SZÍNDINAMIKA '82
COLOUR DYNAMICS '82
DYNAMIQUE DES COULEURS '82
FARBENDYNAMIK '82

OMIKK TECHNOINFORM
1982

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Engedélyszám: 49186

II. NEMZETKÖZI SZÍNDINAMIKAI KONFERENCIA

II. INTERNATIONAL CONFERENCE ON COLOUR DYNAMICS

BUDAPEST
8-10, 6. 1982.

Organizers of the Conference:

Hungarian National Committee of AIC
Scientific Society for Building
Hungarian Society for Urbanistics
Association of Fine Artists
Union of the Hungarian Architects

Chairmen of the Hungarian Committees of the Conference

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DR. P. PONGRÁCZ	Scientific Committee
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CS. KLAUSZ	Publication Committee

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EXHIBITIONS OF THE CONFERENCE

"SZÍNDINAMIKA" /Colour Dynamics/ at the "Műcsarnok" /Art Hall/ Budapest, XIV. Dózsa György-út 37

Inauguration by Dr. J. Szabó, Under-Secretary of the Ministry of Building and Town Development on 28 May at 12.00 h

COLOUR DINAMICS at the Budapest Exhibition Hall /Szabadsajtó út 5/

Inauguration by R. Trautmann, Deputy President of the Presidium, President of the Scientific Society for Building on 8 June at 11.00 h

COLOURS, CENTURIES, MONUMENTS at the Aula of the Hungarian Intendance of Historical Monuments /Budapest, I.Táncsics M. u. 1/

Inauguration by P. Mendele, Director of the Intendance on 7 June at 11.00 h

COLOUR DYNAMIC DESIGN at the Budapest Technical University /Budapest, XI. Egry J. u. 18/

Inauguration by Dr. O. László, Dean of the Faculty of Architects of the Budapest Technical University on 7 June at 11.00 h

KNOWLEDGE OF COLOUR IN THE PRIMARY SECONDARY AND UNIVERSITY EDUCATION at the Headquarters of the Hungarian Teachers Training Institute /Budapest, VII. Gorkij-fasor 17-21/

Inauguration by P. Bakonyi, Acting Director-General of the Training Institute on 7 June at 15.00 h

C O N T E N T

Marcus, G. /Sweden/	
Bedthy, M. /Hungary/	A5 - 1
Kapesa, M. /Hungary/	A5 - 2
Demiecka, V. /Poland/	A5 - 3
Klausz, Cs. /Hungary/	A5 - 4
	A5 - 5
Patwardhan, S. /India/	
Anschner, W. /GDR/	C5 - 1
Spillmann, W. /Switzerland/	C5 - 2
Callmeyer, F. /Hungary/	C5 - 3
Földvári, M. /Hungary/	C5 - 4
	C5 - 5
Greguss, P. /Hungary/	
Parra, F. /France/	A6 - 1
Tilles, B. - Bodó, K. /Hungary/	A6 - 3
Csáji, A. /Hungary/	A6 - 4
Nagy, D. /Hungary/	A6 - 5
	A6 - 6
Prieling, H. /FRG/	
Németh, A. /Hungary/	C6 - 1
Király, S. /Hungary/	C6 - 2
Schöne, K. /GDR/	C6 - 3
Kapy, J. /Hungary/	C6 - 4
Horváth, I. /Hungary/	C6 - 5
	C6 - 6
Zádor, M. /Hungary/	
Harteneck, H. /FRG/	A7 - 1
Földvári, M. /Hungary/	A7 - 2
Jákó, K. /Hungary/	A7 - 3
Kővári, Á. /Hungary/	A7 - 4
Kelemen, M. - Balázsovich, B. - Medgyesi, I. /Hungary/	A7 - 5
	A7 - 6
Horváth, D. /Hungary/	
Király, S. /Hungary/	C7 - 1
Szathmáry, G. /Hungary/	C7 - 2
	C7 - 3

Heckenast, J. /Hungary/	C7 - 4
Visontay, I. /Hungary/	C7 - 5
Pusztay, G. /Hungary/	A8 - 1
Schöner, A. /Hungary/	A8 - 2
Kovács, A. /Hungary/	A8 - 3
Somogyi, J. /Hungary/	A8 - 4
Kapy, J. /Hungary/	A8 - 5
Ruttenberg, J. /Israel/	C8 - 1
Fehér, M. /Hungary/	C8 - 2
Csépányi, A. /Hungary/	C8 - 3
Kautzky, N. /Hungary/	C8 - 4
Dulin, J. /Hungary/	C8 - 5
Szentpéteri, T. /Hungary/	A9 - 1
Hammitzsch, H. /GDR/	A9 - 2
Lissák, Gy. /Hungary/	A9 - 3
Gaul, E. /Hungary/	A9 - 4
Den Tandt, J.B. /Belgium/	A9 - 5
Turóczi, M. /Hungary/	C9 - 1
Ranschburg, Á. - Fehér, J.A. /Hungary/	C9 - 2
Gáborjáni, P. /Hungary/	C9 - 3
Rákóczi, G. /Hungary/	C9 - 4
Nagy, D. /Hungary/	C9 - 5
Willumsen, U. /Norway/	A10 - 1
Szép, L. /Hungary/	A10 - 2
Klausz, Cs. /Hungary/	A10 - 3
Brožek, J. /CSR/	A10 - 4
Hári, A. - Sivik, L. /Sweden/	A10 - 5
Béres, E. /Hungary/	
Krtilová, A. - Sticha, V. /CSSR/	
Prieto, S. /Brasil/	

FOREWORD

The phenomenon called colour is an essential element of our closer and broader environment as well, of our world as a whole. Colour will be perceived as a primary or secondary radiation. This radiation, on reaching our eyes, generates an experience of colour in us. We are able to distinguish several million colour-experiences. Colour-experiences are the constituents of our life. They give us assistance in our orientation, in recognizing different objects and materials, distinguishing anything that is mature from the immature, the healthy from the unhealthy; under their effect our blood pressure and gastric acid composition would change; they are able to kindle feelings and raise thoughts in us; colours may appear in compositions that give us pleasure or raise antipathy.

Man, as a maker of a second nature, a constructed world, has ever since used the power implied in colour in order to make his constructed environment more useful and more beautiful. For thousands of years this human activity was based on experiences handed over to each other by generations and on creative intuition of artists.

Recent decades witnesses an acceleration of the rate of building activities, factories, districts of towns and towns themselves being erected practically within weeks, and therefore it so happened that, because of increased dimensions, past experiences are not enough to give assistance for the makers. New functions and differences of scales have made also artistic intuitions uncertain. That is why we can see so often colour designs that are ugly, being not to the purpose and contradicting the functions. In order to avoid this and also to make our constructed world more useful, beautiful and humane, work was started (short of any previous agreement) by experts of various fields, physicists, psychologists, doctors, architects, painters, sociologists to deal with problems connected with mutual relations between colour, man and the constructed world.

Spontaneous observations were followed by organized experiments and later by the exchange of experiences to result, in our days, in creating a new science, called colour dynamics, having for its aim the definition and collection of the scope of knowledge required for using colours to make our constructed world more useful and more beautiful.

The Hungarian National Committee of AIC (known formerly as the Hungarian Colour Committee) desired to promote the development of this new science by deciding to organize in 1982, for the second time (first in 1976) an international exchange of experience of experts concerned with the design of our coloured environment and with the establishment of theoretical knowledge required for this design. This field of subjects forms part of the subjects fixed by the statutes of AIC. Upon request from the Hungarian National Committee of AIC the Executive Committee of AIC declared the conference COLOUR DYNAMICS'82 as the official Midterm Conference of AIC. Proposed equally by the Hungarian National Committee of AIC, and pursuant to a decision by the Executive Committee of AIC, this conference set up the Working Committee on the Planning of Coloured Environment of AIC, establishing thereby the first international organization of those concerned with the new science of colour dynamics.

Taking part in organizing the Conference, in addition to the Hungarian Committee of AIC, were also the Scientific Society for Building, the Hungarian Society for Urbanistics, the Union of the Hungarian Architects and the Association of Fine Artists. The Conference was opened by A.C.W. Hunt, President of the AIC, and was attended by 260 specialists from 25 countries. 28 lectures were held, which were followed by seminars and round-table discussions in different subjects. In conjunction with the Conference five exhibitions were organized to show, in highly illustrative form, mutual relations between colour, man and environment, together with designs of colour dynamics prepared in different countries and colour photos of completed

projects. The exhibitions were seen by a total of 20 000 visitors. Catalogues for the exhibitions were available. During the Conference the Hungarian Office of Standardisation published a Technical Directive dealing with the aims of coloured environment planning and being highly suitable for describing the colour system Sinoid (Coloroid) by which relationships of colour harmony can be well defined. The conference was also accompanied by projections of films on colour harmony, and on theoretical and practical problems of coloured environment planning. The present publication contains texts of the lectures. Only those lectures are published in abstracts the texts of which were not submitted in full by the authors.

Budapest, September 1982

Dr. A. Nemcsics
President
of the Hungarian National Committee of AIC

P A P E R S

Authors in alphabetic order

R.W.G. Hunt

Introduction

When colours are seen in the environment, it is their appearance which is of primary interest. But specifying colour appearance is a difficult task.

CIE Measures

CIE methods of colour specification enable spectral power distributions to be weighted by means of a set of colour-matching functions to obtain tristimulus values (X, Y, Z or X_{10}, Y_{10}, Z_{10}). The Y tristimulus value is proportional to luminance, and is correlated approximately with the lightness of colours. To obtain measures that correlate approximately with other colour perceptions, chromaticity co-ordinates ($x = X/(X + Y + Z)$ and $y = Y/(X + Y + Z)$) are usually obtained; by using a chromaticity diagram in which y is plotted against x, it is then possible to determine for a colour (relative to its illuminant) its dominant wavelength, $_{d}$, which correlates approximately with hue, and its excitation purity, p_e, which correlates approximately with saturation. The following measures are then available:

Perception	Correlate
Brightness	Luminance, L
Lightness	Luminance factor, L/L_n
Hue	Dominant wavelength, $_{d}$
Saturation	Excitation purity, p_e

However, this group of measures is not satisfactory for several reasons. First, the measures only correlate approxi-

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mately with the perceptions. Thus luminance takes no account of the Helmholtz-Kohlrausch effect or of contrast effects; dominant wavelength takes no account of the curvature of loci of constant hue on chromaticity diagrams; and excitation purity takes no account of the variations in saturation of the colours of the spectrum. Second, the measures correlate very non-uniformly with the perceptions; for example, large changes in dominant wavelength at the long-wavelength end of the spectrum are much less significant than small changes near the middle of the spectrum. Third, the measures are incomplete, in that there are no correlates for colourfulness (the absolute degree to which an area appears to be chromatic) or for chroma (colourfulness judged in proportion to the brightness of a similarly illuminated white; as distinct from saturation, which is colourfulness judged in proportion to the brightness of the colour itself).

To remedy some of the above short-comings, the CIE introduced its CIELUV and CIELAB spaces, with associated correlates of lightness, L^*, hue, h_{uv} and h_{ab}, saturation, s_{uv}, and chroma, C^*_{uv} and C^*_{ab}. These measures have proved useful in expressing colour differences in terms of lightness, hue, and chroma components; and the spaces themselves correlate approximately with the Munsell System. However, these spaces also have short-comings. First, the correlations with perceptual attributes are still only very approximate: for example, neither space correctly predicts the loci of constant hue. Second there is still no account taken of Helmholtz-Kohlrausch and contrast effects. Third, the spaces do not (and were not intended to) provide for the effects of chromatic adaptation caused by the use of illuminants of different colours. Fourth, there is still no measure that correlates with colourfulness.

Models of Colour Vision

To remedy the above deficiences of the CIE spaces by continuing to use purely empirical formulae that are not based on some model of colour vision seems a formidable task. It is

therefore becoming increasingly felt that the way ahead is likely to depend on the development of formulae based on models of colour vision, such as the two that will now be briefly summarized.

In the first model, a set of likely spectral sensitivity curves for the eye is taken, and three zones are proposed in which the retinal signals, R, G, B, are processed. In the first, linear zone, an achromatic signal, R + G, is derived, which forms the basis for perceptions associated with luminance (such as flicker and visual acuity). In the second, non-linear zone, the signals become non-linear and compressed by being raised to the power of 1/2, and three colour difference signals are established, $C_1 = R^{1/2} - G^{1/2}$, $C_2 = G^{1/2} - B^{1/2}$, and $C_3 = B^{1/2} - R^{1/2}$. In the third, interpretive, zone, constant hue corresponds to the ratios $C_1 : C_2 : C_3$ being constant, unique red to $C_1 = C_2$, unique green to $C_3 = C_1$, unique yellow to $C_1 = C_2/11$, and unique blue to $C_1 = C_2/4$; colourfulness, M, is a function of C_1, C_2, and C_3; saturation, $s = M/(C_1 + C_2 + C_3)$; and chroma is a function of s, R + G, and M. The model gives good predictions of the Munsell and NCS (Swedish) systems of surface colours, and of the appearance of spectral colours. This model is at present limited to adaptation to medium photopic levels of daylight-type illuminants. (Hunt, 1982).

Nayatani, Takahama, and Sobagaki, have also taken a set of likely spectral sensitivity curves of the eye, and, and for each of the three channels, R, G, B, signal processing of the form $a(dR + R_0)^c$ takes place. The coefficient d represents Von Kries type adaptation, R_0 represents noise, c is an exponent that increases with increasing intensity of adapting light, and a is a coefficient that ensures brightness constancy for samples of reflectances of about 20 % and ensures that spectrally neutral samples of reflectance equal to that of their background are perceived as achromatic. This model provides a very satisfactory framework within which can be

explained the increase in apparent contrast with illumination level, the apparent colours of samples seen in coloured lighting, and the increase in colourfulness with illumination level. (Nayatani, Takahama, and Sobagaki, 1981).

Conclusion

It is to be hoped that an amalgamation of models of the above types could eventually lead to measures of colour appearance becoming available that have good correlations with the way colours are perceived in the environment.

References

Hunt, R.W.G. (1982): A model of colour vision for predicting colour appearance. COLOR Res. Appl. 7 (to be published).

Nayatani, Y., Takahama, K., and Sobagaki, H. (1981): Formulation of a non-linear model of chromatic adaptation. COLOR Res. Appl. 6, 161-171.

