

- THE UNITY OF THE SENSES. -

Esther Elizabeth Hanson.

- The Unity of the Senses. -

- I. The Physical Organism.
- II. The Points of outer Contact.
- III. Mutual Aid between the Sense Organs.
- IV. Transferred Functions.
- V. Evolution into Abstract Thought Process.
- VI. The Final Product.

- o -

The Unity of the Senses. ---

The parts of the human body that chiefly interests the student of mental science are the nerves and nerve centers, principally collected in the brain, the organs of sense, and the muscular system.

The brain is the principal organ of the mind. We know that the brain is the principal organ of the mind from the local feelings that we experience during mental excitement. In most cases of bodily irritation, we can assign the place or seat of the disturbance.

In ordinary circumstances we have no local consciousness of mental action, but in time of great mental agitation, or after some usual exertion of thought, the aching or oppression in the head tells where the seat of action is, precisely as aching limbs prove what muscles have been exercised during a long day's march. If the brain is diseased or injured it impairs in some way or another the power of the mind. For example, if a person receives a blow on the head it will destroy consciousness for a time.

The nervous system may be divided into two parts. First, the central nervous system, consisting of the brain and the spinal cord. Second, the peripheal nervous system. We may include under the peripheal nervous system the nerve fibers running from the central system to the various parts of the body, and all collections of nerve cells outside of the great central nervous organs. In the part last mentioned are included the nervous mechanisms of the ear, eye, tongue, nose, skin, viscera and the nerves connecting them with the brain or spinal cord.

The units of the nervous system are the nerve fibers, and nerve cells. We find that the entire nervous system is formed on a uniform plan. Cells or aggregations of cells, are joined to each

other by nerve fibers; and all are connected directly with the brain.

The nerves are found in every part of the body and we may compare their distribution with the wires of a telegraphic system. Without some such method of transmission, the sensation of the actions or functions of the senses could never reach the brain, neither could there be any commands sent out from the brain. The function of the nerves is to convey impressions and impulses to and from the central organs.

The two different classes of nerves are afferent and efferent. The nerves which carry an impulse to the brain or to any central organ are called sensory or afferent nerves; those which carry an impulse from an organ are called motor or efferent nerves. If a sensory nerve is cut, sensation in the part to which it extends is lost, while motion remains. For instance when you burn your finger the sensory nerve reports the pain. The motor nerve carries the command of the brain back to the muscles of the fingers causing it to move the finger away. Now if the motor nerve was destroyed in some way there would be no way of bringing into action the commands of the brain to take your hand or finger away when hurt. You would suffer a great deal of pain yet you could not prevent it.

There are three classes of nerves. The spinal, cranial, and sympathetic. The spinal nerves have their origin in the spinal cord by two roots; the anterior root is the motor and the posterior is the sensory one. The anterior is connected with the white matter of the cord, while the posterior is connected with the gray matter. It also has a small ganglion of its own at a little distance from the origin. The roots unite and are covered with a sheath. If the anterior root is cut sensation remains and voluntary motion is lost, if the posterior root is cut voluntary motion remains and sensation is lost.

The spinal cord begins at the base of the brain in an expansion called the medulla oblongata, and passes down the cavity of the back bone, and it is composed of the same tissue as the brain, but has the white fibers on the outside, and the gray cells within. It is separated into halves by deep fissures, called anterior and posterior fissures. When separated it resembles the letter H. The spinal cord, gives off thirty-one pairs of spinal nerves which traverse various parts of the body. They are found in pairs at the same level from each side of the spinal cord. Each nerve has two roots, and anterior and posterior. These unite in one bundle a little distance from the spinal cord.

The cranial nerves spring from the lower parts of the brain and the medulla oblongata. They extend to the ear, nose, eye, tongue, lungs, stomach etc.

The sympathetic system consists of a double chain of ganglia on each side of the spinal column extending into the chest and abdomen. Delicate nerves from these ganglia extend to the vital organs, the heart, lungs etc, also to the veins and arteries and to the spinal and cranial nerves.

