Sensations: Nature, Attribute and Types (With Diagram)

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After reading this article you will learn about Sensation:- 1. Nature of Sensations 2. Attributes of Sensations 3. Types 4. Static Sense.

Nature of Sensations:

A sensation is the simplest form of cognition. It is a simple impression produced in the mind by a stimulus. The stimulus acts upon a sense-organ or the peripheral extremity of a sensory nerve; the impression is conducted by the sensory nerve to a sensory centre in the brain; then it is experienced as a sensation.

This is the case with sensations

of colours, sounds, tastes, smells, heat, cold etc. Stimuli are either external to the organism or within the organism.

They are either extra-organic or intra-organic. Organic sensations of hunger, thirst, fatigue, headache, etc., are produced by changed conditions of the organism. They have no special sense-organs. Sensations are simple impressions of some qualities.

But their meanings are not known. As soon as their meanings are interpreted, they become perception. A baby just born will have pure sensations. But adults can never have

absolutely pure sensations.

They interpret the meanings of sensations and know them to be sensations of qualities (e.g., sounds) of certain objects (e.g., bells) occupying definite portions of space in the external world. But a newborn baby is incapable of interpreting the meanings of sensations.

Thus pure sensations have a hypothetical existence. Sensations are the elementary raw material of our knowledge of the external world. We believe in their existence in order to account for perceptions.

Sensations are simple impressions of sensory qualities. Perception is the awareness of objects in the environment. The seeing of light is called a visual sensation. But the seeing of an object is called visual perception.

The smelling of an odorous substance is called an olfactory perception. The bare awareness of a sensory quality, e.g., colour, sound, odour, taste, or

temperature is a sensation. But the experience of an object in the environment together with sensory qualities is called perception.

Sensations are the integral elements in acts of perception. They are not experienced alone in normal adult experience. But we can investigate them by examining the components of our perceptions of different kinds of objects. Sensations are the most elementary processes of cognition. We shall examine their attributes as psychical processes apart from their meanings as vehicles of knowledge.

A sensation is caused by a stimulus. A stimulus is a relatively simple factor in the environment acting upon a receptor or sense-organ. It is external to the organism. A ray of light acts upon the eye and produces the sensation of colour. A stimulus is a simple condition or factor in the physical world. It

is different from a situation, which is a complex group of stimuli.

A design or pattern is a situation. We perceive it as a whole unit. It is a complex whole or a pattern of stimuli. It is an object of perception. It is not experienced by sensation. A stimulus produces a sensation. A situation is apprehended by perception.

Different kinds of stimuli produce different kinds of sensations. Rays of light of different wave-lengths produce different kinds of colour sensations. Sound waves differing in amplitude, length, and composition produce different kinds of sound sensations.

Solutions which contain particles of matter of such size that taste bud are stimulated produce sensation or taste. Gaseous particles given off by odorous substances that affect the membrane of the nose

produce sensations of smell.

Solid objects which affect the skin and mucous membrane produce cutaneous sensations of pressure. Radiant stimuli produce temperature sensations. Noxious stimuli, such as cutting, pricking and those injuring tissue produce pain sensations. These are the stimuli external to the organism. They are extra-organic stimuli acting upon the receptors or sense-organs and the sensory neurons.

There are stimuli within the organism also. They consist in physiological changes originating in the organism itself. They are intra-organic stimuli. Muscular contractions in the walls of the stomach produce sensation of hunger. Dryness of the palate produces sensation of thirst.

Movements of muscles produce motor sensations. Physiological conditions produce organic and motor sensations. Thus different kinds of sensations are produced by different kinds of stimuli.

Stimulus and Response:

The behaviourist regards psychology as a science of behaviour. Behaviour is a response to a stimulus.

It is represented by the formula:

S → R

The organism responds to stimulus. So the phenomenon is expressed by the formula:-—

S → O→ R

Here S stands for the stimulus; O stands for the organism; R stands for the response. The stimuli come from the environment, and act upon the organism which reacts upon them; its responses effect changes in the environment.

So the formula may be expanded into the following:

W—S—O—R—W

The individual receives

sensations from the stimuli in the environment, which act upon the receptors or sense-organs. He responds to them through the effectors or muscles and glands. He makes muscular movements and glandular reactions in response to the stimulation of the sense-organs.

He has central neurons in the spinal cord and the brain connecting receptors and effectors. Muscles and glands are responsive organs.

These are two kinds of muscles, striped and unstriped. The striped muscles are under the control of the will. They move the arms, legs, trunk, tongue, and larynx. The unstriped muscles are not subject to the control of the will.

They control the blood-vessels, intestines, the organs of elimination and reproduction. Hence by response we mean “the total striped and unstriped muscular and glandular change which follows upon a given

stimulus" (Watson).

Responses may be simple or complex. Behaviour consists in simple responses of the organism to stimuli in the environment, such as simple reflexes, or in a complex reaction patterns or systems of responses, such as instinctive actions.

Attributes of Sensations:

There are certain general distinguishable characters of sensations. They are sometimes called attributes of sensations. Sensations have quality, intensity, duration (protensity) extensity (volume or voluminousness) and local sign (local character).

(i) Quality:

Sensations differ in quality. Sensation of colours, sounds, tastes, smells heat and cold; differ from one another in quality. There is generic difference among them. They are sensations of different kinds. They have different sense-organs. They are produced by

different kinds of stimuli. Sensations of colours are produced by the action of light waves on the retina of the eye-ball.

Sensations of sounds are produced by the action of air waves on the auditory organ. Red, green, blue, yellow, etc., differ from one another within the same genus of colour. There is a specific difference among them. Red differs from blue specifically, and from heat and cold generically. In the generic difference of sensations, there are different kinds of sense-organs, and different kinds of sensory of different nerves.

(ii) Muller's Theory of Specific Energy of Nerves:

What is the cause of the generic and specific difference of sensations? There are different kinds of stimuli, different sense-organs, and different sensory nerves for different kinds of sensations, visual, auditory, olfactory, gustatory, and cutaneous.

Air waves act upon the auditory organ, and produce nerve currents, which are conducted by the auditory nerve to the auditory area in the brain. Light waves act upon the visual organ, and produce nerve currents which are conducted by the optic nerve to the visual area of the brain.

Similarly, other kinds of stimuli act upon other sense-organs, and produce nerve currents which are conducted by other sensory nerves to the other sensory areas of the brain.

The optic nerve however stimulated, by a light wave, an electric current, or a mechanical blow, invariably produces a sensation of light or colour. It carries one specific kind of energy, viz., light-energy. Similarly, an auditory nerve carries sound-energy; and so on.

The different kinds of nerves

conduct specific kinds of energy to the brain. This is called the theory of specific energy of nerves formulated by Johannes Muller. There are special nerve-fibres even for special kinds of sensations belonging to the same genus, viz., blue, yellow, red, green etc., which carry specific energies to the brain.

Hence the generic and specific differences of sensations are explained by specific energies conducted by different kinds of energy nerves.

