AIC Color 97
AIC Couleur 97
AIC Farbe 97

Proceedings of the 8th Congress of the
International Colour Association

Compte-rendu de la 8 journée de
l'association internationale de la couleur

Tagungsbericht von der 8. Tagung der
Internationalen Vereinigung für die Farbe

Volume I

Kyoto, Japan
May 25-30,1997

The Color Science Association of Japan

INTERNATIONAL COLOUR ASSOCIATION
ASSOCIATION INTERNATIONALE DE LA COULEUR
INTERNATIONALE VEREINIGUNG FÜR DIE FARBE

ISBN 4-9980598-0-7 (2-1)

Published by Color Science Association of Japan
Nichika Bldg., 2-12-14 Hamamatsucho, Minato-ku,
Tokyo 105, Japan

Printed in Japan

An Atlas of Cesia with Physical Samples

José L. CAIVANO and Patricia M. DORIA

An atlas covering all the visual appearances that are comprised between the categories of transparency and translucency, mirrorlike appearance and matte quality, as well as between each of them and the sensation of black, has been built. This atlas contains all the appearances in which any color can be seen, so that, by combining every sample of the atlas of cesia with every sample of a color atlas, all the visual sensations that have to do with the spectral and spatial distributions of light are included.

1. INTRODUCTION

Cesia is the name given to the visual perception of the different spatial distributions of light. The sensations of transparency, translucency, mirrorlike appearance, matte opacity, glossiness, blackness, etc., are within the scope of cesia. A theoretical model —in the form of an order system— and a notation system for cesia was first proposed in 1988 [1]. An adjusted version of this model was published in 1991 [2]. Afterwards, and in accordance with that, during the 1993 AIC Congress in Budapest a method to build scales of cesia by means of spinning disks was presented [3]. The more complete account of this method provide, along with the theoretical background, the proportions of materials necessary to build the scales [4]. The relations between cesia and color were approached from the basic concepts of the trichromatic theory [5]. In the AIC Interim Meeting 96, in Sweden, the importance of cesias as visual signs that provide useful information in the interaction with the environment were analyzed in a more humanistic account [6]. There are, of course, other bibliographical sources related with this process (authors such as David Katz, Arthur Pope, Sven Hesselgren, Ralph Evans, Richard Hunter, César Jannello, John Hutchings, Paul Green-Armytage, and others); the connections with them are described in the references cited.

After these developments, the next logical step seemed to build an atlas with physical samples, the atlas being a material representation of the order system for cesias. Such an atlas, covering all the possible ranges of cesia, has now been devised and assembled. In spite that other materials could be employed, in this case the atlas has been made with pieces of glass. The samples are arranged and notated according to the following dimensions: degree of *permeability* (or its opposite, opacity), degree of *absorption* (or its opposite, luminosity), and degree of *diffusivity* (or its opposite, regularity).

2. METHOD

In this preliminary version of the atlas, five samples are set for each of the eight different kinds of scale that appear as the boundaries of the system: 1) matte-opaque to black, 2) specular to black, 3) translucent to black, 4) transparent to black, 5) specular to matte-opaque, 6) transparent to translucent, 7) specular to transparent, 8) matte-opaque to translucent.

The five levels of absorption are obtained with transparent glass, three different neutral density glass filters, and black glass. The five steps of diffusivity are obtained by different degrees of grinding and polishing of the samples. In these scales, the samples go from perfect polished glass

to glass treated with fine emery, without any further polishing. The degrees of absorption and diffusivity are combined in order to build a page of the atlas, where all the samples have the same permeability. The five degrees of permeability, then, are obtained by applying mirror coatings to the glasses, with the following transmission and reflection percentages (nominal values): 100/0 (no coating), 75/25 (1/4 mirror), 50/50 (half-mirror), 25/75 (3/4 mirror), 0/100 (full mirror). Figure 1 is a schematic representation of the atlas. Figure 2 shows, in more detail, one page of constant permeability.

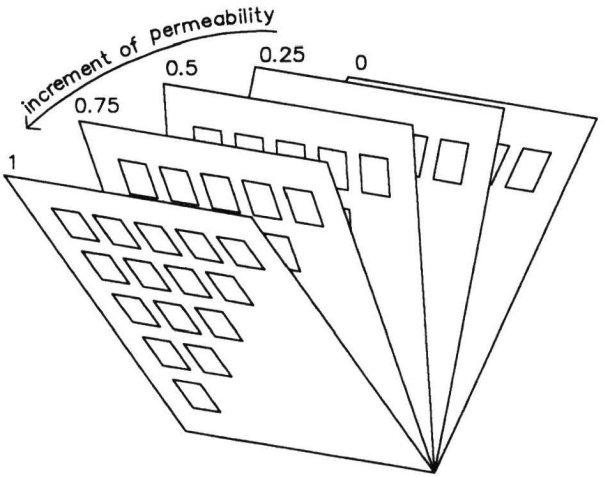

Fig. 1: Arrangement of the samples in the atlas of cesia. Each of the five pages has a different permeability.