OUTLINES OF A THEORY OF COLOURS IN COMBINATION

A. Hård, L. Sivik

One subproject within a research program called "Colour-Man-Environment" (Supported by the Swedish Building Research) is concerned with the perception and appearance of colours in combinations. Colours never appear one by one, always together, and the number of possible ways they can be combined is infinite. If we want to study attributes and qualities of colour combinations we must have a meaningful way of structuring them. Below is outlined a tentative model for description of colour combinations, a model which will now be tested for theoretical and practical validity. The following dimensions are suggested:

The

Contrast	can be described by its	distinctness
		kind
		size
Chord	can be described by its	complexity
		content
		relations
Harmony	can be described by	area-relation
		similarity
		rhythm

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THE USE OF COLOUR IN MODERN ART, WITH A SPECIAL VIEW TO THE WORKS OF VICTOR VASARELY

U. Willumsen

The signification of colour in the art has changed throughout the centuries. And the history of art is as well a history of the changing use of colour as a tool to gain the special expression which the artist has intended to give.

Periodical the colours has been attributed to certain symbolic meanings, as for instance within religion (liturgic colours), and the heraldry. Certain colours also have been assigned to special psychological attributes, as for instance that green is a "calming" colour, and red is an "exciting" colour. Most of these assertions were never proved by scientific experiments, but very often have been accepted as "historical truths".

But in certain fields on colour psychology we may say: "this is really true, its based on experiments, and we really know it". It turns on attributes of colours which we may call "dynamic attributes of colour" or "colour dynamics". Combined with similar line and form dynamics, we may say that we hold the basic bricks of art.

The art of painting usually displays within a frame, or the bounds of a two-dimensional area. As soon as the artist puts strokes by the brush on the canvas, visual and perceptual "happenings" are taking place within the frame. Lines, forms and colours behave like "dynamic forces", according to certain laws and behaviour patterns connected to how our organ of vision reacts. Our body-orientation makes us perceive

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horizontal and vertical lines and forms as being of stability and orderly structures, while sloping lines seem to be unstable, mobile and restless. They put us "out of balance". Sloping lines also give the illusion of three-dimensional depth on the canvas, while the lines oriented to the axes of the canvas bound emphasises the two-dimensional character. So there will easily arise a conflict between the two opposite tendencies. The function of our vision has a built-in tendency to put everything in the vision area into stability and rest. Deviations make an impression of unrest and dynamic motion.

The process of vision also includes our recognition of things, objects and meaningful figures. And it is really surprising how few and how small details are needed to give the associations and recognition of figures or objects. Our sense of colour has a similar mode of operation. The eye automatically brings far and near objects into focus, but this process may arise conflicts to the focusing of long- and shortwaved colours, so that red colours seem to be nearer than the blue ones. This also will cause the illusion of three-dimensional depth on the painted area. Also certain colours are connected to the recognition of familiar objects or colour symbols. And furthermore our sense of colour aims at totality and structures into the contents of colours within the painted area. Also connected to our use of colour we automatically aspire to balance and stability.

Shortly, these are the dynamic forces and prospects within the frame of a painting. Lines, forms, colours, familiar figures, similarities and structures in the visual attributes can cooperate or arise conflicts, - infinitely. And the possibilities of paradoxical and self-contradictory effects are fully present.

The naturalistic and figurative art tries to avoid conflicts between the visual means. Usually the desired result is to build up a well established illusion of three-dimensional space into the painting.

The non-figurative art and the later "op-art" (optic means) has a far more free access to use all means mentioned, to a dynamic mobility within the area of the painting. This makes the space of the painting to a flexible world where everything can happen.

The art-creating functions of colour are connected to certain visual or perceptual attributes by the colours. Shortly mentioned:

Colours are different, and there are lots of them. Perhaps this is the most notable feature of colour. This diversity makes colour to an important means for information. The colours tell about the actual situation in our environment, or about the objects in the neighbourhood. Colour puts distinctive stamp to objects or surroundings, and therefore participate in the recognition and identification. They give associations to familiar situations.

But this great diversity in fact depends on a small number of attributes or visual features of colour. All colours can be characterized by some few elementary attributes.

Colours can be CHROMATIC or NON-CHROMATIC. Most of them are something between. Which means that a colour perception could be regarded as containing definite proportions of the attributes:

YELLOWNESS, REDNESS, BLUENESS, GREENNESS, WHITENESS, BLACKNESS

Colours may differ in all these attributes, or they may show similarities in one or more of them.

There are several ways to perceive and define colour similarities. The most important ones, according to colour gestalt compositions, are:

a) equal hue
b) equal whiteness
c) equal blackness
d) equal chromaticness
e) equal lightness (Fig.1.)

All of them defined by means of the NCS (Natural Colour System) model of colour perception.

Colour differences mostly are called colour CONTRAST. The various kinds of colour contrasts, being the most important ones in colour compositions, are:

1. the contrast of different lightness (light / dark)
2. the contrast of different chromaticness (chromatic / non-chromatic)
3. the contrast of different hues (green / blue, for instance).

Two different colours with a common border will show a more or less distinct borderline. And the distinctness of this border will be a measure of the amount of the contrast.

The three kinds of colour contrast do not weigh equal. As a rule-of-the-thumb it is sufficient to us to say that the relative weights of the contrasts are approximately: 1) contrast of lightness is weighed 6, 2) contrast of chroma is weighed 3, and 3) the contrast of hue is weighed 1. (L.Sivik and A.Hård, Gothenburg University).

The less distinct the border appears, the more the two colour areas aspire to melt together in a bigger attending pattern, gestalt or figure. (Fig.2.).

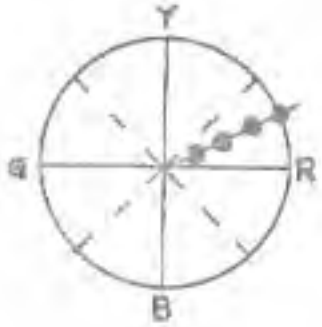
Knowledge of all these dynamic forces of colour makes the attributes of colour to the basic building bricks in all non-figurative art, and especially the "op-art". The famous artist Victor Vasarely, born in Pécs here in Hungary, most consequently utilizes these forces to create an art that figures a "new world" no one ever saw before.

With his great creativity he constantly figures perceptions of changing space. In one moment we are established in a structured and well-known space of a painting, and the next moment this is destroyed. And we are loosing our footing while new constellations of space are built up. His paintings are pulsating in constantly movability. His world of art is presented

to us in a nearly supernatural clear air of autumn. Nothing is covert. All is created by simple logical visual means. The hard-edge stringency of the forms and the maximum effects of the colours gives us visions from another world, far away from the idyllic everyday. In some of the works we may suspect a fantastic world seen through the microscope. Others can give the impression to be floating in the universe without any weight. And with foreign galaxies as our next destination. It is a world of mathematics and geometries created in relationship to science fiction. He also uses the colours and forms in a way that gives paradoxes and double-meanings, so in fact he creates a vivid mobility that gives the impression of incidences and passing of time. The area of the canvas has become a space, but not a stationary one, it is a pulsating and changing source, sometimes enlarging backwards into the depth of the painting, and sometimes forwards out of the canvas towards us.

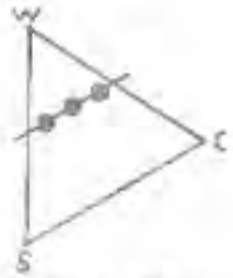
But he has also taken the logical consequence of the structure creating forces in colour and form expressions. In an imaginative and logical attempt to transfer his ideas also to the architecture, he creates new ways for a powerful teamwork between painting art, architecture and total shape of the environment. The future architects and the urban planners will benefit from his pioneer work.

And that is even more interesting: they cannot avoid this, - as his work directly points out the visual "laws of nature" which we cannot ignore. The laws are there. It is up to everyone to use them constructively.

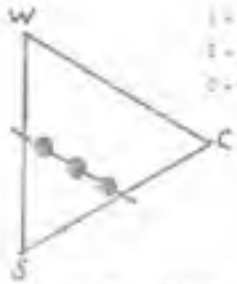


Y = YELLOW
? = RED
? = BLUE
? = GREEN

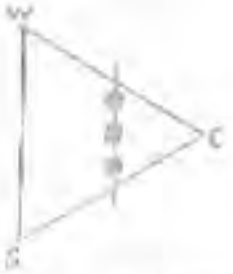
a) constant hue
- constant proportions of the elementary attributes, in this example y and r.

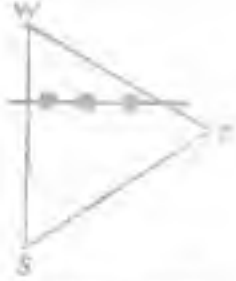


constant Whiteness



constant Blackness





constant Blackness

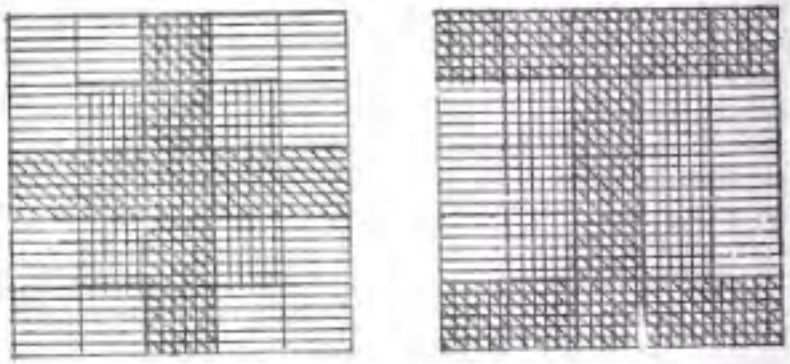


Fig. 2.
Two examples on how pattern figures (gestalt) are f
ed colour areas together, when the border is less
ight in one direction, and more distinct in another.

A. Kemcsics

The up-to-date architectural creation increasingly relies on colour as a means of expression. Practically, colour of built space surfaces, their overall harmony decidedly affect the space sensation. Several sciences such as physiology, sociology are concerned with the effect of colour on man. Other sciences such as physics, aesthetics associated with the former ones try to establish the laws of colour harmony raised by simultaneous colour sensations. Aspects in the relevant literature are rather heterogeneous, the problems are approached unilaterally, with a rather scant knowledge of problems and methods of other fields. No common theoretical basis has been developed so far for a uniform approach to the problems of what is the role of colour in the architectural space, and how colour compositions affect the space sensation - but the theory of architecture is expected to do it.

The effect of colour in space sensation

Space sensation is a complex process involving several sensory organs, the most important being vision, hearing and feeling of motion in space. They receive stimuli combining to space stimulus giving rise to space sensation.

Space stimulus is elicited by commensurable, perceivable objective space comprising space element relationships describable by physical magnitudes. Their respective forms and aspects are mostly perceived through reflection, absorption or transmission of light, one form of radiant energy, from the surface of, or through, the element. This radiant energy means visual stimuli of space.

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Assuming space element surfaces to be identical by texture and colour, and the incident light to be of the same direction, intensity and spectral energy distribution throughout the space, the visual stimuli affecting the eye create - because of cover. line and air perspective, light-shadow effect, visual and motional parallaxis, - a space sensation such that its even variation is directly related to the uniform variation of the real space. The condition of identical light means uniform wavelength of light getting from the surface to the eye, hence throughout uniform colour sensation, and besides, that in case of an identical angle of incidence, the ratio of light quantities incident on, and reflected by, the surfaces is the same everywhere. That is, the brightness sensation is throughout the same, and besides, a constant ratio of complementary radiation in the light reflected gets into the eye, hence a uniform sensation of saturation arises.

To examine the importance of colour, let us assume stimuli affecting our eyes from real space elements of dimensions, proportions, correlations such that no possibility of cover and interpretation of line perspective relations exist, besides, the observer does not move in space, depriving him from the help of motion parallaxis laws in space sensation. With these restrictions, together with the former ones relating to the light and the colours, the real space can only be appreciated from the evaluation of colour sensation differences.

From the intensity differences of stimuli getting from space element surfaces into the eye, first of all, position in space of the light source can be concluded on, then, from surface hue, saturation and brightness differences, on the distance between the observer and the space elements, hence on the space itself.

It is known by experience that the farther an object, the more the hue component of the colour sensation elicited by its surface is shifted to shorter wavelengths, its saturation com-

ponent to neutral colours, and its brightness component varies as a function of the two other components and the position of the light source. This experience contributes to space sensation but its significance is more pronounced if the former condition of identical space colours is cancelled. In reality, this is nearly always the case. Having space elements of different colours prevents the observer from deciding which of the elements is the nearer or the farther. Red and orange are felt to be nearer than blue or green even if in reality the former are farther.

The colour as expression of the space function

Colour contributes to the development of space sensation also through expressing the space function. Function of the built environment is based on necessity raised to social level. Within the system of man and elements of his environment, structural relations are defined by complex functions, composed by three function types such as utility function, aesthetic function and informative function. Let us investigate how the colour - both stimulus and sensation - contributes to realise and express these functions.

Environment is space for human activities serving to meet human demands, mostly related to the utility function of environment. The built environment is expected to protect against weather, to support dynamic effects from machines, to protect against excessive heat fluctuations, intensive noises, inherent harms of some working processes. A recent demand is to be at one's ease in the environment, to expand one's bodily and mental abilities.

Colour is an important factor in meeting these demands. Its psychophysical and psychosomatic effects may raise blood pressure, change the composition of blood and gastric juices. A coloured environment may make one healthy or sick. In an environment of preferred colours one is better off, one works more willingly. Some colours reinforce the concentration abil ty, other colours scatter one's attention.

Just as every creation, also architectural space and its every element is an unseparable unity of purport and form. Our environment meets its aesthetic function if it expresses its utility function in conformity with the unity of purport and form where purport is understood as utility function, and form as form and colour of surrounding objects. Practical and mental components of function are interdependent. It may even be said that aesthetic design of an object or an architectural space is impossible without knowing its function. Thus, no generally valid aesthetic prescriptions exist.

Development of colour conditions of the built environment also depends on the importance attributed to practical functions of the environment for the human life. Every work, activity is shaded with feelings, thoughts, ideas adhering also to the object, tool or built space in proportion of its importance or function in one's life. Colours of the architectural space as formal elements of the pair of concepts purport and form get their necessity from the expression of function, creating in one's consciousness the harmony sensation of unseparable unity between purport and form. Of course, visual effect of a colour composition may give rise to aesthetic pleasure that, however, detached from the space purport i.e. function, cannot give a full space sensation.