(iii) Intensity:

Sensations of the same quality may differ in intensity. A light may be dim or bright, a sound faint or loud, a smell mild or strong, a taste weak or strong, a pressure light or heavy. A dim light produces a faint sensation of light.

A bright light produces an intense sensation of light. All sensations differ in intensity; lights, sounds, tastes, smells, temperatures, pains, pressures,

hunger, thirst, fatigue, etc., all vary from very weak to very intense. The other conditions remaining the same, greater intensities of stimuli produce greater intensities of sensations.

(iv) Duration of Protensity:

Every sensation has a sensible duration. A sensation may linger in the mind for a certain duration. A sound sensation may last for a shorter or longer duration. The sound which lasts five seconds feels differently when it ceases from a sound which lasts twenty seconds. This is a difference in duration. Duration is also called potensity or protensive magnitude. Sensations alike in quality and intensity may differ in duration.

(v) Extensity:

Visual and tactual sensation have extensity. This is admitted by all psychologists. Look at the moon and then at a star. You have two visual sensations. The first visual sensation has greater extensity than the second. Touch a book with a finger-tip, and

then with your palm.

You have two tactual sensations. The first tactual sensation has greater extensity than the second. Extensity is the attribute of a sensation which is due to the area of the sensitive surface which is stimulated by a stimulus. Extensity is different from intensity. Put a coin on your skin.

Then put another coin beside it. The second tactual sensation will gain in extensity. But put the second coin upon the first coin on your skin. Your tactual sensation will gain in intensity. Extensity is different from extension. Extensity is an attribute of sensations. Extension is an attribute of material bodies. Extension of a material body remains the same but as we recede from it farther, it appears to be smaller.

Here the extensity of the visual sensations changes, while the extension of the body remains the same. Extension of a body can be measured in inches, feet,

etc. But extensity of a sensation cannot be measured in this way. The perception of extension develops out of extensity of visual and tactual sensations. Extensity is also called ‘extensiveness’, ‘voluminousness’, ‘diffusion’, or ‘spreadoutness’.

William James holds that other kinds of sensations also have extensity. The sensation of the loud report of a thunder has greater extensity than the squeaking of a slate pencil. The taste of the solution of quinine in which the tongue is dipped has greater extensity than the taste of a bit of sugar on the tip of the tongue.

The smell of a bunch of roses has greater extensity than that of a single rose. The pain of cramp all over the body has greater extensity than that of a headache. Thus all kinds of sensations have extensity. William James tries to develop the perception of space out of the extensity of sensations. This

view is rejected by others.

(vi) Local Sign:

If a person touches your cheek, forehead, and nose successively with the same pencil point with the same degree of pressure, your tactual sensations will differ from one another in local signs. They will not differ in quality or intensity.

Local sign is a peculiar attribute which distinguishes a sensation of one part of an extended sense-organs, e. g, skin or retina, from an otherwise identical sensation of another part. It is due to the particular locality of the sense-organs stimulated, while extensity is due to the extent or area of the sensitive surface stimulated.

Local sign is also called local signature or local colouring. Lotze discovered local signs of sensations. Perception of extension partly develops out of extensity and local signs of visual and tactual sensations.

Extensity has two

peculiarities:

(a) A sensation having extensity is made up of a number of simultaneous sensations having different local signs.

(b) The constituent sensations form a continuous whole.

Quality, intensity, duration extensity and local sign are unique and irreducible attributes of sensations.

Weber-Fechner Law:

Stimuli of various intensities act upon our sense-organs. But we cannot be conscious of all of them. Stimuli of very low degrees of intensity cannot produce sensations. Similar is the case with stimuli of very high degrees of intensity.

A very faint sound, a very faint light, a very faint odour, may fail altogether to produce a sensation. The point at which a stimulus becomes intense enough to produce sensation is called the limen or the threshold.

The least intense stimulus which produces a sensation marks the absolute threshold. Five to seven quanta of light energy produce a visual sensation on the retina. A quantum is the smallest quantity of light energy found in nature. Differential threshold is shown by the smallest change in a stimulus which is appreciated. As the stimuli become more and more intense, they produce more and more intense sensations.

When the stimuli become very intense, they cease to be felt altogether, and we feel pain. A very dazzling light causes acute pain. A deafening sound, scorching heat, and biting cold are painful. The point at which the various stimuli cause pain is known as the upper limit of sensation. The interval between the limen or threshold and the upper limit or the height of sensibility is called the range of sensibility.

The German Physiologist, Weber, formulated a law. Between the upper limit and the

lower limit or threshold, the greater is the intensity of the stimulus, the greater is the intensity of the corresponding sensation. But every increase of stimulus above a certain amount does not produce an increase of sensation.

The increase of stimulus may be too small to be noticed. It is too small to produce an appreciable sensation. For example, we may increase a weight a little, but the increase is so small that we are unable to perceive it. The stimulus must be increased by a certain amount if the increase is to be noticed. This gives the difference threshold or least noticeable difference.

The intensity of the stimulus must be increased by a constant fraction of it in order to produce an appreciable difference in the intensity of the sensation. The addition to the intensity of the stimulus must be a definite fraction of the original stimulus. In the case of pressure, the stimulus must be increased by

1/20 in order to produce a change in the pressure sensation.

When we put a weight of 20 grams upon the hand, we must add one whole gram so that we may observe a change in the pressure sensation. If we place 100 grams upon the hand, we must add 5 grams before we can observe any change in intensity.

In the case of sounds, the stimulus must be increased by 1/3; in the case of brightness, the stimulus must be increased by 1 /100. The stimulus must be increased by a constant fraction so that we may observe any change in intensity.

Fechner formulated the law as follows: “To increase the intensity of a sensation in arithmetical progression, the stimulus must be increased in geometrical progression.” “The sensation increases as the logarithm of the stimulus”. This is known as Weber-Fechner Law.

It means that the stimulus must be multiplied by a constant fraction, in order that the corresponding sensation may increase by the addition of a fixed unit.

Suppose, x to be the liminal intensity of a sound sensation, 9 to be the intensity of the stimulus (air vibration), 1 to be the least discernible increase of sensation, and 4/3 to be the constant fraction by which the stimulus has to be multiplied in order to increase x by 1.

Then in order to produce the intensities of the sensation x + 1, x + 2, x + 3, and so on, the intensities of the stimulus must respectively be 12(=9 x4/3), 15 (=12 X 4/3), 21 1/3 (=16 X 4/5), and so on. The constant fraction is called the quotient of sensibility.

But the Weber-Fechner law is approximately true within certain limits. First, the law has not been verified in the case of taste and smell sensations. The results are uncertain in the case

of temperature.

The law has been approximately verified in the case of hearing, sight, pressure, and the muscular sense. Secondly, the law holds true most accurately in the medium ranges of intensity. The results are quite uncertain towards the upper and lower limits.

The sensation increases more rapidly towards the lower limit, and less rapidly towards the upper limit than is demanded by the law. Thirdly, the law tacity assumes that the sensation increases by a fixed unit. But this is not true.