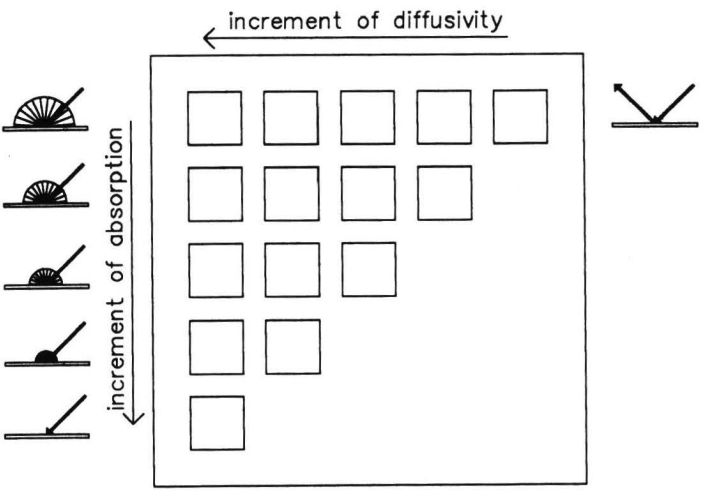

Fig. 2: Each page having the same permeability contains the variations of absorption and diffusivity.

The samples are square glass tiles of 50 × 50 millimeters, with 2 millimeters thickness, mounted in acrylic plates. As a consequence of the mounting, the visible area for each sample is a square of 42 × 42 millimeters.

An alternative version of the atlas has been made combining commercial polyester filters. Once more, neutral density filters (in this case made of polyester) are used. Then, these filters are combined with filters that produce different degrees of light diffusion. And finally, a different mirror coating is applied to each of these previous arrays.

3. RESULTS

The atlas presented here comprises five pages with 14 different samples in each one, and one sample that is common to all of them (the one that represents black). The result is, thus, a total of 71 different samples of cesia. This number is relatively small, as compared with most color atlases, for instance the Munsell atlas and the atlas of the Natural Color System, with more than 1,500 samples each. The possibility exists of making a larger atlas of cesia. At this moment, and with any further technical development, we are able to assemble an atlas with 361 samples, but it is by far more expensive and involves more complicated techniques than a color atlas of the same quantity of samples.

The samples of this atlas of cesia are achromatic, and include all the appearances that are within the space limited by the five elementary cesias: translucent appearance (produced by diffuse transmission of light), matte appearance (produced by diffuse reflection of light), transparent appearance (produced by regular transmission of light), specular or mirrorlike appearance (produced by regular reflection of light), and black appearance (produced by a high absorption of light). However, the notion behind this is that all these appearances can be produced for every color, so that for each sample in a color atlas we can have all the cesias in which that color may appear or, on the contrary case, for each sample in the atlas of cesia we can have all the colors in which that cesia may be seen. By combining 70 samples of cesia (excluding the black one) with 1,500 color samples, we can have a total of 105,000 samples with different visual appearances.

4. CONCLUSIONS

As we have said, the samples of the atlas are a representation of the visual appearances of cesias. It is important to note that cesia is not an attribute of materials or surfaces, because the same material sample can have different cesias, depending on the light intensity and the direction from which it is illuminated, and the geometry of observation. For this reason, each sample in the atlas represents a certain sensation of cesia in a certain viewing situation, but not in a different one. It is necessary, thus, to establish such standard conditions. The length of this paper prevents us for a detailed explanation; these conditions are specified in the atlas itself.

In the domain of applications, this atlas has a main practical advantage: it is a tool for all those who need to evaluate the aspect of appearance that depends on the spatial distribution of light, by simply looking for the sample that best matches the object in question or by interpolation. Starting from this, there are a number of particular applications we can imagine; let us see just a few of them. In the linguistic domain, the semantic extension of the words alluding to sensations of cesia can be determined, as it has been made with color words. In the field of environmental design, different materials used in architecture, graphics, industry, textiles, clothing, etc., can be classified according to the range of cesias they are able to cover, so that the designer may know beforehand the palette of cesias available for each material.

ACKNOWLEDGMENTS

This research has been conducted under the grant UBACyT AR-003/J, from Buenos Aires University. J. L. Caivano has received grants from the National Council for Research, Argentina, for this particular research and other related ones. The authors are very grateful to Noren-Plast SA, for the donation of materials, and specially to Juan Carlos Goch and Roberto Daniel Lozano, from the National Institute of Industrial Technology, Argentina, for continuous support and advice.

REFERENCES

1. CAIVANO, J. L., Cesía. In Final report, grant of research, Buenos Aires University (1988), pp. 79-86.
2. CAIVANO, J. L., Cesia: A system of visual signs complementing color. Color Research and Application 16 (4), (1991), pp. 258-268.
3. CAIVANO, J. L., Appearance (cesia): Variables, scales, solid. In Colour 93, Proceedings of the 7th Congress of the International Colour Association, ed. A. Nemcsics and J. Schanda, Hungarian National Colour Committee, Budapest (1993), vol. B, pp. 89-93. Reprinted in Die Farbe 39 (1/6), (1994), pp. 115-125
4. CAIVANO, J. L., Appearance (cesia): Construction of scales by means of spinning disks. Color Research and Application 19 (5), (1994), pp. 351-362.
5. CAIVANO, J. L., Cesia: Its relation to color in terms of the trichromatic theory. Die Farbe 42 (1/3), (1996), pp. 51-63. Extended abstract published in Colour Communication UMIST, 1995, Proceedings, ed. C. J. Hawkyard, University of Manchester (1995), pp. 222-223.
6. CAIVANO, J. L., Semiotics and cesia: The meanings of the spatial distribution of light. Forthcoming in Proceedings of the Interim Meeting 1996 of the International Color Association, "Colour and Psychology", Göteborg, Sweden, June 15-18, 1996.

AUTHORS' ADDRESS

José Luis CAIVANO
Patricia M. DORIA
Secretary of Research, School of Architecture, Design and Urbanism, Buenos Aires University, Ciudad Universitaria, Pav. 3, 4th floor, 1428 Buenos Aires, Argentina
E-mail: postmast@semvis.fadu.uba.ar / jcaivano@fadu.uba.ar