Colour: An Innate Property of the Matter

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Jaina View about Colour

According to the Jainism, whole universe is made of six ultimate realities known as dravya. They are — Jīva, Pudgal, Dharma, Adharma, Ākāśa and Kāla. Out of them, pudgal (matter) is the only dravya which is rūpī. One which possesses the properties of sparśa (touch), rasa (taste), gandha (smell) and varṇa (colour) is known as rūpī. Matter is the only dravya which is the object of sensuous cognition. Other five dravyas do not possess above four properties. That's why they are arūpī. The term rūpī does not mean visible, but perceivable and signifies the concurrent existence of all the four sense data.

Whether, the matter is in the form of skandha or it is in the form of paramāṇu (ultimate particle), these four innate properties, i.e., touch, taste, smell and colour, will always be with them. Here, we shall discuss about the colour.

Colour is an innate property of matter. These are five elementary colours blue, yellow, red, white and black. A physical body or matter must have atleast one of them. Matter may have more than one colour in the form of mixture, but it is not possible to have a matter without any colour.

As we have said earlier, a paramāṇu also possesses any one of the five elementary colours. If we go into the depth of the colours, it may be infinite also. There may be a paramāṇu with one unit of blackness, two unit of blackness, up to infinite units of blackness. In this way, there may be infinite types of colours. One thing which is to be noted here is that the intensity of a colour may vary but the colour itself of a paramāṇu cannot be other than five elementary colours unless it is going to form a skandha by combining with the other paramāṇu.

Two or more paramāṇus of different colours when combine altogether, they form skandha. The colour of a skandha may be different from that of the constituent paramāṇus. It depends upon the intensities of different colours of the constituent paramāṇus.

Light and Colour

Modern science explain the phenomenon of colours on the basis of the
wave theory of light. Light was shown by Maxwell to be a component of the electromagnetic spectrum. Light travels in the form of waves. All these waves are electromagnetic in nature and have same speed \(= 3 \times 10^{10} \text{ cm/sec.}\) in free space.

Thus, the light is defined here as the radiations that can affect the eye which shows the relative eye sensitivity of an assumed standard observer to radiations of various wavelengths. The lower and upper limits of visible spectrum (wavelength) are not well defined, but they are about 4300 Å and 6900 Å respectively (1 Å = 10⁻⁸ cm). The eye can detect radiation beyond these limits, if it is intense enough. In many experiments in physics, one can use photographic plates or light sensitive electronic detectors in place of human eyes.

Each wavelength of visible spectrum of the electromagnetic radiations corresponds to a definite colour. As this wavelength changes, the colour will also change. The lowest wavelength which one can see corresponds to violet colour and the maximum wavelength which one can see corresponds to red colour.

The normal white light from the sun contains the whole visible spectrum. When white light falls on any material object, it absorbs some of the radiations and reflects the rest. The reflected radiations when reach our eyes, we perceive the colour of that object corresponding to the wavelength of these radiations. Thus, when the light from the sun falls on the grass, it absorbs radiations of all wavelength except one representing green colour. Consequently, only radiation of wavelength representing green colour reaches our eyes. They stimulate the optic equipment and we see the grass as green.

It is obvious that the reflection of wavelength corresponding to green colour and absorption of the rest of the wavelengths by grass is due to its own specific structural properties. Thus, on the basis of scientific theory of colour, it becomes clear that the perception of grass as green or rose as red depends upon the fact as to which wavelength is reflected and not absorbed by the object, and this in turn, is decided by something inherent in the object-some structural peculiarity of the object itself.

We perceive the sense of colour, not only by the reflection of some particular wavelength by an object, but sometimes body itself radiates the light of some specific colour. As the temperature of a body is raised, first of all it emits infra-red radiation, then red light, then yellow light and finally white light. If we could obtain even higher temperature in the laboratory, we could make bodies blue hot as is
actually observed with some of the stars. Here one thing is to be noted that the
colour of a body may change accordingly. It depends upon the temperature of the
body.