The addition of 1 gram to 20 gram may not be felt in the same way as the addition of 1 seer to 20 seers. Lastly, James and Munsterberg point out that a strong sensation is not a compound of many weak sensations, but an entirely new sensation in quality.

The Weber-Fechner Law has been explained physiologically,

as due to the nature of nervous action. As a sensory nerve is stimulated by a stimulus it gradually becomes less sensitive. So a stronger stimulus is required to produce an appreciable effect in the cortical centre belonging to that sense.

The Law has also been explained psychologically. Wundt explains it by the general psychological law of relativity, according to which the conscious effect of a mental state depends upon previous mental states. Thus the law is interpreted in terms of physiological and psychological laws.

Types of Sensations:

Sensations are of three kinds:

(1) Organic sensations,

(2) Special sensations, and

(3) Motor or kinaesthetic sensations.

Hunger, thirst, etc., are organic sensations. Sensations of

colours, sounds, tastes, smells, pressures, heat, cold, etc., are special sensations. Sensations of movement are motor sensations. Organic sensations are produced by the conditions of the internal organs of the body.

Special sensations are produced by the stimulation of the special sense-organs, viz., the eye, the ear, the tongue, the nose and the skin by special kinds of stimuli. Motor sensations are produced by changes in the organs of movement, viz., muscles, tendons and joints.

(i) Organic Sensations:

Some organic sensations are not localizable. They are vital feelings, e.g., sensations of comfort or discomfort. They are produced by the general condition of the organism as a whole. These sensations mingle into one total sensation called common sensibility or the coenaesthesia.

The sensations of comfort, discomfort, physical well-being

and uneasiness cannot be localized. Some organic Sensations are vaguely localizable. Headache, hunger, thirst, etc., are vaguely localized. Headache can be localized in the head. Some organic sensations are definitely localizable, e.g., cuts, burns, sores, bruises, etc., in the injured tissue.

Organic sensations have the following characteristics. They have no special sense-organs. They are not produced by external stimuli. They are produced by changes in the internal organs of the organism. They are due to the physiological conditions of the various visceral organs, e.g., stomach, intestines, internal sex mechanisms, and kidney. The throat, lungs, and heart are non-visceral structures.

Activities of the visceral organs excite sensory nerves, which send nerve impulse to the central nervous system. Hunger is an organic sensation produced by the rubbing together of the

stomach walls when it begins its churning movements. Thirst is a sensation produced by the dryness of the membrane in the back of the throat. Organic sensations have little knowledge giving value.

They do not inform us anything of the external world. They are called the 'barometer of our life process', because they inform us of the sound or unsound conditions of the body. They have a tendency to blend into one another, and fuse into a mass. They are not so clearly distinguishable from one another as special sensations such as colours, sounds, etc., are.

They cannot be easily revived. It is very difficult to remember the sensations of hunger and thirst. But special sensations can be easily remembered. They are not capable of definite localization in most cases. They have a high degree of emotive value. They are important conditions of our happiness and misery. Sensations of comfort and

discomfort, physical well-being and uneasiness deeply affect our happiness and misery.

(ii) Special Sensations:

Sensations of colours, sounds, tastes, smells, temperature, pressure, etc., are special sensations. They have special sense-organs, e. g, the eye, the ear, the tongue, the nose, and the skin. They are produced by special kinds of external stimuli, e.g., light waves, air waves, etc.

They are clearly distinguishable from one another. They are capable of localization. They can be referred to definite points of space on the body or in the external world. They have great cognitive value.

They give us knowledge of the qualities of external objects. Sensations of colours, sounds, tastes, smells, heat, cold and pressure reveal to us the sensible qualities of external objects. They are the raw material of our knowledge of the external world.

They admit of a greater variety

of kinds and degrees than organic and motor sensations. There are various kinds of visual, auditory, cutaneous, olfactory and gustatory sensations.

(iii) Kinaesthetic Sense: Kinaesthetic or Motor Sensations:

The Receptor and Stimulus:

The Kinaesthetic sense reports movements of the muscles, tendons and joints. It is not simply the muscular sense, but also the tendinous sense and the joint sense. The nerve endings which lie in the muscles, tendons, and joints are sensitive to being pulled and pushed about with muscle contraction and joint movement yielding sensations of strains, weight, and bodily position and movement.

The kinaesthetic sense means the sensation of movement. It is not simply the muscle sense. It is the muscle, tendon and joint or articular sense.

The muscle sensations, the

tendon sensations, and the joint and articular sensations can be distinguished from one another in the kinaesthetic sensations. The muscle sensations are of the nature of diffuse pressure of dull pain. The tendon sensations are of the nature of strain or effort.

The joint sensations are of the nature of massive pressure. In certain nerve afflictions joint sensibility is retained, but muscle and tendon sensations as well as cutaneous sensations are abolished. In such cases posture and movement sensations are experienced.

This shows that the joints play a major role in kinaesthetic sensations. Tendinous sensations give us sensations of effort, strain, exertion, for example, when a heavy weight is supported.

The motor neurons end in the muscles. Energy comes from the central motor neurons and moves the muscles. The movement of the muscles is reported to the brain by the

sensory neurons. Each muscle has the power of contraction and may thus become shorter and thicker.

As its ends are attached to bones, one bone is brought close to one another, and a movement of a limb is produced. In normal reaction the muscles is contracted by a nerve current passing to it through its motor nerve. The muscle itself, however, is irritable.

When it is separated from its nerve supply, it can be made to contract by a stimulus applied directly to it. It can be aroused by a blow, by a sudden change in temperature, by chemical stimuli, and by electrical stimuli.

Motor sensations are produced by the strain in the muscles, tendons and joints. The conditions are reported to the brain by sensory or afferent nerves which have their endings in the muscles, tendons and joints. In motor sensations there is also the compression of the skin. There is a sometimes pure

tactual sensation of contact.

They are often accompanied by organic sensations, e.g., increased circulation of blood, quick breathing, heat, perspiration, fatigue, etc. Sensations of muscles, tendons, and joints contribute important factors to motor sensations.

The sensations of the compression of the skin, contact with external objects, and organic sensations of fatigue, etc., accompany motor sensations. Sensations of muscles also contribute to the perception of varying position, movement, and tension.

If you stretch out your arms, shut your eyes, and slowly bend your elbow-joint, and attend to the manner in which you are aware of the direction, velocity, and duration of the movement, you will realize the nature of kinaesthetic sensations.

When your hand is moved by some other person, your eyes, being shut, you feel kinaesthetic

or motor sensations. When we speak of motor sensations, we refer to the sensations localized in the muscles, tendons, and joints. The afferent nerves which have their endings in the tendons produce sensations of strain in different degrees.

No Sense of Effort or Innervation sense—Is there any sense of effort or innervation-sense? According to Bain, there is a sense of effort or innervation-sense produced by the discharge of energy from centres in the brain to the muscles.

It is a peculiar sensation of motor discharge. William James denies its existence. Motor sensations are, according to him, sensations of muscles, tendons and joints. There is no sensation of putting forth energy or excitement of the motor neurons.