The brain is oval shaped and located in the cranium, surrounded by membrane. It consists of two parts, the cerebrum and cerebellum and is composed of both gray and white matter. The white matter is associated with motion and the gray matter with sensation. The white matter consists of nerve-fibers supported in a delicate framework of connective tissue. The gray matter, in addition, contains a number of nerve cells, or ganglionic corpuscles, some of which are quite large. These cells are not present in the white matter.

The cerebrum occupies the front and upper parts of the skull,

and comprises about seven-eighths of the entire weight of the brain. It is a mass of white fibers covered gray matter. It is arranged in folds, and divided into two hemispheres, connected beneath by fibers of white matter. These hemispheres are independent. The cerebrum is the seat of intelligence. When it is removed from animals they pass into a state of stupor.

The cerebellum lies behind the cerebrum, in the back part of the head. Its structure is similar to the cerebrum, but instead of folds it has parallel ridges which let the gray matter down into the white which gives a peculiar appearance called the arbor-vitae. It is the center of voluntary motion. When it is injured in any way, a person will walk unsteadily, the body is not well balanced. Experiments have been performed on birds by removing the cerebellum and the experiment showed that they thereby lost control of their muscles.

The cortex or the outer covering of gray matter of the brain, is the important part, or that part principally used in mental action. And an organ which is worked hard needs more rest and nutriment than an organ that is not worked so hard. In order to secure the best intellectual action, there must be assimilation of the most nutritive food, sufficient sleep, plenty of fresh air and exercise. If not, the brain is likely to become dull and the power to accomplish anything very limited is lost.

If you were to examine the brain of a fairly intelligent person, by unfolding, and making it very smooth, it will be found that it has a superficial area of about four square feet. The greater the intelligence of the person, the deeper are the folds, and the brain also has a finer structure. Education does not have the tendency to form the brain of the two sexes alike, but rather serves to inten-

sify the difference. While the brains of the two sexes of the savage people resemble each other. The brain reaches its maximum weight by the fifteenth year, but still keeps on developing internally until thirty years. After the age of twenty the brain is less plastic. It is thought that by the time they are thirty, some can not get a new idea into their head. There may be some truth in this in the case of impulsive thinkers. But in the case of a reflective thinker, who has guarded his mind from the habit of becoming prejudiced there is no reason for not developing new ideas and keeping up gradual growth development or a change by new and advanced idea.

Perception through the different senses are the perceptions of touch, smell, taste, hearing, and sight. The sense of touch is most highly developed in the fingers and the tip of the tongue. If we come in contact with some object we will experience a sensation of feeling which we can not fully explain, and then if you remove your hand or finger or whatever it may be you will still retain some feeling. It is said that a person that has had their arm cut off, will experience such sensations that it seems to him as if his arm was still there. He still retains the sensation of feeling at the end of these nerves where the arm was cut off.

The organ of smell is the nose. The upper portion of the nasal cavity is lined by the olfactory mucous membrane, characterized by a special thickness and a brownish color. In it are distributed the terminations of the olfactory nerve, which is the first of the senses of the cerebral nerves. Smell is of great importance both to man and animal life. By the sense of smell we learn to avoid many things that may be injurious to the body. The animals the center in the brain for the sense of smell is often its predominating part, while in man it is reduced to an insignificant proportion.

Animals are aided a great deal by the sense of smell. If a dog wishes to find some animal or even a person it will use its sense of smell in so doing. But in man we do not find it developed so as to be used in that manner. The reason for this is presumably on account of man's superior intelligence, he makes use of other senses and accomplishes his purpose through other senses by the use of his power of reason. This organ is less under our control than those of the other senses.

I made twenty-five different tests or experiments in order to discover some characteristic of the sense of smell, and I learned from those tests the following facts; first, after the parties had smelled of three or four odors they could not distinguish between others very definitely and sometimes they were entirely unable to do so, the only cause for which evidently is that they retain a part of each odor and the organ of smell becomes overtaxed. Second, that the people who lived in the country had a keener sense of smell than the people who lived in town. The reason for this may be ascribed to the fact that the air in the country is purer than in the city. Third, I will give a detailed statement of the experiments referred to above together with the detailed statement of experiments made by other parties of the females, and the results of the two experiments taken as one is as follows.

