PART I.

OBSERVATIONS ON THE FRAME OF THE HUMAN BODY AND MIND, AND ON THEIR MUTUAL CONNEXIONS AND INFLUENCES.

INTRODUCTION.

MAN consists of two parts, body and mind.

The first is subjected to our senses and inquiries, in the same manner as the other parts of the external material world.

The last is that substance, agent, principle, &c. to which we refer the sensations, ideas, pleasures, pains, and voluntary motions.

Sensations are those internal feelings of the mind, which arise from the impressions made by external objects upon the several parts of our bodies.

All our other internal feelings may be called ideas. Some of these appear to spring up in the mind of themselves, some are suggested by words, others arise in other ways. Many writers comprehend sensations under ideas; but I every where use these words in the senses here ascribed to them.

The ideas which resemble sensations, are called ideas of sensation: all the rest may therefore be called intellectual ideas.

It will appear in the course of these observations, that the ideas of sensation are the elements of which all the rest are compounded. Hence ideas of sensation may be termed simple, intellectual ones complex.

The pleasures and pains are comprehended under the sensations and ideas, as these are explained above. For all our pleasures and pains are internal feelings, and conversely, all our internal feelings seem to be attended with some degree either of pleasure or pain. However, I shall, for the most part, give the names of pleasure and pain only to such degrees as are considerable;
referring all low evanescent ones to the head of mere sensations and ideas.

The pleasures and pains may be ranged under seven general classes; viz.

1. Sensation;
2. Imagination;
3. Ambition;
4. Self-Interest;
5. Sympathy;
6. Theopathy; and,
7. The Moral Sense; according as they arise from,
   1. The impressions made on the external senses;
   2. Natural or artificial beauty or deformity;
   3. The opinions of others concerning us;
   4. Our possession or want of the means of happiness, and security from, or subjection to, the hazards of misery;
   5. The pleasures and pains of our fellow-creatures;
   6. The affections excited in us by the contemplation of the Deity; or
   7. Moral beauty and deformity.

The human mind may also be considered as endowed with the faculties of memory, imagination, or fancy, understanding, affection, and will.

Memory is that faculty by which traces of sensations and ideas recur, or are recalled, in the same order and proportion, accurately or nearly, as they were once actually presented.

When ideas, and trains of ideas, occur, or are called up in a vivid manner, and without regard to the order of former actual impressions and perceptions, this is said to be done by the power of imagination or fancy.

The understanding is that faculty by which we contemplate mere sensations and ideas, pursue truth, and assent to, or dissent from, propositions.

The affections have the pleasures and pains for their objects; as the understanding has the mere sensations and ideas. By the affections we are excited to pursue happiness, and all its means, and to fly from misery, and all its apparent causes.

The will is that state of mind which is immediately previous to, and causes, those express acts of memory, fancy, and bodily motion, which are termed voluntary.

The motions of the body are of two kinds, automatic and voluntary. The automatic motions are those which arise from the mechanism of the body in an evident manner. They are called automatic, from their resemblance to the motions of automata, or machines, whose principle of motion is within themselves. Of this kind are the motions of the heart, and peristaltic motion of the bowels. The voluntary motions are those which arise from ideas and affections, and which therefore are referred to the mind; the immediately preceding state of the mind, or of

the ideas and affections, being termed will, as noted in the last article. Such are the actions of walking, handling, speaking, &c. when attended to, and performed with an express design.

This may serve as a short account of the chief subjects considered in the first part of these observations. These subjects are so much involved in each other, that it is difficult, or even impossible, to begin any where upon clear ground, or so as to proceed entirely from the data to the quaestio, from things known to such as are unknown. I will endeavour it as much as I can, and for that purpose shall observe the following order.

First, I shall lay down the general laws, according to which the sensations and motions are performed, and our ideas generated.

Secondly, I shall consider each of the sensations and motions in particular, and inquire how far the phenomena of each illustrate, and are illustrated by, the foregoing general laws.

Thirdly, I shall proceed in like manner to the particular phenomena of ideas, or of understanding, affection, memory, and imagination; applying to them what has been before delivered.