This theory is strengthened by Sach's discovery of the sensory nerves passing from the inside of the muscles to the higher

centres. Bain's theory of the 'innervation-sense' is positively disproved by recent experiments. When the motor areas of the cortex are directly stimulated by an electric current they do not produce motor sensations.

But when the areas immediately behind them, which receive sensory nerves from the skin and muscles, are stimulated in this, way, they produce motor sensations. The so-called sense of innervation is a needless hypothesis, because it cannot explain anything which cannot be explained without it.

It is not required to explain volition, since volition is not a sensation. It is not necessary to account for the attempt to make a movement. Our sensations of movement come by way of sensory nerves, and are like other sensations in this respect. But we have direct knowledge of our own activity as a mental process, apart from incoming sensations. We have

consciousness of mental activity.

There are three kinds of motor sensations, e.g., those of position, free movement, and impeded movement. When you keep your arm outstretched without moving it, you have a sensation of position. When you move your arm to and fro in empty space, you have a sensation of free movement. When you lift a weight, you have a sensation of impeded movement.

Motor sensations have a high cognitive value. They give us knowledge of the fundamental properties of matter, e.g., extension, impenetrability, position, distance, direction and weights of things. Muscle sensations from the eye are of great help to us in the judgement of the distance, size, and shape of objects seen.

Motor sensations have also a great affective value. Muscular exercise is a source of pleasure and pain. Pleasure of health depends, to a large extent, on the

state of the muscles. Thus motor sensations have cognitive and affective value.

Static Sense: Sense of Equilibrium:

The semi-circular canals in the internal ear are the sense-organ for the sensation of balance or equilibrium. Fine nerve-endings in the semi-circular canals constituted by tiny tubes of Bone and membrane arranged in three planes from the receptors.

The static sense or the sense of balance works with the kinaesthetic sense in maintaining posture. Giddiness results from the unwanted disturbance of the liquid in the semi-circular canals. Static sensations, in co-operation with kinaesthetic sensations, make possible the control over posture balance, and the force exerted by the body.

(i) Taste:

(a) Receptor and Stimulus:

Taste is a chemical sense. Tiny

nubs, papilla, or prominences on the surface of the tongue contain taste buds or taste bulbs in which hair cells connect with the ends of a sensory nerve. Taste buds are branches of sense cells. They are not located on the surface of the tongue. They art placed in little pits which extend down the surface.

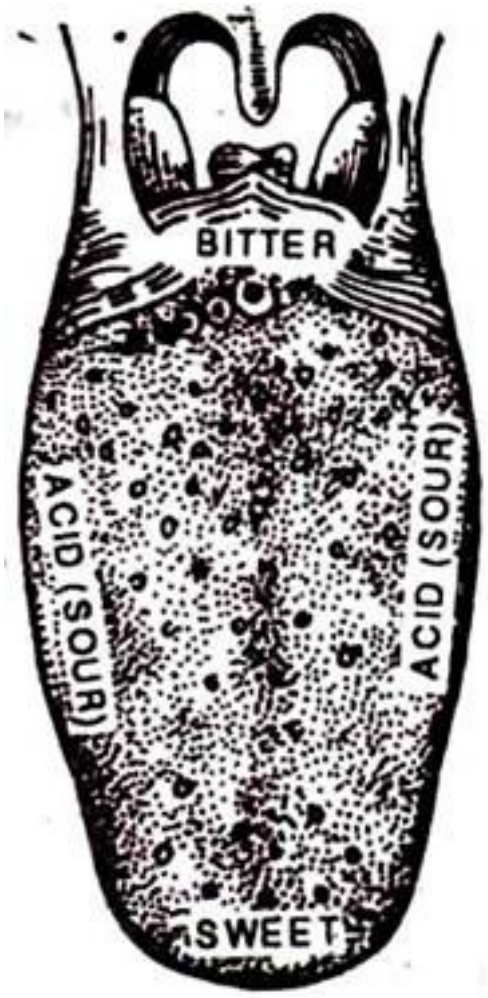
A chemical substance in liquid forms or soluble in the saliva of the mouth is the stimulus. It must be liquid or soluble in order to affect the ends of the hair cells and be tasted. There is a chemical action between the sense-organ and the stimulus. It is conducted to the brain by the gustatory nerve.

(b) Primary Tastes:

Sweet, sour, salt and bitter are the four primary tastes. Wundt added metallic and alkaline tastes also. But the metallic taste is a combination of taste with smell and muscular sensations. Strong alkalies may make the tongue slippery and may also produce puckering of the surface

of the tongue.

The metallic and alkaline tastes are not recognized as primary tastes now. The four primary tastes, sweet, sour, salt, and bitter cannot be reduced to any other simpler tastes. The tip of the tongue is more sensitive to sweet, its back to bitter, and its sides to sour, but it is equally sensitive to salt over its whole surface.



Generally, the tastes of many things we taste are compound tastes. They are reducible to primary tastes. Lemonade produces the tastes of sweet and

sour. Grape-fruit yields a combination of sweet, sour and bitter. Chocolate, ice-cream, and most other foods yield combination of many tastes. The total number of compound tastes produced by different things is enormous.

There are blends of tastes with other types of sensory qualities. Tastes are mixed with smell in flavours. Juices extracted from onions and potatoes taste almost alike when their odours are excluded by closing the upper nasal passage by a plug.

Tastes are mixed with organic sensations of the alimentary canal, e.g., in relish and disrelish. Tastes are mixed with touch in tastes of hot and cold. Cold Coffee is different from hot not on account of taste, but because of smell, coldness and heat.

Charged water tastes the same as uncharged, but the former stimulates pressure sense-organs, while the latter does not. Fiery tastes like pepper and

mustard are mixtures of taste with muscular sensations.

Thus tastes are mixed with pressure sensations. Sometimes sensations of taste, smell, pressure, heat, cold, etc., combine into a sensory fusion, which is not often analysed into separate parts.

There appears to be contrast in taste sensations analogous to contrast to colours. If you taste distilled water after taking salt, it will taste sweet. A weak solution of a sweet substance tastes more sweet in contrast with salt.

Sweet has a much weaker contrast effect on salt, than salt on sweet. There are similar relations of contrast between salt and acid, and between sweet and acid. Bitter appears not to be affected by contrast effects.

(c) Value:

The sense of taste has a little cognitive value. It gives us little information about the qualities of external objects. But it has a

high affective value. It gives us pleasure and pain. Different kinds of food with different tastes give us different degrees of pleasure and pain. Bitter medicines give us pain. Tastes cannot be revived in memory.

(ii) Smell:

(a) Receptor and Stimulus:

The olfactory sense-organ is a membrane lining the nasal cavity and composed of a layer of cylindrical cells whose outer ends are exposed to currents of air. It is stimulated by minute chemical particles of matter afloat in the air.

The stimulus is some vapour or gas or odoriferous particles dissolved in the air. There is a mechanical, or probably a chemical, action between the stimulus and the sense-organ. It is conducted to the brain by the olfactory nerve. The olfactory sense is sometimes called a chemical sense.