Experiments for testing sense of smell.

No.	Material odors.	The numbers that could identify the odors correctly.		
		25 Males	25 Females	Total
1.	Violet	6	5	11
3.	Red Clover	1	0	1
5.	White Rose	4	4	8

Experiments for testing sense of smell.

No.	Material odors	The numbers that could identify the odors correctly.		
		25 Males	25 Females	Total.
6	Lilac	1	3	4
7	Apple Blossom	1	0	1
10	Geranium	2	1	3
11	Oil of Cloves	14	9	23
12	Oil of Peppermint	17	18	35
13	Vanilla	9	10	19
14	Oil of Pennyroyal	2	2	4
15	Nutmeg	14	13	27
18	Oil of Almond	3	2	5
21	Oil of Catnip	0	3	3
22	Alcohol	5	1	6
23	Turpentine	14	16	30
24	Oil of Sassafras	2	1	3
25	Tar	22	16	38
26	Oil of Wintergreen	4	10	14
27	Oil of Cinnamon	9	13	22
28	Asafetida	18	17	35

The organs of taste consist of the tongue, the palate, and a portion of the pharynx. What we perceive in taste is merely a sensation. The different articles of food which we eat effect and this will cause a sensation.

"The tip of the tongue in many persons, is almost exclusively excitable by sweet, and altogether insensitive to bitters. The middle of the tongue is wholly irresponsive to gustatory stimuli. The edges are only sensitive in certain cases."

The ear consists of three portions, the external ear, the middle ear or tympanum, and the internal ear, or labyrinth. The latter contains the end organ of the auditory nerve. The outer side of the ear is covered with a membrane called the concha, and then a passage leading from it, the external auditory meatus. This passage is closed at its inner end by the tympanic or drum membrane; small glands secrete the wax of the ear.

The middle ear or tympanum is an irregular cavity in the temporal bone, closed externally by the drum membrane. In this drum there is a series of small bones which transmit the vibrations of the membrane. From the inner side, the Eustachian tube proceeds and opens into the pharynx. The external ear collects the vibrations of the air caused by sonorous bodies; these are carried through the tube to the drum of the ear; they are there transmitted by the series of small bones and thus reach the fluid, the vibrations of which affect the auditory nerve and thus results the sensation of sound.

The organ of sight is the eye. The eye is a flattened sphere formed by a tough white membrane the sclerotic, which encloses a nervous surface and certain lens and humors. The rays of light pass through this to the inner surface. The back part is covered with a fine network expansion of the optic nerve called the retina. At the center of the retina is a small yellow spot, this is very sensitive to light; from this we have direct vision.

Brooks says, "We assume that our first perception of external objects come through the sense of touch, and that the other senses are instructed by the sense of touch." "Then if we take for granted what Brooks says we will know by the organ of touch that there is an external world.

The organs of touch and sight are closely related to one

another. For instance, when in the dark we can not see but we can feel our way. We examine goods not only by sight but also by feeling of it. In order that a workman may recognize his tools by his hand alone, he must be acquainted with the feeling of his tools each one separately. The roughness, smoothness, weight etc. In plastic operations dealing with soft viscid matters, requiring particular consistency, as dough, clay etc, we must know the firm impressions of different qualities and degrees of consistency so we may know when the proper point has been reached. This demands the cohesion of a complete sensation of touch. In order to appreciate the acquisitions of touch in their highest form, we must refer to the experience of the blind, who have no other sensation of solid and extended bodies. The impressions of sight are so much more enduring than any others, that we hardly think of a visible body otherwise than as seen by the eye. For instance, a workman more or less thinks of a hammer by the visible appearance, and not of its touch to his hand. But the blind must think of objects as felt things, the revived sensations in them is a projection on the hand, not on the eyes, and they alone are in position to judge what is the natural permanence of the skin impression, and how far they can be recovered and lived in, when the reality is absent. Their thoughts and dreams are touches not sights. Not only is their power of tactile discrimination of a very exalted kind, but they also attain the higher state of realizing past touches as if fully present. A blind person becomes more acquainted with the sense of touch, they become fixed. That is, a blind person feeling his way along a wall by his hand, will remember everything he comes in contact with and will know every step he takes, and if he is to travel this way again he will remember very distinctly every crook and turn. Being under the necessity of always guiding his

course by touch, he acquires coherent successions of feeling of contact, as other men acquire sight.