Those striving to express purport of the architectural space have to know relations between environment structure, the so-called composition relations in order to create formal conditions including those of colour sensations, colour harmonies. Thus, also space colour harmonies share space sensation forming.

Informative functions of the environment make destination of the environment and its elements comprehensible to man, just as the ways of utilizing and operating these elements. Informative functions of the environment are mostly borne by colour information, either logical or aesthetic, depending on the con-

tained message. Both logical and aesthetic colour information is borne by the same element but to every form of message another structure corresponds, peculiar by its visual system, complexity and structuration, as well as by psychical differences of the message. The purport of information is transferred by stressing, condensing and grouping some visual signals in the space or surface bearing the information, omitting others. A group of colours may raise attention by its outstanding arrangement and well readable structure.

Colour information of the logical kind consists of standardized, practical codes, strictly appealing to the mind, intended to transfer knowledge, to prepare decisions on receivers' acts, to control their behaviour and attitude.

Colour information of the aesthetic kind is primarily sentimental, expressing inner conditions and intended to impress mentally, sentimentally, based on the knowledge of the common meaning. By their operative and fixing function, visual signals not only carry the meaning of the purport of architectural space as a creation, and of its social idea, but also are expressions of the approach typical of the personality and culture of its designer. Necessarily and expendiently, colour information appears in the architectural space as colour harmony relations, stressing their investigations.

Role of colour harmony in space art

Surfaces in the architectural space bear colours of different hues, saturations and brightnesses, hence these colours and the space sensation they raise are perceived as a complex, in interaction, rather than one by one. Interaction means colour returning by adaptation or modification of the colour sensation due to simultaneous contrast, and especially, that some colours are felt to be pleasant, beautiful or harmonic as a complex. Now, the concept of colour harmony will be referred to colour sensations, to colours of the architectural s ace.

The effect of various colour sensations to modify distance feeling or to express a function cannot be discussed independent of each other, if not theoretically; in the real space, colour harmony complexes are tools of forming space sensation by colour.

To now, the theory of architecture did not examine theoretically the concept of colour harmony, and this is the first attempt to formulate it.

Purport levels of colour harmony

Colour harmony sensation is composed of various components such as colours of the complex, the environment bearing these colours, and its relation to man living in, and observing colours of, this environment. This relation is the more universal, the more the people to whom an identical surrounding means identical harmony sensation. According to the degree of generalizability of harmony purport following from the relation, various levels of harmony purport may be spoken of (Table 1.).

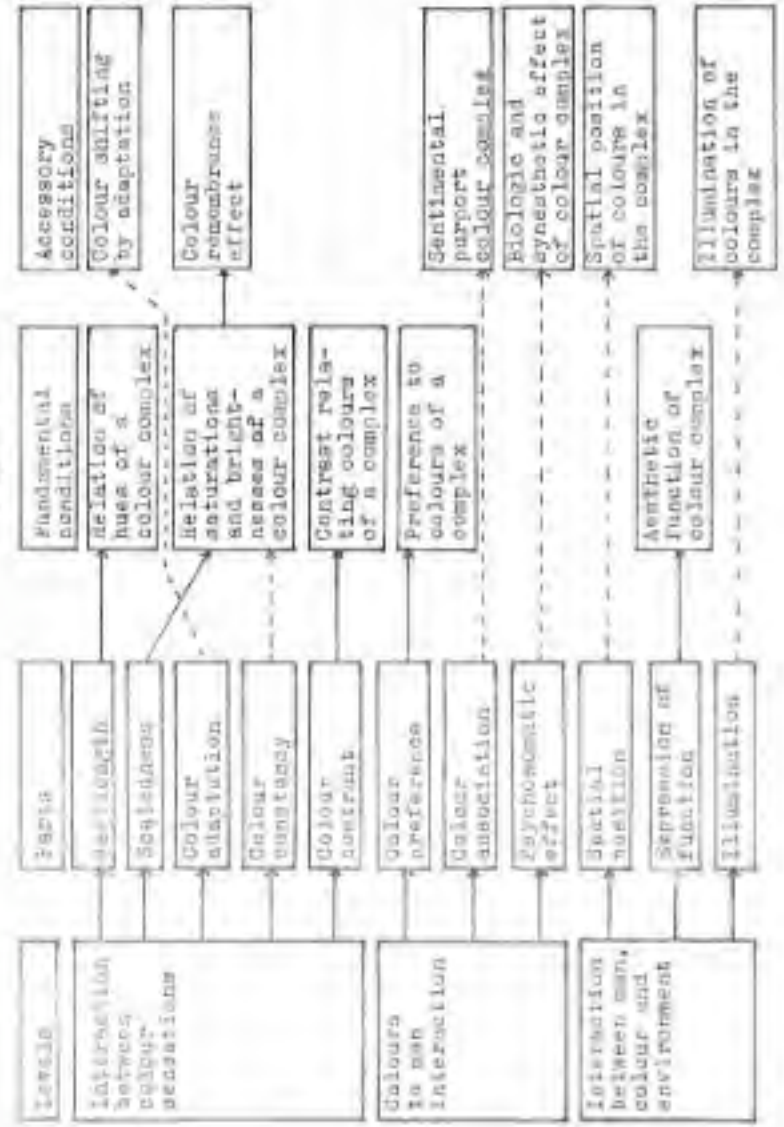
Relation between colour sensations

Three superimposed levels of colour harmony purport have been defined. The first level is that of perception, including relationships decisively identical for everybody, following, first of all, from the process of colour perception and attributable to fundamental psychophysical processes, expressing interactions between colour sensation parameters. Such are relations between hues, saturations and brightnesses of harmonizing colours denoting also the harmony type e.g. complementary harmony, group harmony etc.

Relation of colour complex to man

The second level of colour harmony purport refers to the effect of the perceived colour complex on the mind and body of the observer. A given relation between colour sensation parameters in a given colour complex does not mean a feeling of

Table 1.



harmony for every observer, but it depends on the age, sex, culture of the observer, as well as on association, and even on psychosomatic effects of the colours.

Relation of colour complex, man and environment

Perception of any colour complex and development of the elicited harmony feeling much depends on the spatial position of the colours in the complex, on the relative size of colour surfaces, on the illumination, on the spectral energy distribution in the light source, and also on the environmental function expressed by it, or simply, from the function of the environment bearing it. These relations expressing the interaction between colour, man and environment are the third level of harmony purport.

Fundamentals of colour harmony sensation

Five among harmony contents may be considered as fundamental, in lack of which no aesthetic content of a colour complex may be spoken of.

Saturation to brightness relation in the colour complex

A fundamental condition of colour harmony was experimentally found to be an even graduation of colour complex saturations and brightnesses. The kind of harmony depends on the kind of graduation. A scale of colours of identical brightness and decreasing saturations yields a harmony complex suiting subtle messages of somewhat decadent character, except of sentimental outcrosts. Dark varieties suggest decadence. Bright varieties had been preferred in Classicism. A scale of colours of equal saturations but decreasing brightnesses is somewhat coarse but rather dynamic, preferred in folk art. Scales of brightnesses and saturations varying in the opposite direction are richer than the former ones, suiting messages of vigorous, varied saying. In addition to these four fundamental graduations, there are so-called limit scales of numbers with different

proportions of white and colour content or black and colour content.

Hue relation in the colour complex

One component of space sensation is the visual aspect of surfaces, decisively dependent on the hue. Relation between hues in a colour complex determines the type of colour harmony. Hue sameness, group, complementary, triadic and tetradic harmonies may be distinguished. The simplest and most frequent harmonies are hue sameness and group harmonies but also complementarity is of known significance for the harmony sensation. It is superior to other hue relations by its aesthetic purport but is of no special importance among other harmony purports as against long believed. Triadic and tetradic relations are of inferior significance than complementarity. Complementary harmonies are full of tension. Triadic and tetradic harmonies have less of tension but bear richer and complexer messages than do complementarities.

Contrast relations between colours of a complex

Hue, saturation and brightness contrasts are fundamental conditions of harmony. Any form of the mentioned graduations includes some or several of these contrasts. Besides, also presence of quantity and quality contrasts in the harmony complex is of importance. Message of the complex is affected by the ratio of surface areas and appearances of the involved colours. Surface appearance is meant as lustrous or dull surface and texture.

Preference of colours in a complex

Preference of a given colour complex is essentially determined by cultural sphere, nationality, landscape, sex and age, and by [illegible], by physical, health and mental condition, and by emotions.

Aesthetic function of a colour complex

Harmony complex is a product with aesthetic purport, thus, an elementary artistic creation. If it is the origin of space sensation in an architectural space, it has to express utility and informative functions of space and space elements.

Accessory conditions of eliciting colour harmony sensation

Missing conditions do not exclude harmony sensation but their occurrence forwards it and announces aesthetic purport of the complex. Six accessory conditions of harmony sensation have been determined.

Adaptive colour shifting

Adaptation permits to appreciate identically a harmonic colour complex in spite of light conditions varying by intensity during the day. Otherwise no harmony complex could be created if not for light conditions at a given instant, that would mean impossibility to settle the aesthetic purport. Adaptation causes colour sensations of yellowish green, orange, red and purple seen for a few minutes to shift towards yellow colour sensation, while green, bluish green and violet are shifted towards blue. Also the sensation of saturation is much shifted by adaptation.

Effect of colour remembrance

Colour remembrance essentially helps to elicit the phenomenon of colour constancy. It corrects the colour of the known formal elements of space, and its effect can only be bypassed if the colour in the harmony complex much differs from that remembered of. Colour harmony feeling is subject to customaryness. The more customary a complex, the more harmonic it is felt to be.

Sentiments bound to in the colour complex

Chiar otherwise identical conditions, that complex is felt to

be the more harmonic that contains the sharper outlined sentiments. Colour symbol systems of different ages consisted in harmony relations involving sentiments.

Biological and synesthetic effect of the colour complex

Under otherwise identical conditions, those colour complexes are felt the more harmonic that have a more favourable biologic effect, as well as those likely to elicit the phenomenon of synesthesia connected to one sensory organ, usually hearing.

Spatial position of the colours in the complex

Harmony sensation also depends on what members of the colour complex are borne by horizontal, and what by vertical surfaces, what are below or above the horizon of the observer, near to, or far from him. The harmony sensation is also affected by the divisions and configuration of the coloured surface.

Illumination of the colours in the complex

Intensification or weakening of illumination effects the impression of saturation and may reduce the aesthetic purport of the colour complex. In composing a colour complex to be illuminated by a light source of intermittent spectrum, the spectral energy distribution of the light source reckoned with in creating harmony has to be settled lest the aesthetic purport of the complex gets lost. In counterlight oranges, yellows and reds are felt to be less saturated, and so are blues and greens in full light. Harmony sensation is best achieved in a built environment of diffuse illumination.

M. Albert-Vanel

Mesdames, Messieurs, je vais essayer de quitter le ton habituel aux conférences pour vous développer une expérience vécue, plus qu'une théorie.

En 1975, lors de la Conférence sur la Dynamique des Couleurs, ici à Budapest, je me souviens avoir parlé de la responsibilité de l'artiste et du scientifique, face aux problèmes collectifs. Nous disions alors que l'on ne devait pas proposer des techniques sans en examiner les applications. Et que de son côté l'artiste ne crée pas pour son seul plaisir, mais pour le plaisir de ceux pour qui il travaille.

Notre but est de participer à une amélioration de la vie sociale et culturelle.

La couleur participe ou doit participer à cette amélioration. Reprenons donc la discussion à six années de distance.

Je n'ai, durant ces six années cessé de m'interroger à ce propos. Comment parvenir à ce but?

L'univers des villes devient de plus en plus gigantesque et les objets industriels de plus en plus nombreux.

Il en résulte que la mise en couleur ne peut plus dépendre de notre sensibilité, car il s'y mêle des problèmes fonctionnels d'éclairement, de normes, de salissures, etc...

On voudrait pouvoir s'appuyer sur la science pour résoudre ces problèmes.

Malheureusement celà ne mène à rien.

Prof. M. Albert-Vanel, ENSAD-CEC, Paris, France

Pour tout ce qui concerne l'univers physique, le chemin est bien tracé. On ouvre un livre et on trouve une profusion de courbes et de diagrammes. Mais en fin de compte on se retrouve au but de la colline, au bord du vide.

La science s'arrête en chemin, elle ne nous dit rien sur la façon d'utiliser les couleurs et la façon dont le message sera reçu. Si je m'interroge honnêtement sur mon travail je ne puis me satisfaire d'une science aussi rudimentaire ou de l'autre côté, du flou et souvent du délire de la production artistique.

En fait c'est la partie intermédiaire qui manque: celle du vécu.

Lorsque nous éprouvons une difficulté, il est bon, pour un temps, de fermer son atelier ou son laboratoire et de se promener. Tout se trouve dans la nature et il suffit de regarder. Mais arrêtons-nous un instant sur ce que nous voyons. Ce qui frappe tout d'abord, c'est une impression d'ensemble. Les nuances colorées se fondent les unes dans les autres. Nous ne voyons pas les couleurs, mais les relations entre les couleurs.

Et c'est seulement lorsque la couleur a une relation surprenante avec l'environnement que nous la remarquons, comme une paille violette dans un paysage.

La lumière joue sur les différents matériaux, les rendant transparents, translucides, réfléchissants.

Une feuille d'arbre ne sera pas la même en réflexion ou à contre-jour.

Les couleurs se modifient selon les heures de la journée et se transforment dans le temps, comme les peintures sur une vieille porte.
Tout est mobile, relatif et fugace.
C'est ce qui fait la norme de la couleur.

Par rapport à cette complexité du réel la Colorimétrie apparaît comme un univers extrêmement réducteur.

Si l'on interroge un physicien, il nous dira que le reflet ou la transparence n'ont absolument rien à voir avec la couleur.

Pour lui la couleur se définit selon trois paramètres et c'est tout !

Je prétends, pour ma part, que le reflet et la transparence font bien partie de la couleur et que c'en est même une part importante. Ainsi, entre un verre d'eau et un verre de lait on peut créer tout un dégradé de transparences ou d'opalescences successives.
Mais celà est parfaitement inclassable dans un atlas de couleur.
Le blanc et la transparent y sont confondus en un seul point.
A la suite de cette expérience, je dois dire, que j'ai beaucoup d'inquiétude pour mes amis physiciens.