Lastly, I shall endeavour to give a particular history and analysis of the six classes of intellectual pleasures and pains; viz. those of imagination, ambition, self-interest, sympathy, theopathy, and the moral sense.
THE

DOCTRINES OF VIBRATIONS

AND

ASSOCIATION IN GENERAL.

CHAP. I.

THE GENERAL LAWS ACCORDING TO WHICH THE SENSATIONS AND MOTIONS ARE PERFORMED, AND OUR IDEAS GENERATED.

My chief design in the following chapter is briefly to explain, establish, and apply the doctrines of vibrations and association. The first of these doctrines is taken from the hints concerning the performance of sensation and motion, which Sir Isaac Newton has given at the end of his Principia, and in the Questions annexed to his Optics; the last, from what Mr. Locke, and other ingenious persons since his time, have delivered concerning the influence of association over our opinions and affections, and its use in explaining those things in an accurate and precise way, which are commonly referred to the power of habit and custom, in a general and indeterminate one.

The doctrine of vibrations may appear at first sight to have no connexion with that of association; however, if these doctrines be found in fact to contain the laws of the bodily and mental powers respectively, they must be related to each other, since the body and mind are. One may expect, that vibrations should infer association as their effect, and association point to vibrations as its cause. I will endeavour, in the present chapter, to trace out this mutual relation.

The proper method of philosophizing seems to be, to discover and establish the general laws of action, affecting the subject under consideration, from certain select, well-defined, and well-attested phenomena, and then to explain and predict the other phenomena by these laws. This is the method of analysis and synthesis recommended and followed by Sir Isaac Newton.

I shall not be able to execute, with any accuracy, what the reader might expect of this kind, in respect of the doctrines of vibrations and association, and their general laws, on account of the great intricacy, extensiveness, and novelty of the subject. However, I will attempt a sketch in the best manner I can, for the service of future inquirers.

SECT. I.

THE DOCTRINE OF VIBRATIONS, AND ITS USE FOR EXPLAINING THE SENSATIONS.

PROF. I.—The white medullary Substance of the Brain, spinal Marrow, and the Nerves proceeding from them, is the immediate Instrument of Sensation and Motion.

Under the word brain, in these observations, I comprehend all that lies within the cavity of the skull, i.e. the cerebrum, or brain properly so called, the cerebellum, and the medulla oblongata.

This proposition seems to be sufficiently proved in the writings of physicians and anatomists; from the structure and functions of the several organs of the human body; from experiments on living animals; from the symptoms of diseases, and from dissections of morbid bodies. Sensibility, and the power of motion, seem to be conveyed to all the parts, in their natural state, from the brain and spinal marrow, along the nerves. These arise from the medullary, not the cortical part, every where, and are themselves of a white medullary substance. When the nerves of any part are cut, tied, or compressed in any considerable degree, the functions of that part are either entirely destroyed, or much impaired. When the spinal marrow is compressed by a dislocation of the vertebrae of the back, all the parts, whose nerves arise below the place of dislocation, become paralytic. When any considerable injury is done to the medullary substance of the brain, sensation, voluntary motion, memory, and intellect, are either entirely lost, or much impaired; and if the injury be very great, this extends immediately to the vital motions also, viz. to those of the heart, and organs of respiration, so as to occasion death. But this does not hold equally in respect of the cortical substance of the brain; perhaps not at all, unless as far as injuries done to it extend themselves to the medullary substance. In dissections after apoplexies, palsies, epilepsies, and other
distemper affecting the sensations and motions, it is usual to find some great disorder in the brain, from preternatural tumours, from blood, matter, or serum, lying upon the brain, or in its ventricles, &c. This may suffice as general evidence for the present. The particular reasons of some of these phenomena, with more definite evidences, will offer themselves in the course of these observations.

Prop. II.—The white medullary Substance of the Brain is also the immediate Instrument, by which Ideas are presented to the Mind: or, in other words, whatever Changes are made in this Substance, corresponding Changes are made in our Ideas; and vice versd.

