Subjective colour mixing with the colour wheel

(Item No.: P0872500)

Curricular Relevance

Area of Expertise: Biologie
Education Level: Hochschule
Topic: Humanphysiologie
Subtopic: Gesichtssinn
Experiment: Subjektive Farbmischung mit der Farbenscheibe

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Intermediate	10 Minutes	20 Minutes	1 Student

Additional Requirements:

Experiment Variations:

Keywords:

Aligning discrimination, Colour receptors, Colour mixing, Physiological impression of mixed colours

Overview

Short description

Principle

If a circular disc separated into various differently coloured sectors is rotated by a motor so fast that the eye can no longer distinguish the colours, a mixed colour is then perceived. By varying the composition and size of the sectors, it is possible to give the impression of any colour at all. The colour triangle can be used to predict what the perceived colour will be (Fig. 3).
At the same time, it must be observed that not all colours appear equally bright. This effect caused by the sensitivity maxima of the colour receptors in the retina leads to the fact that, for example, red is much brighter than blue. This effect can be compensated by the selection of the appropriate sector size.

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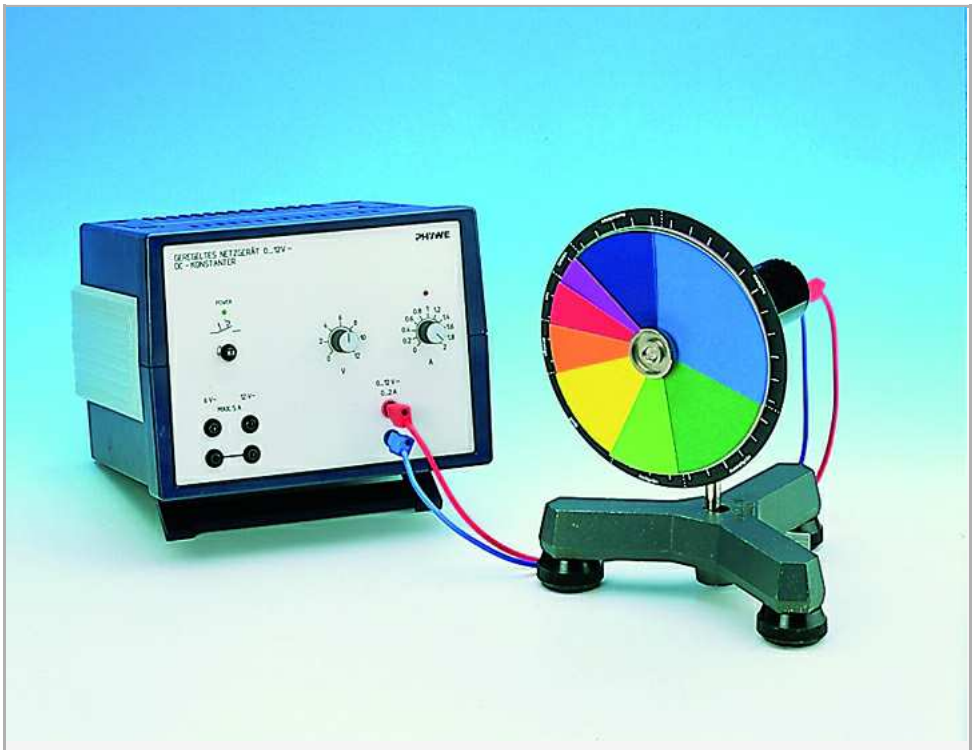

Fig. 1: Experiment setup

Equipment

Position No.	Material	Order No.	Quantity
1	PHYWE power supply DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
2	Motor with disk holder	11614-00	1
3	Experiment lamp 5, with stem	11601-10	1
4	Tripod base PHYWE	02002-55	1
5	Colour disc, adjustable	65987-00	1
6	Bench clamp PHYWE	02010-00	1
7	Stand tube	02060-00	1
8	Connecting cord, 32 A, 750 mm, red	07362-01	2
9	Connecting cord, 32 A, 750 mm, blue	07362-04	2

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Task

Reproduce the perception of a mixed colour or of white using rotating coloured discs with 2 to 8 sectors of various colours.

