

*Erworbene Tritanopie.* COLLIN und W. A. NAGEL. Zeitsch. f. Sinnesphysiol., 1906, XLI., 74-88.

Collin and Nagel describe three interesting cases of acquired abnormality of color vision, two of which they classify as tritanopia (von Kries) or violet-blindness (Helmholtz). The first patient was a student who had received a '*Durchzieher*' in the region of the left eye. The eye-lid had been incised and the orbital wall fractured, but the eye-ball itself had received no external injury. Normal color vision failed to return when the wound was healed, hence the case was submitted to a thorough investigation. Both eyes were found to be emmetropic, and the right was normal in appearance and in function. In the fundus of the left eye there was found a small gray patch in the region of the macula, and in the extreme peripheral region a blood clot, several ruptures of the retinal blood-vessels, and an œdematous condition of the retina, — all due, it is believed, to the wound and fracture. The color sense of this eye was strikingly abnormal, a condition which gradually disappeared with the disappearance of the abnormal condition of the retina. In the early stages of the test the patient reported that yellow-green appeared to be blue, and that yellow (Na-line) seemed pale violet (lilac), when the stimulus color subtended a visual angle of 1.5 degrees or less. These colors were seen normally by the right eye, and binocular regard gave retinal rivalry (yellow and violet). Red was seen normally by the injured eye, excepting that it appeared more saturated than to the normal eye. At about 575-580  $\mu\mu$  the violet (yellow) passed abruptly into blue (green); at this region too was found a narrow band of almost uncolored light. Bluish began at 560  $\mu\mu$ , and 'distinctly blue' at 545  $\mu\mu$  (yellow-green to the normal eye); 430  $\mu\mu$  was reported to be dark blue (distinctly violet and brighter to the normal eye). The spectrum was of normal length at the red end, but was very much shortened at the violet end. Two weeks later the pathological condition of the macula was no longer visible; nor was any abnormality of color vision revealed in tests with the long-waved half of the spectrum. But blue (470  $\mu\mu$ ) seemed greenish blue, and violet seemed blue; the latter stimulus however assumed a violetish tinge with long-continued regard.

The second patient suffered from albumino-uric retinitis with complications. In the early stages of the tests this patient confused yellow and green with gray, but she had no difficulty with red or blue. Nine days later it was found that her previous equations of yellow and green no longer held. Yellowish green in juxtaposition with blue seemed gray; when yellowish green was exposed beside yellow, the former was

called blue and the latter white. Upon a white back-ground yellow and green both seemed blue. Tests made twenty-four days later showed a marked decrease of abnormality of the color system.

The third patient was a workman who suffered from severe headache. The ophthalmoscope showed a temporal bleaching in both eyes; otherwise the fundus was normal. This patient confused blue with green, and yellow with green. Red was invariably recognized. The Nagel plates made up of spots of yellow-green and blue-green were reported to be of a uniform green color. In tests with spectral colors (visual angle of  $2^{\circ}$ – $3^{\circ}$ ), yellow green ( $570\mu$ – $575\mu$ ) was called white, gray or yellow; violet ( $430\mu$  to end of spectrum) had no distinctive color. The paper closes with a discussion of the results obtained in these tests.

*Ein Fall von Grünblindheit (Deuteranopie) mit ungewöhnlichen Komplikationen.* ALFRED GUTTMANN. Zeitsch. f. Sinnesphysiol., 1906, XLI., 45–53.

This case had been tested repeatedly 'by different methods' and pronounced normal. The Nagel test however showed the presence of an abnormal color system, and a thorough investigation was undertaken. The Helmholtz color-mixing apparatus was arranged to show a semi-circle of red ( $670\mu$ ), and a semi-circle of yellow ( $590\mu$ ); the patient reported that he saw a uniformly colored yellow disc. (It is not clear why this case should be called *Deuteranopia* rather than *Protanopia*.) A somewhat similar confusion seems to have been obtained with red and green light ( $670\mu$  and  $535\mu$ ). In tests with pigments, a mixture of  $8^{\circ}$  blue and  $352^{\circ}$  black-white proved to be indistinguishable from a mixture of  $49^{\circ}$  of the same blue and  $311^{\circ}$  of black-white. Nor could the patient distinguish between mixtures of  $12^{\circ}$  blue +  $348^{\circ}$  black-white and  $50^{\circ}$  yellow +  $310^{\circ}$  black-white. Yet he was not blue-blind; it would appear from the author's statement that blue and yellow stimuli were confused only when presented in relatively slight degrees of saturation. Another striking feature of the abnormality was the sub-normal sensitivity to differences of brightness in colored and uncolored stimuli. Patches of spectral red ( $670\mu$ ) were exposed, and while one remained constant in brightness the other was varied until the judgment 'brighter' or 'darker' was reached. It was found that the width of the slit could be varied between limits represented by the units 20 and 40 without any perceptible change of brightness; for the normal subject the corresponding readings were 25 and 26. Yellow ( $589\mu$ ) gave limits of 17–31 for the abnormal and