S'ils confondent l'eau et le pastis, il doit leur arriver de terribles mésaventures !

Et s'ils se rasent devant une feuille blanche au lieu d'un miroir, ils doivent être tout bêtefrès! L'univers devient alors terrifiant!

Ce n'est là qu'un exemple, mais on pourrait en fournir d'autres.
Ainsi qui confondrait l'or avec le jaune?

On peut donc avancer l'hypothèse selon laquelle la Colorimétrie se contente d'une définition restreinte de la couleur, parce que c'est commode.

Réduire un fait à trois grandeurs physiques permet de le représenter dans un univers cartésien à trois dimensions.
Mais cette réduction se fait aux prix de terribles sacrifices.

Nous allons pourtant quitter ces exemples pour parler de quelque chose d'encore plus important.

Il est courant de se trouver désemparé devant le banal problème d'un relevé de couleur.

Ainsi où classer la coloration d'une feuille aux multiples nuances? Doit-on choisir la couleur dominante?
Mais qu'est-ce que celà signifie, par rapport à la richesse de ces nuancements?
C'est comme si on nous demandait de supprimer la beauté des choses pour pouvoir les classer.
Renonces à la beauté, comme à satan, et vous accéderez à la Colorimétrie...
Le problème le plus grave est bien celui-ci:
La science classe les couleurs isolément, alors que notre perception se fait d'ensemble.
Un pétal de fleur, par exemple, peut à lui tout seul, couvrir la page d'un atlas Munsell ou même plusieurs pages.

En fait les couleurs isolées ne sont que le support à l'information. Elles ne constituent pas l'information.

Autrement dit les relations de structures son plus importantes que les composants de ces structures.
Il faut de très gros agrandissements pour arriver aux couleurs trichromes composant une affiche.

Quand elles dessinent un oeil, on oublie leur aspect jaune - magenta - cyan, au profit de la perception du signe oeil.

Ce signe, avec d'autres signes constitue un visage.

Le ton crème de ce visage peut, ensuite, devenir une sensation noir et blanc, qui sera, à son tour, influencée par les couleurs environnantes.

Et celà jusqu'à la scène global de la place où se trouve cette affiche.

Que de distance, par rapport à nos couleurs isolées, jaune - magenta - cyan du départ!

Ce ne sont en réalité que des ensembles colorés qui s'emboîtent les uns dans les autres en approches successives.

Lorsque nous voyons une belle personne devant nous, nous ne pensons heureusement pas aux molécules et aux atomes qui la composent, à moins d'une déviation toute particulière!

Nous en avons une perception globale et trouverions bien naïf de vouloir décrire cette personne à partir de ses atomes! En fait il s'agit de quitter le niveau des couleurs matérielles, pour accéder à un autre niveau: celui du perceptif.
Et dès lors les choses sont totalement différentes et n'obéissent plus aux mêmes règles.
Il en résulte qu'il ne suffit pas de reprendre les bases de la Colorimétrie et de lui ajouter de nouveaux paramètres de plus en plus subtiles.

Il faut repenser sur d'autres bases, puisque l'univers perceptif est structuré d'une manière indépendante, par rapport à l'univers physique.

Puisque la couleur se modifie dans le temps et dans l'espace, il est donc nécessaire d'apporter la relativité à la couleur.

Tout percept on pourra donc se définir comme une relation entre les différents ensembles colorés intervenant dans l'espace temps de l'observateur.

La première loi serait donc que la perception des couleurs se fait d'ensemble.

Déjà la Gestalttheorie nous avait démontré que des pastilles disposées sur un fond ont tendance à se regrouper en petites unités.

Il en va de même pour les couleurs.
Si nous partons d'une suite colorée, comme les couleurs les plus souvent citées de Berlin et Kay et que nous prolongeons cette séquence vers sa zone d'indécision, en la re-

pliant sur un fond nous constatons que les couleurs reconstituent des ensembles comme les couleurs vives, les pastels, les grisés, etc...

Toute exploration sémantique est obligatoirement un parcours dans l'espace des couleurs.

Il en résulte que parler de couleurs isolées n'a pas de sens, puisque toute couleur est perçue sur un fond donné, dans un contexte donné.

Arrivés à ce stade de la discussion on me fait souvent l'objection suivante:

D'accord, c'est important de voir par ensembles, mais il suffit de reprendre un "solide" des couleurs classiques et de tracer à l'intérieur des lignes reliant un point à un autre et constituant un ensemble.

C'est vrai, et j'ai d'ailleurs commencé par là.
Mais justement, avec un solide des couleurs isolées, on ne peut au mieux décrire qu'un seul ensemble.
On ne peut pas montrer le lien ou l'opposition entre plusieurs ensembles, comme on montre le lien ou l'opposition entre plusieurs couleurs.

Puisque ce sont les ensembles qui importent dans la perception, il faut amener les distinctions à partir d'ensembles colorés et non à partir de couleurs.

Imaginons que nous ayons, par exemple, à différencier au maximum six secteurs d'une architecture circulaire, par des ambiances colorées.

Nous sommes donc tenus à différencier au maximum nos six ensembles.
On peut fournir une solution optimiste à ce problème.

La raison en est que les ensembles colorés se fondent sur

la notion de couples antagonistes.

Ainsi la plus grande opposition est celle des chromatiques au noir et blanc.
Ensuite vient l'opposition du chaud et du froid.
Enfin l'opposition du clair et du foncé.
Les grises représentent la tendance entropique du système.
Ces oppositions principales constituent, en quelque sorte, les pôles de notre espace de la perception colorée.

On trouve donc apparemment des similitudes avec un "solide" du type Munsell, ou la théorie de Hering.

Nous allons voir que les différences sont importantes.
La première différence consiste dans le fait que le "solide" des couleurs classe les couleurs par différences.
Par contre les ensembles colorés fonctionnent avant tout sur la ressemblance.

Le fait que les différentes couleurs qui composent un ensemble soient claires ou foncées, colorées ou non,chaudes ou froides donne l'unité à l'ensemble.

En somme il y a unité dans la diversité.

Mais à partir de là les choses deviennent plus compliquées et si l'on veut multiplier les ensembles, il faut bien que les jaunâtres se distinguent par rapport aux chauds et aux froids, sans se confondre avec les blanchâtres. Il faut aussi que l'on puisse utiliser la transparence, etc...

Si bien que l'espace des ensembles colorés ne peut se construire sur trois dimensions seulement.

Dès lors celà nous pose un problème, car comment concevoir et représenter un espace à N dimensions?

Pourtant celà serait fort intéressant de parvenir à un "solide" des ensembles colorés, comme il existe des"solides" de couleur. J'étais dans cette perplexité, lorsqu'à la

suite de travaux de permutations de couleurs dans l'image, s'est imposée à moi la vision d'un système planétaire.

Ce fut comme une illumination, puisque dès lors le système pouvait rester ouvert sur autant de dimensions qu'il était nécessaire. La position des planètes, en effet, n'est pas figée dans l'espace. Elles sont mobiles, s'attirent, se repoussent.
Il y a des collisions, des éclipses.
On peut imaginer des étoiles principales et leurs satellites.

Il m'est tout de suite apparu que cette représentation était conforme à ce qui se passe pour les ensembles colorés.
C'est pourquoi j'ai appelé celà "Planets-Color-System".

Mais il restait bien des détails à mettre en place et le système a pris au cours du temps différentes apparences selon que je valorisais tel ou tel aspect.

Aujourd'hui les choses tendent à se rééquilibrer et je puis le décrire ainsi:
Nous traçons un axe vertical, permettant de classer les ensembles selon leur plus ou moins grande coloration.

On notera trois catégories principales: les colorés, les décolorés et les incolores.

Un autre axe, à l'horizontale, permettra, au niveau des colorés, de classer les ensembles par dominante chaude ou froide.
Un troisième axe, en profondeur, au niveau des décolorés, permettra de disposer des ensembles en fonction de leur clarté, c'est-à-dire opposant les tons pastels aux tons rabattus.

Dans ce cas l'axe du jaune au violet est donc parallèle, sur le plan supérieur, à l'axe du clair au foncé.

On rajoutera la transparence et le réfléchissant au niveau des incolores.

Mais je n'ai pas encore évoqué le point essentiel, qui repose sur une idée apparemment paradoxale:

C'est le fait que le spectre, ou sa représentation chromatique, est perçu comme unité.

On pourrait dire qu'il s'agit d'une couleur complexe, qui trouve sa cohésion sur le plan perceptif.

Il en résulte que tout ensemble coloré peut être défini comme étant une modulation particulière du spectre ou de la gamme chromatique. On peut ainsi passer de la gamme chromatique à une dominante colorée, comme des tons rougeâtres, et de là, au rouge uniforme.
Celà peut bien entendu se faire pour les différentes couleurs.
On aboutit ainsi à une nouvelle distinction: celle de polychrome - ou plusieurs couleurs - à celle de monochrome - ou une seule couleur.

Il ne faut donc pas confondre Polychrome et coloré, puisqu'il peut y avoir des polychromes dans les décolorés ou même dans les incolores, comme différents gris.

A partir de l'axe central, de la plus grande polychromie, on se dirige donc, à l'extérieur vers la plus grande monochromie.
Il en résulte une curieuse propriété de notre espace:celle selon laquelle le centre est l'image globale de la périphérie.
Celà a également pour conséquence le fait que toute couleur peut se trouver simultanément en différents points de l'espace.

Arrivés à ce point, on pourrait même inverser la problématique, pour soutenir qu'en fait il n'y a réellement que des ensembles colorés. La monochromie ne serait qu'un cas de tension extrême d'un ensemble vers son unité.

D'ailleurs cette monochromie inatteignable n'existe pas dans la nature. Et même une couleur isolée, que l'on dira monochrome, réfléchit en fait un tas de radiations différentes.

On peut également joindre nos ensembles entre eux.

Il ne suffit pas, en effet de disposer des pôles de notre espace, il faut encore que l'on puisse joindre entre eux les différents ensembles.

Ainsi on passe régulièrement du Chromatique aux tons pastels, aux gris, aux rabattus. On peut également passer du chromatique aux gris échelonnés ou des couleurs aux gris échelonnés, ainsi de suite. Mais en faisant cette opération de passage d'un ensemble à un autre, on constate que le passage peut s'effectuer de deux manières, selon que l'on procède par mélange ou par juxtaposition.

Ainsi le passage du chromatique au blanc occasionnera par mélange des tons pastels, alors que la juxtaposition conservera les couleurs initiales de la gamme chromatique et les fera varier en proportions seulement.

A une certaine distance le résultat sera le même.

Néanmoins cette distinction de ces deux possibilités constitue pour ainsi dire l'écart entre deux planètes doubles.

Cet écart permet d'apprécier la différence entre contraste et fusion optique dans un ensemble.

On retrouve ici un aspect Yin - Yang de la philosophie chinoise et il est curieux de constater qu'un même ensemble peut exister dans l'opposition des deux éléments qui le constituent, comme le blanc et le noir, qui occasionnent un contraste, ou au contraire, dans le passage graduel entre ces deux extrêmes, par tous les gris intermédiaires.

Il me faudrait beaucoup de temps pour développer en dé-

tails de système dans toute sa richesse et sa complexité.

Mais il faut faire court, alors j'en arriverai à la formulation globale, en planètes principales et leurs satellites, ou ensembles secondaires.

Sur ces bases l'ensemble peut devenir de plus en plus fouillé et de plus en plus dense.

On débouche alors sur une autre application: la définition des catégories esthétiques.

Nous en fournirons trois principales:
- Les chromatiques, dans la vivacité du bariolage, ou l'accord harmonique des tons de même clarté et de même saturation.
- Les camaieux, composés d'une couleur dominante et de toutes les nuances gravitant autour.
- Les gris échelonnés, permettant les suggestions de lumière ou de transparence.

A ce propos, on pourrait avancer l'hypothèse, que lorsque quelque chose ne marche pas dans un plan de couleur, c'est qu'il y a compromis entre ces différentes esthétiques, sans choix bien clair. Ou cela peut encore venir du fait que l'esthétique choisie ne constitue pas la réponse appropriée au problème posé.

Mais c'est surtout au niveau de la signification des couleurs que le système devrait apporter ses plus grands services.

Le concept d'ensembles colorés est bien l'intermédiaire indispensable pour passer de la couleur physique à la couleur sémantique.
Si nous n'abordons pas les couleurs d'ensemble, nous nous trouvons cantonnés dans le domaine des archétypes, sans pouvoir aller plus loin.

Les archétypes reposent sur la croyance qu'à une couleur

correspond une signification universelle, quel que soit le temps ou l'espace. Or la pratique montre des contradictions inadmissibles avec cette théorie.

Ainsi une même couleur peut prendre des significations différentes, voir même opposées, selon le contexte d'emploi.

Par exemple un rouge seul pourra signifier à la fois le feu, le sang, l'amour, etc...

S'il est isolé sur un fond vert bleuté, sa signification reposera sur cette dualité comme quelque chose de vivant, dans la nature.

S'il y a plusieurs rouges, celà peut devenir un champ de coquelicots.

Enfin si cet ensemble rouge et vert bleuté se trouve en affiche dans une ville décolorée, celà pourra signifier une provocation ou une volonté d'évasion, par rapport à ce contexte contraignant.

Ce n'est donc qu'à travers la notion d'ensembles colorés, puis de fonction, que la signification extrêmement rudimentaire des couleurs isolées va se diversifier, s'affiner dans un sens plus précis. En un mot le message va porter.

Pour donner une comparaison, on pourrait dire que les couleurs isolées sont des mots, les ensembles des phrases et l'articulation des ensembles entre eux fournirait les chapitres.

Ainsi on lirait une architecture comme une suite d'ensembles colorés imbriqués.

On examinerait l'image de la façade, par rapport à la ville, l'image décolorée du parking souterrain, par rapport au hall d'entrée aux couleurs éclatantes, la connivence de l'ascenseur, le camaieu des bureaux, etc....

Dans le domaine de l'image je pourrais également envisager de nombreuses applications.

Celà fait actuellement l'objet d'une recherche à l'Ecole Polytechnique de Paris, en traitement d'image sur ordinateur.