The evidence for this proposition is also to be taken from the writings of physicians and anatomists; but especially from those parts of these writings which treat of the faculties of memory, attention, imagination, &c. and of mental disorders. It is sufficiently manifest from hence, that the perfection of our mental faculties depends upon the perfection of this substance; that all injuries done to it affect the trains of ideas proportionably; and that these cannot be restored to their natural course till such injuries be repaired. Poisons, spirituous liquors, opiates, fevers, blows upon the head, &c. all plainly affect the mind, by first disordering the medullary substance. And evacuations, rest, medicines, time, &c. as plainly restore the mind to its former state, by reversing the foregoing steps. But there will be more and more definite evidence offered in the course of these observations.

Prop. III.—The Sensations remain in the Mind for a short time after the sensible Objects are removed.

This is very evident in the sensations impressed on the eye. Thus, to use Sir Isaac Newton's words, "If a burning coal be nimbly moved round in a circle, with gyrations continually repeated, the whole circle will appear like fire; the reason of which is, that the sensation of the coal, in the several places of that circle, remains impressed on the sensorium until the coal return again to the same place. And so in a quick consecution of the colours," (viz. red, yellow, green, blue, and purple, mentioned in the experiment, whence this passage is taken). "The impression of every colour remains on the sensorium until a revolution of all the colours be completed, and that first colour return again. The impressions therefore of all the successive colours are at once in the sensorium—and beget a sensation of white." Opt. b. I. p. 2. Experiment 10.

Thus also, when a person has had a candle, a window, or any other lucid and well-defined object, before his eyes for a considerable time, he may perceive a very clear and precise image thereof to be left in the sensorium, fancy, or mind (for these I consider as equivalent expressions in our entrance upon these disquisitions,) for some time after he has closed his eyes. At least this will happen frequently to persons who are attentive to these things in a gentle way; for, as this appearance escapes the notice of those who are entirely inattentive, so too earnest a desire and attention prevents it, by introducing another state of mind or fancy.

To these may be referred the appearance mentioned by Sir Isaac Newton, Opt. Qu. 16. viz. "When a man in the dark presses either corner of his eye with his finger, and turns his eye away from his finger, he will see a circle of colours like those in the feather of a peacock's tail. And this appearance continues about a second of time after the eye and finger have remained quiet." The sensation continues therefore in the mind about a second of time after its cause ceases to act.

The same continuance of the sensations is also evident in the ear. For the sounds which we hear are reflected by the neighbouring bodies, and therefore consist of a variety of sounds, succeeding each other at different distances of time, according to the distances of the several reflecting bodies; which yet causes no confusion or apparent complexity of sound, unless the distance of the reflecting bodies be very considerable, as in spacious buildings. Much less are we able to distinguish the successive pulses of the air, even in the gravest sounds.

As to the senses of taste and smell, there seems to be no clear direct evidence for the continuance of their sensations after the proper objects are removed. But analogy would incline one to believe, that they must resemble the senses of sight and hearing in this particular, though the continuance cannot be perceived distinctly, on account of the shortness of it, or other circumstances. For the sensations must be supposed to bear such an analogy to each other, and so to depend in common upon the brain, that all evidences for the continuance of sensations in any one sense, will extend themselves to the rest. Thus all the senses may be considered as so many kinds of feeling; the taste is nearly allied to the feeling, the smell to the taste, and the sight and hearing to each other. All which analogies will offer themselves to view when we come to examine each of these senses in particular.

In the sense of feeling, the continuance of heat, after the heating body is removed, and that of the smart of a wound, after the instant of infliction, seem to be of the same kind with the appearances taken notice of in the eye and ear.

But the greatest part of the sensations of this sense resemble those of taste and smell, and vanish to appearance as soon as the objects are removed.
THE DOCTRINES OF VIBRATIONS

PROP. IV.—External Objects impressed upon the Senses occasion, first in the Nerves, on which they are impressed, and then in the Brain, Vibrations of the small, and as one may say, infinitesimal, medullary Particles.

These vibrations are motions backwards and forwards of the small particles of the same kind with the oscillations of pendulums, and the tremblings of the particles of sounding bodies. They must be conceived to be exceedingly short and small, so as not to have the least efficacy to disturb or move the whole bodies of the nerves or brain. For that the nerves themselves should vibrate like musical strings, is highly absurd; nor was it ever asserted by Sir Isaac Newton, or any of those who have embraced his notion of the performance of sensation and motion, by means of vibrations.