Touches are associated with both sound and sight. When we associate the tactile properties of things with their visible appearance we can instantly bring to mind one thing from another. We can distinguish metals, stones, cloth, leaves etc by both senses, and we form an association between the tactile and the visible impressions. Each person has a large amount of knowledge existing in the shape of associated touches and sights. Sounds are associated with sights in innumerable instances.

We connect the visible appearance of bodies with the noise they make when struck. Also we can tell who a person is by their voice and sometimes by their steps. Things that are seen are always remembered the longest, they mean more to us. We choose to conceive the objects of nature as they appear to the eye rather than as they effect the ear or the touch.

Of all the senses, hearing is the richest in the variety of sensations which it furnishes. We have learned from experience to associate different sounds with different objects. When we hear a bird sing we associate its song with a certain bird. We also learn to associate sounds with certain emotions, as the sigh with sorrow, the laugh with joy etc, and to regard the sound as the expression of the emotion. We form sounds to represent our ideas and thoughts; this is done by communication. Sound is the medium of communication from one person to another, except in some exceptional instances.

The senses and sensations that we have considered are not things in themselves but are means to an end or a medium between the physical world and the mental state.

We would naturally ask what are the different steps from

sensation to abstract thought process. It is safe to say that the first step is cognitive consciousness. Every activity or idea of the mind, adds data or information. The consciousness may be a perception of a horse, the concept of government, the idea of law of gravitation. Consciousness, however, is not limited to giving us knowledge, but creates a state of feeling within us and effects a person, in some way, that is, it touches the emotional side more or less. And further, that consciousness is also an expression of activity and involves the will. That is, cognition consists principally of effecting the will and bringing about activity. As the will is not wholly passive in any consciousness. Although knowledge, feeling and the will are present in each cognition one generally predominates, and therefore it is referred to as effecting only the predominating part, but they are not three kinds of consciousness, nor three separate parts of the same consciousness, but are the different aspects which consciousness presents, and each are necessary and dependent on each other.

Every consciousness is the relation of a universal knowledge and an individual element cannot be understood without either. Knowledge is the universal element. Feeling is individual, as the same consciousness could not produce exactly the same feeling in two persons. While the will partakes of both elements and forms a kind of connecting link between the two. Feeling is the subjective side of consciousness, knowledge is the objective side, while the will is the relation between the subjective and the objective. In order to consider this subject, we begin therefore with knowledge, considering sensation in the raw material, passing to the process of apperception which evolves in the successive stages of apperception, memory, imagination and thinking, and ending in the final product of an act of

intuition. Sensations themselves are not knowledge, they have to be considered with relation to each other and that becomes the actual knowledge. From these relations we select the ideals, which become then abstract concepts. We therefore arrive with such concepts as justice, righteousness etc. We therefore will start with sensations, and after passing through these processes of objects, relations and ideals, they are transformed into the self which knows and idealizes. These processes may be reduced and classified in two. The one principally concerned with the formation of the world of known objects and relations out of the elementary sensation while the other is concerned with the formation of the known self. These two processes have been called apperception and retention.

Dewey defines apperception as the relation of mind by means of its organized structure upon the sensuous material presented to it. And retention as the reaction of the appreciated content upon the organized structure of the mind.