On peut ainsi écrire des programmes de colorations successives et examiner comment le sens d'une image se trouvera modifié par ces colorations.

Un même paysage peut alors apparaître dans les différentes saisons ou selon les différentes heures de la journée,selon que l'on remplace telle couleur par telle autre.

Je pense également que la notion d'ensembles colorés est très appropriée à la pédagogie de la couleur.

C'est en effet moins rebutant que la classique méthode dite des "petits carrés" et c'est surtout beaucoup plus efficace, car plus proche de la perception et de la création plastique.

Ainsi ces essais d'étudiant, pour suggérer une floraison par la couleur, ou cette chaîne de colorations évoquant une rose qui s'épanouit et se fane.

Il reste encore beaucoup à faire.

Mais je suis persuadé que l'on ne peut plus parler de perception ou de création par la couleur sans passer par la notion d'ensembles colorés.

Ce concept est très enrichissant et absolument fascinant pour l'esprit.

J'ai, pour ma part, vécu celà comme une aventure que j'ai voulu vous faire partager.

C'est une sorte de voyage mental en terres inconnues.

Depuis cette vision des espaces planétaires, il ne se passe pas une journée où un détail nouveau soudain surgisse et vienne se mettre en place.

Je ne peux donc que vous inviter à entreprendre ce même voyage. Car si cet espace préexiste dans les choses de la nature, il est également en chacun de nous.

En développant celà mes mérites sont minces.

Je n'ai pas le sentiment d'inventer quoi que ce soit, mais de relever ce qui existe.

Je ne fais que montrer du doigt ce qui est là, de tout temps, mais que l'on ne pense pas à regarder.

Je vous remercie.

E. Vilenkin

Each time period in culture can be characterized by the presence or absence of interest for colour. The experiences of colour preferences of a nation, people, the totality of individual colour associatons and colour symbolic systems seem to summarize the whole activity of the man. Social interrelations of people cannot do without colour either, because in these the choice of colours encodes motives of psychophysiology, nature and climate, regulates the social and hierarchical, aesthetical and utilitarian employment of choice.

In colour associations and later also in symbolics were reflected:

- subjective perception of colour shades and combinations depending on age,
- experience in social relations under the conditions of heightened emotionality,
- nature and climate conditions: the fauna and flora of the region, their colour influence according to the season.

In many "primitive" cultures there existed a colour classification consisting of three parts: "white - red - black"./1/

The colour associations were actively related to precious stones, "the colour quality of the stones being the first indication of their difference, classification (grouping of almost all stones: "similar" to ruby and "similar" to emerald, i.e. red and green stones)" /2/.

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Colour views of alchemy are remarkable for for their complicated associations and notion of magic qualities of the materials and their relation with colour. "Colour is an essential moment of an object, its ... potential fate devoid of earthly chances" /3/.

The symbolic system of Oriental Christian art "sounds" as a well tuned instrument in each work of art. V.V. Bychkov wrote that already in Byzantine painting colour was subjected to certain rules of a rather rigid colour canon /4/.

The analysis of various coloured objects in some regions makes us speak about an intercultural manifestation of colour influence which goes far beyond its psychophysiological qualities and ranks among socially significant phenomena. This field of canonized and associatively emerging significance of colour in various cultures at certain stages of the development of mankind can be characterized as the phenomenon of colour culture of each region. "Colour form in a real art process and in each particular work of art as well as spatial plastic form yield to analytical isolation and study, its specific qualities can be described not only for a particular work of art or kind of art, but also for a particular culture epoch, its style phase and direction" /5/.

The colour culture is a complex spatial and temporal process, related to all culture and life phenomena of a nation, people, social group and individual. The structure of the analysis of coloured objects assumes the possibility to represent the process itself on a model in "steps".

The first "step" in our opinion contains the fields of emergence and destruction of colour canons, nourishing colour traditions (with the whole complex mechanism of canon emergence).

As the second "step" the multiformity proper of colour traditions can be considered - living layers of colour culture. "Vectors of stability" of a colour tradition are charact r-

istics of the conditions of formation and disappearance of the particular colour traditions. The centres and zones of colour traditions, their spatial alteration and development in time also belong to the "second step" of the process of colour culture pulsation.

Spreading and distribution of colour tradition zones and centres can be described by means of a spatial model of colour culture.

The spatial model of colour culture is vibrating in time domain and bunches round the vectors - directions of spreading of colour canons from colour culture centres of colour tradition expansion.

It is necessary to point out some constitutives of the process of colour culture development: spatial and temporal parameters of colour culture - principal and dependent characteristics of the whole process; the factors influencing the parameters of colour culture and the colour culture elements themselves, its immediate product - the result of this complicated process with its parameters and factors influencing them.

First of all one should point out factors influencing the colour process itself and its parameters.

By nature they are spatial and temporal factors. According to the nature of influence they can be subdivided into:

1. nature and climate factors (weather, daily and yearly cyclic recurrence of the surrounding nature: fauna and flora, their colour dynamics.
2. historic and culturological factors (periods of development of a particular cultural unit).
3. social and psychological - semantic factors - connection of the palette with the structure of the analysed coloured object:

- sensory - connection of colour perception with emotional and physical condition, social experiences and the whole activity;
- extrasensory - colour and metaphysical experience, parapsychological spheres of "being" of colour, magic and divine understanding of this experience in various cultures from associations to canonizing colour sensations in the field of art (crafts) and life and relative conservation of the canon in religious sphere.

The following step is the isolation and possible materialization of colour culture parameters.

To them belong specific features of particular colour traditions of the analysed region in a given period of time.

This is a kind of a colour culture "memory" explaining and comparing. It enables us to analyse and compare separate colour culture elements. For example the vector expansive nature of colour traditions should be formalised, as well as their stability, their regional centres and their mutual influence in time should be determined. It is also possible to draw conclusions about colour preferences of particular epochs and connect these with the general cultural notion of style and colour image of the environment.

As for colour culture parameters it is possible to select, classify and analyse the data on colour culture.

And finally we think that colour culture elements can include first of all materials, facts, everyday objects (chromamodels of being, comprising both colour palette and the structure reflecting colour preferences beginning from free associations and finishing with complete notion of the universe), fabrics, various decorative covers, floor-cloths, cloaks, etc. pieces of furniture, "folk design", colour of architecture; ceramics, glazed tiles, china; wooden everyday objects, i.e. artificially decorated coloured everyday objects.

Works of art: frescoes, icons, objects of folk artistic crafts.

Each element of colour culture developed colouristically under the influence of folk design notions of functions and beauty of the object and absorbed all shades of colour associations, observations, preferences. Colour palette and colour structure developed as well.

The temporal model of colour culture consists of three conditionally separated spheres: "art", "religion" and "everyday life".

These spheres are as if "pierced" by factors influencing the parameters of colour culture.

The canon emerged in the spheres of "art" and "religion" and is transferred under the influence of factors of these two spheres and free associations to the sphere of everyday life. So emerges the colour tradition with an active core - colour canon. At the same time a process of de-canonization is taking place due to enriching by new associations and specificity of historic situations. The canon being destroyed leads to the death of the colour tradition.

The conditionally "completed" ready canon at one temporal level - tradition "peak" - may fall to pieces and be put into the foundation of the next temporal level. The canonization at the second temporal level goes in the same way to the summit and the canon symbol becomes again the base of the next temporal level, etc.

So there exist spatial and temporal colour culture models built by us.

We have all reasons to believe that we have in prospect immense and interesting work defining and materializing the process of colour culture development, improving its models and fruitful practical employment of the results of the analysis of this process in practical colour designing in modern life.

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BEISPIELE DER FARBGESTALTUNG UNTER EINBEZIEHUNG DEKORATIVER UND KÜNSTLERISCHER ELEMENTE

02-3/1

L. Gericke

Erlauben Sie mir, einige Gedanken zur Bedeutung der Verbindung der Farbgestaltung mit dekorativen und künstlerischen Elementen zu äussern.

In vergangenen Bauepochen gibt es überzeugende Beispiele für eine Bereicherung der Architektur durch dekorative und künstlerische Elemente.

Das Hauptziel bestand meines Erachtens darin, durch eine interessante Gliederung des Bauwerkes im Innen- und Aussenbereich dem Auge eine grosse Vielfältigkeit von Formelementen und Farbnuancen zu bieten. Es ist sicher auch der Grund, dass wir uns an farbig und plastisch reich und interessant in guten Proportionen gegliederten alten und neuen Bauten erfreuen und sogar in unserer schnelllebigen Zeit einen Augenblick verweilen, um sie in Ruhe betrachten zu können. Ganz anders verhält es sich an kahlen, glatten, grauen Flächen mancher nachlässig und zu nüchternen Innen- und Aussengestaltungen. Diesen Bauten schenken wir ungern unsere Aufmerksamkeit, um von vornherein negative Emotionen zu verdrängen, denn sie lösen Schmerz, Bedrücktheit und Unbefriedigtsein aus.

Der Drang des Menschen nach emotionaler Befriedigung ist aber ein wichtiges Mittel der Stimulierung, der Erfüllung seiner Bedürfnisse.

Die Zielstellung moderner, rationeller, grossflächiger Architektur und der völlige Verzicht auf dekorative und künstle-

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rische Elemente schafft eine erhebliche Verarmung im Innen- und Aussenraum.

Unser Auge sucht nach Anregungen und findet sie eher an alten, bröckelnden Fassaden, als an vielen zu perfekt glatten, totgestalteten Flächen aus Beton, Fliest und Metall. Sicher weist eine bröckelnde Fassadenfläche auf einen Zerfall hin, doch hier wirkt die Natur mit und schon entstehen reizvolle Zufälligkeiten, Mauerwerk wird sichtbar und unterschiedlich farbig fein nuancierte Putzschichten treten hervor. Für unser Auge gibt es viel zu entdecken.

So ist es nicht verwunderlich, dass schon Leonardo da Vinci in alten Mauerflächen Motive und Anregungen für seine Bilder suchte und wie er schreibt, Menschenbildnisse und ganze Reiterschlachten entdeckte.

Leon Battista Alberti schreibt in seinen 10 Büchern über die Baukunst:

"Vor allem die Augen begehren von Natur besonders nach Schönheit, worin sie sich sehr eigensinnig und heikel zeigen. Auch weiss ich nicht, woher es kommt, dass sie mehr nach dem verlangen, was fehlt, als sie billigen, was da ist ... Ja manchmal können sie gar nicht sagen, was es eigentlich sei, das sie beleidigt, ausser dem allein, dass ihre ungemessene Leidenschaft, die Schönheit anzuschauen, nicht ganz erfüllt wurde." /1/.

Durch die Einbeziehung dekorativer und künstlerischer Elemente kann meines Erachtens dazu beigetragen werden, die Monotonie mancher Innen- und Aussengestaltung bis zu einem gewissen Grade zu beseitigen.

Inhaltlich, funktionell, orientierend und insbesondere formal ästhetisch löst sich dadurch eine wertvolle Ergänzung und Bereicherung im Einklang mit der Farbgestaltung erzielen. Ohne die grossen raumbildenden Flächen mit zu intensiven bzw. dunklen Farben zu versehen, ist es unter anderem möglich, durch dekorative und künstlerische Elemente zusätzlich Farb-

und Gestaltungserlebnisse zu schaffen, die im Raum eine gliedernde Funktion übernehmen. Dadurch lassen sich weitgehend monotone Raumsituationen beseitigen.

Die Gestaltung sollte unter den Aspekt der Steigerung des Raumeindruckes vorgenommen werden und sowohl ästhetischen Forderungen als auch funktionellen Belangen Rechnung tragen. Durch grosse gefasste oder fein differenzierte Flächen oder konstruktive Ordnungsschemen sowie Farbfelder nach berechnender Intensität, Grösse oder chromatischer Folgerichtigkeit ist es möglich, eine interessantere und spannungsreichere Verteilung der Farben im Raum zu schaffen.

Der Kontakt zwischen den Arbeitsräumen, Verkehrswegen, Werkhallen, Besprechungs-, Versammlungs- und Speiseräumen lässt sich mit Hilfe dekorativer und künstlerischer Elemente charakteristisch herausstellen. Mit Farbelementen kann gezielter eine kompensierende oder konnonierende Wirkung geschaffen werden, denn die Farbe besitz eine starke emotionale, psychische und ästhetische Einflussnahme auf die Menschen, sie kann eine schmückende und zierende oder ordnende Funktion übernehmen, als Farbeffekt einbezogen werden, als Informationsfaktor Anwendung finden, eine atmosphärische, malerische, ausschweifende oder beruhigende Funktion einnehmen.

Eine Farbgestaltung unter Einbeziehung dekorativer und künstlerischer Elemente regt an, gibt Impulse, macht unbekannte Farb-, Form- und Strukturbeziehungen sichtbar und schafft eine interessantere, anregende Umwelt.

Nur wenige, im Verhältnis zu den vielen neuen Bauwerken, überzeugen allein durch die Klarheit in der Konstruktion, durch gute Proportionen und einen interessanten Materialeinsatz.

So schreibt der Maler und Grafiker Hundertwasser:

"Der Schaden, den die rationelle Bauweise anrichtet, ist um ein Vielfaches höher als die scheinbare Einsparung. Und somit ist der Beweis erbracht, dass die rationellen Bauten kriminell

werden, wenn man sie in diesem Zustand beliesse." /2/ Er fordert nicht die Zerstörung dieser Bauwerke, sondern eine Veränderung.

Langeweile, Gleichförmigkeit und Wiederholung finden wir häufig bei Bürohochhäusern. So ist es verständlich, dass eine sehr sachliche, wenig differenzierte Farbgestaltungskonzeption für den Neubau eines Projektierungshochhauses der Nutzer als unzureichend empfand und einen neuen Auftrag zur Farbgestaltung unter Einbeziehung dekorativer und künstlerischer Elemente erteilte, der durch das Gestalterehepaar Thierfelder und sich realisiert wurde.

Nachfolgende Beispiele sollen die Bemühungen und einige Erfahrungen bei der Gestaltungsarbeit aufzeigen.

Das Projektierungshochhaus und der dazu gehörende Küchen- und Speisesaaltrakt sind gekennzeichnet durch viele lange und schmale Korridore, gleichartige Bereichs- und Bürorräume sowie verhältnismässig grosse Gemeinschaftsräume, insbesondere den grossen Speisesaal.

