard by the Author to express himself on this subject, in his public lectures, with that solidity of judgment, combined with facetiousness, which rendered him unparalleled as a public teacher, in the following terms, as nearly as his memory serves him: "Some physiologists, Gentlemen, will have it, that the stomach is a mill; others, that it is a fermenting vat; others again, that it is a stew-pan: but, in my view of the matter, it is neither a mill, a fermenting vat, nor a stew-pan: but—a stomach, Gentlemen, a stomach!"

of natural science to the animal economy, are to be found in the works of Dr. Boerhaave.

Towards the end of the 17th and beginning of the 18th century physiologists had begun to perceive, that life was regulated by laws peculiar to itself, and that some other principles than those of mechanism and chemistry, ought to be resorted to in explaining the operations, whether of health or disease. The humoral pathology was that which prevailed in all antiquity, except in the Methodic sect, founded about a hundred years before the Christian era by Themison, who introduced the principle of contraction and relaxation, attributes of the solids, as the causes of diseases. Glisson and Willis, in England, Baglivi, in Italy, and Hoffman, in Germany, led the way in this reformation, in modern times, and there was a fair prospect of a more legitimate system of reasoning being established. This was checked and retarded by the appearance of Boerhaave, in the beginning of the 18th century. He was a

man of uncommon capacity, great erudition, and indefatigable industry, and a zealous and honest searcher after what he conceived to be truth. But probably, from the habitual application to his favourite study, chemistry, he suffered himself to be deluded into what is now viewed as a most fallacious train of reasoning. This he delivered in language so imposing, that his doctrines prevailed universally for about fifty years in the schools of physic, and among the practitioners of all Europe: and it is equally astonishing and humiliating to contemplate, how the assent of an enlightened age, could have been won over to a body of doctrine, so puerile and shallow.*

* As a general efficiency of the art, to say the least, must have been more or less the effect of the prevalence of doctrines so fundamentally erroneous, is it to be wondered at, that in that age there should have been a disposition in extra professional authors to ridicule and disparage the profession of physic? This was observable not only in France, but in England; (vide the Spectator *passim*) and other works, particularly the Dramatic.

So heavy a censure ought not to be brought lightly against a person so celebrated in his day, who possessed many truly estimable qualities, and to whom science is much indebted for the improvement and diffusion of rational chemistry, and for being the first who brought the thermometer into general use and notice. In proof of our allegations, let his theory of inflammation, therefore, being one of his most important and peculiar doctrines, be tried by candid criticism and discussion.

He held that the proximate cause of inflammation, was a morbid viscidity of the blood, obstructing the course of circulation in the small vessels. The main fact brought in proof of this, was, the coriaceous crust formed on the surface of blood, drawn from a patient labouring under an inflammatory affection. This is disproved by considerations so obvious, that it is truly unaccountable that they should not have occurred to this eminent physician and his followers. For, in the first place, it does not appear in blood

taken away at the beginning of inflammation, as it certainly would, if the alleged viscidity were the cause of the disorder.—Secondly, The same crust appears on blood, taken from a person labouring under inflammation from a mechanical injury, such as a fractured bone: a sure proof that it must be an effect, and not a cause.—Thirdly, This crust is merely the separated coagulable lymph of the blood, at all times present in it, and an essential constituent of it; and when it separates itself on the surface, it is from its fluidity being increased, and from continuing longer in a fluid state while in the act of cooling, so far is this appearance from arguing viscidity.—Fourthly, It is found usually in blood taken from pregnant women. This doctrine of Boerhaave, had an universal currency in the beginning of last century, and materially influenced practice, as appears by the terms attenuant, diluent, &c. applied to medicines, and introduced in conformity to the theory of the lentor of the blood, being one of the principle causes of disease.

The like judgment may be passed on this author's chemical principles of pathology, by which he referred the cause of a large class of diseases, to certain acrimonious conditions of the fluids. That morbid acrimony, in various forms, does exist, that its effects are considerable in producing and aggravating disease, that the elimination of vitiated and redundant matter, constitutes some of the most valuable resources of practical medicine, cannot be denied; but it is equally manifest, that, as the fluids owe their respective healthy condition to a specific organic action, their morbid changes must be brought about by the same means; that is, in almost every instance, by means entirely foreign to the processes of chemistry in inanimate matter.* The only exception to these, are those already

* It was in the School of Edinburgh, under Dr. Cullen, that the doctrines of Boerhaave received their chief overthrow. Cullen was the first who clearly marked, and defined the principles of life, as distinguished from those of dead matter.

mentioned at page 80, in regard to digestion, and the urinary secretion and concretions.

The whole of the humoral pathology rested on a fallacious and shallow, though specious foundation. Boerhaave and his followers, in their principles and practice, assumed, that all alkaline bodies promoted putrefaction in the living body, and were therefore pernicious in a large class of diseases. No experiments are alleged in proof of this, and the doctrine was probably taken up on a slender and inconclusive analogy founded on the supposed tendency of chemical ferments ; particularly with regard to the volatile alkali (*ammonia*) which is one of the products evolved in the putrefactive decomposition of animal substances. But it has been ascertained by the experiments of Pringle, that alkaline substances produce no septic effect on dead animal matter. Even if they did, it would not follow that they exercise any such power over living matter.

What is called morbific matter by Sydenham, and other theorists, consisting of vitiated secretions ought to be regarded as the effect, and not the cause of disease. A due regard to them in practice is, however, of the highest importance; for one of the principal means of relief and cure in many diseases, consists in the elimination of acrid and vitiated secretions. But morbific matter, properly so called, that is, the matter of infection or contagion, produces its effects in quantities incredibly minute, and having excited by its specific *stimulus* a certain series of movements and changes in the solids, as happens in plague, small pox, or typhous fever, it is no longer traceable, but vanishes and is lost sight of; so that there can be no practical question about effecting a cure by the elimination of it, the only question then being how to regulate the excited state of the solids. In the progress of this excitement, the same morbific matter comes to be generated and multiplied; but neither then is the object of practice to expel it; for, not to mention the impracticability of this, the cure is effected by a

provision of nature at the moment when the morbid poison is multiplied to the utmost, and when it might naturally enough be supposed to be most deadly. This act of nature consists in her then rendering the subject of the disease insensible to any farther impression of the morbid poison, as is so strikingly exemplified in the cases which recover from small pox; and it is plain that if this did not happen, every case whatever must prove fatal.

We have seen melancholy proofs of the extreme errors in which physiologists have been betrayed, by a false and perverted application of science, in the instances quoted from Pitcairn and Borelli. But, though the principles belonging to inanimate matter, were to be applied with the utmost precision of correct induction, they would go a very short way in ascertaining causes, or guiding practice. It is only by touching the springs of life, that the actions of life can be regulated. The early physiologists, in all their reasonings, have almost entirely overlooked all

those energies peculiar to life which have been enumerated ; namely, the Generative, the Conservative, the Temperative, the Assimilative, the Formative, the Restorative, the Motive, the Sensitive, the Appetitive, and the Sympathetic, not to mention the affections of the mind.

And it is evident, that, as the actions of life must depend on the compound operation, and reciprocal influence of all these powers, those who propose to found practical medicine on their knowledge of the laws of life, must encounter such difficulties in estimating and ascertaining the result of them, as must appal the boldest theorist. For, as in an algebraical problem, if any one element of the calculation should be omitted, or mis-stated, the result must be erroneous ; so, if in taking our measures in medicine, due weight is not assigned to each of these influences, our practical inferences must be illusory. These sentiments are admirably expressed by Bacon in the following passage : *Subjectum illud medicinæ (corpus nimirum humanum) ex omnibus quæ natu-*

ra procreavit maxime est capax remedii; sed vicissim illud remedium maxime est obnoxium errori. Eadem namque subjecti subtilitas et varietas, ut magnam medendi facultatem præbet, sic maxime etiam aberrandi facilitatem.

The circulation of the blood, the distribution of the blood-vessels and nerves, the relative position and co-aptation of the muscles, bones, and viscera, were well known before the middle of the last century; but the existence of the lymphatic system, as co-extended with the whole body, being unknown till that period, and as this knowledge was necessary for understanding the animal machine, professional men were in no degree qualified to account for its structure and diseased action. And who will affirm, that in the present improved state of knowledge, or even in the utmost attainable degree of it, he would be sufficiently confident that his measure of science was such that he could purely *a priori*, act upon it with practical effect? Could any one, though he had reached the very summit of

anatomical and physiological knowledge, venture, without the utmost risk of error, to predict or control the results of actions into which there falls to be considered, not only the properties of inanimate matter, but the variously combined operations of all those properties peculiar to life, which have just been enumerated, and the influence of mental affections. And when it is further considered, what a mass of credulity and error has actually accumulated in medicine, from the presumptuous attempt to grasp at such objects, and to make hasty and dangerous application of them to practice: when we cast our eyes upon our shelves, loaded with volumes, few of which contain any genuine profitable knowledge, the greater part of them composed chiefly of matter, either nugatory, erroneous, inapplicable, or mischievous, in which the dear bought grain is to be sought in the bushel of chaff, may it not be questioned, whether such researches have not tended more to retard and corrupt, than to advance and improve practical medicine?

Those who are disposed to depreciate the practical value of anatomy, might allege that there are several of the most important functions upon which the knowledge of the structure of the dead body, though ever so minute and perfect, could throw little or no light; nay, that there are some morbid circumstances and indications in the living body, ascertained by empirical observation, in which mere anatomy is more apt to mislead than instruct. For example, it is known from experience, that impressions made on the external surface of the body, have a decided effect upon the subjacent *viscera*, though there subsists no anatomical relation between them: thus cold applied to the external surface of the thorax or abdomen, will more readily excite inflammation or spasm in the lungs or bowels, than in other parts. And in curing inflammation of these *viscera*, the abstraction of blood from the adjacent surfaces, will, as we learn from experience, have much more effect than a bleeding from the system, though there is no anatomical connexion between these parts, that portion of the circula-

tion which is in the skin, being as remote from that of the subjacent lungs and intestines, anatomically considered, as any other part of the body. It has also been alleged, by the disparagers of anatomy, that even for the purpose of detecting the seat of diseases after death, the information obtained is extremely limited, or altogether fallacious; for whether it be from the morbid affection existing in one organ, and the sensations from sympathy being in another; or that the symptoms of disease are different in constitutions, or from its not being possible to decide what morbid appearance has been the cause, and what the effect of the disorder, it so happens that those even who are most practised in morbid anatomy, are in numberless instances deceived as to the pre-conceived nature and seat of the disease, as investigated by dissection; so that often little other instruction is acquired, than a lesson of modesty and of distrust in ourselves.

Are we then to admit, that the greater part of what we have been taught at the schools of phy-

sic, and of what we have read, or may read, in books, is in no wise conducive to our practical improvement?—Far from it, for

1st. Though anatomy, physiology, and pathology, should be proved to be of little or no avail, nay of pernicious tendency in the practice of physic, the acquisition of these branches of education is nevertheless indispensable, in order to appreciate their value, and in order to be armed with antidotes against the influence of fallacious theories, and to obtain the guidance of true beacons, instead of false lights. There is nothing better known to those, who are conversant in medical practice, than that the most ignorant and shallow, those of the least learning, nay those of no learning at all, are the most addicted to hypothetical reasoning, the most infected with presumption and self-conceit. The only means, therefore, of guarding ourselves from being misled by false theories, or by the misapplication of those that are true, is to gain a thorough acquaintance with both. I say *thorough*, for the philo-

sophic poet in stating the beneficial influence of a liberal education on the practice of life, does not say simply *didicisse*,* but FIDELITER *didicisse*; that is thoroughly, and in good earnest. In a word we should strive to attain that only criterion of substantial and profound knowledge, that of knowing how little we know.

2dly. The knowledge of Nature, in all its branches, is an indispensible requisite in the cultivation of the mind. It is highly useful, were it only as a *palæstra* or gymnastic exercise of the understanding, by that salutary discipline of the mental faculties, implied in the acquisition of habits of attention, and the practice of the reasoning powers. Besides, all arts and sciences have a bearing on each other; and the history and philosophy of animal life, is surely as necessary an accomplishment to a physician, as any other branch of science or literature; and we should

* Ingenuas didicisse fideliter artes,
Emollit mores nec sinit esse feros. OVID.

be tempted to think, from this sense of the word *physician*, being peculiar to our language, that this notion especially prevailed in England. The study of nature is surely the most salutary of all intellectual exercises in the practical arts, particularly that of medicine, inasmuch as it comprises the knowledge of the mutual agencies, about which it is conversant. Mathematical acquirements are here comparatively but little applicable; for, the relations of quantity, about which the exact sciences are conversant, do not apply to the laws of organic beings, and is a process of thought quite distinct from that which is termed inductive, employed in the investigation of nature.* It is, in creating habits of self-control, of steady and protracted attention, in which I conceive the main practical utility of mathematical studies in natural and moral sciences consists.

* See an Essay on this subject in the Philosophical Transactions, vol xlv., page 505, by Dr. Reid, of Glasgow.