(b) Primary Odour:

Henning finds six elementary odours of olfactory sensations as follows:—(1) fruity or etherial odours found in apples, grapes, orange, oil, etc.; (2) flowery or fragrant odours found in pansy, carnations, etc.; (3) spicy odours, found in cloves, cinnamon etc.; (4) resinous odours, found in pitch, turpentine, etc.; (5) scorched odours found in burnt substances, tar, pyridue, etc.; (6) putrid or foul odours, found in decaying animal matter, hydrogen sulphide, etc.

(c) Compound Odours:

These are the outstanding odours. There are many intermediate odours. Pure odours are rare. Compound odours are common. They are reducible to two or more of these six odours. The number of combined odours is very large.

(d) Odours Blended with Other Sensations:

There are blends of smells with other sensory qualities. Smells

ate mixed with tastes in flavour. They are mixed with touch, e.g. in the 'pungent' odours of snuff, ammonia, etc. They are mixed with organic sensations of the respiratory system, e.g., in 'fresh smell' of a storehouse etc.

(e) Olfactory Sensitivity:

The sense of smell is the oldest sense. It is keener in dogs than in men. It is keen in bees and other small insects. It is extremely delicate. Camphor can be smelt in a dilution of one part to 400,000th part of water. Its cognitive value is not very great.

Smell sensations ate vague and indistinguishable. But odours call up vivid remembrances of past experiences. They have a close relationship to sex excitement, especially in the lower animals, Strong perfumes have a similar effect. The sense of smell has a greater cognitive value in animals.

In them it is capable of fine discrimination, which depends on the area of the sensitive

surface. Odours have a high affective value. They give us pleasure and pain. The flavour of food, the fragrance of flowers, and the like, are a source of greater pleasure.

(f) Adaptation:

The sense of smell is easily fatigued. If a person continues to smell a bad odour, he will cease to perceive it. This is called adaptation. A person sitting in a stuffy and badly ventilated room may fail to perceive a bad odour owing to adaptation. But another person coming from the fresh air into the room will at once perceive the bad odour.

(g) Contrast:

Successive contrast affects are found among olfactory sensations also. If a person smells a foul odour and then a fragrant odour, he will more vividly feel the latter. Similarly, after sensing a fragrant smell, a person senses a foul smell more vividly.

But simultaneous contrast effects are not so clear in smell. If two stimuli are applied at the same time to the olfactory sense, the presentation of one stimulus does not bring about a more active response to another.

(h) After-images:

There are after-images or after-sensations in smell. After we cease to perceive an odour, it lingers in consciousness as an after-sensation. It persists for some time on account of the continued activity of the inner machinery of the sense-organ, even after the withdrawal of the stimulus.

(iii) Cutaneous or Tactual Sensations:

(a) Receptor and Stimulus:

The skin is the organ of cutaneous sensation.

It consists of three layers:

(1) The insensitive outer layer or epidermis,

(2) The sensitive middle layer or dermis, and

(3) The inmost layer composed of fat.

Nerve-fibres issue from the middle layer. Under the epidermis there are conical papillae, some of which contain small egg-shaped bodies composed of cells touch-corpuscles to which nerve-fibres are attached.

There are four distinct organs called cold spots, warmth spots, pain spots, and pressure spots in the skin. If you take a cool blunt-pointed object, like a knitting needle, and explore gentle some portion of the skin, such as the back of the hand, you will find that at certain points there flashes out a distinct sensation of cold.

They are called cold spots. At other spots nothing but pressure will be felt and if the pressure be very gentle, no sensation will be felt in many places. If the point be slightly warmed, you will feel

warmth sensation at some spots.

They are called warmth spots. If a fine broom straw or horsehair be substituted for the knitting needle and the skin be explored with a gentle pressure many spots will yield a distinct cutting pain sensation. They are called pain spots. From some spots will issue sensations of pressure.

They called pressure /spots. Cold spots sometimes yield sensations of cold, if they are stimulated with slightly warm objects. They are the paradox sensations of Von Frey. The sensation of heat is a blend of warmth and cold.

There are no heat spots. If we apply a stimulus of increasing warmth to a region of the skin which has both cold and warmth spots, we feel for some time only the warmth; but when the stimulus has reached a certain temperature, the cold spots, suddenly and paradoxically, give us sensations of cold and, the blend of warmth and of paradoxical cold is felt as heat.

Burning hot is probably a combination of warmth, cold and pain. The tip of the tongue and the tips of the fingers are very sensitive to touch; the cheek and the forearm to heat; the cornea to pain. A pain spot yields a pain sensation, even if it is explored with a cold or hot heedle. Cutaneous pain, therefore, is a kind of sensation distinct from the feeling of a pin.

(b) Primary Skin Sensations:

There are four primary cutaneous sensations: coolness, warmth, pressure and pain. Some recognize touch and tickle in addition to them. Compared to touch, as when the skin is lightly touched with a dull pencil point, pressure is felt as more dull and deep. Tickle is aroused by drawing a light bristle across the back of the hand, especially if contacts are made with hairs.

(c) Compound Skin Sensations:

Many cutaneous sensations are

compound sensations. Itch is the combination of touch, tickle, and mild pain. Moistness is the combination of cold and pressure. Certain stinging sensations are combinations of touch, pain and warmth.

Hardness and softness are combinations of touch with resistance encountered by the muscles. They are qualities of objects and are perceived. They are not qualities of stimuli which are sensed. Roughness and smoothness also are combinations of touch and pressure with muscular sensations of resistance.

In roughness there are irregular and discontinuous pressure sensations. In smoothness there are uniform and continuous pressure sensations. Tickle is a variety of gentle touch mingled with organic sensations.

(d) Adaptation:

There is adaptation in the sense of touch. One may become quite insensitive in a short time to

warmth, cold, and pressure, but not to pain. One becomes insensitive to the pressure of clothes. A cook becomes insensitive to warmth while cooking food in a fire.

A labourer becomes insensitive to cold while labouring in winter with insufficient clothes. But a person cannot be insensitive to pain. He may neglect a pain, but when he turns attention to it, he feels the sensation. Odours become weak through adapta-tion. But severe pains do not become less severe as they continue.

The sense of touch is the primitive sense-organ. The other sense-organs are said to have been evolved from it. It has high cognitive value. It can discriminate different degrees of pressure, heat, cold and pain. Active touch, i.e., touch combined with muscular sensations give us knowledge of movement, resistance position, distance, and direction of material objects.

(iv) The Sense of Hearing:

(a) Receptor and Stimulus:

The ear is the sense-organ for sounds. The stimulus consists in vibrations of the air. Air waves are produced alternate condensation and rarefaction of particles of air. Any vibrating body which can produce such changes in the air waves are the stimuli of sound sensations.