Um in den langen Korridoren eine Farbdifferenzierung zu erreichen, wurden die Türen von einem kräftigen Dunkelgrün bis Gelb abgestuft und über den Türen ein Pfeil und das Informationsschild farbig einbezogen.

Im Eingangsbereich erscheint an den Wänden das dunkelste Grün der Türen, so dass man von dem dunklen Grün der Wände und Türen allmählich beim Durchschreiten der Korridore eine Aufhellung bis zur gelben Farbe erlebt.

Durch eine Wandgestaltung im Eingangsbereich in der gleichen Farbskala (Dunkelgrün bis Gelb), ausgeführt auf runden, farbig gebeizten Sperrholzflächen, unterschiedlich plastisch geschichtet, entsteht eine weitere Form- und Farbdifferenzierung in diesem Bereich.

Die Bereichsräume sind durch unterschiedliche Farb- und Formsysteme gekennzeichnet, durch Farbabstufungen der Bereiche

Grün, Braun, Blau und Orange charakterisiert. Die Raumfarben sind feiner differenziert in den dekorativen und künstlerischen Elementen aufgenommen.

Bei den farbig gestalteten Elementen wurde innerhalb eines Raumes das gleiche Formprinzip angewandt, nur die Farbskalen in einer gewissen quantitativen Umkehrung bei den einzelnen gestalteten Farbtafeln eingesetzt.

Um dem Imbissraum, der durch zwei grosse Fensterfronten zu offen und zu hell wirkte, eine gemütliche und warme Atmosphäre zu geben, wurden die Wände in einem tiefen Dunkelbraun gehalten. Quadratische plastische Elemente in unterschiedlicher Stärke ebenfalls Dunkelbraun, sind mit hellen Brauntönen bis Orangegelb durch Kreisbögen gegliedert und unterschiedlich zueinander geordnet. Dadurch entstehen verschiedene Farb- und Formgruppierungen, ähnlich einem Puzzle.

Ein ähnliches Prinzip in anderer Farb- und Formwahl wurde in einigen Gemeinschafterräumen angewendet.

Grosse Schwierigkeiten bei der gestalterischen Gliederung und Differenzierung entstanden beim Speisesaal mit seinen 30 m langen Wänden.

Um die sehr monotone Raumsituation zu beseitigen, war eine gestalterische Gliederung des gesamten Raumes erforderlich. Dies konnte nicht durch einzelne Gestaltungselemente oder Gruppen erfolgen. Die Gestaltungselemente mussten durch eine farbige Linienführung optisch und formal Halt bekommen. Bänder aus orange gebeistem Sperrholz bilden in Verbindung mit den orangefarbig gestrichenen Türen auf einer dunkelbraunen Wand das formale Gerüst für die verschiedenen dekorativen Elemente, die unterschiedlichen Gruppen zugeteilt, sich um das Band und die Türflächen ordnen.

Selbstverständlicher ist die Anwendung dekorativer und künstlerischer Elemente in gesellschaftlichen Einrichtungen, um interessante Raumsituationen zu erreichen, wobei in diesen

Räumen durch den Einsatz wertvollerer Materialien schon eine vielfältige Gliederung der Flächen und eine unterschiedlich formal ästhetische Gestaltung der Räume gegeben sind.

In einer Studie der Ausstattung und künstlerischen Gestaltung für gesellschaftliche Einrichtungen wurden Untersuchungen zu unterschiedlichen Raumwirkungen durch verschiedene Form- und Farbvariationen durchgeführt.

Drei Gestaltungsvarianten eines Eingangsbereiches zeigen verschiedene Möglichkeiten der Raumgliederung sowie der Farb- und Materialwirkung.

Während bei der ersten Variante vorwiegend die runden Formen sowie die geschwungenen Linien Anwendung fanden und die Farbigkeit bis auf ein Weinrot der Sitzmöbelpolster überwiegend zurückhaltend gestaltet sind (weisse Gipsdecken, schwarz-graue Schieferplatten strukturiert, weisser Rauhputz, Natursteinfussboden, dunkles Holz an den Stützen und als Kunstobjekt ein Terrakottarelief vorgesehen wurden), basiert die zweite Variante auf dreieckigen Formen und der Raum erhält durch eine dekorative und künstlerische Wandgestaltung aus gebeiztem Holz von Orange bis Rotbraun eine sehr aktive Farbigkeit. Unterstützt wird diese Tendenz durch eine orangefarbene Decke und orangebraune Sesselgruppen. Als Kontrast zu diesen warmen Farben steht der weisse Marmor des Fussbodens und die Anordnung von Spiegeln an den Säulen, wobei die Spiegel zu einer illusionistischen Wirkung des Raumes beitragen und die starr farbigen, dekorativen Wände in verschiedenen perspektivischen Sichten in den Spiegeln erscheinen. Die dritte Gestaltungsvariante basiert auf rechteckige Formvariationen. Dadurch wirkt sie mehr ruhig und ist auch in der Farbigkeit durch Naturmaterialien bestimmt. Eine braune Holzkassettendecke, weisser Rauhputz an den Wänden, roter Klinkerstein als Fussboden, Eichenholz in naturfarbenem Leinöl und Lasur, Holztäfelung und eine Textilgestaltung als dekoratives und künstlerisches Element geben dem Raum eine gediegene Wirkung.

Anhand von weiteren Beispielen werden Untersuchungen der Ausstattungs- und Farbgestaltung eines Kinos, eines Ausstellungsraumes, eines Festsaales, Cafés, eines kleinen Foyers sowie eines Imbißraumes demonstriert.

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L. Gerő

Edifices made of stone have for a long time past been the noblest among constructions of earth, wood or stone. Brickset buildings are white, be they rough-cast or plastered, and this colour signifies their rank. Once the fortified princely palaces were called "fehérvár" (i.e. "white castle", e.g. Belgrade), the princely residence was called in Hungary Székesfehérvár (Residential White Castle), the residence of the captain-general ("Gyula" in old Hungarian) was called Gyulafehérvár. The white external character of stone buildings has survived to our days in Mediterranean settlements such as at Ischia, Capri, Positano, Amalfi or Alberobello in Italy, at Thera on the Santorin Island or Oia in Greece, and in thousands of villages in Spain; the whitewash covering a variety of forms presents the pleasant overall picture of these settlements.

The colours of buildings in European urban aglomerations were made grey by coal-heating soot. Only few colours survived in some cities, such as the well-known terracotta and Pompeian-red coats of plaster, the facades with travertine of yellowish patina in Rome. Most of our cities in the Austro-Hungarian Monarchy had turned grey by the turn of the century, e.g. Vienna, Prague, Budapest, or Cracow, Lemberg. But this was the case also with other European metropolises. Bright colouring was evidently applied for distinguishing from their everyday grey surroundings already in the past the prominent buildings such as the Houses of Parliament in Vienna or the Royal Palace in Athens.

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After the heavy destructions of World War II attention was turned increasingly from individual monuments towards the protection and reconstruction of groups of buildings, sections of streets, whole streets, places, even quarters of cities. In the course of such city-reconstructions individual monuments, their colouring connected with their appearance in the cityscape, assumed growing importance. In the masses of buildings that had turned grey in many a city by the turn of the century, monuments were given prominence by butter-colour (e.g. oil-paint) in London, and this was soon followed by applying creamy colouring to ancient monuments in Vienna: all this promoted a worthy accentuation of monuments in the metropolitan vastness of houses. But this sometimes involved deplorable sacrifices such as the repainting in bright colours that broke up the fine homogeneity of dark-brown patina at Joseph-Platz in Vienna. Such endeavours resulted in the revival of stone facades, the still controversial removal of dark patina (mostly filth) from a number of monuments in Paris, or from the mediaeval City Hall of Brussels.

After 1945, colours began to resume - timidly in the beginning - their original role in the appearance of cities. When plans were made for reconstructing in 1948 the 100-fathom frontage of the Palace of Invalides in Budapest, designed by Martinelli (headquarters of the Municipal Council today), the history of frontage colouring was surveyed. It has been found that the mediaeval houses were coloured inside and outside alike. The rich colours of mediaeval attire still appear from the traditional uniform of the Swiss Guard in the Vatican, from pontifical purple, ermine robe, gala dresses of diplomats, the red stripes of generals, etc. The frontages of mediaeval houses were painted on various patterns (e.g. agreeing with elongated hexagonal paving-tiles) in vigorous colour such as white, green, or black; the dwelling-[illegible] of Tárnok utca 11 in the Castle Hill Quarter of Buda is

a still existing example of authentic reconstruction where the coloured-patterned painting was replaced here and there by designs imitating bread-stone and painted on the plaster whereby a lively impression was given to the wall surfaces. Thus the mediaeval streetscape always presented an extremely bright - we might as well say gaudy - colour effect and this appears also from the paintings of mediaeval masters.

The Baroque streetscapes were also vigorously colourful as is seen from the well-known paintings of Guardi and Belotto (Canaletto). But the Baroque frontages were no longer painted mottled, the various surfaces - corbels, columns, pillars, wall-faces, frames of windows and doors - were given one colour each. The colours of Baroque buildings appeared not only as nuances, but also often in powerful contrasts such as on the black-and-yellow frontage of Batthyány Palace at Dísz tér 5 in Buda. The colour effect was often enhanced by plaster of rough-cast mortar applied to wall-faces or wall-fillets.

The sculptural decoration of Baroque frontages is rich. The many surfaces of the numerous cornices, pillars, capitals, pedestals, window-frames, wall-faces were raised or lowered in relation to one another. The raised parts (cornice, window-frame, column, pillar, capital) cast a shadow on the surfaces placed deeper, hence their appearance is of brighter effect. This effect could be enhanced by colouring the deeper surfaces darker, but, on the other hand, this is reduced by painting the deeper surfaces brighter. Such practice has deplorably emerged here recently in Budapest (through the inverse painting of the City Parish Church, the church at Batthyány tér, or of the frontages of the lodging-houses at Bajcsy Zsilinszky út). The reason was probably that the originally bright (white) parts of cutstone got soiled whereby they appeared in time darker than the painted parts while they were brighter at the time of construction.

At the age of classicism - in the first half of the last century - the Baroque colouration of buildings was continued, but lost much of its vigour and was reduced to faint, pastel colours. These dim, light colours were characteristic of that time as appears from the blueprint collection of the Verschönerungs-Commission of Pest, or is still seen at the noted row of monuments of the Neva-embankment in Leningrad. Further good examples are the National Museum in Budapest, the Hall of the Pest County Council, and many more of our neoclassic buildings.

In the second half of the last century only one colour was applied instead of the many former to the buildings of Romanticism and Early Eclecticism, and it was enriched at most by one of its shades. And at the end and turn of the century the fading of cityscapes took place as has been mentioned by way of introduction.

And what is the situation today? Especially since the 1960's we have seen ever more colourful cityscapes all over Europe. Through opening up and presenting half-timbered houses the increased protection of historic urban nuclei has greatly contributed to the colourfulness of cityscapes e.g. in England at Windsor and Rye, or in the great number of settlements of Kent; or at Strasbourg and Colmar in France, or the German Schwäbisch Gmünd and Quedlinburg, or the Belgian Gent, and other cities. The historic protected cities in Hungary such as Buda, Sopron, Kőszeg, Székesfehérvár, Győr, Pécs, Eger, Vác; or Krems, Melk, Linz, Steyr and Eisenstadt in Austria; or the German Rothenburg, Dinkelsbühl, Nördlingen, Munich and Göttingen; or Moscow, Leningrad and Zagorsk in the Soviet Union; or Prague, Telč, Tabor and Jihlava in Czechoslovakia; Zürich and Basel in Switzerland; or Warsaw and Cracow in Poland - to mention but a few - had all been given a joyfully more colourful apparel than they had worn for a long time. It is perhaps only Cracow whose recent

colouration is still somewhat timid, the feeble colours do not represent worthily her monuments of great value.

Italy has been left out of this enumeration because the cityscapes of Rome, Firenze, Verona, Siena, Bergamo, Venice, etc. have always remained colourful, have never turned so grey from the smoke of coal-heating as the northerly cities of Europe; this applies also to most parts of France and the Iberian Peninsula.

City quarters reserved for pedestrians are now laid out more and more frequently (e.g. at Nuremburg, Bremen, Bruges, etc.) and also this promotes the reestablishment of the historical role of colours in the course of reconstructing urban monuments.

However, in connection with the welcome renovation of the appearance of our cities, we should like to warn against committing the error mentioned with the Baroque method of painting. To give prominance by harsh colouring to insignificant buildings in the stead of monuments, or close to them, would create the same anomalous situation as the wrong painting of plastic Baroque frontages. A vigorously coloured eclectic facade gives the impression of such historic value which this building does not possess and has never possessed. From this point of view the most recent frontage colouration of Rákóczi út in Budapest stands open to debate while at the same time the temperate colour harmony in the whole city of Szeged may certainly be approved of.

Colouration - as we have seen - is connected closely with the history of buildings and can reveal something about it; but apart from all its value-enhancing properties it could, if left to incompetent hands, also spoil any ancient monument, even the whole aspect of a city. Let us therefore fashion on these considerations colourful streetscapes radiating serenity in the renovated ancient quarters of our cities.

J. Fajó

Colour dynamics forms in my opinion part of environment-planning - it is a partial unit of this greater, wider, more harmonious unity. One property of planned environment inspiring delight in life is its colourfulness. All objects of man-made second Nature ought to be brought into harmony and designed visually - but they are not because this point of view is accepted neither on the institutional nor on the individual level. The shapers of environment, this orchestra designing an ensemble of objects, have no conductor; the model designer, the painter, the sculptor or the interior designer are but lonely showmen. We are designing buildings, furniture, plastic decorations, textiles, gardens, information systems separately, and even if any of them might be fine and good in itself, no organically coordinated environment emerges from all this, not even by chance, in the present system of organisation. It is therefore that this attitude ought to be changed urgently and environment-planning become an art accepted by the State.

Colours have in a human world not only the function of conveying pleasure taken in harmonies formed of colour ensembles in the genre of panel pictures; their other function must be to render the spaces of our life brighter, better arranged. The space-partitioning role of colours helps us in keeping informed about spaces constructed for given functions, about objects, the world of materials, about architecture. All objects, ensembles of objects created by human society serve something definite to live for: they are units of production,

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János Fajó, fine artist, painter, Budapest, Hungary

entertainment, relaxation or healing. In this system of tasks the spectacle, colours and forms - the exterior cover of materials - have as visually acting factors a determinant role on the human psyche according to aims. Colour dynamics is therefore an indispensable part of environment-planning.