3dly. The habitual meditation on natural causes, tends to banish superstition, and to abolish the frivolous practices riveted in ordinary minds by early impressions and imposing authorities, or sanctified by immemorial usage and tradition. These illusions are found to prevail not only in rude ages, but in those of considerable civilization; for, besides amulets, incantations, and various other supernatural influences, certain practices, hardly referable to any ascertainable agency, either natural or preternatural, have prevailed in all ages. We find it, for instance, stated in very good Latin, by authors who flourished about 150 years ago, on the fanciful principle of what is called signatures, that turmerick is good for the jaundice, because it is of a yellow colour; that fox's lungs are good for the asthma, because that animal has strong powers of respiration, as is proved, by the long and hard run he makes when hunted; that the testicles of the wild boar, reduced to powder, are good against barrenness, and kidney beans against diseases of the blad-

der; and that the root of the ochis,* was indicated by its shape, to be a promoter of procreation. And have we not seen in our times, persons of liberal education, of both sexes, who could persuade themselves that certain unmeaning motions of the hand, called magnetising, could exert sensible and salutary influences upon persons however distant? But these need no longer blush for themselves, when they are told that some of our early instructors in the laws of nature, were nearly as absurd. Bacon did not disbelieve in amulets, sorcery, and magic; and Boyle seriously recommends the thigh-bone of

* This doctrine of signatures was avowed by Dioscorides and Pliny, among the ancients, and after the restoration of learning, not only by that maniac Paracelsus, but by later writers, who maintained that it was conformable to principles of reason and religion, that remedies should be stamped as it were by the seal of the Almighty, as visible indications of their virtues. It is hardly necessary, in answer to this to say, that it is equally untrue in fact, as it is at variance with the ordinary administrations of Providence and the analogy of Nature.

an executed criminal, prepared in a prescribed manner, as a remedy in certain disorders. Nor can it be doubted, that practitioners would still be liable to fall into the like weaknesses, were they not, as they now are, habituated to the contemplation of the genuine agencies of Nature. The effect of the study of nature, in thus counteracting superstition, is no where, that I know of, so well expressed as in these lines of Virgil :

> Felix qui potuit rerum cognoscere causas,
> Atque metus omnes et inexorabile fatum,
> Subjecit pedibus *sterpitumque Acherontis avari.*

Men of great capacity, and high mental attainments of a different class, also men of dignified stations, the heads of the law and the church, but who had not given their minds to such pursuits, have been known to become converts to the most grovelling imposture, and dupes of the vilest quackery. When to these considerations it is added, that the fair exercise of judgment is impeded by the inordinate love of life, and fear

of death, among those in the full possession of their faculties ; that it is not only impeded, but impaired in those who are under the influence of sickness ; and when it is farther considered, that great allowance is to be made for those who become impatient from protracted sufferings unrelieved, and perhaps unrelievable by human skill, we shall be at no loss to frame an apology, nor find it difficult to account for persons of the best understanding, being occasionally betrayed by their own credulity, or that of their importunate and well-meaning friends, into the most irrational practices. In short, when we reflect how deeply interesting life and health are, particularly to the affluent, and that they engage the hopes and fears of mankind so anxiously, as to pervert the judgment of the most enlightened, the popular mis-conceptions on this subject, ought rather to be a matter of pity and regret, than of surprise, indignation, or derision.

4thly. Though physiological and pathological researches, even the most correct have had little

share in suggesting active and useful remedies, the greater part of these having been discovered in dark ages by fortuitous incidents, or in more enlightened ages by analogical reasoning, yet theories, though ever so visionary, afford useful suggestions. It is also very remarkable, that theories, though widely different, do often wonderfully coincide in matters of practice with each other, and with well established empirical usages, each bending and conforming, in order to do homage to truth and experience. It has been remarked, that Boerhaave, in following out his fanciful and erroneous views of the animal economy, stumbled upon some practices, the utility of which were sanctioned by experience. For example, he dissuaded from the use of sudorifics, and strong purgatives in pleurisy, from the consideration of their carrying off the most liquid part of the blood, leaving the remainder in that state of spissitude, in which he conceived the proximate cause of inflammation to consist. This is sound practice, however exceptionable the theory may be. He believed that the blood

owed its red colour to iron, a doctrine found, by future chymists,* to be erroneous; and with this in view, he strongly recommends the internal use of this metal in chlorosis, and other cases of chronic debility, in which there is an evident deficiency of red globules. Though this remedy does not act on the principle which suggested it, it has nevertheless, been found to be a most efficacious plan of treatment in these disorders. Some of Sydenham's theories, such as those of fermentation and coction, have appeared so fanciful, so abhorrent to nature and sound philosophy, that it has been said, that if any one were to utter nonsense for a wager, he could hardly surpass what this eminent physician has delivered on these subjects. Nevertheless, as his expressions may be received as metaphors or allegories, fermentation and coction being obscure conceptions of those processes, types, and crises, which actually exist in nature, they are not so foreign to truth as they appear to be in

* Brande and Vauquelin.

their literal acceptation, and admit of an application practically useful, as has been already remarked. Such suggestions as those of Boerhaave are at lest preferable to trials made at random, and are fairly admissible, if duly tested by experience.

5thly. It must be obvious to every reflecting mind, that those who have made themselves acquainted with the various organs and functions engaged in the animal economy, must have a great advantage in practice over the unlearned empirick, in discriminating the morbid affections from each other, and in varying accordingly the respective means of relief. For instance a physiologist and anatomist, from his knowledge of the intimate nature of morbid affections, the difference of their seat, and other circumstances, is able to distinguish spasmodic from inflammatory pains a distinction which would not readily occur to an uncultivated observer, but of the most vital importance in practice, for the remedies required for the relief and cure of a spas-

modic pain in the stomach and bowels, demands a treatment, not only different, but opposite, to that which proceeds from inflammation. It is only anatomical and physiological science that can exhibit to a practitioner a clear and vivid conception of these and other distinctions essential to the safe and efficient treatment of diseases.

6thly. Whatever doubts there may be with regard to the degree in which anatomy is useful in physick, there can be no doubt of it, with regard to surgery, in which an accurate knowledge of the relative position and structure of organs is indispensible.

Finally, the state of health ought to be fully known, as a standard by which to measure the magnitude, as well as to ascertain the nature of disease, as is well expressed in the following passage of Galen: *Cujusque morbi tanta est magnitudo quantum a naturali statu recedit—quantum*

vero recedat is solus novit qui naturalem habitum ad amussim tenuerit.

But if the benefits, derivable to medicine from physiological science, are so limited, from what other and better source is improvement to arise? The answer is, from accurate observation; in other words, from enlightened empiricism. It seems an abuse of words, to restrict the term *science* to physiology and pathology, and to withhold it from those processes of the understanding, by which facts are ascertained and accumulated, and useful inferences deduced from them, constituting OBSERVATION. Shall we dignify with the title of Science, the absurd positions of Pitcairn, the puerile and shallow hypotheses of Boerhaave, and Silvius, and deny it to those solid and applicable truths, the fruits of chaste observation and sober experience, ascertained by those methods of induction which it was the great aim of Bacon to recommend, and his great glory to introduce, as the only parent of legitimate, substantial, and useful knowledge?

On the contrary, the truth seems to be, that a higher order of intellect, a more rare and happy genius, a more correct and better tutored understanding, is required to elicit practical truths by observation, than to invent theories.

By empiricism, is vulgarly understood that knowledge of the virtues of divers medicines, which are supposed to have been ascertained by experience, as applicable to their respective maladies. A few of this description might be named, such as mercury in the venereal disease; fox-glove in a large proportion of cases of hydrothorax; the meadow saffron in most cases of articular gout; and above all, the citric acid, in sea-scurvy. But the exhibition of these, and the like remedies, constitute a very small proportion of the whole practice of medicine. The number, variety, and complication of disorders, is such, that the most acute exercise of judgment is called for to discriminate cases, to adapt the treatment to the indefinite diversity which occurs in actual practice, and to ascertain

the most advisable methods of cure, all which can only be effected by applying the rules of induction, that is, of enlightened empiricism, together with such lights as can be gathered from chaste and sober theory.

We have already more than once adverted to that profound wisdom displayed in the constitution of our mental faculties, whereby they are made responsive to the constitution of external nature, in the same manner as our senses, and that this is strikingly exemplified by the susceptibility of the human mind to those associations and habits which arise out of the repetition of events durably connected together by the constancy of the laws of nature. Unless these were indelibly imprinted, or recorded, as it were, in the mind during the early stage of our existence, life could not be maintained; all those instincts, by which we pursue what is salutary, and eschew what is noxious and dangerous, being founded on this principle. The avoiding of fire, and of precipices, the collision of hard and pointed bodies,

may be quoted as examples of this. And what is called sagacity, in the adult stages of life, is a sort of approach to, or imitation of this intuitive faculty; but, instead of being the immediate suggestion of nature, is acquired by cultivation; so that by practice we learn to connect cause and effect, means and end, operations which, in well turned minds, are performed with promptitude and precision, by interpreting fairly the appearances of nature, and stripping them of those adventitious fallacies, which mislead ordinary minds. In order to attain this, there are required an appropriate natural capacity, the good fortune of not having been beset with prejudices in early life, an habitual exercise in the observation of nature, a candid and ingenuous disposition, an ardent love of truth, an exalted sense of duty, a large store of facts in a correct and tenacious memory, the power of combining, comparing, and discriminating these, by an intuitive glance, in the moment of applying them to the practical end in view. This is what is understood by the term *tact*, in English and French,

ευστοχια, in Greek, being that faculty by which principal facts are decided on, and is performed by an instantaneous, silent, and almost unconscious calculation and induction, to be met with only in minds, at once happily constituted and highly cultivated.

From this it will be seen, how vain all acquired knowledge is, without practical habits; for in the liberal, as well as in the mechanical arts, expertness can be attained only by frequent and long continued exercise of actual labour: and it is by a happy and appropriate figure, that those who become skilled in languages, painting, eloquence, physick, or the common business of life, are said in Latin, *callere*, whence *callidus*, words derived from *callus*, that is, a horny substance formed on the hands of mechanical artisans, by long and unremitting labour. Whatever the attainment may be which we aim at, whether mental or manual, nothing but *practice will make perfect*, there being a certain expertness in the exercises of the mind, as there is a slight of hand

in mechanical operations, attainable only by long and assiduous application. This same law of nature is finely illustrated in the following passage from Cicero de Officiis: *Nec* MEDICI, *nec imperatores, nec oratores, quamvis, artis præcepta perceperint, quidquam magnæ laudis dignum, sine usu et excercitatione consequi possunt.* Was it not clearly the intention of the author, in placing physicians here in the foremost rank, to intimate, that, of all professions, the hardest discipline of practice and experience, was required in physick? For it would be presumptuous in us to think, that he meant by placing us first, to concede to us the precedence in dignity over generals and orators. This collocation of words, may be merely for the sake of euphony, or may be a climax in which he means to assign us the lowest post. Be this as it may, our best thanks are due to this great statesman, orator, and philosopher, for admitting us into such good company on any terms, after what has been said of us, by Dr. Conyers Middleton, in his dissertation, *De servili conditione Medicorum apud Romanos.*

From all that has been said, we ought to be in some measure qualified to come to a decision on the celebrated question of the comparative merits of the empirick and dogmatic methods of cultivating physic. It seems pretty evident, that if either method were employed exclusively, or carried to an extreme, the art of physic would suffer, both in its efficiency, and its prospects of future improvement. It has clearly appeared, that, under such a complication of causes, influencing the operations of life, it would be utterly hopeless to decide any point purely and strictly *a priori*, and that it is absolutely necessary, that experience be called in as an aid and a test to the inferences of theory. On the other hand, a blind empiricism would be found deficient, without that discriminative judgment, founded on an acquaintance with the laws of life, and without those enlarged and correct views of general nature, by which the excess of credulity and scepticism is equally repressed. This question was much agitated in antiquity, and is most ingeniously, eloquently, and judiciously discussed by

Celsus, in the preface to his excellent work. He evidently leans to the side of empiricism, which, in the very crude state of anatomy and physiology in that age, certainly argues his good sense; but he by no means explodes the study of the structure and functions of the body, as of no practical utility, and concludes with the following recommendation, or rather apology, for dogmatism: "*Ista naturæ rerum contemplatio, quam-*
"*vis non faciat medicum, aptiorem tamen medi-*
"*cinæ reddit.*"

The conclusion therefore upon the whole is, that these two methods ought not to be regarded as adversaries, but as allies; and that good sense will consist in excluding neither, but in fairly appreciating what is due to each. This is a compromise congenial with that which the poet proposes between Genius and Study:

——— Ego nec studium sine divite vena,
Nec rude quid possit video ingenium alterius sic
Altera poscit opem res, et conjurat amice. Hor.

SECTION IV.

2d. Source of Error.—Diversity of Constitutions.

The second head of causes, which retard and obstruct the progress of medical knowledge, is the Diversity of Constitutions.

Practical knowledge in medicine, as in every other art, proceeds on the assumption, that the course of nature is steady, and that what has a given effect on one human subject, will have the like effect upon another. From what has already been said, however, it is manifest, that this holds less strictly in the living human body, than in any other object in nature to which art can be

applied. The simplicity of the laws of inanimate nature, admits of the most certain inferences, whereas the indefinite action and re-action of the numerous faculties peculiar to life, enumerated in the first section, add greatly to the difficulty and uncertainty of experiment and observation, as already set forth. But this is not all; for constitutions being gifted with various degrees of each of these faculties, an endless variety is found to take place among individuals, giving rise to that uncertainty in the results of medicine, which has brought upon it the character of a conjectural art. This diversity is but little observable in mere animals, and seems referable to the artificial habits belonging to beings capable of exercising reason, and analogous to that variety in the stature and form of the body, and in the features of the face, as well as in the tempers, and dispositions, and understanding of individuals, peculiar to the human species.

What is here meant, is not exactly synonymous with what is technically termed idiosyncrasy, by

which is understood, if I mistake not, individual peculiarities, or rare exceptions to the usual constitution and habitudes of the human body. The diversity which is here meant, answers more properly to what has been termed *Temperaments*, when applied to the original constitution of the system, such as scrofula; and *Pre-dispositions*, or *Diatheses* when applied to acquired habits, such as gout and scurvy. They run through large portions of mankind, and in some degree, diversify the whole species; insomuch, that the form and symptoms of the same disorder, and the effects of medicine, are hardly alike in any two persons, and in many are widely different. What, for instance, can be more different than the common cases of small pox? In some, the disorder is so slight, as not to interrupt the business of life, even when not communicated by inoculation; while in others, it is as malignant and mortal as the pestilence: and there are all the intermediate shades, diversified to infinity by the number of pustules, the degree and kind of febrile action. There is a like diversity, in some measure, in all

diseases. The different degrees of susceptibility to small-pox, and other morbid poisons, may also be adduced as a striking exemplification of this diversity of natural constitution ; for, of persons equally exposed to casual infections, numbers escape altogether. And were it not for this diversity, in point of fatality and susceptibility, in small-pox, plague, and other epidemics, the human species might be extirpated by any one of them.