The ear consists of three parts:

(1) The external ear of auricle,

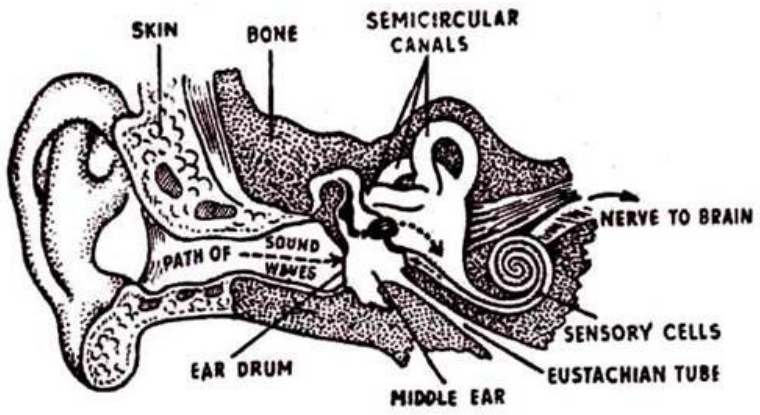
(2) The middle ear or tympanum, and

(3) The internal ear or labyrinth.

The external ear gathers the sound waves and transmits them to the middle ear. The sound waves strike the ear-drum called the tympanic membrane, and set it in vibration. This vibration is conducted by means of three tiny bones, called the hammer, the anvil and the stirrup, to the membrane at the close of the

middle ear.

The labyrinth consists of three parts, viz., (i) the vestibule, (ii) the semicircular canals, and (iii) the cochlea. The cochlea contains a membrane called the basilar membrane, on which is seated the organ of corti, consisting of rods and cells.



This is the real organ of hearing. The nerve-fibres issuing out of the nerve-cells compose the auditory nerve. The vibration of the membrane at the end of the middle ear sets the membrane in the cochlea into sympathetic vibration.

The nerve-cells which are located along the harp of the cochlea translate these vibrations into the nerve currents which are conducted by the auditory nerve to the brain. Then sensations of sound are

produced in the mind.

(b) Tones and Noises:

An auditory sensation is the response of the ear to air vibrations. Auditory sensations are of two kinds: tones and noises. Tones are musical sounds. Noises are non-musical sounds. Tones are produced by regular and periodic air vibrations. Noises are produced by irregular and non-periodic air vibrations. Tones are smooth and steady; noises are mixed and irregular.

(c) Pitch, Timbre, Consonance and Dissonance:

Tones have pitch, timbre, and harmony or discord. Pitch means the highness or lowness of a tone. The soprano voice has a high pitch, the base a low pitch. Pitch depends upon the rate or frequency of air vibrations.

The greater the number of vibrations which consecutively

stimulate the ear in a second, the higher is the pitch. Hence the pitch of a sound depends on the length of the air wave; a low note depends on a long, and a high note on a short wave length.

Timbre is the peculiar quality of a tone produced in a particular musical instrument, different musical instruments may give the same note or pitch with the same loudness, but they can easily be distinguished by their timbre. Timbre depends upon the complexity of air waves.

It is due to the mingling of the fundamental tone or ground tone with overtones or partial tones. It depends on the number of overtones produced by any musical note whose pitch is heard. It is the peculiar characteristic of a tone by which we identify it as proceeding from a particular human voice.

Certain tones fuse with one another and produce an agreeable effect in consciousness. This is called harmony or consonance.

This depends on the proportions of the rates of vibration. Other tones refuse to fuse and are harsh and discordant in their effect upon us. They are disagreeable. They produce discord or dissonance. Loudness or intensity of a sound depends upon the amplitude of air waves; the greater is the amplitude, the louder is the sound. The amplitude of air waves determines the loudness of sounds.

The volume or extensity of sounds depends upon the area or extent of the sounding object. The roaring of a lion is more voluminous than the voice of a man. The sound of the waves of the sea is more voluminous than the murmur of a stream.

Let us arrange the attributes of sound sensations with their physical antecendens in pairs. Tone X periodic vibration; noise =non-periodic vibration; pitch = vibration rate; timbre = vibration composition; intensity or loudness = amplitude of

vibration. Volume = area of the sounding object.

(d) Value:

The sense of hearing has a high degree of discriminating power. It is probably lacking in local character. It can give us knowledge of succession and help us in perceiving time. It is a great aid to the acquisition of knowledge through language.

Its emotive value is very great. The charms of music are derived from it. The semicircular canals in the inner car are responsible for the sense of balance or equilibrium. They constitute the static sense. They have nothing to do with hearing.

(e) Helmholtz's Resonance Theory of Hearing:

The sense cells are situated on the basilar membrane. It is like an elastic tape extending the length of the cochlea from its bottom to its apex, and fastened to bones at the two ends. It has fibres crosswise. It is widest at

the top and narrowest at the bottom. When sound waves enter into the labyrinth, they produce ripples in the liquid of the cochlea, which make the fibres of the basilar membrane vibrate sympathetically.

The different regions of the basilar membrane are turned to sound waves of different lengths. Sounds of high pitch produce short waves in the liquid of the cochlea, which produce sympathetic vibrations in the short fibres near the bottom of the basilar membrane.

Sounds of low pitch produce long waves in the liquid, which produce sympathetic vibrations in the long fibres near the apex. Intermediate tones produce waves of medium length in the liquid, which set the fibres of medium length in the middle of the basilar membrane vibrating sympathetically.

When waves of different lengths are produced, in the liquid, the fibres of the different regions of the basilar membrane are set in

sympathetic vibration. A person hears high, low, and intermediate tones through the sympathetic vibrations of the fibres of the different regions of the basilar membrane.

The bottoms of the basilar membranes of many persons deaf to high notes have been found to be impaired on post-mortem examination. This fact lends support to the theory of Helmholtz.

(v) The Visual Sensations:

(a) Receptor and Stimulus:

The eye is the sense-organ for visual sensations. Light waves are the stimuli. The proper organ is the retina within the eye-ball. Light waves act upon the retina, and the photo-chemical action is conducted to the brain by the optic nerve. The rods and the cones in the retina are the proper receptors, in sensations.

The eye-ball is spherical in size. It has three coats. The tough outer coat is called the sclerotic

to which are attached six external muscles that move it. Inside the sclerotic, there is the choroid coat filled with a dense dark pigment.

It makes the eye impervious to light except through the cornea and the pupil. Inside the choroid there is proper sense-organ for vision. There is a round opening in front of the sclerotic, closed by a transparent substance called the cornea. Back of the cornea there is the anterior chamber filled with a liquid called the aqueous humour. Behind it there is the iris, a round black disc with a hole in the centre called the pupil.

The pupil contracts and expands to admit more or less light into the eye-ball. In dim light it expands to admit more light; in bright light it contracts to admit less light. Immediately behind the iris, there is the double-convex crystalline lens surrounded by the ciliary muscle and ciliary processes, which accommodate, it to objects at

different distances.

The lens with its attachments constitutes the mechanism of accommodation. Behind the lens there is the large main chamber of the eye filled with a liquid called the vitreous humour. It fills the cavity between the lens and the retina. Behind it there is the retina.

