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Barmer (Rajasthan)

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Dr. K.S. Krishnan, D.Sc. F.R.S.,
Director, National Physical Laboratory,
New Delhi 12,

Respected Sir,

I enclose herewith for your perusal outline of the subject, (SMELL ? & IT'S PHYSICAL ASPECT) I propose to study during the term of fellowship for which I intend to apply to the Indian Institute of sciences, Govt. of India.

I feel that these random thoughts would not take any definite shape without the able guidance of some superior mind possessing experience of scientific thinking for that I approach to you with humble request to convey your consent to select me as a student of yours at the Physical Laboratory, if I am worthy of being one.

The last date for the submission of the application for the Junior Research Fellowship is 11th. Feb., '60. I look forward to your kind consent in time so that I may send the application form duly completed to you for further transmission.

With kindest regards,

Yours Sincerely

M.L. Bohra
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SMELL & PHYSICAL ASPECT

Be it a particle or a wave or both or an entity hither-to-unknown, it is beyond doubt that it makes us feel the presence of the material emitting it in the near surrounding.

LET it be a particle

either 1. the molecules leave the matter either by way of diffusion or due to mass gradation (density difference during the process loss of weight is inevitable. Would Graham's law of diffusion or Brownian motion and Radio active disintegration law account for it? Difference of velocity of intelligence from different sources is inevitable, or (2) energy bundles are radiated from the body, attach themselves with the other molecules of the surrounding atmosphere which subsequently travel to the alfactory nerve endings or the energy quanta reach the response and by way of radiation. Would Planck's law of radiation reveal the distribution of energy from different sources? or, the matter surrounding itself form an atmosphere of aroma till the saturation containing the particles responsible for it, just like electronic atmosphere ~~of~~ around all material bodies, when disrupted by the everagitating molecules of the atmosphere, the tiny particles move in directions determined by the collision process. Would the phenomenon of saturated vapour pressure laws of collision and kinetic theory of gases and work function account for the intensity of it at a place?

If it is wave motion, shall we be able to demonstrate the phenomenon of interference, diffraction and polarisation? Would Maxwellian distribution of energy give some information regarding the distribution of energy over various odours? Shall we be able to assign some wave length to a particular odour?

Almost all elements of the periodic classification are odourless except a few halogens. But their compounds possess peculiar odours. (Ammonia, Hydrogen sulphide,

Phosphin, oxides of Nitrogen, aromatic compounds and many others) Does valency-bonds, electronic configuration and isomerism play any role in creation of it? or it is simply in the consciousness of the mind of the human-being who believes in the existence of mind (super prior to the creation of matter? Is it a molecular phenomenon? or does it reach to the atomic state of affairs?

Does Temperature, pressure and humidity have their effects over the aroma?

Does atomic energy irradiated source reveal same thing else?

What ever be the mode of propagation of smell through the space, it is a fact that the sense reaches the olfactory nerve endings, which in turn respond to it. This end of nerve is stimulated. The stimulation travels along the nerve fibre to the analysis centre. The inside of the nerve fibre is found to be at lower potential as compared to outside. In giant nerves (50 micron diameter) this potential difference is 50 mV. This rest P.D. is attributed to K^+ Na^+ and Cl^- ion permeability through the axon; and their concentration, inside and outside the fibre. ^{Concentration between the axoplasm and interstitial fluid,} When the nerve is stimulated the potential at the point of stimulation is less than that of inside the fibre. Hodgkin² and Katz have shown that during excitement the axon membrane changes its relative permeability to K^+ Na^+ & Cl^- (1.0:0.04 : 0.45 to 1.9 : 20; 0.45) Thus the membrane becomes selectively permeable to Na^+ & relatively impermeable to K^+ . During the impulsive stroke Na^+ leaks into the nerve fibre from surrounding fluid, and during receding stroke K^+ is supposed to leak out. Duration of this spike potential at a point is one millisecond for 20 micron nerve. It reveals the local action at a point. This spike potential at a point ~~is one millisecond for~~ travels from one end to the other so as to maintain the created P.D. Thus the spike p.d. acts like a travelling stimulation electrode. The nerves are said to be depolarised. If this is the mechanism of impulse propagation, the action can be said to be an electrical one. Will it be possible to set up an electrical network using organic and inorganic membranes to create p.d. between the two ends when exposed to some odour?