There could hardly be adduced a more striking example of the unaccountable peculiarity of constitutution, than the familiar fact of the diversity of individuals with regard to their various susceptibility of sea-sickness. Some are so constituted as never to be at all affected by it ; the majority of those who are exposed to its causes become exempted from it by time : but some are so constituted, as never to get the better of it, though ever so long at sea. It would be vain, I believe, to search for any other cause of this, than that primordial and inscrutable peculiarity in which

all the other diversities of the human constitution originate.

The like diversity is observable in the operation of certain remedies. What can be more different, and even opposite, for instance, than the operation of opium on different constitutions? It is a medicine of such eminent and beneficial effects in the majority of constitutions, by procuring sleep and assuaging pain, that the art of medicine could hardly be practised without it. Yet there are innumerable individuals so constituted as not to admit of relief from it: some in which it is so far from producing these benignant effects, that it causes great inconvenience and distress, such as sensorial disorder, sickness at stomach, nervous tremors, febrile heat and anxiety: some in which, though it disagrees in ordinary circumstances, it will procure relief in cases of intense spasmodic pains: some, in which it proves in-

effectual, or noxious, in every circumstance.* There is more or less diversity, though not so remarkable as here, in the operation of most, if not all medicines, particularly with regard to the dose required, to produce the same effect on different subjects.

It may farther be remarked with a view to the ascertainment of the correct inferences which sound practice demands, that the effect of medicines, and other powers, affecting the human body, are very different in the same individual, at different times and in different circumstances. I have known opium disagree with persons in their early life, and agree with them in more advanced age. This same medicine, though highly adverse to some constitutions in ordinary circumstances will, as mentioned above, procure

* Professor Kuhn, of Philadelphia, mentions a species of *rhus* growing in Pennsylvania, the exhalations from which are entirely innocuous to some persons, while they are deadly to others. American Medical and Philosophical Register.

relief under severe spasmodic pains, such as those from gall stones when unaccompanied with inflammation. An example applicable to the same subject, may be taken from the controversy regarding the safety or danger of sleeping in damp sheets. A very eminent Physician* has argued, that the opinion of this being dangerous, or even hurtful, is little better than a vulgar error. Others are equally persuaded of the reverse of this. The truth seems to be, that to those who are in high health, and have a vigorous circulation on the surface of the body, this practice is harmless; but in those who from age, infirmity, or natural constitution, have a languid circulation in the cutaneous vessels and the extremities, the flow of blood to parts so remote from the heart, is checked by the cold; and dangerous determinations are made on internal parts.

* Dr. Heberden. See Transactions of the College of Physicians, vol. ii. page 521. London, 1772.

It may be fairly questioned, whether diversity of constitution has had its due weight in the contemplation of medical observers. It is evident, that unless we are fully aware of it, we may expose ourselves to the same fallacy, as those who in the fable made the contradictory report with regard to the colour of the chameleon. This consideration strongly points out the necessity of accurate induction, extensive observation, and the comparison of facts. In a limited observation, to which only one or more cases of the most infrequent effects of a medicine may have occurred, there is a hazard of erecting an exception into a rule, by mistaking these facts for instances of the universal effects of it. It is only by a sort of arithmetical computation, founded upon large averages, that truth can be ascertained; and hence the danger of founding a general practice on the experience of a single case, or a few cases. This danger of being misled by exceptions, is greatly encreased by the publication of single extraordinary cases, which too much abound in the numerous periodical journals of

this country, tending more particularly to puzzle and distract young practitioners. This seems to be the chief cause which has retarded the progress of vaccination in England above any other country. The peculiar exuberance of our press brings into notice a few adverse cases, which produce an undue influence on weak minds, not aware that for every such case, there are many thousands of favourable cases which are never heard of.

Does not the diversity of constitution also account, in part, for the proverbial discrepancy imputed to medical opinions, and the deplorable controversies which have too often existed among practitioners and writers? Were the members of the profession fully aware of this cause of difference, would it not lead them into an amicable endeavour to reconcile and account for the inconsistent reports of their respective modes of practice, instead of engaging in contentious argumentation, not always carried on with that dig-

nified coolness and candour, which becomes a liberal profession.

There is nothing in which a young practitioner should be more on his guard, than being misled by the sweeping dogmas of schools, and the indiscriminate practices of sects, or of favourite practitioners. This evil may be conceived to grow up in the mind of a tyro, in the following manner. Let him at his outsetting, either at a school of physick, or in witnessing the practice of some private practitioner, meet with one or two impressive and imposing cases, terminating happily under a particular treatment, this will attach him undeviatingly to the like style of practice for the remainder of his life, unless his mind should be duly prepared by the caution here inculcated. In a typhous fever, for instance, it may be the lot of one practitioner while serving his novicate, to have witnessed, either under his own care, or that of some respected instructor, one or two striking cures, from an exhibition of strong cordials: another

has witnessed life saved, as he believed, by well timed and free evacuation from the bowels: to a third, it has occurred to see one or two cases, which being left in a great measure to themselves, have, by the salutary efforts of kind nature, been conducted to a safe termination.— Now, each of these having from his limited opportunities of observation, imbibed a persuasion, that his own method is universally applicable, is guided by it as the rule of his future practice. Nothing seems more clear to a comprehensive mind, than that they are all four right, in so far as relates to their respective class of cases; and that they are all wrong in regard to the general principles of practice. The cordial method of the first, is well calculated for those constitutions, in which the principles of life are on a reduced scale, either by original constitution, or by being brought to a low ebb by previous exhaustion; and in some such cases, the cordial practice in its utmost extent is required to save life. The second style of practice, is well calculated for those cases, in which there is a redundant

and vitiated secretion of bile, or other humours, in the *viscera* of the abdomen. It is incredible with what rapidity and abundance vitiated feculent matter will in some cases be generated and accumulated ; insomuch, that one of the main points of practice will consist in a vigilant attention to the state of the bowels, and the administration of proper purgatives. Such cases occur most frequently in tropical climates, and in the autumns of temperate climates. On the other hand, I have met with continued fevers in which there was no departure from nature in the quality of the alvine discharges.—In the third case, general or local bleeding is not unfrequently indicated, by the state of the pulse, or by the heat, pain, tension, or tenderness to the touch, evincing sanguineous determination on vital parts.—The last method, that is the negative, or what has been styled the *Expectant*, is well adapted to those cases which have none of the forementioned tendencies, and to which the self-healing powers of nature are all sufficient. There are many cases, in which a mixture of these methods

is advisable; and in most cases the practice requires to be varied in different stages of the fever. These remarks will apply also to puerperal fever and scarlet fever; and it is fondly to be hoped, that a due attention to them would put an end to those deplorable controversies, carried on in some instances with much acrimony and illiberality, to the great discredit of the profession and detriment of the sick. When practitioners become fully aware of these varieties, it appears that no more than an ordinary degree of discrimination and sagacity are requisite to regulate the treatment conformably to them.

In a work of Dr. Hamilton's on the utility of purgative medicines, these remedies are recommended not only in typhous fever, but in scarlet fever; and he does not qualify this advice by stating that there are any cases to be expected. I have certainly seen cases of both these sorts of fever, without any perceptible deviation from the healthy state in the secretions of the abdomen, and in which purging would seem not to be

called for, particularly in scarlet fever, in which the employment of purgatives, as a general practice, is considered by the best practitioners in this quarter, as highly pernicious; and there are few symptoms so certainly fatal in this disease, as a spontaneous diarrhœa. Though it is to be wished that the author of this instructive work had expressed himself in a more qualified manner, he has by no means merited the severe criticism inflicted by a German Journal, where it is said, that "Hamilton's recommendation of purgatives in typhous fever, only proves what "blunders and absurd methods of treatment the "human body can, in certain circumstances "withstand."* Whatever error our author may have committed, these journalists have been guilty of a still greater, by denying the utility of the practice in all cases whatever. And I beg to repeat that great benefit has been derived from Dr. Hamilton's work; for I remember the time

* See Bibliotek der Heilkund H. Band, p. 184, Berlin, 1809.

when much less attention was paid to the quantity and quality of the alvine discharges, as indications of the diseased state of the bowels, than has been the practice since its appearance.

As the present subject of discussion regards the distinctive application of medicine, I shall take the liberty of making one or two more remarks on this work, which I should not stop to do, if I did not entertain a high respect for its author.

One of the diseases, in which he recommends, unqualifiedly, the employment of this treatment, is the *chorea sancti Viti*. The qualified adoption of this practice, I am so far from disputing, that I lately imitated it with success in the case of a young female from the East-Indies, in which the vitiated quality, incredible quantity, and long continuance of alvine *sordes*, was such as to bid defiance to all the principles of physiology and pathology, to account for. But in a young English female, under my care,

about the same time, for the same complaint, nothing preternatural being observed in the alvine discharges after the first clearance of the intestines, she was successfully treated by the cold bath and metallic tonics, chiefly the sulphate and oxyde of zinc, and the recovery was effected in a shorter time than in the other case. I found that, in St. Thomas's Hospital, the like success attended the latter treatment of this disease. Opium, hyosciamus, and leeches to the temples, were found good auxiliaries.

There is another point, in which I feel myself bound to declare my dissent from this respectable practitioner. He denies that different species of purgative medicines possess distinct powers over the different species of matter to be evacuated and contemns the notion of cholagogues, hydragogues, &c. In the course of my experience, there is no practical fact with the truth of which I have been more satisfied, than the specific action of the various species of these remedies in stimulating different organs, in dis-

lodging and eliminating different species of corrupted secretions, and other feculent matter. What, for instance, can be more different than the operation of aloes acting as a mere eccoprotick on the muscular fibres of the intestines, and only in a particular portion of them, namely, the descending colon and rectum, and expelling only solid fæces, from that of elaterium, of which half a grain, taken three or four times at the interval of half an hour, evacuates immense quantities of serous fluid, exhibiting an example of the wonderful power of sympathy: for an impression made on the internal surface of the stomach, by a few particles of matter, conveys by magic, as it were, an impulse to the most remote extremities, rousing their absorbents to action; and, in case of *œdema* there, awakening the sleeping energies of these vessels, which, like millions of pumps at work, transmit the morbid fluid to the intestines and urinary passages, effecting a detumescence of the hydropic limbs in the course of a few hours, and affording a striking illustration of the sympathetic

action of medicines, and an instructive example of the operation of those of the sorbefacient class. Again, what can be more different than the operation of neutral salts and calomel, the former exerting but little influence beyond the surface of the intestines, exciting the action only of the serous exhalants, mucous glands and follicles; while the other, by extending its stimulus to the biliary ducts and pores, detaches foul congestions, which the other could not reach. Ipecacuanha acts specifically on the stomach, and other medicines on other portions of the intestines and on different glands; and it is presumable, that no two articles stimulate equally the same organs. It is for this reason that compound purges are found more beneficial than simple articles, as they touch a greater number of the intestinal organs.* The combination

* See an Article, by Dr. G. Fordyce, in the second Volume of Transactions of a Society for the Improvement of Medical and Surgical Knowledge, p. 214, London, 1800.—Without reference to this, or any other mode of reasoning,

found most convenient and efficient, and most employed as a general purgative in the practice of this metropolis, when no specific operation is indicated, is a mixture of purging salts and senna, a combination, but little employed by Dr. Hamilton. Dr. Cullen used to say that senna was one of the best purgatives, if it could be divested of its griping quality, which he had in vain attempted by manna, and various aromatikcs. It has been found, that the combining of it with salts completely answers this purpose.

After the exposition which has been made of the great variety of constitutions, would it be too much to affirm, that all the practical works in existence ought to be re-composed, in order

Sydenham (see his Treatise on the Gout) and other practitioners have recommended empirically a mixture of medicines of similar virtues. One of these being asked by his patient why he put so many ingredients into his prescription, is said to have answered more facetiously than philosophically, "in order that the disease may take which it likes best."

to insert in them, for the benefit of mankind, and the credit of the profession of physick, the following qualifying words. "The practice here recommended will be found to answer in a great majority of cases; but in imitating it, there are numerous exceptions to it, which it behoves every judicious and conscientious practitioner to bear in mind." There is a sentiment, similar to this, in Dr. Anderson's Agricultural Tracts. He says, "the inutility of publications on agriculture, has chiefly been owing to the authors not specifying clearly the nature of the soil to which the practice recommended applies."

SECTION V.

3d Source of Error—the Difficulty of appreciating the Efforts of Nature, and of discriminating them from the operations of Art.

The next obstacle, in the way of our practical judgments, is the difficulty of ascertaining to what degree the efforts of nature operate in the restoration of health, in what cases, and to what point the interposition of art is necessary and salutary, and how the operations of nature and of art are to be distinguished from each other.

The self-healing powers of nature have already been adverted to, in enumerating the principles peculiar to life : and that there is such an energy implanted in animal nature, must be obvious to the most illiterate and careless observer; for both, in mere animals and in man, not only wounds are cured, but various maladies are removed, without any interposition of art. This is effected by virtue of the energies which sustain life from the beginning to the end of its existence, in opposition to the noxious and destructive causes with which it is incessantly assailed, and perpetually at war, as it were, and has been designated as one of the fundamental laws of life under the title of the Restorative principle. Such, indeed, is the virtue of this self-preserving and presiding energy, that whatever deserves the name of *cure*, is referable to it as the work of nature ; for the operations of art consist merely in regulating it, either by exciting it when languid, restraining it when vehement, in changing morbid action, or in obviating pain, or irritation, when they oppose its salutary cour-

ses. This, I apprehend, is so well understood among well educated physicians, that the word *cure*, as applied to their own merits, is proscribed as presumptuous, and rarely, I believe, escapes the lips of any practitioner, whose mind is duly tinctured with that ingenious modesty which characterizes the liberal and correct members of the profession.