In like manner we are to suppose the particles which vibrate, to be of the inferior orders, and not those biggest particles, on which the operations in chemistry, and the colours of natural bodies, depend, according to the opinion of Sir Isaac Newton. Hence, in the proposition, I term the medullary particles, which vibrate, infinitesimal.

Now that external objects impress vibratory motions upon the medullary substance of the nerves and brain (which is the immediate instrument of sensation, according to the first proposition) appears from the continuance of the sensations mentioned in the third; since no motion, besides a vibratory one, can reside in any part for the least moment of time. External objects, being corporeal, can act upon the nerves and brain, which are also corporeal, by nothing but impressing motion on them. A vibrating motion may continue for a short time in the small medullary particles of the nerves and brain, without disturbing them, and after a short time would cease; and so would correspond to the above-mentioned short continuance of the sensations; and there seems to be no other species of motion that can correspond thereto.

Con. As this proposition is deduced from the foregoing, so if it could be established upon independent principles, (of which I shall treat under the next,) the foregoing might be deduced from it. And on this supposition there would be an argument for the continuance of the sensations, after the removal of their objects; which would extend to the senses of feeling, taste, and smell, in the same manner as to those of sight and hearing.

PROP. V.—The Vibrations mentioned in the last Proposition are excited, propagated, and kept up, partly by the Æther, i.e. by a very subtle and elastic fluid, and partly by the Uniformity, Continuity, Softness, and active powers of the medullary Substance of the Brain, Spinal Marrow, and Nerves.

This proposition is chiefly an evidence and explanation of the foregoing; and accordingly might have been included in it.

However, as it is of great importance in the present subject, I thought it best to give it a distinct place and consideration.

Before I enter upon the proof of it, it will be proper to premise something by way of explanation, concerning the æther, and the qualities of the medullary substance just mentioned.

Sir Isaac Newton supposes, that a very subtle and elastic fluid, which he calls æther, for the sake of treating upon it commodiously under an appropriated name, is diffused through the pores of gross bodies, as well as through the open spaces that are void of gross matter. He supposes likewise, that it is rarer in the pores of bodies than in open spaces, and even rarer in small pores and dense bodies, than in large pores and rare bodies; and also that its density increases in receding from gross matter; so, for instance, as to be greater at the hundredth of an inch from the surface of any body than at its surface; and so on. To the action of this æther he ascribes the attractions of gravitation and cohesion, the attractions and repulsions of electrical bodies, the mutual influences of bodies and light upon each other, the effects and communication of heat, and the performance of animal sensation and motion. My business in these observations is only with the last; but the reader will do well to consult what Sir Isaac Newton has himself advanced concerning the existence of this æther, and the properties and powers which he has ascribed to it in the last paragraph of his Principia, the Questions annexed to his Optics, and the Letter from him to Mr. Boyle, lately published in Mr. Boyle’s Life. As to myself, I am not satisfied that I understand him perfectly on this subject. I will hint a few things partly from him, partly from my own reflections, concerning the existence and properties of this æther.

Since a thermometer kept in vacuo varies with the heat and cold of the room in which it is placed, as much as another surrounded by air; and since the small parts of hot bodies probably vibrate to and fro, and by thus vibrating keep up the heat for a certain time; one may conjecture that a subtle medium remains after the air is exhausted, and that heat is communicated to the thermometer suspended in vacuo, by the vibrating motions of this medium. See Opt. Q. 18.

The greater density of the æther at a distance from bodies than at their surface, may be conjectured from the various phenomena solved by this supposition; which phenomena may also be alleged as probable evidences of the existence of the æther. See Opt. Q. and the Letter to Mr. Boyle.

The great subtlety and elasticity of the æther may be inferred from the motions of the planets and quick propagation of light, if we first suppose its existence, and concurrence in the propagation of light, and efficacy in causing gravity. And from its great elasticity we may infer, that it is extremely susceptible of vibrations and pulses, in the same manner as common air. See Opt. Q.

Since the gross bodies that lie upon the surface of the earth