The other alternative is that the molecules in ionic state responsible for the odour enter the nerve fibres through the ends, handing over the charge combined with the ions present. If it is so the presence of the material in combined state should be found there in the blood vessels. Reduction of conc. of chlorine ions should occur.

May it be an electrical process or some other but how the analysis centre gives it a particular tone?

What are the factor responsible for it? Or should we argue that when we are exposed to an oven we feel the warmth but when exposed to the furnace we feel pain, should we assume the existence of pain in the heat of the furnace of it is what our mind creates? So should we believe in minds creation or the particular behavior of the matter? Should we search for the pigments in the blood responsible for differentiated odour preception as Sir C.V. Raman has recently given information regarding the presence of four pigments responsible for colour preception (Xanthophyll, Haemoglobin, Oxyhaemoglobin and Methemoglobin)

How human beings feel it? Will be another line of approach. What are the physiological effects? Will it be possible for us to classify the odour consciousness from feeling point of view?

Do plants grow more in an atmosphere of pleasant odour? Does it affect the process of transpiration, respiration and pollination in plants?

Following series of experiments and study of the various phenomenons would lead us to some conclusion.

1. To determine the velocity of propagation of smell from various sources (gas, liquids and solids) properly taking due consideration for Doppler effect, temperature pressure, humidity and diffusion coefficient. At an early stage the reception will have to be done with the human sensory organ, where personal equation plays a role.
2. To determine the intensity of smell at a point in a field due to a source at a particular moment.

Number of particles reaching a certain area placed at the point in question can reveal it. Diffusion experiment would reveal it. If coloured source is strongly illuminated and placed under some liquid the microscope focussed at a point would give the number of particles reaching their. If the energy distribution follows inverse square law will also be revealed, together with the rate of loss of matter by the source.

If the propagation is not a diffusion process and if it is in the form of quantum of energy of course not so energetic to penetrate the appreciable thickness of material surfaces, but quiet capable of exciting the olfactory nerves. We set an experiment to demonstrate the absorption spectra of a liquid or gas after exposing it to the source of a smell. If the energy is due to electronic jumps this spectra would reveal it. Or the valency bonds which are in rapid vibratory motion release the energy, which can only be responded by the olfactory organ, a material entity. If one type of matter can respond to a certain action some such similar network of course assembled in a man made laboratory would also respond to it.

Hydrogen & Nitrogen are odourless but as soon as they combine to form a molecule of ammonia some sort of energy is released, which consequently reaches the receptor. Question is if molecules of ammonia are kept fixed in space at a point by some semipermeable membrane impermeable to ammonia molecule, will it be possible for sense to reach us? If answer to this question is in affirmative, we are forced to assume the radiative state of affairs with the molecule. Will the molecules radiate energy for indefinite period?

Is it spontaneous, self excited phenomenon? Does the molecule disintegrate under these conditions? can we derive some expression for the rate of loss of mass by the molecule and its half life period? Or the bombardment of air particles release some energy in the form of odour. It is a fact that so long as a molecule of ammonia remains the molecule of ammonia it should give the properties of it, hence it will go on emitting the odour.

Matter in itself has no existence, it is the interplay of energy over matter, which makes existence of matter and its behaviour recognisable. Should we suspect the presence of some tiny energy particles just like photons or Gamma rays being constantly radiated by the molecules?

Systematic study at the origin or at the end can reveal the nature of it.

Our ultimate aim would be to set up an electrical or some such network which would respond to it. Organic and inorganic semipermeable membranes in assembly with the other fluids and electrical wirings connected to oscillographs would respond.

Regarding the origin we find the properties of matter using the technique of gas Chromatography infrared ^{ray} analysis, Low temp. Vacuum distillation, mass spectrography absorption spectra etc.

Regarding the applied phenomenon temp effect pressure effect combination of certain odours (flavours) flavour and food acceptance physiology of the human being will be studied.

An experiment can be set up to find the effect of pleasant odours over the growth of plants food production, process of transpiration, respiration and pollination.