It has already been fully argued, in the beginning of this Dissertation, that in the human species at least, the interposition of art is founded in reason, and necessary for the preservation and restoration of health ; and it would be highly desirable, if the provinces of nature and art, could be defined by some precise line of demarcation, in order to prevent mutual encroachments ; and so to instruct the practitioner, that he shall neither be too sanguine and officious, nor too supine, inert, and despondent. Cases occur in which the perfection of skill consists in abstaining from all active remedies, either because the restorative powers of nature are adequate, or because

the disorder is too powerful and untractable to be subdued, as in the irremediable alteration of structure in vital organs. Youth and inexperience can seldom be brought to see cases in this light, and are, therefore, apt to institute an active and prejudicial treatment, when greater age and proficiency are satisfied either with looking on and consoling, or confining themselves to a palliative practice. No precise definition nor graduated scale of diseases expressive of the degree in which they are curable, has been attempted in so far as I know ; and it must be confessed, that on a subject so vague, little more can be effected than by that approximation which good sense and judgment will suggest, as applicable to individual cases. Nevertheless, the Author submits the following outline as the basis of a more general rule on this subject. It is founded on a classification of diseases as they affect the three great vital cavities of the body. Those of the head, such as epilepsy, mania, hemiplegia, and hydrocephalus, seem to be the least under the control of art, owing probably to the

very delicate texture of the brain: those of the abdomen on the other hand, such as inflammation of the bowels, bloody flux, and cholera, afford us proud triumphs of medical efficiency; for it will be conceded by the most sceptical, that without the intervention of art, a great majority of such cases would prove fatal: those of the thorax, intermediate to the other two in situation, are also intermediate as to the degree in which they are medicable, the chief of them being inflammation of the lungs, asthma, and consumption; the two first affording the most unambiguous proofs of life being frequently saved by a vigorous interposition of medical agents, while the last bids defiance to all the resources of art.*

* By consumption, is here understood that disease in which the parenchymatous structure of the lungs is irremediably injured, the proximate cause being abscesses consequent on tubercles. There are cases of a curable nature, which, from a similarity of symptoms, are not unfrequently mistaken for the true phthisis pulmonaris, and of which the proximate cause is a chronic affection of the mucous membrane lining the tracheal and bronchial surfaces.

One of the principal steps to be taken for ascertaining the efficacy of remedies, as distinguished from the restorative efforts of nature, will consist in obtaining an accurate history of diseases, particularly in circumstances in which little or no artificial means have been employed. Without some such standard of comparison, the utmost ambiguity, with regard to the effects attributable to medicine, must prevail: and there is perhaps no subject more exposed than this, to that most common of all fallacies in the general practice of life, the mistaking the *post hoc* for the *propter hoc*. Some of the early records of physick are very valuable in this respect. Hippocrates, for instance, in his epidemics, gives a number of minutely detailed cases of fever, in which little or no medicine was employed, few having been then discovered. The results are in support of the argument of those who maintain the opinion in favour of artificial means, for the proportion of mortality being that of twenty-two on forty-five, far exceeds that of any

modern statement in the like cases.* In the present times, so many remedies are known, that the omitting of them, with a view to ascertain the comparative powers of nature and art, would be deemed an unwarrantable experiment; so that an inquisitive mind, prone neither to scepticism nor credulity, but anxiously and honestly intent on observation, finds it nearly impossible to institute satisfactory inductions for the regulations of practice.

On the other hand, in rude ages, and even in those ages in which science has been in some degree cultivated, there are examples of artificial means being carried to a most pernicious length. It is related by Ambrose Pare, the father of French surgery, who lived in the middle and end of the 16th century, that it was the cus-

*See Medico-Chirurgical Transactions, vol. iv. page 128, where this subject is treated more in detail, in an article on the proportional prevalence of mortality of diseases, by Sir G. Blane.

tom to apply boiling oil to recent wounds, and to perform amputations with red hot knives. Being surgeon to the army, he observed, on one occasion after a battle, that from the impossibility of overtaking all the cases by regular dressing, some were apparently neglected, no hot oil being applied; but having remarked that these cases were next day in an incomparably better state than the others, his eyes were opened to the absurdity and barbarity of the old practice. This induced him to suspect the like errors in other points, and he was the first in France who promulgated rational methods of treating surgical cases.—A similar incident is related of the great father of surgery in our country. John Hunter in early life, was employed as a surgeon at the siege of Belleisle, in the year 1761. After an action some French soldiers, who had gun shot-wounds, hid themselves in a barn for four days, at the end of which time their wounds were found in a much better state than those whose wounds had, according to the universal method of treatment at that time, been dilated by the

knife. This of course proved a lesson for future improvement. Many casual instances occurred in the late war, tending to the like inferences. It was found after the battle of Waterloo and other battles, that many of the wounded officers and men who were left on the field all the succeeding night, or even longer, as at the battle of the Pyrennees, where the ground being woody and full of rocky ravines, the men were not immediately discovered, were found in a much better state than those who had the advantage of warm quarters and alimentary cordials. This was more particularly the case with regard to gunshot wounds in the thorax. But this observation will not apply to such wounds as consist in severe lacerations, and fractures demanding amputation: for it has been established by most correct evidence, that great benefit in such cases is derived from immediate operation,* and much

* See Observations by Mr. Copland Hutchison.

disadvantage from a deferred one.* The benefit supposed to be derived from the Royal touch in scrofula, has been ascribed by some author to the like cause; for this is a disease in which active practice, particularly the use of the knife, has been proved hurtful; but when, from the confidence in the touch, these practices have been omitted, and nature alone allowed to act, the cure has been effected, not to mention the effect of confident hope in promoting the cure of this and all other disorders.

* This is a point of the highest practical importance, and was first stated in a clear light by Mr. A. Copland Hutchison, in a work published by him in 1816, entitled, "Some Practical Observations in Surgery," and in another work, by the same Author, in the following ye ar, entitled "Some farther Observations on the proper period for Amputating in Gun-shot Wounds." See also an article in the Transactions of the Medical and Chirurgical Society, for 1817, by Dr. Quarrier, Surgeon of His Majesty's ship Leander, in the action off Algiers, in August 1816. The expediency of this practice seems since to have been admitted, in the ample Treatise on Surgery, by Mr. Guthrie, London, 1821.

We learn that in the dark ages, it was a common practice to apply salves and bandages, not to the wound itself, but to the weapon by which it was inflicted, the wound being bound up with a simple bandage for seven days, without being inspected or disturbed. This is said to have originated among a sect of absurd mystics, called the Rosicrusians. It is quite conceivable, and indeed conformable to what has been said, that the wound in this situation would make greater progress in healing by the first intention, than when disturbed by daily dressings and applications. And it is not a little curious, that a method founded on the most blind and gross ignorance of nature, should conicide with a method founded on the most enlightened views of nature, while the half-learned were involved in error.

It is also difficult to mark where nature ends and art begins; for, in the rudest state of society, or in the most destitute circumstances of life in civilized society, though no article of the

Materia Medica should be administered, there will be an exercise of judgment called for in the application of heat and cold, of fresh or confined air; also of diet and exercise; and by the injudicious regulation of these, nature may be as much thwarted as by a perverted use of remedies. And is not the scope of nature more likely to be mistaken by the ignorant and vulgar, than by persons of cultivated minds? But the warmest advocates for the sufficiency of the ways of nature, ever so wisely interpreted and conducted, will not controvert the evidence in favour of such remedies, as bleeding in pleurisy, or mercury in the venereal disease, and of certain remedies, whether depletory or cordial, in various circumstances of continued fever.

It is manifest, therefore, that a large share of medical skill must, at all times, and in all cases, consist in ascertaining to what extent nature may safely and advantageously be entrusted with the cure of disease, so as to supersede the unseasonable and injurious interposition of art, and

in discerning, as far as possible, what is due to the self-healing power of nature, and what to the co-operating resources of skill, which the practitioner is called upon to exert for the preservation of life, and the restoration of health. Without some principle, more or less definite on this subject, he would be continually groping in the dark, and would feel himself full of discouraging hesitations and painful reflections. For if his mind had a bias to scepticism, he might on some occasions be unable to satisfy himself, in case of a fortunate result, whether his patient had recovered by *virtue* of the means employed, or in *spite* of them; and in case of a fatal result, his feelings would be still more distressing; for what could be more painful to a conscientious and sensitive mind, than the uncertainty whether the loss of the patient was most imputable to the remedy or to the disease: if on the other hand, he should be prone to *credulity*, he might be so far blinded as, *bona fide*,

to plume himself, and to congratulate his patient on a great *cure*, in what may have only been a *great escape*.

SECTION VI.

4th. Source of Error—Superstition.

As most diseases, particularly calamitous epidemics, were supposed, in rude ages, to proceed from the anger of the gods, the remedy naturally suggesting itself was the means of appeasing them. Sacrifices, even human sacrifices, were resorted to in times of Paganism; processions, and other religious observances in the Christian world.

Under the head of superstition, may be ranked fatalism; for it follows from this dogma of faith, that all means of averting predestined events,

that is, all future events whatever, are not only unavailing, but impious. It is manifest, that if this were consistently adhered to, every effort conducive to self-preservation, or even the common comforts and accommodations of life, would be paralized; there would be an end to all the pursuits and duties of social life; nay to the very existence of the human species. Though this speculative principle, however, has never been able entirely to overpower and extinguish the feelings and dictatesof nature to this extent, except among a few fanatical maniacs, there are proofs enough in the history of mankind, of its pernicious practical effects. One of the most conspicuous examples of this, is found among the professors of the Mahomedan faith, in their abstaining from the means of stopping the progress of the plague. Among Christian sects, profe sing this doctrine, the like evils have arisen in an inferior degree, as exemplified in the opposition which the inoculation of the small pox met with from this religious prejudice.

There are minor species of superstition, which influence weak and uninstructed minds, in all ages and countries. The vulgar, even in the most enlightened periods, are not entirely exempt from belief in the powers of sorcery and magic, and other fantastic and imaginary agencies, such as exorcisms, charms, and amulets. It is pleasing, however, to contrast the present times, in which there is almost an extinction of these delusions, with ages not very remote. It is only one hundred and eighty-two years since great numbers of persons were condemned to death in the ordinary course of law, and executed for witchcraft in England;* and only one hundred and nineteen years since the like dis-

* In the year 1646, two hundred persons were tried, condemned, and executed for witchcraft, at the assizes for Suffolk and Essex, (See Howel's Letters;) and in 1699, five persons were tried by special commission at Paisley, in Scotland, condemned and burnt alive for the same imaginary crime.

graceful proceeding took place in Scotland.* The like trials, convictions, and executions, took place in New England, in the end of the 17th century.†

Many superstitious, or rather fantastical remedies, are to be found in the works of Sir Theodore Mayerne, a native of Swisserland, who possessed all the medical erudition of the age in which he lived; that is, the first half of the 17th century. He was physician to three Sovereigns of England, was held in the highest estimation at court, and had, during that time, by far the greatest practice in this metropolis. We find among his remedies, the balsam of bats for hypochondria, remedies taken from certain parts of adders, sucking whelps, earth-worms, &c. We find also, as articles in his materia medica, the secundies of a woman in her first labour

* These dates are reckoned from 1819, the date of the first edition of this work.

† See Evelyn's Memoirs, vol. ii. p. 35.

with a male child, the bowels of a mole cut open alive, mummy made of the lungs of a man who died a violent death, and other articles equally ridiculous, besides various amulets. We are, nevertheless, indebted to him for the first introduction of calomel, and other valuable remedies; for he introduced a considerable share of chemical and pharmaceutical knowledge into England; and some valuable practical observations are to be met with in his works. The anointing and bandaging of the weapon with which a wound has been inflicted, and the Royal touch, which have been already adverted to, may be enumerated among the superstitious, though not pernicious practices. And the virtues of certain wells dedicated to particular saints to whom they were supposed to owe these virtues, are referable to the like principle; for the chronic heats of the skin, for which they were chiefly recommended, are found to be equally benefitted by any other cold spring.*

* See a Work on this subject by Dr. Rigby, of Norwich.

Superstitious practices ought not, therefore, in all cases to be disregarded. The rust of Telephus's spear, mentioned in Homer, as a cure for the wound it had inflicted, was probably the *ærugo æris*, the weapons in those days being chiefly made of brass; and this is found by experience to be one of the best applications for cleansing sores, and disposing them to heal. The inoculation for the small pox, in India, Turkey, and Wales, was practised on a superstitious principle, long before it was introduced as a regular practice into this country. The superstition consisted in buying it; for the efficacy of the operation in giving safety, was supposed to depend upon a piece of money being left by the person who took it for insertion. And it is not a little curious, that the same practice should have existed in countries so remote.*

* See Annual Register, and Russel's History of Aleppo. —See also some interesting remarks on the practice of Savage Nations, in Stewart's Elements of Philosophy of the Human Mind.—See also various superstitions recorded in the works of Etmuller and Cole.

It has been already mentioned, that the remedy specifically appropriated for these maladies of the mind, is the cultivation of natural knowledge; and it is equally curious and gratifying to observe, that though the lights of science are attained by only a small proportion of the community, the benefits of it diffuse themselves universally: for the belief in ghosts, and witches, and judicial astrology, hardly exists, in these days, even amongst the lowest vulgar. This effect of knowledge, in banishing the vain fears of superstition, is finely alluded to in the last words of the admirable lines, already quoted from Virgil, *strepitumque Acherontis avari.*

The inference, from the whole of these reasonings, is, that the entire phenomena of animated, as well as inanimate existence, are referable to the established order of nature, and are so many exemplifications of her laws: and that the truths derivable from the knowledge of them, are the

only sure guides of human conduct in medicine, as well as in every other department of practical life.

SECTION VII.

5th. Source of Medical Error. The Ambiguity of Language.

As the end of language is the communication of thought, it is self-evident that there can be no such thing as correct reasoning, unless the same import be annexed to the same words, in the oral and written intercourse of mankind. A large proportion of all the false reasoning and controversy, which has existed among the learned and unlearned of all ages, has arisen from the want of a precise definition of words. The most valuable part of the writings of Locke, are

those which relate to the abuse of language. It is a subject upon which there is great room here to dilate; for none of the departments of practical knowledge have suffered more than medicine, from ambiguous phrases, and verbal disputations. It falls under this head, therefore, to caution practitioners, particularly our younger brethren, against prescribing for the *name* instead of prescribing for the *nature* of a disease; and it is proposed to illustrate this by a few examples, referring the reader to the chapters of Locke's Essay on the Understanding, which relate to this subject.

