the hue of this primary ; it mixes well with both blue and red, producing tolerably bright green and orange respectively. A warm or reddish yellow mixed with blue results in a "dirty" green or olive, consequently a yellow the reverse of this, a cool, slightly greenish yellow, is the hue of the primary pigment yellow.

The primary red pigment, with which we are most concerned because of its being the name given by artists and physicists alike to one primary in each set, is of a crimson or violet hue, the opposite of scarlet or orange. Rose madder or crimson lake are, for instance, nearer the hue of this primary than vermillion. If we mix any blue pigment with vermillion we at once neutralise the colour, and we do not obtain bright violet or purple. We only obtain bright combinations by mixing it with yellow, the primary pigment nearest to it in prismatic order, and produce bright orange hues. With a bluish red, however, as rose madder, not only is it possible to obtain bright effects when mixed with blue, the primary nearest to it in prismatic order, but when mixed with yellow, the primary most opposite or farthest prismatically, bright orange hues result. Consequently, a red of a bluish hue, as represented by rose madder or crimson lake, indicates the more exact hue of the primary pigment red.

Blue, yellow and red, of the particular hues I have endeavored to describe and illustrate, are therefore the three primary pigment colours.

There is always a possibility of error in describing a colour by reference to a particular pigment. Pigments bearing the same name, not infrequently vary very much in hue from one cause or another. The colour pigments I have enumerated are given as the nearest to the particular hues I wish to describe. Coloured plates, in books on colour, are also often very misleading, due no doubt to printers' inexactness, or the fading of some of the colours.

In all practical mixtures the primary pigments would not necessarily be employed more than any others. The two colours to be mixed would be chosen as nearly as possible in hue. If an artist, for instance, desired a brilliant orange, he would obtain it by mixing a yellow and red as similar in hue as possible, as near together in prismatic order as could be obtained, say any warm yellow and vermillion ; to use a greenish yellow or bluish red, as lemon chrome and lake, would of course, introduce some blue, and thus tend to neutralise the compound orange, and make it dull or "muddy."

That the primary pigments should be of bluish hues, is scientifically explained by the vibratory theory of light. It is well known that all colours are caused by vibrations of different strengths affecting the eye ; the stronger vibrations excite red, the weaker blue or violet. In combinations of colours, the weaker vibrations are more easily subdued. In mixing rose madder and yellow, the weaker blue and violet, or neutralising colours, which may be said to be present in the madder, are overcome and destroyed, and a bright secondary orange is the consequence. On the other hand, if vermillion and blue are mixed together, the stronger and more powerful vibrations of red and yellow assert themselves to such a degree that the weaker blue is neutralised, and a "dirty" colour having some slight resemblance to violet is the result. In this case the three primaries—red, yellow and blue—are combined, the result of which, of course, produces a neutral or dull compound colour tinged with the predominating colours red and blue, which together make violet.

All colours are properly sensations, caused by the action of light on the retina of the eye. It is now, I think, generally admitted that there are three sets of nerves, and that each of these when excited produces a sensation we name colour. Hence colour does not exist outside ourselves, and, strictly speaking, it is as incorrect to allude to a pigment as a colour as it is to allude to any other sensation as being the object causing it. Instead of naming any object, say red, it would be more exact to say that the object caused us to experience the sensation of red, for often the object itself is the opposite colour of what it appears to be. A colour object, or pigment, absorbs some of the white light shed upon it, and rejects the remainder, the rays rejected affect the eye, and excite there the sensation we name colour. In the case of a red pigment, all the blue and green producing rays have been absorbed, and the rejected rays excite red. No doubt it is much simpler to refer to pigments, or colour objects, as actually being the sensations rather than causing them, and many persons seem to have had great difficulty in grasping the distinction.

The primary sensations are, therefore, the only primary colours, properly speaking. They are generally named violet, green and red. The violet is less red than is commonly conceived by that term; a warm ultramarine perhaps best describes it. Maxwell selected a violet blue between the lines F and G on the spectrum, which, as Prof. Rood points out, is represented tolerably well by artificial ultramarine. Benson, in his "Science of Colour," names this primary blue ; but as most authorities adopt the term violet, this name may, I think, be accepted as most correct.

The primary sensation green is represented in pigments by emerald green. There seems little difference of opinion as regards this colour.

The primary red sensation is distinctly an orange red, or scarlet ; and, Helmholtz selected a red, not far from the end of the prismatic image, which could scarcely be named orange, Maxwell adopted a red which in the spectrum lies between lines C and D. This is a scarlet red, as Rood states in his "Modern Chromatics," with a tinge of orange, and is represented by some varieties of vermillion. Benson gives vermillion as best illustrating this primary red sensation, and perhaps all the authorities I have consulted describe a red the reverse of a crimson or violet-red. This primary sensation, therefore, appears to be the very opposite in hue from the primary red pigment. It is very evident that the idea conceived by the term red in the one set of primary colours is not the same as in the other set.

In order to avoid confusion, a different name might be substituted for this colour in each set based upon their particular hues, as crimson the primary pigment, and scarlet the primary sensation, which terms I adopted in a former paper on "Colour Harmony," read before the Literary and Philosophical Society of Liverpool, during its seventy-second session. To ignore the old association of the six principal colours, however and the omission of the term red altogether seems undesirable if it can be avoided.

Before attempting to suggest new terms, however, it is neccessary to consider the secondary colours. In pigments they are usually, and I think correctly, named orange, green and violet, and denote the resulting colours from the mixtures of two primaries, red and yellow, yellow and blue, blue and red respectively. All the ambiguity relative to the primaries is also peculiar to these secondary colours, and indeed to all colour terms.

With the exception of the orange, the names of these secondary colours are the same as those given by physicists to two of the primary sensations, and as I have already explained that the primary sensation red is distinctly an orange red, it may, I think, be reasonably concluded that the colours of the prim-