The point of the retina at which the optic nerve enters the eye-balls is called the blind spot which is insensitive to light. If you fix your vision on the cross with one eye dosed and the other eye unmoved and move the figure slowly towards the eye, at a certain point you cannot see the cross because the image will fall on the blind spot of the retina.

It is devoid of rods and cones. Nearly at the centre of the retina there is the yellow spot, the point of clearest vision. In its centre there is a pit or depression, the fovea centralis. In the fovea there are only cones. As one proceeds from the fovea,

the rods become more numerous, the cones are less numerous, until at the periphery the cones are almost entirely absent.

Light passes through the cornea where it is refracted. Then it passes through the aqueous humour. It is admitted into the inside of the eye-ball through the pupil in the iris. Then it passes through the lens where it is again refracted.

Then it passes through the vitreous humour, and finally reaches the retina where it sets up neural changes which are conducted by the optic nerve to the brain. Then sensations of brightness of colours are produced in the mind.

(b) Brightness and Colour:

Visual Sensations are of two kinds:

(1) Sensations of brightness, and

(2) Sensations of colour.

Brightness sensations are produced by mixed light waves of various lengths. Pure colour sensations are produced by homogeneous light waves of waves of practically equal length. The more homogeneous are the light waves, the more saturated —the purer—are the colours. In fact, we never got colour sensations without brightness sensation also. The intensity of colour sensation depends upon the amplitude of light waves.

They vary in length, in amplitude and in form. Different lengths of waves give us different colour sensations. Variations in the amplitudes of waves account for the intensities of the colour sensations. Very often we see several waves of different lengths or amplitudes combined.

This combination gives a variation of form of the total wave. The wave form gives us sensations of saturation. The saturation of the colour sensation depends upon the mixture of wave lengths. The

more the mixture of wave the less is the saturation.

The visual sensations are generally divided into two groups, the colour and colourless qualities. A great many colours are recognized which are given particular names; red, orange, yellow, yellow-green, green, green-blue, blue, indigo, violet, purple, etc. all these colours are not elementary. Or, are some of them combinations of elementary colours?

(c) Primary Colours:

There are four primary colour sensations, red, yellow, green and blue. The colour-tone of the visual sensation depends upon the wave-length of the stimulus. A wave-length of 760 millionths of a millimeter give red, one of 605 gives yellow, one of 500 is green, and one of 470 gives blue-Red, yellow, green and blue are the primary colours. All other colours are blends of these primary colours.

(d) Mixed Colours:

Orange is a mixture of red and yellow. A deep orange has a reddish hue. It also contains a tinge of yellow. We cannot see in it any other colour. It seems to be a blend of red and yellow. Some orange are very much like red; others are very much like yellow.

We can arrange whole series of hues, beginning with red ending with yellows Beyond yellow, we can arrange a series of hues, which begin with yellow, and are slightly tinged with green, later become an even mixture of yellow and green and finally merges with pure green.

Beyond green, we can arrange another series of hues, which begin with green and are slightly tinged with blue, later become an even mixture of green and blue, blue-green, or peacock, and finally merge with pure blue.

(e) Compound Colours:

Thus, orange is a blend of red and yellow. Violet is a blend of red and blue. Purple is a mixture

of red and violet. Peacock is a mixture of blue and green. Indigo is a mixture of deep blue with a slight tinge of red. Indigo violet and purple are steps in continuum between blue and red.

All colour sensations are continuous. They form a belt which describes a circle called the colour circle. It consists either of red, yellow, green and blue, or a blend of any two of these which are adjoining in a circle.

In addition to the colours, black and white are two other elementary visual qualities. White introspectively is not like red, yellow, green, or blue, nor is it like black. The same is true of black; it is not like red, yellow, green, or blue; nor is it like white. Black and white distinctive sensations.

Compound colours result also from the blending of red, yellow, green, and blue with a grey of a lighter or darker shade. Pink; is a mixture of red and light grey.

Olive is a blend of yellow and green, and moderately dark grey. Brown is a combination of dark grey and orange. All visual sensations may be reduced to the primary qualities, red, yellow, blue, green, black and white.

We should remember that colours are sensations: they exist in our consciousness; they cannot mix with one another. Only the external stimuli, namely, the light waves are mixed in order to produce unique colour sensations which are called compound colour.

(f) Complementary Colours:

Two wave lengths of light, which, when acting on the retina, give a sensation of white or gray, are called complementary, red and blue-green, green and purple, yellow and indigo-blue, orange and green blue, violet and yellow-green are complementary colours.

There are two kinds of visual

after-images, positive and negative. They are due to the prolonged stimulation of the retina after the withdrawal of the stimulus. They should be called after-sensations. If you look at a bright light and quickly look towards a dark surface you will see a patch of light for some time. This is a positive after-image.

The colour of the positive after-image is the same as that of the inducing colour, but only weaker in intensity. If you look at a piece of red paper for ten or fifteen seconds and then look at a white wall or paper, you will see a greenish spot of the shape of the red paper.

This is a negative after-image. If instead of red paper you use a piece of blue paper, when you look at the white background you will see a yellow patch. This is also a negative after-image. The colour of a negative after-image is complementary to that of the inducing colour. Try looking at a white paper. You

will find that the negative after-image will be black.

(g) Colour Contrast:

Blue and yellow, red and green, clash with each other. This is called colour contrast. A girl with red hair should not put on a green dress, for the green will make the hair look redder. Yellow and blue appear yellower and bluer by the side of each other than when seen apart. These are examples of simultaneous contrast which is peculiar to the sense of sight.

(h) Successive Colour Contrast:

There is also successive contrast among colour sensations. Look at a bright surface and then at a surface of medium brightness; it will appear dark. Look again at the surface of medium brightness, and then at the bright surface; it will appear bright. Blue and yellow are complementary to each other. Look at blue and then at yellow; the latter will appear more

saturated than usual. These are examples of successive contrast.

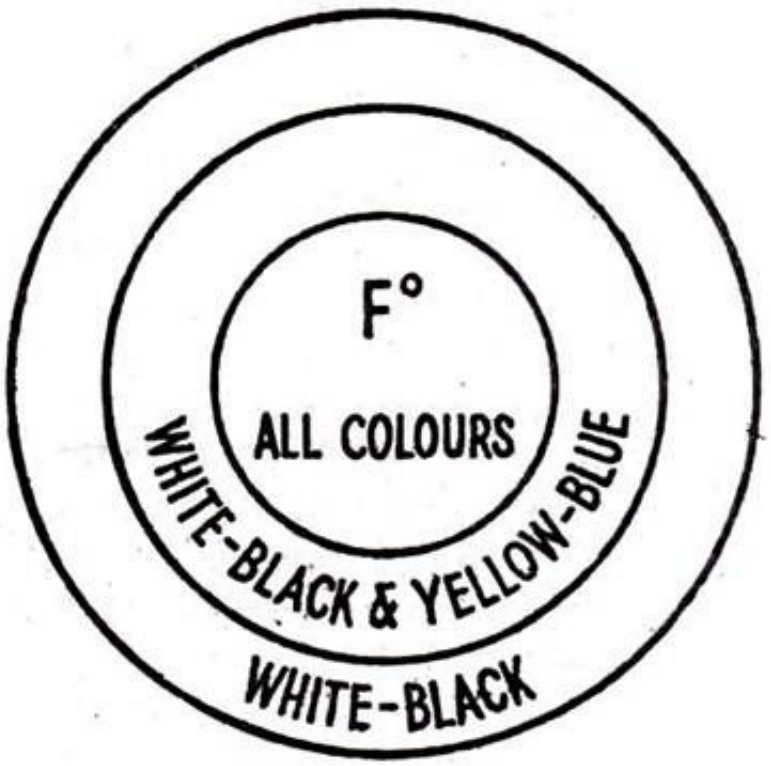
(i) Colour Blindness:

Some persons are totally colour blind. They see all colours in terms of their brightness, e.g., as white, grey, or black. They are colour blind to blue and yellow as Well as to red and green. Total colour-blindness, amounts to red vision, which gives white and black, or light and dark but none of the spectral colours.