The term *scurvy*, in the English language, and *scorbutus* in the general medical language of Europe, has been employed to denote, both cutaneous eruptions, and that disease which is caused most commonly by a long use of salt provisions, and principally known by its appearance in ships which have been long at sea. By having this name in common, these two diseases, though widely different, may, without

any thing in common in their characters, have been considered identical, and treated as such, particularly by a Dutch physician and author, named Eugalenus, in which he was followed by his countryman Boerhaave, and other authors, both British and continental. The consequence of this strange jumble was the adoption of a very vague, inefficient, and inconsistent practice, a practice also in the highest degree pernicious ; for it seems to have been mainly owing to the want of a clear conception of the *diagnosis* and of the peculiar nature of the scurvy, that a simple, infallible, and readily procurable remedy for it, was long neglected, to the incalculable detriment of humanity, and the public service. Lemon and lime juice was well ascertained to be a certain preventive and cure of this dreadful malady very early in the 17th century ; but the attention of Physicians having been absorbed in vain speculations, and their judgments perverted by the ambiguous import of the word ; this excellent remedy was so much over-looked and neglected, that it was not

rendered available to the best interests of mankind till after the middle of the 18th century. Had the expedition fitted out under Commodore Anson in the year 1740, been provided with a few casks of lemon juice, none of those dreadful sufferings which make humanity shudder in perusing the narrative of that voyage, could have occurred. On account of the same most unfortunate misapplication of a word, Boerhaave recommended the use of Mercury in the sea-scurvy, because it is found to be a remedy in various cutaneous affections; and in conformity to this, it is related by Dr. Kramer, that some of the medical officers of the Imperial armies in Hungary, did, in the year 1720, subject to a mercurial course 400 men ill of the sea-scurvy, every one of whom died. Let no one therefore allege that the incorrect application of a single word is of small importance.

Another example, equally illustrative of the fatal effects of the ambiguity and misapplication

of words, may be quoted from the vague acceptation of the term Yellow Fever.

In order to understand this, it will be necessary to make some historical statements.

In that district of the globe in which are situated the islands called the Great and Little Antilles ; also in the continential regions round the Gulph of Mexico, and along the coast of South America, the fevers which prevail there have certain symptoms peculiar to themselves, and not occurring in any other part of the globe, except when carried from thence, which they sometimes have been, particularly to the seaport towns of North America, and the south of Europe.

The peculiarities alluded to, consist in a universal yellowness of the skin, and the vomiting of a dark-coloured fluid, resembling the grounds of coffee.

These fevers are observed to proceed from

three remote causes, very distinct in their nature.—The first is that which consists in the exhalations of the soil such as produce the endemic fevers in other countries and climates, and prevailing chiefly in autumn.—The second, is that which consists in foul air engendered on board of ships on long voyages, in circumstances of personal filth and want of ventilation, frequently combined with hardships and privations, and is the same with those stagnated and corrupted effluvia of the living human body, which produce typhous fever.—The third cause is, that in which there is no suspicion of foul air, either from the soil or the living human body, but merely from circumstances of intemperance, fatigue, and insolation, affecting chiefly, and almost exclusively, new comers from temperate and cold climates.

How fevers proceeding from causes so different should all be attended with a yellowness of the skin, and exclusively in this region, has not been accounted for : and the only conjecture is,

that it is probably connected with the importation and employment of negroes, this being the most striking peculiarity of those colonies.—They are all of a malignant nature, but that which proceeds from the human effluvia the most so.

The first may be distinguished by the appellation of the *Endemic;* the second, by that of the *Pestilential,** *Malignant*, or *Typhus Icterodes:* the third, by that of *Sporadic.*

It has been from the want of making this distinction, and from classing all these three under one head, that the endless and acrimonious controversies regarding contagion have arisen.

* By *Pestilential*, it is here meant only to express a very high degree of prevalence, together with an extraordinary and calamitous rate of mortality. In this respect, this epidemic takes precedence even of the Plague; for, on a population of 16,000 civil and military at Gibraltar, in September 1804, there perished 6000, a proportion considerably above that of the pestilence of the Levant.

There is not the least suspicion in any rational mind, that the endemic and sporadic species are contagious. This is only alleged with regard to the pestilential or typhous species.

It may be asked what proof there is that this last is specifically different from the other two?

To this it is answered that it is matter of history; that besides the endemic and sporadic fevers prevailing at all times in the above-mentioned regions, there has occurred at various intervals of time, a raging epidemic, which could be traced to the arrival of a ship or ships in the circumstances above-recited, and at a season in which the ordinary malignant fevers do not prevail. The most remarkable of these epidemics on record, are that of 1647 in Barbadoes; that of 1686, in Martinique; that in the Spanish Main, in 1729 and 1740; and the most general and destructive of all, which broke out at Grenada, in the month of March 1793, which spread rapidly to the whole Caribbean Archipelago,

and from thence to North America, and the shores of Europe.

The wide spread, and long continuance of the last, was owing to the revolutionary war of France which broke out in that year. In consequence of this war, larger armaments than had ever been known, were sent to this station, in which the great number of new-come Europeans tended to feed and prolong this epidemic. In consequence also of the horrible cruelties perpetrated at St. Domingo, and other islands in this year, a great number of the surviving inhabitants took refuge in North America, and carried with them the contagion of the fever. This epidemic had not been known on that continent for thirty-one years: but it soon spread along the whole line of sea-port towns from New-England to Georgia.

It is ascertained, on the best authority, that this fever, is not a native production of that continent, but has only prevailed occasionally, and

generally at long intervals of time; and that in consequence of intercourse by sea with the West-Indies.

The most remarkable, and I believe the only instances on record of its existence in North-America, are that of Boston, in 1693 on the arrival of a squadron of English ships of war, from the West-Indies; that in Carolina, in the years 1732, 1739, 1745, and 1748, all which, by the account of the physicians who describe it, could be traced to no importations from the sugar colonies; that of Philadelphia in 1751, and 1762; and that above-mentioned in 1793. This last, in consequence of the encreased frequency of intercourse with the islands, and the neglect of quarantine regulations, continued to re-appear here and at the other sea-ports of that continent at intervals of a few years during the rest of the revolutionary war.

It is to be remarked, that this very singular empidemic has never appeared but in the sea-

port towns, and never in the inland towns, nor among the rural population. Nor are there any facts to prove that it ever arose but from maritime intercourse. The ordinary endemic fever of that continent, is the remitting marsh autumnal bilious fever, without yellowness, and without malignity, and as much incident to the interior as to the maritime districts.

It now remains to give the history of it as it appeared in Europe. It may be chronologically stated as follows: at Lisbon, in 1723; at Cadiz, in 1732, 1733, 1744, 1746, 1764, 1800; at Malagar, in 1741, and 1803; at Gibraltar, in 1804. It has since appeared, at different times in these cities, as well as at Carthegena, Alicant, and Leghorn.

It is to be remarked here also, as in North-America, that this epidemic was an entire stranger in these countries till their intercourse with the new world, having never been known on

this side of the Atlantic till 1723. From its strong-marked features, both as to its external symptoms and its calamitous ravage, it could not have escaped the notice both of medical and civil history had it ever existed. In so far as regards our own means of information, we well know that nothing the least resembling it has occurred at Gibraltar, since it has been in the British possession, that is for a whole century, this fortress having been captured in 1704, and the unexampled epidemic having visited it in 1804. It is indeed utterly impossible to account for its appearance here, but from its vicinity to Cadiz and Malaga, where it prevailed so much in the first years of this century. Yet such is the blind and paradoxical rage of controversy, founded on prejudices and pre-conceived opinions, that the advocates of non-contagion have actually affirmed that it might be accounted for from marshy exhalations. But where had these exhalations been (if any such could exist on an arid rock) for the preceding hundred years, and as far back as history reaches? The same was al-

leged as the cause of it at Cadiz, a city situated on a peninsula of dry sand, and at a time when no such epidemic was known to the close-connected Isla de Leon, and other neighbouring districts, which are really marshy and subject to endemic fevers, but of a quite different description from the yellow fever. It falls to be remarked also that in Europe, as in North America, the disease affected only those sea-port towns in communication with the colonies, and not the inland towns, nor the ports of other countries in the same circumstances of soil and climate.

Now, let any person of common understanding, *whose mind is not indelibly imbued with the dogmas of non-contagion*, reflect, whether a disorder of a description new and foreign to Europe, and affecting from first to last, only those parts of it in communication with America, and falling with much greater frequency on Cadiz, where alone, by the laws of Spain, ships from the colonies are allowed to touch; whether, I say, it is possible to conceive that this could happen

by mere chance, without foreign importation, and that by the like chance the same should occur in North America? And let it be also well considered, that this disease did not appear in North America, or Europe, *simultaneously* with its apearance in the Antiles, but *subsequently* and *progressively*, and only after those periods in which the epidemic broke out in these islands. The main diagnostic of an endemic, as distinguished from a contagious epidemic fever, is, that the former having for its remote cause something floating in the common atmosphere, its appearance in different places must be *simultaneous;* whereas the latter, having for its remote cause the *effluvia* of the living human body, its diffusion among a population must be *progressive.* The Author, therefore, again calls upon every person of common understanding *whose mind is not already indelibly imbued with the dogmas of non-contagion*, to say, whether, weighing and combining these circumstances, he can believe, or conceive, that the singular epidemic which has at different periods visited North America,

and the South of Europe, has no connexion with the like fever, which prevailed immediately before these periods, in the Caribbee Islands and the adjacent shores.

If these views of the subject alone should not prove decisive to minds prejudiced or unprejudiced, the following considerations will, perhaps, effectually cast the balance in favour of the existence of contagion.

1st, The evidence in proof of its being actually imported from sea by particular ships, communicating it to the spot where the landing is made, and spreading from them to all communicating parts, whether contiguous or remote. 2dly, the established fact, that its progress can be arrested by the separation of the infected from the sound. 3dly ,The difference of this pestilential form of the disease from the other two, in rendering those who have gone through it unsusceptible of a future attack. This was so well ascertained

in Cadiz, that those who had recovered from it were without fear employed as nurses to those who laboured under it. 4thly, It is distinguished from the other two forms of the disease, by greater numbers being affected by it, and with symptoms more intense and mortal. 5thly, There are well attested examples of its being communicated from one ship to another in the middle of the ocean. As exhalations of the soil are here out of the question, any one such fact may be considered as an *experimentum crucis*, incontestably establishing the principle, and upon this alone the whole merits of the case might be rested.*

* The three following cases, as resting on irrefragable evidence, may be quoted—that of the communication of it from a French prize taken by the Hussar and other frigates off the Capes of Virginia, in May 1795—that from a French frigate, the Palinurus, to the English sloop of war Carnation, on her passage from England to windward of Barbadoes—and that from a French ship of war in her passage from the West Indies to the crew of an English

After the strong case which has thus been made out, it will naturally be asked, upon what grounds, an opinion the opposite of this, has been entertained by so many gentlemen of respectable name and character?

The most obvious apology for them seems to be, 1st, The great similarity of symptoms in the three species of fever which have been described. They are all three attended with universal yellowness of the skin, and the dark-coloured vomit; and all prove fatal in a space of time from three to six days.

On the other hand, their differences consist in the following particulars. The endemic and sporadic constantly exist in those regions, whereas the pestilential only appears at uncertain intervals, sometimes of many years, and prevails

ship taken off Cape Finisterre. The yellow fever was communicated to them by the seamen sent on board of her from the French ship.

in a much more fatal degree, sparing few who are within its influence, and carrying off a large proportion of the whole population; and though the most prominent characters are similar, they are in this species more intense, it is not incident more than once to the same individual; and lastly, it is actually communicable by contagion, while the other two are not so. It is, in short, the external similarity of the symptoms which has created the error. But it should be remembered, that *similarity* is not synonymous with *identity;* and that there are other diseases, such as the erysipelas, opthalmia, and typhous fever, in each of which there are cases so similar in symptoms, that no external difference is discernable, but yet differ in the essential point, of one being contagious, and the other not so.

The 2d cause of this delusion is from those who have reported upon it, confining their views to one spot, and not considering it on a comprehensive scale, in all its extent and bearings.

There is a third source of error, which may be alleged as an apology for those who deny contagion. This is, that this fever has never appeared in North America nor in Spain, except at one season of the year. This is admitted; for nothing is more certain than that this fever is restricted to a certain range of atmospherical temperature, never having appeared either on the continent of America, nor in Europe, except in seasons in which the heat of the air is permanently equal to that within the tropics, that is about 80 degrees of Fahrenheit; and that it disappears as soon as the thermometer falls a few degrees; and disappears entirely, not only in the severe winters of America, but in the temperate weather of that season in Spain. This argument has been triumphantly urged by the non-contagionists; but the force of it will vanish in a moment, upon reflecting that, in this respect, it is perfectly analagous to the true plague, which has also its range of atmospheric temperature; for it never was known either between the tropics nor within the polar circles; nor has it ever

appeared in England, and the other temperate climates of Europe, except at one season of the year, that is, from June to October, and almost entirely vanishes before Christmas. It is also very remarkable, that the plague in Egypt ceases at the summer solstice, when the thermometer generally stands at, or above 80°. In this respect, the pestilential yellow fever and the plague, differ from the small-pox, measles, and other specific contagions, which are not influenced by climate nor season, nor by any circumstance, but the proximity or contact of living human subjects, or their infected effluvia and secretions. It is also in common to the two former, that they seldom appear at first but in a dense population, subject to bad ventilation. To assert therefore that a disease is not infectious because it is not, like small pox, infectious in all circumstances, is not only a gratuitous assumption, but in this case contrary to ascertained matter of fact.