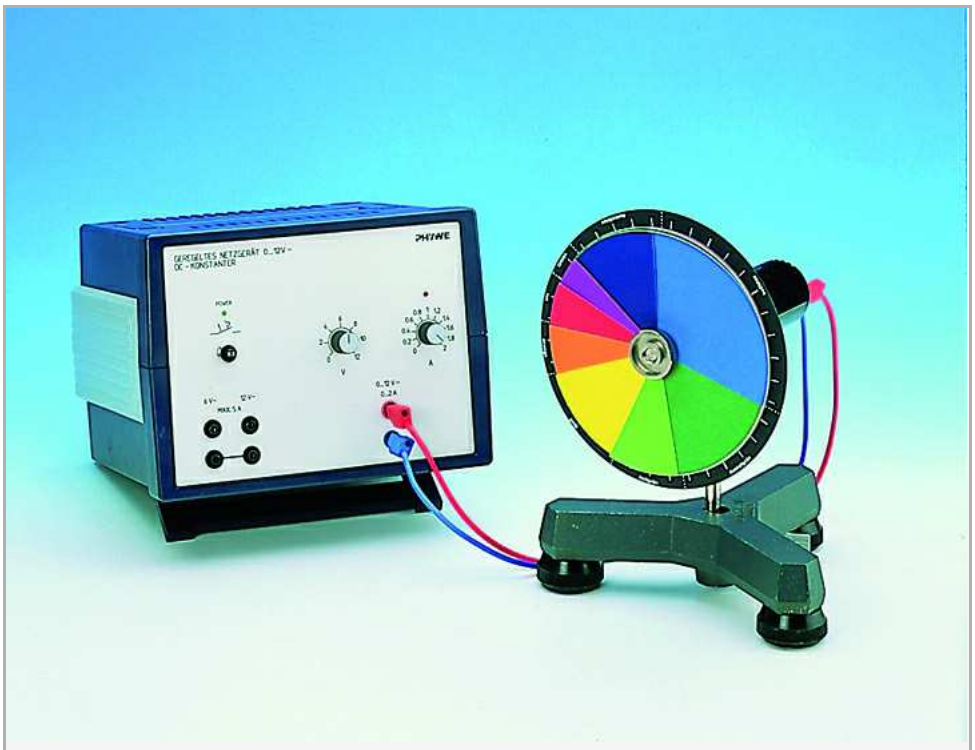

Fig. 1: Experimental set-up

Set-up and procedure

Set-up

- Connect the motor to a tripod base and connect it to the DC voltage output of the (switched-off!) Power supply (Fig. 1)
- Connect the experiment lamp with the bench clamp to the edge of the table (use the stand tube to extend the stem); Connect the lamp to the AC voltage output of the power supply unit.
- Adjustment of the power supply: DC voltage to 0 V, amperage to 3 A, alternating voltage to 6 V (insert short-circuit plug in corresponding socket in socket ring), switch on the power supply .
- Place two arbitrary colour cardboard discs as shown in Fig. 2 - one inside the other and put on the black disc (with scale); Note the size of the two colour sectors.

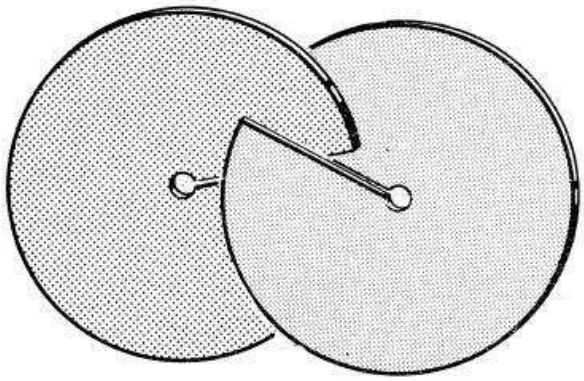

Fig. 2

- Fix the colour disc (cardboard discs + metal disc) on the axle of the motor using the disc holder.
- Darken the room and align the experiment lamp so that the colour disc is illuminated well.

Procedure

- Increase the DC voltage with the rotary knob on the power supply until the disc rotates so fast that the eye can no longer distinguish the individual colours; Note the colour impression.
- Repeat the experiment with other colour cardboard disc and sector sizes and note the respective physiological impression of mixed colours.
- Conduct the experiments also with three, four etc. colour cardboard discs, for 8 colour cardboard discs, the sector sizes for generating physiological impression of mixed colours "white" on the black metal disc are given.

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Result and evaluation

Results

- Which colour box combinations and sector sizes produce mixed colours that look exactly like one of the 8 basic colours of the colour disc?
- The formation of the mixing colours will be interpreted with the help of the colour triangle (Fig.3).

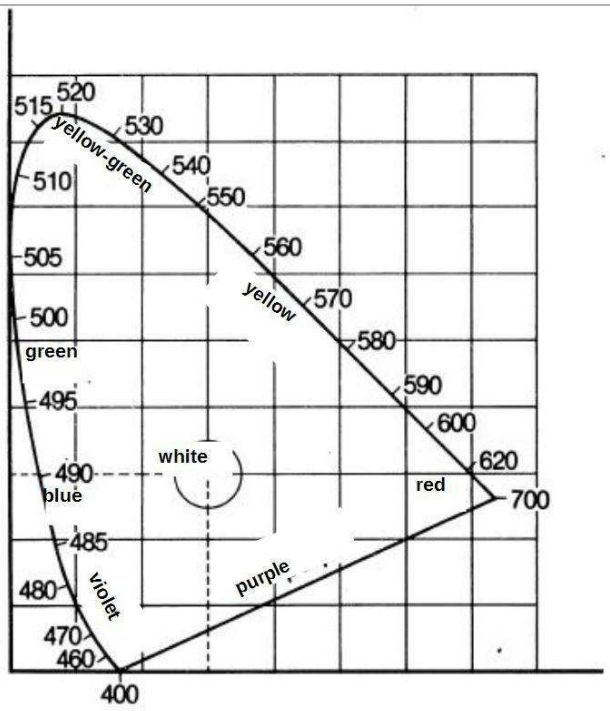

Fig. 3

- Why does the colour impression gray is formed so often?
- Why the mixture of all 8 basic colours is not perceived as pure white?