Professor Holmgren's Test For Colour Blindness
(Holmgren-Thompson Wool Test for Colour - Blindness)

Maker, source: American Optical Company, Southbridge, Pennsylvania
Year made, acquired: c. 1900

l x w x h; 27 x 12 x 4 cm
markings on standards: green "A"; purple "B"; red "C".
Each wool skein has a brass plate with a number marking "1", "2" "3" etc., with a moveable brass disc to cover the number.

Instructions pasted on inside of box:

INSTRUCTIONS

Procedure:

1. Place the 40 small skeins together. Keep the tags covered.
2. Select the 10 skeins that best match the light green master A.
3. Next, from the remaining thirty, select the 5 skeins that best match the red master, C.
4. Finally, from the remaining twenty-five, select the 5 skeins that belong with the rose master, B.
5. Record the tag numbers of each selection set, arranging them in order of closest match to the respective master skeins

Students at the University of Toronto used the Holmgren Wool test for laboratory exercises. Physicians and laymen used the test primarily for the detection of colour-blind employees of railway and shipping lines. A set of instructions (most likely added at the University of Toronto) were pasted inside the front lid of the container (see above). These instructions are very similar to a variation of Holmgren's test designed by Dr. William Thomson, a Philadelphia ophthalmologist. The test kit consists of three test worsteds and forty match and confusion worsteds. The subject was asked to match the worsteds with the test wool. If she chose the confusion colours instead of the proper match colours, the subject was said to be colour blind. For example, with the Pink Test worsted, if the subject chose blue or violet, the subject would be termed red-blind. If she chose green or gray, the subject was said to be green-blind.

Fithiof Holmgren (1831-1897), the inventor of the above test, was a Swedish physiologist who made his reputation studying the retina's electrical response to light. Early in his career, Holmgren studied under Herman von Helmholtz and Emil DuBois-Reymond. The success and popularity of Holmgren's original test owed as much to his innovation as to the context of his work. Holmgren's original test was directly inspired by a well-publicized railway accident at Lagerlunda, Sweden, in 1876. Holmgren suspected that the engineer of the train suffered from colour-blindness and he set out to test this theory by examining 266 employees of the Uppsala-Gabole line. As he suspected, thirteen of these employees were found to be colour blind. Holmgren's test quickly established itself as a systematic, reliable way of detecting colour blindness in railway and shipping employees.

The original Holmgren test of 1879 was the first successful attempt to standardize the detection of colour-blindness. Seebeck and Wilson had made a similar attempt in the 1850's but their efforts were ignored and forgotten (Boring, 1942). Holmgren based his test on the Young-Helmholtz theory of colour perception which stated that there were three sets of colour perceiving elements

in the retina. According to the theory, a defect in one of these elements caused a variant of colour-blindness. Holmgen designed the test to require matching, rather than naming of colours. The original test was more cumbersome than the kit used by U of T students; it had over 160 wools: 3 test colours, and 20 match and confusion colours, (8 shades each).

Dr. William Thomson* devised his test under similar circumstances. In 1879 the American government commissioned Thomson to devise a colour-blind test for railway and shipping employees. Thomson worked to simplify Holmgren's method so that a "non-professional" could conduct the testing and transmit the results to an expert for interpretation. In a series of variations to Holmgren's test, Thomson reduced the number of matching colours, and numbered the worsteds.

Much of the success of the Holmgren-Thomson test can be attributed to the simplicity and portability of its design. This test represents one of the earliest examples of a psychological test used on a large group of people.

In the Literature:

Ball, James Moores (1904). *Modern Ophthalmology*. F.A. Davis, Co.
Boring, E. G. (1942). *Sensation and Perception in the History of Experimental Psychology*. New York: Appleton - Century. pp. 182-197.

Collins, Mary (1925). *Colour-Blindness: With a Comparison of Different Methods of Testing Colour-Blindness*. London: kegan, Paul, Trench, Trubner, & Co, Ltd.
Granit, R. (1972) Frithiof Holmgren (1831-1897), *Dictionary of Scientific Biography*, New York: Scribner's.

Thomson, William M.D. and Carl Weiland, M.D. (1897) Detection of Color-Blindness in *System of Diseases of the Eye*, Vol II, Norris, William and Charles A. Oliver (Eds.) Philadelphia: J. B. Lipponcott Co.

Whipple, Guy Montrose (1924). *Manual of Mental and Physical Tests*, Volume I, Baltimore: Warwick & York.

* The makers of the inside label for the demonstration kit (most likely people at U of T) spelled Thomson as Thompson. This was a common mistake. Whipple (1924), vol. I, p. 181-193, refers to Thomson (1897) as Thom**p**son (1897).