Such are the outlines of this controversy, into the particulars of which, the Author has not deemed it necessary to enter with the same amplitude and earnestness, as in the first edition of this work; and which he felt then to be unavoidable as a matter of duty,* conscience and feel-

* The Author, in making use of the word *duty*, means here to refer not merely to those general principles of humanity, which ought to form the leading character of the medical mind, but to those functions which regard him personally. It fell to his lot, in an early part of his professional life, to be appointed Physician to the largest naval armament ever employed by the British Government on foreign service. The number of ships of the line in commission in the West-Indies in the year 1782 amounted to 39: of which 36 composed the line-of-battle on the 12th of April of that year. The splendor and importance of the victory of that day, in which he had the honour to be at the side of the commander-in-chief, are too memorable in the British annals to require to be mentioned here; nor would it become him to enlarge on the services which it became his duty to perform to the British navy since that period. It is enough to say that the remunerations which he has received from his King and country, have superadded the obliga-

ing, convinced as he was that these errors had occasioned, and were then occasioning, the death of thousands, and that thousands of lives might be saved by the adoption of regulations founded on a more correct view of the subject. These considerations prolonged the remarks on this subject, which has been quoted merely as an illustration of the danger of ambiguous language, to a greater length than belongs to a treatise of this general nature. But seeing that, in so far as he can learn, there is a general conversion of opinion,* to what he deems the cause of truth

tions of gratitude to those of duty, and he feels the full force of both, as incentives to exert his best faculties in dispelling the fatal delusions which have prevailed on the present subject.

* There is sufficient proof of this in the public declarations of the corporate medical bodies in Europe and America, and the consequent general adoption of quarantine regulations.—Since this sheet went to press, the Author has learned with the deepest grief and concern, that the like convictions have not universally prevailed among the me-

and humanity, he does not judge it necessary to dilate farther on this subject, a circumstance at which he sincerely rejoices, not only for the good will which he bears to mankind, but because it releases him from the painful necessity of differing in such strong language as formerly, from Gentlemen, for whom he in other respects,

dical officers of the West Indies; for by official documents just arrived, it appears, that, in consequence of the infatuated neglect of police and quarantine regulations, the most tragical events have taken place among the officers and men of the army on that station. In the Island of Tobago, there died last year of this epidemic, more than two-thirds of the troops which had arrived from England—only seven men escaped the attack of the fever, and the like calamity occurred in Jamaica. The only consolatory circumstance in these documents is, that at one of the Islands (Barbadoes) where separation was enforced, there was an exemption from this calamity; a circumstance which has at length induced the Medical Board of the army to enforce, by positive orders, what they have found it impossible to effect by the more liberal and lenient powers of persuasion and reason.

entertains the most unfeigned regard and esteem.*

* The authorities and argument against the existence of contagion, will be found detailed in a work on this subject by Dr. Bancroft, comprizing all that can be alleged on that side of the question, entitled, "An Essay on the Disease called Yellow Fever," Lond. 1811, and a sequel to it in 1817. On the side of contagion, the chief authorities are the travels of Don Antonio Ulloa and Don Jorge Juan,—a tract by Dr. C. Chisholm, entitled "An Essay on the Malignant Pestilential Fever introduced into the West India Islands from Boulam," Lond. 1795,—the Medical Sketches of Sir James Macgregor, Lond. 1804,—a Treatise on this subject, by Mr. Pym, Inspector of Army Hospitals, Lond. 1818,—an Article in the Medico-chirurgical Transactions, vol. v., by Sir Joseph Gilpin,—numerous articles in the Medical and Philosophical Register of New-York,—articles in the Edinburgh Medical Journal for 1796 and 1805,—separate works by Sir James Fellows and Dr. Caillot, the latter in French,—the Report of the French Commissioners at Cadiz, in 1804. But perhaps the work the most elaborate in point of industry, the most forcible in point of argument, the richest in facts and observation, is one in Spanish, by Dr. Arejula, of Cadiz.

The only other example which shall be adduced of a disease, the *name* of which is in danger of misleading us with regard to its *nature*, shall be Dropsy.

The most common notion that used to be entertained of this disease was, that in all cases, it essentially consists in a debility of the powers of life, which in most instances had been exhausted by intemperate living, inducing visceral obstruction. The deficiency of the powers of assimilation, a diminished proportion of the red globules and gluten of the blood, a decay of the muscular powers, as also of the restorative principles manifested by the proneness of wounded parts to fall into gangrene, the occurrence too of this disease after profuse hæmorrhages, and from the circulation being mechanically impeded by organic diseases of the heart,* all militated

* See Burns, on Diseases of the Heart.—Two striking cases of this sort occurred to myself; one, that of a young soldier in St. Thomas's Hospital; the other, that of an old

in favour of this opinion. On the other hand, there are cases possessing the pathognomic characters of Dropsy, that is, the accumulation of colourless fluids in the cellular membrane, and in the great vital cavities, attended with scanty urine, in which none of these debilitating causes exist. It will sometimes arise idiopathically, and without visceral affection, as I have seen it do, even in very early life; also after scarlet fever, and after sudden exposure to damp and cold, without any other assignable cause. It has been observed, that, in a large proportion of cases, great quantities of albuminous matter, such as belongs to the serum of the blood, is found in the urine. It has been farther observed, that with regard to practice, so far from this disease being treated as one of debility, bleeding and other lowering and febrifuge medicines, as indicated by an excess of vascular action, are found

Flag Officer, in private practice. Both were dropsical: and in both, the valves of the heart were found ossified; and in neither was there any suspicion of intemperance.

to be best adapted to its nature; and with regard to its proximate cause, which the old writers, and others who regarded it as always a disease of debility, were disposed to refer to the defect of absorption; the modern writers alluded to, are more inclined to view it as an active and inflammatory affection, depending rather on excess of effusion than defect of absorption. It cannot be denied that this latter view of the disorder was too much overlooked by the earlier writers, and that it has been adverted to with greater precision by later authors and practitioners, particularly by Dr. Blackall, in one of the most valuable medical works of these days, and so excellent, that all the well wishers to physick, would be glad to see a like compendious and accurate treatise on every other important disease. In drawing the attention, however, to this class of cases, he seems hardly to have allowed a due weight to that great majority of cases, which unquestionably depend on a deficiency of the vital powers.

The inference intended to be drawn from the whole of this is, that there is a great variety, and even contrast in cases coming under the generic term dropsy, which require a different, and in some measure, an opposite treatment, and that much exercise of judgment is required, in order to avoid indiscriminate practice.

SECTION VIII.

6*th. Source of Error. The Fallacy of Testimony.*

Lastly, since the life of any individual, however long it may be, and whatever industry and sagacity may have been employed in the course of it, is greatly inadequate to the task of collecting a stock of knowledge sufficient for professional practice; and since he must be indebted to others, whether his cotemporaries and countrymen, or belonging to distant ages and countries, for a large share of necessary information, it is obvious, that the value of such information

must depend on the credit due to the authors, and on the clearness of the language in which it is couched. Besides the sources of fallacy and error, already enumerated, the medical practitioner has to encounter those, which spring from the credulity, ignorance, vanity, self-interest, self-delusion, the love of controversy, the love of singularity, the want of candour, and the inveterate prejudices of those who report facts. It is a melancholy truth, that there is perhaps no department of human knowledge, in which there is so great a want of correctness, with regard to recorded observations, as well as reasonings, as in Medicine. We ought, therefore, to be strongly fenced against the inroads of error in others, as well as ourselves.*

It was a favourite saying of Dr. Cullen, that there are in physic more false facts, than false

* See some acute observations on this subject in a work entitled, "A Reply to the Anti-Vaccinists," by James Moore, Esq. Fellow of the Royal College of Surgeons, London, 1800.

theories. It is by the want of due caution with regard to these, that quackery has chiefly been sustained; for those who do not belong to the profession, being off their guard, from not being in the habit of observing, and reflecting on the fallacy of testimony, and other sources of error: and being anxious to catch at relief, from whatever quarter, perhaps with minds soured by disappointment, and exquisitely sensitive to hopes and fears however vain. These impressions are also wonderfully favoured by the operation of mystery and concealment; for, by some principle of human nature, not easily explicable, there is a peculiar interest and importance attached to whatever is secret. *Il y a quelque chose de singulierement piquant, dans le mystere*, says some French author. The credit of these remedies is also greatly enhanced by the successful cases only being made public; for the innumerable cases in which they are used, whether openly or secretly, without the boasted good effects, still more, if with bad effects, are never reported; while those supposed to be success-

ful, are studiously promulgated. And there is here a farther source of false or dubious testimony; for those who are induced to use these remedies, being anxious to ward off reproach or derision, justify themselves by making the most favourable report, and even by affecting to have received relief: and not unfrequently fancying and honestly believing that they have actually received it. It is also a curious, and well ascertained fact, that no nostrum has, in any instance, maintained its character after it was revealed. This was strikingly exemplified in the case of Ward's various remedies, which went entirely out of vogue, the moment they were published, which was done after his death, by an injunction in his last will. And it is still farther in proof of the capriciousness of the world* at

* I perhaps have wronged *the world at large*, and should have confined the remark to England. Professor Nemnich, of Hamburgh, in a Narrative of a tour he made in this country, about twenty years ago, calls England the Paradise of Quacks, and enumerates quackery, among the

large, on medical subjects, that all his remedies are excellent preparations or compositions, and under the exercise of discretion, well adapted to the diseases which they professed to cure. Indeed, the injury done to the world by secret medicines in general, is not so much from any thing pernicious and inefficient in their nature, as from their indiscriminate use, and the false confidence they inspire to the exclusion of other, and better remedies. On the contrary, it is presumable, that it must have been from some eminent and ascertained good effects observed from them, that the authors of them were first induced to offer them to the public. On the other hand, there are remedies not secret, but entirely inert, which attain a high degree of reputation, most commonly from the salutary powers of nature being mistaken for the effect of artificial appliances, or from the power of imagination: witness tar water in this country, and gin-

national peculiarities, in the same list with boxing, horse-racing, bull-baiting, and cock-fighting.

seng among the Chinese, animal magnetism and metallic tractors. Moreover, there are medicines of great value, which in consequence of being extolled by sanguine credulity, far beyond what experience justifies, come by cool experience, or perhaps inordinate scepticism, to be run down and stripped of all virtue, so that from being proclaimed good for *every thing*, they come to be denounced as good for *nothing*. Cicuta, Digitalis, and Nitric acid may be quoted as examples of this.

There is another source of error, arising from the delusions of patients, who without any intention to deceive, suffer themselves to be blinded by extreme anxiety of mind. The deceptions of animal magnetism, by which is meant a pretended, subtle influence of one living human body on another, similar to the metallic, or real Magnetism, may serve as an example of these delusions. The fallacy of it has been detected on the clearest evidence, and is exploded in England and France; but it still maintains its ground

in Germany, insomuch, that it is said to be taught as a reality at some of their universities. The like deceptions have been practised with the metallic tractors, which it was pretended relieved certain pains by mere contract or friction through some obscure influence not referable to any known law of nature. The former of these impostures was detected by a committee of the Academy of Sciences at Paris, in 1783, of which the celebrated Franklin was a member. An equally satisfactory detection of the other, was made and published by Dr. Haygarth, of Bath. These delusions are referable to the credulity and creative imaginations of patients; but medical authors and practitioners themselves are not exempt from the charge of the like weaknesses, and they propounded their doctrines and facts with so much plausibility and unsuspected good faith, as to delude those who are not sufficiently on their guard. The convictions of their own sanguine minds are, indeed, so irresistible as to betray them into errors against the plainest evi-

dence of the senses. This may be exemplified in Solano's account of the varieties and indications of the pulse; and we can in no other way account for the effect of remedies, and of cures performed and reported *bona fide* by different authors, which could never be verified by the experience of others.

It is indeed impossible to set bounds to the power of self-delusion in creating sensations excited without the presence or operation of any actual corporeal impressions. I have frequently seen simple and ignorant persons, when under the false apprehension of having caught a certain impure disorder, tormented with real pains in various parts of their bodies, particularly their loins and noses. I have been assured by those, who have been in circumstances of exposure to the infection of the plague, and in momentary dread of catching it, that they have felt acute pains in the groins and arm-pits, these being the parts known to be most prominently affected in that epidemic. More familiar, though less aggrava-

ted examples of this, occur among those subject to hypochondria. Enthusiasm, mania, dreaming, night-mares, and delirium, give rise to all the diversified forms and gradations of the same species of delusion.

With regard to that class of delusions which consists in the seeing of apparitions, Dr. Ferriar,* of Manchester, and Dr. Alderson,† of Hull, have very philosophically accounted for them, by proving them to be exemplifications of morbid action, as much as dreams and delirium. There are also some ingenious remarks on the same subject in Mrs. Grant's History of the Popular Superstitions of the Highlands. She mentions that it is part of the creed of those who believe in them, that the visions are perceptible to only

* An Essay, towards a Theory of Apparitions, by Dr. John Ferriar.

† See the Medical and Chirurgical Journal of Edinburgh, 1810, p. 287.

one person at a time, a circumstance which well accords with the theory of their being morbid affections of a single individual, for were it any thing existing in the reality of external objects, they would be equally perceptible to all.

The greater number of fantastic illusions are of a gloomy colour, and distressful nature: but some being of a cheerful complexion, it becomes a question whether it would be advisable to cure the patient of these. Horace gives his opinion against the dispelling of pleasing illusions in a world in which there is so large a mixture of bitters in the cup of real life, and he illustrates it by the amusing story of a person of this description, who upon being cured of his delightful reveries, exclaims,

"Pol me occidistis amici."

The English poet expresses himself much to the same purpose in the line,

"If ignorance is bliss, 'tis folly to be wise."