Apperception is also defined as the perception of things in relation to the ideas which we already possess. From the last definition we have seen that the apperception of different persons would be as different as the difference between their ideas which they possess; this accounts for the bias and prejudice of certain persons to certain ideas; also accounts for the fact that some cannot or will not be converted to or from certain principals which they hold. It also accounts for the progressiveness or nonprogressiveness of certain individuals. Also for the early training and environments of certain persons, ever afterwards nominating their action in life. Apperception is said to pass through three stages which are called association, dissociation and attention, which are to be considered

as degrees in the development of the apperceiving activity. The laws of each are as follows. "The law of association is that the activity of the mind never leaves sensuous elements isolated but connects them into larger wholes." "The law of dissociation is in associating sensuous elements, the mind never gives all the elements equal value, but emphasizes some and neglects others."

"Attention is that activity of the self which connects all elements presented to it into one whole, with reference to the relation which they have to some intellectual end. Of the different stages of knowledge perception is the first and the basis of all knowledge, and is defined as that power which interprets the raw material given by sensation. It begins with the external and advances to the internal.

To perceive is opposite to thinking; the latter is subjective and the former objective. Intelligence is necessary to the former but not to the latter. It is the distinguishing of self from the outer world which is not self. "It is that stage or phase of knowledge in which the function of discrimination or differentiation predominates over that of identification or unification."

The next stage of knowledge is that of memory which can be said to be somewhat blended with that of perception. The memory develops relation of time the same as perception develops relation of space. "Memory is defined as knowledge of particular things or events once present, but no longer so." Knowledge as it exists in the stage of perception is limited to the present although it strictly has no past or future, but memory extends to a range of knowledge beyond the present. However, in the stage of memory knowledge is still yet limited to the individualistic or to some particular time.

Memory involves a distinction of a train of ideas from one self and also involves the activity uniting and identifying.

We discriminate events as particular by referring them to some time, as we do objects by referring them to some place. Memory, like perception, is an active construction by the mind of a certain data, but the interpreting process which is involved in both is in memory carried a stage further.

"Imagination has been defined as that operation of the intellect which embodies an idea in a particular form or image." This stage of the intellect resembles the two previous stages, in this, that its product is always particular but is unlike them in this that this particular product is not necessarily referred to some one place or time existing there. It is a distinct idea; not an object or event but it is an idea of some object or event.

This element of the intellect is involved in perception and memory, but these latter being so predominant that it is not recognized. It is dissociated from perception and memory however, in this that an image may have an ideal existence and need not be referred to an actual thing, therefore we refer to the ideal and the real.

The process of forming images when the image becomes dissociated from its detail of space and time becomes ideal. This act of separation from the circumstances of space and time is a universal activity. This is a stage of knowledge, that stage which is transitory from the particular to the universal, and it extends on to the more distinctly universal, the stage of thinking.

"Thinking has been defined a knowledge of universal elements that is of ideas as such or of relations." In thinking the mind is concerned with ideas not confined to any time and definite place,

but with ideas which are general or universal in their nature. Its closest connection is with the imagination, but while in imagination the predominating element is the particular form, while in thought the predominating element is universal and is ideal. This universal element or idea in thought is always a relation. There are several more or less complete stages of thinking, there are conception, judgement and reason.

All knowledge is based upon relation, it presupposes that there is no such thing as an isolated fact in the universe, that is, every fact is depended or mediated. The higher development of reasoning in thought is called systematization.

Philosophy is therefore an attempt to systematize all special branches of science in their organic unity. Science by the highest form of knowledge, and reasoning, developes more closely the relations of the facts of knowledge. Philosophy as a complete science aims to do this fully. Philosophy developes the presence of unity in variety, and is the attempt to find a true universe.

In the preceding analysis of so-called stages of knowledge, we have attempted to show their connection with each other, and in considering the whole analysis it becomes apparent that the stages are all more or less dependent upon each other. In fact perception is as impossible without conception as conception is without perception, that is, all knowledge involves both the identifying, and the distinguishing activity. It follows therefore, that the physiological result is an intuition. Intuition is therefore not a purely immediate act as it might appear, but being ultimate knowledge it cannot extend beyond itself, but all dependence, all mediation must be within itself. Its predominating element, however, is that of all

ultimate wholes. Intuition has been divided into three stages; intuition of the world, intuition of self, intuition of God.

To attain this final product the process from its earliest stage shows a harmonious working of the senses as a unity.

- o -