Colours of Quarks and Gluon

According to the modern science, quark and gluon are supposed to be
the ultimate particle of the matter. Quarks are the charged particles while gluons
are chargeless particles. It was believed that 'a baryon is made of three quarks
which are having equal energies and same direction of motion. But, in principle,
particles of equal energies and other similar properties cannot live altogether. To
avoid this problem, it was postulated that the quarks and gluons possess any one
of the three colours which are red, yellow and blue. In this way, a baryon is made
of three quarks of same energies which are moving in the same direction, but
they differ in their respective colours. It is experimentally proved that a quark or a
gluon possesses one out of three colours, i.e., red, yellow and blue.

Similar to the quarks, there exist anti-quarks which possess anti-colours.
When one quark of some particular colour combines with an anti-quark of anti-
colour, it form a colourless meson.

To explain the colours of fundamental particles in detail, a new dynamics
has been developed which is known as 'Quantum Cromodynamics'.

Discussions

In short, we can state the Jaina view about colours like this, that — (1) the
colour is an innate property of the pudgala (matter), and (2) these colours are
five in number. Now we shall discuss both these points on the basis of modern
science.

It is well known that there are a number of material objects which do not
have any colour. For example, good quality of plain glass (solid), distilled water
(liquid) and air (gas) do not possess any colour. Then how can we justify that
the colour is an innate quality of matter?

To explain the existence of colours in such type of things, we have to go
into detail about the properties of its fundamental particles. Quarks are supposed
to be the smallest possible building block of all the material objects. We cannot
see it, but according to the modern science, this quark too possesses some colour.
When we cannot see the quark, how can we see its colour? Then, what do we
mean by saying that 'a quark is red'? What we mean here, is a red quark will
always vibrate with a frequency corresponding to red colour. But the intensity of the wavelength corresponding to that frequency is so small that we cannot see it.

One thing more is that when one coloured quark combines with an anti-coloured anti-quark, it forms a meson which is a colourless particle. In this way, coloured quarks can make a colourless particles.

We can assume that a quark is just like a paramāṇu and a meson is just like a smallest possible skandha. Thus, according to the modern science, paramāṇu (quark) will always be a coloured particle but a skandha (meson etc.) may or may not be a coloured one. Hence we can conclude that all the material object are made of number of coloured fundamental particles (so called paramāṇu). With this respect, colour is an innate property of the mater. But we have to accept the fact that it is not necessary that all the skandhas should be coloured.

Second point of discussion is that how many colours exist in the Universe? According to the Jainism, the number of colours are only five. But according to the modern science, it is not the case. Each wavelength of visible region of electromagnetic spectrum is associated with some particular colour. If there is a little change in the wavelength, the colour will also change. In this way, there are a number of colours. In daily life also, we see that there are number of colours. Then, how can be justified that there are only five colours?

First of all, we have to classify the colours in two forms — (1) primary (or elementary) colours, and (2) derived colours. There are only five primary colours. Derived colours may be of any number. When we say that a body possesses a colour other than five elementary colours, it is to be understood that the body will certainly have a mixture of five elementary colours only in different proportions.

We can further justify the existence of five primary colours by going into detail of colours of quark the — smallest possible building block of matter. As we have said earlier that a quark possesses any one of the three colours. If we assume quark as a paramāṇu, then on the basis of science, a paramāṇu may have any one of the three colours (i.e. blue, yellow and red). But a skandha may have number of colours depending upon colours of all the constituent paramāṇus forming that skandha.

But problem is not yet solved. According to the Jainism, there are two more colours, i.e., white and black. According to the science, a body possesses
white colours means it reflects or radiates all the radiation of visible spectrum. Similarly, when we say a body possesses black colour, it means that body absorbs all the radiations of the visible spectrum. Or we can say, white and black are not the colours, but are something special. By upacāra we can say that white and black are also colours.

When white light from the sun passes through a prism, it gives a spectrum of seven main colours. Are these seven colours different from the five primary colours of the paramāṇu? Light itself is a skandha and whatever we see is nothing but a skandha and not a paramāṇu. When we see number of colours, it means we are seeing number of colours of skandha in the form of light which is being reflected from the body. The colours of a composite body (skandha) would thus be determined by the resultant of the frequencies of its components.

Now we can conclude that the smallest possible building block of matter (i.e., paramāṇu) will have any one of the three colours, i.e., blue, yellow and red. Two colours, i.e., white and black are said by upacāra. But a skandha may have number of colours or it may be colourless also. It depends upon the colours of their constituent paramāṇus. Hence, whatever is being said about five colours of matter in Jainism is true with respect to paramāṇu only.

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