The value of that recorded knowledge, which rests on testimony, is also greatly impaired, by the difficulty of ascertaining the exact import of the terms, by which the ancients, and even the earlier writers among the moderns, designate the remedies they employed, whether simple or compound. Of the simples mentioned by the ancients, very few are now recognizable. If we except opium, alloes, and perhaps one or two more, it is doubtful, whether there is a single article of the ancient *materia medica*, which can be satisfactorily ascertained; and for want of such knowledge, much valuable practical instruction has been lost. This will be best illustrated by an example. A secret medicine, under the title of *Eau medicinale d'Husson*, was introduced into this country, one of the first years of this century, as a remedy for the gout,* and it was

* See a clear exposition of the History and virtues of this medicine, in a work entitled "An Account of the remarkable Effects of the Eau Medicinale D'Husson, on the Gout." By Edwin Godden Jones, M. D. London, 1810.

found peculiarly beneficial in a great number of cases, particularly in that of Sir Joseph Banks, President of the Royal Society. A few years afterwards, it was discovered that a vinous tincture of the *colchicum autumnale* had the same virtue, and little doubt was entertained of the identity of this, and the secret medicine; and Sir Joseph Banks, among others, has experienced exactly the same effects from both. About the same time, a passage was noticed in the works of Alexander Trallian, a physician who practised in Asia Minor, in the 4th century, ascribing similar effects to a medicine, called hermodactyls. This was naturally supposed to be the same with the colchicum; but as there was no description of it in any ancient author, this was merely matter of conjecture, till enquiry having been made at Constantinople, it was discovered, that there was an herb still bearing that name brought from the Islands of the Archipelago, and specimens of it being transmitted to Sir Joseph, it was actually found to be a colchicum. Sir Joseph Banks, and others, have used

a vinous tincture of the root of this herb with the same good effects as the French nostrum, and to these proofs of the identity of their operation, I can add my own experience in a great number of cases of articular gout in which I have prescribed it. Here was a most valuable piece of knowledge, lost to the world for many ages, from the want of a description of the article, which, on that account could not be recognized from one age and country to another. And we see what incalculable advantage must result to medicine in general, from the cultivation of natural knowledge, from this consideration, as well as others already stated; an advantage peculiar to the present age, for never till now, have the various objects of natural history, particularly of botany, been so described, that in all ages to come, however remote, no ambiguity can arise, regarding the identity of the remedies recommended, among the medical practitioners of this, or any future age.

From the like consideration, we see a reason for the adoption of the scientific and systematic terms, in the *materia medica* and pharmacopœia, in preference to those loose and trivial names, of which the true import could never be ascertained by our posterity. But, for the like reason, the terms which have been abolished, and which have passed into desuetude, should be kept upon record, with explanations annexed to them; for there are many of the titles of medicines, especially of those that are compound, which are already so far forgotten, that much of the practical knowledge, contained in the works of the authors of the 16th, 17th, and even in the beginning of the 18th century, such as Hoffman,* is nearly lost. Their titles are so obscure and quaint, as to convey no knowledge of their ingredients, and it is next to impossible, for a common reader, to find a description of them, to serve as a key to the author's meaning. It would

* There is a translation into English, of the practical parts of this author, which for want of a glossary for the compound medicines, is of little value.

add greatly to the value of pharmacopœias, if a glossary to these compositions were annexed to them, in place of studiously avoiding all mention of obsolete terms, as is the custom in these works. A work explanatory of the old formulas of medicine would be extremely useful, and is a *desideratum* in medical literature.

There is still another circumstance deserving of mention, for which due allowance should be made in the writings of the ancients, as it contributes to the uncertainty of the knowledge transmitted to us in their writings : errors of transcriptions are incident to all subjects ; but more particularly to those that are professional and technical, because being less understood by transcribers than subjects of general knowledge, substitutions and omissions are more likely to occur.

On this subject of medical testimony, it is necessary to beware of scepticism, as well as credulity. Thenumerous instances in which boast-

ed remedies, and plans of cure, proposed by practitioners, are found to fail in the hands of others, produce a fastidiousness, which is occasionally carried to excess. It has already been remarked, that from the diversity of constitutions, the same remedies will not universally succeed. If a medicine therefore, newly recommended, on respectable authority, should not be found to answer to its character, on its first trial, it should not be abandoned. I can exemplify this in myself. About fifty years ago, the volatile tincture of *guaiacum* or *tinctura guaiaci ammoniata*, in doses of half an ounce, was proposed confidently by Dr. Dawson, on his own experience, as a remedy in acute rheumatism, to be administered after the fever had been lowered by the use of some evacuating medicines. My first trials of this practice were so discouraging, that I laid it aside for several years, and the more readily, that it did not seem very consonant to reason, that a medicine, so stimulant, could be adapted to a disease in which there was so much heat, and excitement: but on re-

turning to its use, I found that there were cases, in which it succeeded to my utmost wish. It seemed to be best adapted to the habits in which there was scrofula, or a constitution allied to it.

The mention of Scrofula, reminds the Author of some remarks which he has omitted to introduce in their proper place, in the 4th section of this work ; but as they are of practical importance, he takes leave to subjoin them here. The most distinctive point in the treatment of scrofulous constitutions is, that they not only bear, but require, both medicines and diet of a more stimulating and cordial nature than ordinary subjects. He was led to make this remark in his practice particularly with regard to the means of prevention, from having under his care, some large families affected with this natural predisposition, for such it may more properly be termed than actual disease, for the morbid manifestations of it may lie latent for life, unless excited by external circumstances. He observed that, in the families alluded to, certain articles of diet, such

as wine, strong malt liquor, and a free use of animal food, which in other children would have excited morbid heat and repletion, was the most salutary system of diet in these scrofulous temperaments. The following practical illustration of this in a work on this subject, of the Author's ingenious friend, Mr. James Russel, of Edinburgh, is so apposite, that he cannot abstain from referring to it. In a large family of children belonging to scrofulous parents, one half of them in childhood fell under the care of a medical attendant, who recommended the use of vegetable and meagre diet and nothing but watery beverages. They became all affected with glandular tumors, and other scrofulous disorders. The other half of the children fell under the care of a practitioner, who advised a diet of animal food and a reasonable proportion of fermented liquor. They were all exempt from scrofulous affections. There is an analogous remark which the Author himself has made, with regard to adults possessing this temperament, and in such a number of instances, that

there can be no doubt of its truth. It is that when grown persons of this description addict themselves to intemperance, it produces neither schirrous liver, dropsy, nor even otherwise injures health to the same degrees as in other constitutions.

CONCLUSION.

I HAVE thus exhausted the enumeration I made of the various causes which obstruct, or retard, the progress of practical medicine, namely, the errors and abuses arising out of false or misapplied theory; the great diversity observable in the constitution of individuals; the difficulty of appreciating the efforts of nature, and of discriminating them from those of art: superstition: the ambiguity of language: and the fallacy of testimony.

It will probably not have escaped the intelligent reader, that there are two other causes,

neither uncommon, nor unimportant, which should not have been omitted in this enumeration. These are, the inveterate attachment to pre-conceived opinions, and the excessive devotion to authority. The reason for these omissions, were, 1st, that the purpose of this discussion was to advert only or chiefly, to those causes which are peculiar to medicine. These two are common to all other branches of knowledge, except perhaps mathematics. 2dly, they have already been so fully adverted to, incidentally, as to render it unnecessary any further to enforce, or exemplify them. It may, however, be remarked that, they are both ultimately founded on the same principle of human nature. Man, from his earliest infancy, has a strong instinctive propensity to imitate his fellow creatures around him, a faculty on which the acquisition of language and other attainments depend. The same principle leads him, in early life, to conform to the example of his parents, instructors, or casual associates, in regard to all his actions and opinions; and these, in a majority of characters,

become so rivited in their nature, that, let them be ever so erroneous or absurd, they become utterly incorrigible and indefeasible by adult reason. This, combined in some cases with indolence, leads us to acquiesce in our own opinions and those of others without due examination. This has been pointedly illustrated at page 110 of this work, by an example drawn from the cure of typhous fever; and the two sources of error above mentioned have been already so strongly adverted to in other passages, that it seems superfluous to treat them separately. What stronger example or proof, for instance, could there be adduced, of the pertinacious adherence to pre-conceived opinions in the face of evidence, than what has been adduced with regard to the contagious nature of one of the forms of the yellow fever? and what more impressive exemplification could be alleged of the blind deference to authority, than what has been narrated at so much length with regard to Boerhaave?

With regard to this freedom and independence of opinion, we are here called upon to caution youth against falling into the contrary extreme, which consists in self sufficiency, flippancy, and an affectation of singularity. For after all, the excessive deference to authority, is to be considered only as an exception or exaggeration of what is in itself one of the best guides of human conduct, namely, the respect due to the example and accumulated experience of those who have preceded us in the race of mortal existence.

Before quitting this subject, there is just one other misleading principle, which ought not entirely to escape animadversion: I mean FASHION. This exercises its dominion chiefly over persons out of the profession, but is not without its influence on the members of it. It is evidently referable to the head of authority; for the devotion blindly paid to it, implies the acknowledgment of a certain superiority, to which we are called to sacrifice our own reason and judgment, but which it is the great object of cul-

tivated reason in independent minds, to resist and cast off with disdain.

From the picture that has been exhibited, of the innumerable doubts and difficulties which clog the attainment of medical knowledge, and embarrass the application of it to practical purposes, the timid, sceptical, and indolent, may be discouraged from studies apparently so arduous in their prosecution, and so questionable as to the efficiency, and utility of their result. But it is not from characters of this description, that any good can be expected in any of the useful arts of life. If a like despondency were to pervade mankind in general, there would be an end to all that enterprize and energy, which alone can enable them to act up to their destiny, and follow up those pursuits, upon which the perfection of their nature depends. As the senses would have lain dormant for ever had there been no external objects to stimulate them, so the faculties and virtues, which characterize rational nature and civilized life, could never have been de-

veloped, but through the excitement of those pains, wants, difficulties, and dangers, inseparable from human life. By no other arrangement could our duties, our happiness, our mental and bodily perfections, have been bound together in one harmonious and consistent system. Let us compare the art of medicine, under this aspect, with those of navigation and agriculture. Had man been furnished by the Creator with wings, by which he could have traversed all seas and oceans, so as to supersede the use of ships, where would have been that hardihood of character, and all those ingenious devices, which have called forth the active energies and deep researches of the human mind? If, contrary to the actual institutions of Providence, the life of man had been sustained by the spontaneous productions of nature, instead of the products of industry, neither the faculties of the mind, nor the powers of the body, could ever have been developed; man would have been little superior to the brutes; his active and inventive energies would

have lain asleep for ever; there would have been no room for the talents exercised in the procuring of food, raiment, and shelter, nor in commercial intercourse: all the mutual and endearing ties, and dependences of social and civilized life, all trades, professions, arts, and sciences, whether ministering to accommodation or elegance, constituting man's greatest felicity, whether as objects of pursuit or enjoyment, would have been unknown, and untasted.

It is obvious, that this reasoning being founded on a general law of Nature, must apply equally to Medicine. In a probationary existence, it was necessary that man should be tried, not only by pain and sickness, but by the difficulties of remedying them, as exercises of virtue and ingenuity: Why should the road to medical relief lie through fewer and lighter struggles and dangers, than those of navigation and agriculture?—But the subject is more concisely and emphatically illustrated by the philosophical poet, than

by any amplitude of illustration, or farther multiplicity of words which I could employ:

——— Pater ipse colendi (*medendi*),
Haud facilem esse viam voluit, primusque per artem,
Movit agros, (*ægros*) curis acuens mortalia corda.

INDEX.

A.

Abdomen, the Diseases of it, the most curable of any, 225.

Abortion, prevented by suppositories of Opium, 121.

Absorption, one of the means of carrying on growth and repair, 88.—The great importance of it towards a theory of diseases, 178.

Abuse, the best things most liable to it, 19.

Agency, the actuating, to be distinguished from the influential, 74.

Agriculture—illustrations borrowed from it, 220, 296.

Albumen found in the urine of hydropic patients, 128.

Alexander the Great, his method of dispelling sleep, 100.

Alexander, Dr., his experiments on putrefaction, 48.

Animal Life, the most complicated of all the agencies of Nature, and its results the most difficult to be ascertained *a priori*, 39.

Amputation, immediate, to be preferred in most cases, 229.

Anatomy, its utility questioned, 180; vindicated, 182.

Apologies for the non-contagionists, 259, et seq.

Apparitions accounted for as morbid appearances, 279.

Appetitive Principle illustrated and explained, 140.

Art, definition of it, 9; its interference with Nature, is an abuse of it, 19.—Importance of discriminating its operations from those of Nature, 223.

Artificial ills to be corrected by artificial remedies, 25.

Assimilative Principle, 69; not imitable by chemistry, 70.—Its analogy to the Voltaic process, 71; not referable to nervous power, 73; creates only fluids, 77.

Association and habit founded on the constancy of the laws of Nature, 28.—Necessary to human existence and well-being, 195; casual or

collateral, one of the chief causes of error, by creating false catenations of cause and effect, 37.
Aristotle, a great observer of Nature, 160.
Atmosphere, the weight of its pressure on the surface of the body, 113.
Authority, the excessive devotion to it adverted to, 281, et seq; too little respect for it also to be avoided, 285.
Automatick Life, what is meant by it, 137.
Azote, elaborated by the processes of life, 71.

B.

Bacon, Lord, infected with credulity, 23; but the great improver of science, 167; rejected wrongfully, final causes from philosophy, 162.
Bainton, Mr., his excellent method of treating ulcers, 114.
Banks, Sir Joseph, found colchicum a remedy for gout, 282.
Barbadoes, the yellow fever prevented there by separation, 265.
Bichat, M. distinguishes life into animal and organic, 137.
Blood, its motion sustains life, 108.
Blackall, his observations on dropsy, 269.

Blumenbach, his idea of the Formative process, 44; that it is a continuation of the Generative, 85.
Boerhaave, his doctrines unfounded and detrimental, 169.
Botany, of great advantage in perpetuating the knowledge of medicines, 283.
Boyle, his recommendation of a fantastick remedy, 186.
Brown, Dr. John, his system considered, 67.

C.

Cadiz, the yellow fever more frequent there, than any where in Europe, 255.
Celsus commended, 199.
Chemical affinity, the most simple agent in Nature, and therefore the most easily, and certainly ascertained, 38.—Changes, the effect of medicines not referable to them, 81.
Child-bed, the treatment of hæmorrhage occurring after it, 117, et seq.
Chorea Sancti Viti, various methods of curing it, 215.
Cicero, his remark on the cultivation of medicine, 198.
Cicuta a useful remedy in the cure of gravel, 82.

Circulation of the blood, the knowledge of it not applicable to practical medicine, 167.