Colour-planning can be carried out properly only from profound conviction, on firm professional bases, and not just by following some fashion or performing some commission, perhaps for want of something better. Conscious competence can only be the consequence of a previously existing comprehensive view of life, or, if you like, world conception, because a self-expressing, narrow-minded habit is worthless here. We need gifted professionals, independent, free individuals taken in the best sense. Colour-planning is an indelible expression of the individual's mental niveau and standing; it is the test of the proper place of his views. No deception is possible here: he who is not what he pretends to be will be disclosed by his colour-planning, and in a spectacular way at that, in the magnitude of house or city-quarter dimensions to such an extent that even the blind must see it, and does so in fact! The many blunders of colour-planning in this country prove that colour dynamics is a drastic method of denunciation at the same time.

But there is one thing we must see from present colour-planning practice namely that subsequent coloration must not be our aim. Wherever this is possible it must be avoided as unnecessary additional work through a proper choice of material. The noble materials (marble, chromium steel, stone, aluminium, glass) need not be colour-planned since they are colour carriers. Where in reality painting must be done on the spot, there is something wrong, no good at all. This means that function and material do not correspond to one another and therefore such colour dynamics is mere supplementary activity. We are forced to use substitute materials for the

most part - since we are not a rich country - and these we render psychically tolerable through painting; - this is our reality. Face-lifting, beauty-powdering on the spot should increasingly be replaced by products predesigned according to colour systems - e.g. panels, members - by our participation in prefabrication, by organic colour-planning. If all our industrial products were made in a specified system of colours - the same kind of yellow were applied to ceramics, plastics, textiles, etc. - then a given environment would assemble practically unaided and its effect could not be spoiled.

Our work is made difficult also by the attitude of the paint and dye factories. Namely the world-wide danger exists that colours will be replaced by tints in the field of industrial production. It is in the economic interest of these factories to sell not pigments, but cheap vehicles, colouring agents, dull, dark tints as pastel colours. The result is that everything darkens, gets cloudy and brown round us. The detached farmsteads disappear (this is good), but along with them vanishes the sun-kissed whitewash, the simple rustic cleanliness. Our oxide-yellow village church towers offering orientation get nebulous, disappear, our villages and towns assume gaudy, mixed tints. I am well aware that the high prices of pigments are an economic reality; brilliant whole colours are expensive, but all this would be easier to survey and more correct if the makers of paints indicated their prices not averagely, but in a differentiated way. Let pure lemon-yellow, orange and red be obtainable for as much as their actual production cost is and let there not be hundreds of tints - only tints - without one colour. If, for instance, we look at the STYLOGEN catalogue we do not find one pure colour in it. We would be willing to pay, but let us have paints that are colours at the same time - or else darkness would come soon and only Elisabeth Bridge would shine in the centre of Budapest before long. Needless to say, also incompetent colour-planners have a finger in the pie here. For example,

they remove a fashionable colour - tobacco-brown - from glass and place it on a panel whereby the brilliant, homogeneous stereo-colour turns into a monodark surface and dies. Material and colour, dull and bright are not coordinated here. But the same happens if this is reversed, if the dark colour assumes large dimensions and small surfaces turn bright. The consequence is that superficialness, fashion, incompetence produce motley, spotted hospitals, tunnels, houses. Parts of the town are marred, the built environment, the brandnew architecture does not improve, but spoils the cityscape.

In man-built spaces colours, as well as their optical properties, must be handled with great caution, especially in Hungary's climatic conditions. Namely it is not indifferent to human mood, not even symbolically, whether the sun is shining or the sky is always clouded in man's immediate environment. The Mediterranean towns have become bright with their sand- and limestone-colours, with these natural materials without any paint added. Also the region there is all sunshine and brilliance, and so are the towns as a result; the narrow streets have been laid out to keep off too much light. The people there take cheerful delight in life, and this is due besides sunshine to the colour and brilliance of their environment. The Mediterranean peoples are in no need of artificially coloured towns; but we do not have sufficient sunshine, nor organic colour-carrying materials: our external and internal spaces plastered with substitutes must be painted. But painting must be applied cautiously since the concept of a "colourful town" is simply a dangerous nonsense and leads inevitably to gaudiness. This is so because in dimensions of town-quarter magnitude it is not possible to create harmony according to colours, streets and squares would blend. Moderateness is essential here.

The effect of the colour- and brilliance-content of environment has not yet been realised adequately and this is, in the

last analysis, understandable. On the one hand, we have dealt with this problem very little and, on the other hand, this effect acts insidiously, is practically intangible. The visual level of man-built environment is an emotional infrastructure that forms sentiments involuntarily, influences the awareness of life, and affects the human psyche greatly. Thus it is not indifferent how we make use of its influencing power.

[illegible] D'[illegible] DE L'ENVIRONNEMENT [illegible]

Th. Tosca

Inspection des facteurs qui déterminent le choix de couleurs dans le milieu urbain: leur fonction architecturale, leurs pouvoirs dynamogènes sur le sens topographique, leur rôle dans la composition architecturale, leur contribution dans la formation d'un schéma urbain, leur détermination sur la base des préférences des usagers, leur distribution esthétique.

Développement d'une approche scientifique:

- Recherche bibliographique
- Enquête sociopsychologique auprès de 500 personnes dans le cas de la ville grecque (Thessalonique) et de 350 personnes dans le cas de la ville française (Paris).
  a) Détection des préférences des usagers (que ce soient des habitants ou des passants) sur la coloration des extérieurs des bâtiments selon la méthode du professeur de la Psychologie de l'Université de Göteborg Lars Sivik (Système de Couleurs utilisé l'NCS-Natural Color System).
  b) Recherche des préférences chromatiques "à la mode", dans un sens général, hors contexte, auprès de mêmes sujets, ayant pour but l'évaluation de la distanciation entre les notions actuelles sociopsychologiques et la vigueur de l'accoutumance à des normes sociales traditionnelles agissant catégoriquement contre l'adaptation vitale des usagers à un environnement de plus en plus aliéné.

Thasos Tosca, Architecte Colorista, Assistante Universitaire, Département de Construction de l'Ecole Polytechnique de Thessalonique, Athènes, Grèce

c) Comparaison des résultats des deux expériences et établissement des tableaux de corrélations entre elles et des trajets régulateurs tridimensionnels pour chacune d'elles séparément. Détermination sur le solide de couleurs des régions "valides" pour chaque couleur suprès superposition des deux catégories de trajets.

Proposition artistique basée sur les résultats des enquêtes (paramètres chromatiques et facteurs pondérateurs des couleurs choisies suivant l'ordre et la fréquence de préférence suggérés par les trajets régulateurs).

Il s'en déduit qu'il ne s'agit pas d'une palette limitée à un certain nombre de couleurs mais des vastes régions à l'intérieur desquelles l'architecte (coloriste ou paysagiste) peut procéder à sa création plastique compte tenu des autres facteurs purement fonctionnels.

GUIDING PRINCIPLES AND METHODS IN THE REHABILITATION OF ANCIENT MONUMENTS

A. Komjáthy

Institutional protection of ancient monuments is more than hundred years old in Hungary and numerous examples of the past lend themselves for outlining to you this subject-field.

Permit me to look back among these upon a work of István Möller (1860-1934) relating to the preservation and rehabilitation of ruins at Zsámbék. Conserving work went on from 1896 to 1900 and laid down the requirements and methods which we still follow, namely that the new, the completion, should make possible a distinction from the original. That age was already pregnant with the view according to which some experts, e.g. Gyula Forster, attacked and rejected the eclectic school of building in respect of style. Let me quote him: the care of monuments "... must comprise not solely the ancient building, its original condition, but everything that has been added to it, built to it or into it by later generations ... it must comprise the general state of the building ...". The product of this mentality is the rehabilitation at Zsámbék.

The activities of the succeeding age, the rehabilitation of monuments between the two World Wars, also brought prominent results which are worthy of note and necessary to mention. Let me refer here to the problems connected with the royal basilica at Székesfehérvár (1935-1938) and the royal palace and chapel at Esztergom (1934-1938) whose solution is still acceptable on the basis of our present principles and was an

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Budapest, Hungary

outstanding achievement of that time. These operations were conducted by Elemér Lux (1960-1961). This was the period when the excavations at Visegrád directed by János Schulek were started, the excavations of Roman remains at Szombathely began, and the frescoes of Gizella Chapel at Veszprém were uncovered. The architectural solutions were based on the principles already employed at the rehabilitation of Zsámbék i.e. that completions are necessary partly for structural considerations, partly for improving the possibilities of interpretation and presentation. The scientific points of view bind us to carry out all this in such a way that the surviving, authentic parts be preserved and the completions be presented marked off in material, colour and form. Nobody should be misled, neither the researchers of later ages, nor the current and, especially, the future visitors. The three rehabilitations (Esztergom, Székesfehérvár, Zsámbék) are the foundation-stone of the present school followed in the protection of Hungary's ancient monuments. Another outstanding project of the 1940's based on this method is worth mentioning: it was the rehabilitation of the military amphitheatre at Óbuda where the leading architect was László Gerő.

Summing up the activities of that period we may say - even if we mention the mistakes - that they have created after World War II the background for the protection of monuments in Hungary. Many people active in the fields of instruction, theory and methodology could be enumerated here - they have laid the foundations jointly.

As for our part, we regard the architect, the architect-designer, as the master of the rehabilitation system in the complex process of monument rehabilitation.

In 1972, at the hundredth anniversary of the existence of institutional protection of monuments in Hungary, Ferenc Merényi said the following: "... in our present view, which we hold to be up to date, the task of the institutional

protection of monuments is to rehabilitate with scientific expertise the valuable architectural creations of the remote and recent past, to present them authentically with an enjoyable aesthetical appearance, and to preserve them as living, integral constituent parts of the human environment. This activity is a complex and dignified architectural creative work which coordinates in its artistic, administrative, designing and executive respects numerous attendant arts and disciplines. From this notion of the protection of monuments it follows directly and logically that in Hungary, taking into account our special circumstances and contrary to most other countries, the institution having national control over the cause of monuments, is operating within the framework of the branches for public construction and city-planning...".

Let us now survey our conceptual spheres, the architectural ways, including colouring which assists interpretation and may be regarded as part of architectural tasks and solutions, as well as our solutions in colour which help us in the interpretation of signs and symbols and which are here at the same time solutions depending on materials for the most part.

The concept of monument

"Monuments are creations of fine arts, architectural or connected with architecture, which have survived from the past, and which we want to maintain and fit to the needs of life owing to their complex cultural value. Monuments, as authentic documents that cannot be replaced by anything else, are expressive of a given age or of the process of social and economic development. Standing before monuments we can contemplate the creations of a given age directly and this results in a particular experience which cannot be produced in us in any other way. This experience may be varied: it can convey knowledge, data, can offer aesthetical pleasure, can deepen consciousness, can have a stimulating, instructive effect. But the precondition of all this is in every case

that there should exist a direct connexion with the real object and that this object should have authentic historicalness.

The value of monuments

We regard the monuments as carriers of historic, aesthetical and economic values.

The task of the protection of monuments:

"Tasks connected with monuments follow from the concept and value of monuments. On the one hand, we must maintain and protect monuments, must conserve their original state as far as possible within given possibilities; on the other hand we must ensure that their inherent values be made accessible to everybody, become public property".

This statement is a fundamental principle at the same time and has contributed greatly to the creation of the particular Hungarian school.

Rehabilitation:

"By the rehabilitation of monuments we understand the totality of practical interventions connected with the protection of a given monument. ""Rehabilitation"" as a collective term may be applied to the repair of damage resulting from natural aging and use, as well as to operations of restoration involving major alterations".

Conserving:

"By conserving we mean all interventions carried out on monuments with the sole purpose of maintaining, protecting, securing and keeping in good repair monuments in their original place, in their original material, with their original equipment in their original environment, without changing the existing state".

Restoration:

"The concept of restoration on the other hand comprises in addition to the above all interventions which involve any change in the existing state with the purpose of maintaining the monument, of uncovering its aesthetical and other historic values and of giving it a more impressive appearance.

Some of the operations taking place within the scope of these major collective terms are, by their nature, in current use also outside the field of rehabilitation and therefore their special definition is not necessary in the protection of monuments. There exist, however, special operations of rehabilitation whose uniform interpretation and definition is of particular importance for developing a uniform practice. These are: reconstruction, completion, anastylosis and rebuilding".

Reconstruction:

"Reconstruction is, in theory, the scientific operation with which it is tried to ascertain a non-existent, earlier state of a monument and to lay it down in drawings and descriptions. Reconstruction may involve a monument as a whole, or some of its parts and their building periods. The authenticity measure of a reconstruction depends on the quantity of available data, on their authenticity, their accuracy going down to details; authenticity may have a variety of degrees ranging from clear-cut, full authenticity to theoretical reconstruction experiments based only on hypotheses and analogies. Theoretical reconstruction is an important aid to all monument-rehabilitations standing on a scientific basis and the restorer can in most cases not work without it.

All operations aimed at the replacement or repair of missing parts, i.e. completion, anastylosis and rebuilding, rely on theoretical reconstruction and are its realisation to a certain extent. All sorts of the realisation of reconstruction,

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hence also the operations of completion, anastylosis and rebuilding, are practically called ""reconstruction"" in the figurative sense".

Completion:

"Completion is the operation by which some missing part of a monument is reproduced, be it for the sake of structural or formal unity, or for the sake of a better understanding of parts that have survived in fragments. Completions may be made of materials and in forms that correspond to the original, but they may differ from it as well; the essential characteristic is that completion is not the reproduction of an entire monument, or one of its major connected details, it is only the reproduction of minor parts which assume coherent meaning only in combination with other existing parts.

It further follows from the concept of completion that is presupposes in every case an overwhelming majority of extant original parts in comparison to which the completions fall into the background in respect of their quantity, s ifi-cance and effect".

Anastylosis (reposition):

"The operation of anastylosis - or, in other words, reposition - consists in putting the scattered original constituent parts of a ruined monument in their original position whereby they resume their role and meaning filled in the original architecture. The essential characteristic of anastylosis is that it is aimed at rendering the formal appearance of the monument by making use of the original material that carries the forms. Thus anastylosis is the reposition of ruined details of buildings by using those original members in which the architectural forms are given ipso facto".

