

DISCUSSION AND CORRESPONDENCE.

EXPERIMENTS SHOWING THAT THE RÖNTGEN
RAYS CANNOT BE POLARIZED BY
DOUBLY REFRACTING MEDIA.

TO THE EDITOR OF SCIENCE: I have, to-day, made experiments which conclusively show that the Röntgen rays cannot be polarized by doubly refracting substances.

On six discs of glass, 0.15 mm. thick and 25 mm. in diameter, were placed very thin plates of Herapath's iodo-sulphate of quinine. The axes of these crystals crossed one another at various angles. When the axes of two plates were crossed at right angle no light was transmitted; the overlapping surfaces of the plates appearing *black*. If the Röntgen rays be polarizable, the Herapath crystals, crossed at right angles, should act as lead and not allow any of the Röntgen rays to be transmitted.

On the screen covering the photographic plate were cemented the six glass discs carrying the Herapath crystals; also, three discs of glass overlapping so that the Röntgen rays had to pass through 1, 2 and 3 thicknesses of the glass. The screening of these glasses served as standards with which to compare the action of the rays which had passed through one thickness of glass and the Herapathites. On the screen was also placed a square of yellow blotting paper, $\frac{3}{4}$ mm. thick, on which were placed Herapath crystals.

The screen of compressed brown paper was impervious to two hours' exposure to a powerful electric arc light.

On exposing the screen with the six discs and paper square to the Röntgen rays, in three experiments, for $\frac{1}{2}$ hour, 1 hour and for 2 $\frac{1}{2}$ hours, and developing, *no traces whatever* could be detected of the Herapath crystals on the photographs of the glass discs or on that of the paper square. The contour of the paper was just visible, only by very careful scrutiny. The photographs of the glass discs carrying the Herapathites were circles of uniform illumination; not the least mottling could be detected. Through a magnifying glass these circles appeared with a uniform grain exactly like, in illumination and grain, the photograph of the glass disc having nothing on its surface.

The thinness of these crystals, their powerful

polarizing property compared with their thickness, and their low density of 1.8 are the reasons why they do not at all screen (unlike calcite and tourmaline), the Röntgen rays. These well-known facts induced me to make these experiments on Herapathites. They have confirmed in a very satisfactory manner what Röntgen has shown by his experiments, viz., that the X-rays are not polarized by their passage through doubly refracting media.

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COLOR VISION AND LIGHT.

IN the current number of *The Psychological Review* Mrs. C. Ladd Franklin has written some very appreciative words regarding my article on 'Vision' in the new edition of Johnson's Cyclopædia, but takes exception in very considerate terms to two points which may be worth a moment's attention. The first is to the statement that the retinal cones are sensitive to variations of color chiefly. This was written in connection with an enumeration of certain optical defects common to all eyes; and, of course, there was no intention to imply that the cones are insensitive to that combination of color variations which produces the sensation of white light. Indeed, a previous sentence on the same page may be found which does away with all uncertainty. Nevertheless, the word 'specially' may very appropriately be substituted for 'chiefly.'

The second point is of more importance—a protest against the implication that physicists are satisfied with Helmholtz's theory of vision. My statement that "this theory, with slight modification, is now quite generally accepted by physicists," does not assert that they are necessarily quite satisfied with it. Our opinions are confessedly tentative in proportion to the difficulty of settling the matter by crucial experiments. It is safe to say that no physicist expresses his view upon this subject with any approximation to the confidence with which he asserts the truth of Ohm's law in regard to electric currents. He is compelled to base his statement upon authority; for, as Mrs. Franklin very rightly says, "the physicists have nothing to do with a theory as to what goes on in the retina and in the brain." The practical