Cold affusion in fever, rules for the application of it, 66.

Colchicum found to be a specific for the gout, 282.

Combustion, spontaneous, of the living human body not fully proved, 66.

Conservative Principle explained, 47; first clearly stated by J. Hunter, 48.

Constancy of Nature—the frame and functions of the mind and body are adapted to it, 27–138.

Constitutions, their diversity—one of the sources of practical errors, 201; have not been duly considered as influencing practice, 208.

Consumption, the definition of it, 225.

Crawford, Dr., his experiments on the origin of animal heat not satisfactory, 59.

Credulity, one of the main causes of errors in medicine, 22; the learned as much infected with it as the illiterate, 22–23.

Curability, the various degrees of it in different classes of diseases, 225.

Cullen, his great merit in the philosophy of heat, 57; in defining the principles of life, as distinguished from those of dead matter, 173.

D.

Determination of fluids, general and specific, 126; false productive of disease, 130—compared to the Galvanic process, 129.
Diabetes, an error loci of the alimentary fluids, 92.
Digitalis, a specific in hydrothorax, 194.
Dogmatism, compared with empiricism, 199.
Dropsy, an *error loci* of the fluids is one of its causes, 93—remarks on its nature and treatment, 267.

E.

Eau, Medicinale, a remedy in gout, 281.
Elaterium, its powers as a hydrogogue and sorbefacient purge, 117.
Elementary principles of life enumerated, 41.
Empiricism, enlightened, the best guide of practice, 193; compared with dogmatism, 199.
Erysipelas, some cases of it contagious, 260.
Euthanasia, it what it consists, 52.
Exceptions, the danger of erecting them into rules, 208.
Excitability of Brown explained, 67.
Exercise, necessary to the soundness and perfections of the vital organs, 132.

Exotosis, a morbid act of growth, 93.
Experimentum crucis, whence that expression derived, 38.
Eye, adapted to the properties of light, 30, 138.

F.

Fashion, the power of it, 294.
Fatalism, its pernicious effects, 235.
Fever, the heat of, does not exceed, 110° or 112°, 65; when excited by a morbid poison, the constitution becomes insensible to it, 104; when excited by morbid poisons a salutary process, 105.
Final causes—the consideration of them of great use in investigating Nature, 162.
Fluids, are indued with life, 79; the consideration of them not to be neglected in practical medicines, 175.
Food, what is solid and plain, more invigorating than what is fluid or concentrated, 114.
Formative principle explained, 84.
Fox's lungs, a supposed remedy for asthma, 185.

G.

Galen, his absurd theory, 165.
Galvanism, not identical with the nervous power, but an exciter of it, 71.
Gangrene, produced by a defect of the Conservative principle, 49.
Generative principle, defined and expounded, 43.
Gibraltar, the history of the epidemick which prevailed there, 254.
Gout, quite unknown among hard-labouring people, 133; brought on by excess of animal food, fermented liquor, sleep, and exemption from labour, 134; cured by Eau de Husson, and colchicum, 282—et seq. 282.
Gravel—opium, a principal remedy in the cure of it, 82.
Gravitation—the whole frame of the body adapted to it, 28.
Grecian philosophy, originally instituted on the soundest principles of observation, 159.
Growth, the process of it explained, 88.

H.

Habit and association necessary to our well-being and existence, 28; the foundation of all useful practical attainments, 197.

Hamilton, Dr. remarks on his work on purgative medicines, 213.

Head, the diseases of it the most incurable of all others, 224.

Heat, very little variation in the standard of it in individuals of the same species, 53; but different in different species, 54; very high in birds and insects, 54; arguments in favour of its chemical origin, 55; in favour of its depending on a vital generating power, 57, et seq.; remains for several hours after death, from apoplexy and insolation, as high as during life, 56; a main element of health and disease, 62; its excess, defect, and salutary medium, consisted in its state of actual excitement, 63; its generating power in vegetables, 59; a symptom of disease, 65.

Healing process—grounded on the Formative principle, 93.

Hæmorrhage, life saved by opium and brandy, in cases of profuse and dangerous, 116; active distinguished from passive, 117; treatment of it after child-birth, 117, et seq.

Hermodactyls, proved to be identical with Colchicum, 282.

History of Diseases necessary for their cure, 119.

Horses, better nourished by food, hard and dry, than by what is succulent, 115.
Hippocrates, his observations on epidemics invaluable, 126 ; a great observer of Nature, but fell into absurd theories, 164.
Hope, Dr. John, his observations on the vine, 141.
Hufeland, his account of the relative numbers of male and female births, 44.
Hume, his metaphysical doctrines adverted to, 31.
Humoral pathology—fallacious, 174.
Hunter, John, his great excellence as a physiologist, 48 ; proved that there is a generating power of heat in vegetables, 59 ; the first who explained the process of growth, 88.
Hunter, Dr. W., his excellence as a teacher, 168.
Hutchinson, Mr. Copland, recommends immediate amputation after wounds, 230.

I.

Inflammation—an emanation of the Formative process, 94.—Boerhaave's theory of it, 171 ; refutation of it, 172.
Imitative faculty—its early manifestations necessary to human life and conduct, 292.

Instinct, in what it consists, 32.
Intemperance not so hurtful to scrofulous subjects, as to others, 286.
Involution of embryos an irrational theory, 43.

K.

Kepler—conceived the earth and heavenly bodies to be animated, 87.
Knight, Mr. T. A., his papers on vegetable physiology, and his observations in proof of the sympathy of their roots and stems, 148.

L.

Labor, succeeded by hæmorrhage, 118.
Labour, indispensable to health, 132.
Language, comes under the definition of an art, 10; its formation implies a very subtle operation of mind even among the most young and illiterate, 35.
——— ambiguous, a great source of error, 293.
Lemon juice, a certain cure and prevention of sea-scurvy, 194, 244.
Life, regulated by laws peculiar to itself, 39, 167; its elementary principles enumerated, 41.
Lisbon, the first place in Europe where the yellow fever appeared, 253.

Living bodies, all the changes and motions of them referable to vital action, 77.

——— principle of Mr. Hunter stated, 49.

Locke—the most valuable part of his work on the Understanding, is that on the abuse of words, 244.

Lymphatick system, no sound nor available physiology before its discovery, 178.

M.

Magnetism, Animal, an imposture, 276.

Malting generates heat, 59.

Matter, the question relating to its existence adverted to, 32.

Marcet, Dr., his analysis of chyme, 57 ; and of dropsical fluids, 70.

Mayerne, Sir Theodore, his fantastical remedies, and his merits, 238.

Medicine—embraces the widest range of knowledge of any of the liberal arts, 33 ; enumeration of the sources of error, in it, 156.

Mercury—its operation consists in the absorption of solid parts, 90.

Mind, its constitution adapted to the laws of external nature, 26 ; particularly to their constancy, *ibid*, et seq.

Motive principle, 110; inefficient without tension, 111; not to be accounted for on any mechanical principle, *ibid.*

Mystery, favours false opinions of the virtues of medicines, 243.

Muscular action not created by nervous energy, 123.

N.

Nature, the difficulty of appreciating the effects of, and of discriminating them from those of art, 221; knowledge of it banishes superstition, 159; is highly useful, 183.

Natural History, its great utility in perpetuating the knowledge of medicines, 283.

Natural Philosophy, in its first application to medicine hurtful, 166.

Navigation, an illustration taken from it, 296.

Nervous System, its connection with the muscular system, 121; not necessary to life, 122; except where there is sensation and voluntary motion, *ibid.*

O.

Observation, distinguished from experiment, 26; what constitutes it, 193.

Old age very subject to Plethora, rendering bleeding necessary, 94; subject to salutary spontaneous hæmorrhage, 95.

Opium of essential benefit in the cure of gravel, 82, in hæmorrhage, 117, 120; its variety of effects in proof of the diversity of constitutions, 205.

Oxygene, plays an interesting part in all the operations of Nature, 60.

P.

Pare, Ambrose, commended, 227.

Philadelphia, yellow fever there, 252.

Pichegru, General, anecdotes of him, 98; his habits with respect to sleep, 98.

Physic, art of, in what it consists, 11; disparagement of it, 12; vindication of it, 13, et seq.

Placenta being without nerves, these cannot be necessary to assimilation and growth, 75.

Poisons, morbid, excite a self-healing fever, 104. The elimination of it not an object of practice, 175.

Plague, can exist only under one range of temperature, 261.

Portal, found the heat of the body unchanged many hours after death from apoplexy, 55.

Power, from whence we derive the idea of it, 32.
Pressure, natural, its beneficial effects, 113.
————, artificial, its beneficial effect, 114.
Privations tend to shorten life, 135.
Putrefaction prevented in living organic bodies, by the inherent powers of life, 47, et seq; comes on sooner after death in some circumstances than in others, 50.
Purgative medicines: discrimination necessary in the use of them, 216; different species of them, act upon different organs, and evacuate different humours, 217; the advantage of mixing them, 218.

Q.

Quackery, accounted for, 185, 273.
Quarantine effectually excludes the malignant fever, 257, 264.

R.

Reason, in what it consists, 10; tends to obliterate instinct, 14.
Reductio ad absurdum a form of argument applicable to physical and moral, as well as mathematical subjects, 33, 67.

Remedies, their number co-ordinate with the diversity of disease, 16; their virtues cannot be ascertained by experiments on healthy subjects, 109.
Respiration, its effect on temperature, 60, et seq. on the vital powers, 61.
Restorative Principle expounded, 98.
Rheumatism, acute, cured by Tinctura Guaiaci Ammoniata, 286
Russell, Mr. James, his excellent observations on scrofula, 288.

S.

Salivary glands the outlet of the effete matter of the bones, 90.
Savages not so long-lived as civilized nations, 13; a great part of their misery consists in the want of artificial remedies, ibid.
Sanguiferous system, its great importance to life, and as the subject of medical action, 108.
Scepticism, a disease of the mind, 21; the offspring of superficial knowledge, 13.
Scrofula, prevented by generous diet, 286.—Intemperance does not impair the constitution, ibid.

Scurvy, Sea, its prominent cause, 93.—The fatal errors which have arisen from its ambiguity, 244, et seq.

Sea-sickness, an apt example of the unaccountable peculiarity of constitutions, 204.

Sexes, the successive generation of two does not follow the laws of chance in individuals, yet in a steady ratio on the average of the whole species, 44.

Sedatives, their great benefit in the cure of gravel, 82.

Self-delusion, no bounds can be set to it, 276.

Sensation of a member may be lost, while its voluntary motion and circulation remain, 139; can be excited by the imagination, 286.

Senses, have all a reference to the external world, 28, 30, 218.

Sensitive principle, illustrated, 136—its perfection consists in its fidelity to nature, 138.

Sims, Dr. John, his experiment in proof of the sympathetic principle in vegetables, 146.

Sleep, a branch of the restorative principles, 96. Indispensable to life, 97—may without injury be shortened by habit, 99—its principal refreshment is at first falling asleep, 99; a practical application of this, 100; incident to veg-

etables, 102; excess of it the cause of gout and other chronic disorders, 134.
Small Pox, an exemplification of the diversity of constitution, 204.
Solano, his account of the pulse imaginary, 278.
Solids, all assimilative changes referable to them as a cause, 77; they alone are the subjects of medical action, 80; the doctrine of them first taught by Themison among the ancients; by Glisson, Willis, Hoffman, and Baglivi, among the moderns, 169.
Stahl, his theory for accounting for the Formative process, 86.
Stewart, Professor Dugald, commended, 32.
Stomach, its universal sympathy, strong power, and importance, 83. Its strong action invigorates the whole muscular system, 114, 132.
Superstition, one of the main sources of error, 235; its practices and suggestions should not in all cases be disregarded, 240.
Sydenham, his error in dissuading in all cases from venesection in aged people, 95; his absurd theories, 165.
Syllogistic Logic appreciated, 169.
Sympathetick principle illustrated, 44.
Sympathy—generally, but not always carried on through the nerves, 145; exists in vegetable life, 146.

T.

Temperaments, the diversities which constitute them, 203.
Temperative principle explained, 53.
Tension, a beneficial stimulus, 83; necessary to muscular action, 111; and to life itself, 112; its effects on the stomach, 114.
Testimony, the fallacy of it one of the sources of error, 271.
Themison, the first who taught the doctrine of the solids, 169.
Theory, the difficulty owing to the number of principles at work in the animal economy, 152; though false, it may be of practical utility, 189.
Thorax, observations on its diseases, 95.
Tractors, metallic, an imposture, 277.
Typhous Fever, an example drawn from it, of the necessity of varying practice, 210.

U.

Ulcers, cure of them by strapping, 114.
Union of wounds by the first intention, 107.
Urine, composed of the effete parts of the fluids and solids, 89.
Urinary concretions, probable origin of them, 92.

V.

Van Helmont, his method of accounting for the Formative process, 86.

Vegetables possess a generating power of heat, 59; subject to sleep, 102; their vitality as genuine as that of animals, 122; possess an Appetitive principle, 141; and Sympathy 146.

Vis medicatrix Naturæ manifested in the spontaneous cure of accidents and diseases, 102.

Voltaic process, its analogy to the Formative process, 72–76; the specific determination of fluids analogous to it, 129.

W.

Witchcraft, the prevalence of the belief in it, and the punishment of it as a crime in England, Scotland, and America, 237.

Wounds, their spontaneous cure, 93; their cure by the first intention, 106; great errors in the treatment of them, 227; gun-shot in the thorax, healed best in those who were left all night on the field of battle, 229.

Y.

Yellow Fever, the controversies regarding it, an example of the practical errors arising out of the ambiguity of language, 247, et seq; three species of fever pass under this name, 248; enumeration of its occurrences in the West-Indies, 250; in America, 252; in Europe, 253; the pestilential species incident only once in life, 257, et seq; communicated from ship to ship at sea, 258; prevented at Barbadoes by separation, 265; spread at the other islands from want of separation, 265.

THE END.

PROPOSALS

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AMERICAN MONTHLY JOURNAL OF MEDICINE.

CONDUCTED BY AN ASSOCIATION OF PHYSICIANS AND SURGEONS.

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