Some persons are partially colour blind. Most of them fail to see red and green and combinations of red and green but can see other colours. Red-green blindness is very uncommon among women. But it is present in three or four per cent of men. Blue-yellow blindness is another variety of partial colour blindness.

Different parts of the retina around the fovea are sensitive to all colours. Red and green are only seen accurately for a short distance outside this region.

Yellow and blue are lost next. All colours appear white or grey in the extreme periphery. The outermost zone of the retina, where cones are very scarce, is almost totally colour blind.



Rod vision and cone vision—Go into a dark room, and at first all seems black to you; but gradually you begin to see things, because your retina become dark-adapted. Come out of the dark room, and your eyes are ‘blinded’ but gradually your retina becomes light-adapted and you can see distinctly.

While you are in a dark room, you see only light and shade, but no colours. The fovea has only

cones, and not rods. It has the best colour vision. It cannot be well dark-adapted. Twilight vision in dim light is rod vision.

(j) Colour-Adaptation:

When we enter into a room illuminated with blue, red, yellow, or green light, at first we perceive all objects there coloured blue, red, yellow, or green. But after some time, the eyes get adapted to the colour, and we see objects in their natural colours, as if they were in white light. This phenomenon is called, colour-adaptation.

(k) The Retina's Own Light:

Even when we are in a dark room from which external light is shut out, we continue to have greyish light sensations. When in a dark room we press an eye-ball, we perceive specks of light. These light sensations are due to the retina's own light.

(l) Physiological Theories of Colour Vision:

Young and Helmholtz maintain that there are three substances in the retina, which produce sensations of violet, green and red, when they are stimulated by light waves. When any two substances are stimulated, sensations of mixed colours are produced.

When all the three substances are stimulated, the sensation of white is produced. If the substance corresponding to red is insensitive, red-blindness occurs. If the substance corresponding to green is insensitive, green-blindness occurs.

But if the substance corresponding to red or green is insensitive, a red-blind or green-blind person cannot see white, which is a compound colour. But this is not a fact. So the theory is not right.

Hering maintains that there are three retinal substances, which being stimulated by light waves produce three pairs of colour sensations, red-green, blue-

yellow, and white-black through assimilation and dissimilation: Red, green, blue and yellow are the four primary colours; white and black are neutral tints.

This theory adequately explains how complementary colours mixed equally produce the sensation of white. When assimilation and dissimilation of the red-green substance or the blue-yellow substance are simultaneously aroused, they neutralize each other, and produce the sensation of white.

But, according to this theory, a red-blind person ought to be green-blind also, because the same retinal substance produces the sensations of red and green. But sometimes red-blind persons are not green-blind also. Further, bluish green is complementary to red, and indigo-blue complementary to yellow. Pure green and pure blue are not complementary to red and yellow respectively. So Hering's Theory also is not quite satisfactory.

Ladd Franklin maintains that the different zones of the retina are sensitive to different colours. The central zone (fovea centralis) composed of cone cells is sensitive to all colours. The intermediate zone composed to cone cells and rod cells is sensitive to blue and yellow, white and black.

But it is insensitive to red and green. The outermost zone composed of rod cells is sensitive to white and black only. But it is insensitive to the other colours. This part, of the retina only responds to light-waves in totally colour-blind persons, who see only white and black.

The intermediate part of the retina responds to light-waves in red-green blind persons. The central or innermost part of the retina responds to light-waves in normal persons, who see all colours. This theory appears to be satisfactory.

(vi) Relatively of Sensations:

The existence, quality, and quantity of sensations are felt in relation to other sensations. This fact is called relativity of sensations by Hoffding.

(1) The existence of sensation is experienced in relation to other sensations. It cannot be felt without relation to them. We are always hearing some indistinct sounds which are not noticed. But whenever a louder sound or a significant faint sound occurs, it catches our attention, and is noticed.

So a sensation of sound is left in relation to a background of other indistinct sounds. Similarly we always feel some tactual sensations produced by clothes, contact with the ground, or chairs, etc. But they are not noted. But if somebody touches our hands, we notice the tactual sensation at once. Thus the existence of sensations is appreciated in relation to other sensations, or in contrast with them.

(2) The quality of a sensation is

experience in contrast with other sensations. Dip your hand into hot water, and then into warm water. The warm water will be experienced as cool. But dip another hand into warm water. It will be experienced as warm. Eat a bitter fruit (e.g., moribilinum), and then taste water; it will appear sweet. So the quality of a sensation is relative to other sensations.

(3) The quantity or intensity of a sensation is experienced in relation to the quantity or intensity of the preceding sensation. A person carrying a load of one maund does not feel the increase of the weight by one seer. But a person carrying a weight of one seer feels an increase of it by half a seer.

So the intensity of an appreciable sensation is relative to that of an original sensation. This phenomenon is called relativity of sensations.

Sensation Blend and Sensation Pattern:

Compound sensations are reducible to primary or elementary sensations.

They are of two kinds:

(1) blends, and

(2) patterns.

(1) The blend as well as the pattern of sensations is apprehended as a unit. In a blend the component sensations are so fused together that they cannot be easily separated from one another. They lose some of their own qualities in the sensory fusion which has its own characteristic quality.

Yet they can be distinguished from one another by careful attention. In a pattern, on the other hand, the component sensations do not lose their characteristic qualities in the compound sensation, but they are so spread out in space or time, they can easily be distinguished from one another.

For example, the taste of

lemonade is a blend of sweet, sour, cold and lemon odour; it is sensory fusion of taste sensation, temperature sensation, and olfactory sensation, which has the effect of a single characteristic sensation. It can be analysed into component sensations by careful attention, but it ordinarily appears as a unit. This is the characteristic of blends.

Heat is a cutaneous blend of warm, cold and pain sensations. Orange is a visual blend of red and yellow. The compound sensation, aroused by touching the skin simultaneously with a ring or a square is a spatial pattern. A rhythm or a tune is a temporal pattern. The visual sensation of a patch of colour is a spatial pattern. It spreads out in space. The visual sensation of light being turned down is a temporal pattern.

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