Thus, in totality, the Hungarian protection of monuments operates in the aforesaid conceptual "spheres", even if there

are departures from them and we see overlappings in many a case.

If we wanted to analyse what minor, but indispensable methods must and can be applied to the above main elements, we may say by way of enumeration the following: pulling down existing parts, preservation of damaged, worn, burnt, etc. parts. Presentation of several historic layers, interpretation of architectural plastic sculptures, elements, the question of an original presentation of materials and surfaces, the quality of completions, the role of anastylosis, additions, demolitions and transfer.

What you have seen in the foregoing is certainly not a subject-matter than can be regarded as scientific from your point of view; but I am confident of having given an idea without any attempt at completeness about the activities of a profession or specialised field often based only on scientific exploration or architectural inventiveness.

URBAN-AESTHETICAL PROBLEMS OF GENERAL DEVELOPMENT PLANS

A3-5/1

I. Vincse

As a first approach I have associated two notions or contents quite apart from each other; but this is no spontaneous accommodation, it is rather a purposeful examination which I have chosen as the subject-matter of my report.

Planning on a city scale is not a new trend in architectural designing; it was a concern already of the ancient Greeks (e.g. the City of Birds of Aristophanes). Moreover, the roots of systematic city-planning are seen already in ancient cities, such as Jericho, Uruk, Ur, Nippur, Memphis, Aniang, Mohendjo-Daro. Urbanisation on a larger scale was preceded by the theories of the early Utopians; as a reaction to the negative properties of the mediaeval towns, then in the period of the pre-urbanists (R.Owen, Ch.Fourier), and later upon the advent of the railway and with the development of industrial production, the ideas about the ideal town gained considerable prominence, and this oriented designs on a city scale towards more human realities.

I think that in the middle of this revolutionary era when urbanisation became the content of all this, the question of overgrown cities, of cities to be laid out newly, in the era of agglomerating city-textures and agglomerating city-masses (the Ruhr region in the GFR), the problem of planning has become more acute. At the same time we are concerned on the top level of urbanisation with the elements of a beautiful human environment and also with its frequent absence. Thus the

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István Vincse, Chief-Architect, Nyiregyháza, Hungary

question connected with the practice of general planning has arisen. Today this sort of planning is to be found in a large number of our settlements (towns). The general plan has become indispensable in the system of local council-control, but this is so also in other countries and in international respects as well. Kell Åström reports in one of his works on the Swedish practice of regional planning and so-called master plans controlled by the treasury, and Olli Kivinen presents a similar hypothesis on the practice of Finnish city-planning. The latter author is especially remarkable in stating that the principal task and responsibility of architecture consists solely in structural designing, creative formation, shaping of cityscapes, and visual formation, because designing has specialised extremely. My summary conclusion is that the drawing up of general development plans is necessary as before, but I should like to call your attention without any attempt at completeness to a few facts which are in my opinion deficiencies:

- Today the majority of plans develop self-contained housing estate areas which are designed for being built up and regulated by morphologically homogeneous zones; the result is that the morphological-aesthetical feature of the streets - serving urban traffic for the most part - which are on the boundary of contiguous areas, as well as the shaping of the streetscapes is overregulated or strictly defined.
- There are endeavours for developing systems of subcentres and so-called quarter-centres. These are conserved in respect of general plans, capacity, place and structure.
- The scale of general development plans differs from that of detailed plans; they nevertheless lay down establishments in respect of place and function (public parks, institutions, layout of streets, "fixing of regulation breadths", definition of other categories of area utilisation) which cannot be prognosticated in advance unconditionally and

without any doubt even in a 5-year range. 43-5/5

- The conceptions thus developed rely at the same time on regional principles only in a few cases, or on their pre-estimated calculations, and even less on international connexions of economicalness.
- Hence the present system and regulations of the plans are unfit for environmental planning on an urban scale and of aesthetical quality, are unfit for planning adequate morphological, architectural and, last not least, city-planning space complexes, for laying out streets and squares. Let us think here of the aforesaid restrictions. If I draw a parallel I should say that it is difficult, or almost impossible to play on a chess-board where the majority of the pieces are fixed in their place.

Let me speak in the following about aesthetics and a few questions of colour. A town is the symbiosis of man-made environment, institutions and Nature.Since institutions are man-made for the most part, a town is simply the coexistence of man-made environment and natural environment. This spectrum is perhaps wider than usual since my conclusion applies also to the notion of environment-planning. Consequently aesthetical analysis in town-planning is usually limited to the narrower correlations of the elements in man-made environment, such as the sphere of architectural (urban) squares and streets. This is, in my opinion, also the result of the fact that we still are on the initial phase of a recurring and changing aesthetical planning and adoption of dynamical squares. For the lack of time I shall limit myself to our own, subjective conclusions. It is advisable to include in the subject-field of urban aesthetics only the static agglomeration of man-made spaces which can be surveyed with a glance by the pedestrian spectator, by the contemplative, receptive onlooker. The so-called aesthetical experience limit (or mimetic experience limit) may apply to the verge of these, to which I

shall revert later. 43-5/4

In the course of planning architectural spaces we must not forget about the question of the so-called spectacle organisation. We must find adequate architectural and city-planning space compositions that correspond to the tastes of the time, or, as Louis I. Kahn says "we must create similar architectural values, continuous space relations connected to man". And on the analogy of one-time street-square constructions. This does not relate to full identity, since for lack of other solutions we must evidently return to traditional, accepted means. I should prefer to make the aesthetical analysis of architectural spaces, of man-made environment the task of environmental aesthetics on account of several causal correlations. The role of attendant arts in man-built environments has changed; the architectural conventions and means - not to be interpreted in a pejorative sense - which were adequate in past ages for an aesthetical synthesis of man-made space and objects of fine art must be reassessed today.The one-time architect cooperated with the sculptor and then provided the possibility through direct planning for placing creations of fine arts. The fact is that the latter method is still regarded as acceptable saying that there is a given building or a square and it is the artist's task to "furnish" in adequate quality. I believe that this latter view must be rejected and that cooperation is necessary already in the phase of planning for establishing a conjunctive aesthetical relation of proper quality. Carrying on this train of thought I may say that inter-artistic action should have its proper place in the comprehensive shaping of artificial environments. In his aesthetical analysis of architectural creation György Lukács starts from the particularity that in architecture the mimetic experience of the creation is disanthropomorphising doubly. Anthropocentrising artistic reflexion emerges from the disanthropomorphising elements of static-natural and social function. Thus it is clear that in the course of viewing a

wider environment the aesthetical reflexion is ever stranger than with the former, but we must absolutely concern ourselves with studying it. The reference to the space-time correlation is valid in wider artificial environments but relatively. In artistic intuition the correlation between the complex time factor (motion time, diachronic time, viewing time) and the artificial space does evidently not come about in the same mode of action during creation, or cannot come about in certain overdimensioned scopes. I have mentioned in the foregoing my arbitrarily chosen notion of aesthetical experience limit. The aesthetical experience limit of architectural spaces can be approached from several angles. In looking at a picture it is not indifferent in what circumstances we view that pictorial creation. What I have in mind here is the question of illumination, distance (the onlooker's), the dimension (of the creation), and other questions. In the case of a square of urban man-made environment traditional ornamentation, or present-day "design ornamentation", cannot be neglected either; nor can the receptive onlooker's relation to the creation of art in viewing the tints, shades of colours, fine structural connexions and creations. This means that the quality of interactions in aesthetical reflexions is not indifferent in respect of space proportions (dimensions), in respect of distances, in the correlation and proportions of squares and the architectural objects forming squares, nor in respect of other similar questions. I cannot deal here with the onlooker's state of consciousness, personality, attainments and style of life, with inductive problems (e.g. evocative capacity) that take place in the course of mimesis, however relevant these may be and despite the fact that the processes of consciousness in the recipient are not negligible, neither in architectural aesthetics nor in environmental aesthetics. So I have arrived at the world of colours and colour aesthetics. To the best of my recollection Goethe reached a witty, but somewhat ironical conclusion in his "Reisen

- meist zu Pferde - in ganz Thüringen, Hans" saying through the association of green colour in man that man resembles the donkey. It is not by chance that I mention Goethe since it is commonly known that in addition to his principal literary vocation he likes to deal with questions of natural science, with more or less success. I only mention as a matter of special interest that Goethe contested even Newton (prismal refraction of white light) for proving the correctness of his own ideas. After some twenty years of hard work he wrote in 1810 more than thousand pages on colours in his "Farbenlehre" and was convinced to be the only one who had the right notions about the problems of colours in that century; "... and in this connexion I have feelings of superiority" he said. Also Hegel was concerned with the question of colours; feeling a practically magic power in this experience, he introduced spirituality into creation through colourism. One thing admits of no doubt anyway: colour is a physiological sensation induced in Nature by colours, or, more exactly, a physiological excitation that appears as a qualitative difference in the visual sensation even in the case of a structureless visual field. Just think of the spectroscopical examinations. Thus colour is nothing else but a form in which material appears [for light is material, too]. According to its relevance in architecture, colour was added for preferred studying and planning to the arsenal of the Bauhaus society in the 20's. Paul Klee, one of the masters of that school, regarded the knowledge of Nature as a problem of space, form and colour, and so-called shaping was therefore made up in instruction of the theories of colours, spaces and compositions. Emphasizing among these three elements the question of colours we may say that dealing with it and analysing it scientifically has become unavoidable by now. Instead of intuitive, arbitrary conclusions we need accurate, clear-cut regularity. Instruction in colour dynamics is forced to present also spontaneous knowledge. Let me mention the colour circle of

W. Ostwald which is still used in aesthetical analyses, or the contrasts of J. Itten (light-dark, cold-warm, complementary, simultaneous, qualitative, quantitative), his law of harmony, or Goethe's law of harmony, or temperament rose. These are outworn examples for the most part and are evidently known to the members of the International Colour Association (AIC) and to the participants of this Conference, but I wanted to emphasize the importance and significance of colour aesthetics. I feel at the same time, or rather should like to suggest that when dealing with colours we ought to attribute increased importance to the modes of action of the physical-physiological correlation. Let me mention only one example of the questions to be studied, e.g. the scientific examination of colour esthesia. The receiver, i.e. man, is always present with all his psychical reflexions (consciousness, personality, intellect, sentiment) with his style of life in the role of creation since sensory stimuli are transmitted not only by adequate organs, and notions can arise also in a reversed relation. If man is represented on a coordinate axis as an emotional-intellectual being, and the physical-chromatic factors of material (colour) on another, I think we could draw valuable conclusions; but here I cannot enter into a deeper analysis of this. A similar, although less complex initiative is the SEINOID system based on relative numbers.

By way of conclusion I revert to a few questions. We have agreed that aesthetical planning is necessary in the course of drawing up general plans, especially if we are to solve problems on an urban scale and want to maintain and enhance the accepted aesthetical quality of the creation that corresponds to the given scale. It goes without saying that we must employ novel methods in general and regional planning, but especially in the case of detailed plans. I should place the necessary means in five groups: 1. an interdisciplinary team completed with fine arts; 2. realisation of so-called

elastic types of plan; 3. widening the employment of the technical apparatus (e.g. isometrical display); 4. a better interrelation of the plans; 5. preparation of interdisciplinary, supporting detail plans. Needless to say I made no attempt at completeness in respect of general principles which I regard as further possibilities in planning practice. I only mention that with the present standards of technical civilisation the application of design in planning practice is indispensable. Let me mention here the design-based composition experiments in France of Pierre Vago, the French architect of Hungarian origin. In this connection it is my opinion that the attempts at sterilisation (sterile centres, sterile residential quarters) ought to be restricted, and that it is advisable to orient ourselves towards architectural solutions of a human scale which correspond to the spirit of the age, and to revalue to a certain extent the correlation between form and space instead of producing pseudo-qualities. My suggestion is that the dialectical unity of form and space ought to be interpreted according to, and on the basis of, a dialectical-holistical programme of form, space, technics and style of life. I often keep mentioning that the tasks arising in the course of planning on a general level ought to be carried out with a felt-point pen and a computer.

VERGLEICH DES "ÄSTHETISCHEN UND FUNKTIONALEN FARBKÖRPER-MODELLES FARBATTRIBUTE" MIT DEM OSA/UCS-FARBATLAS DER USA

M. Adam

Vorgestellt wird die Transformation der CIE-Messwerte x,y,Y in die Helmholtz-Koordinaten L/R/H als "ästhetische Polarkoordinaten". Mittels dieser ergeben sich die gleichabständigen ästhetischen Farbsysteme L/T/K (Ostwald, neu definiert) und L/S/H (Munsell, neu definiert).

Die rechtwinkligen Farbkoordinaten-Systeme der USA (vgl. α,β-System von Hunter) und ihre projektiven Transformationen garantieren keine Gleichabständigkeit und keine ästhetische Struktur aus den Gesetzen des Farbsehens. Dies wird experimentell auch den Vergleich nachgewiesen. Alle Farben des OSA/UCS-Farbatlasses werden durch Diagramme L/T/K (farbtongleiche Flächen) und L/R/H (helligkeitsgleiche Flächen) dargestellt.

Es wird eine Synthese der beiden Arten von Farbattributen, der primären und sekundären, in einem einzigen ästhetischen Farbkörper erreicht, also eine "ästhetische Homogenität" mit Strukturbestimmung, nicht nur eine "formale Gleichabständigkeit". Wesentliche Voraussetzung dazu ist die neue Definition von Pigmentvollfarben und der Anschluss an die Erscheinungsweise der Farbe (Materie, Licht, Raum).

Damit wird die CIE-Farbmessung für den Farbgestalter brauchbar gemacht. Zur Anwendung dienen die "graphische Methode", die Farborgel aus wertgleichen Pigmentvollfarben und eine ästhetische Mischtechnik.

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Dem Praktiker werden anschauliche Messmittel: Farbkreiselmessung, Farbleitern und Farbmessflächen mit Korrelation und Eichung zur CIE-Farbmessung angeboten. Die rationelle Farbgestaltung geschieht wesentlich durch Farbton, Sättigung, Helligkeit, Grauverhüllung, Wertgleichheit, Schattierung im Sinne der Licht-Raum-Wirkung. Zur Kontrastbildung dienen die ästhetischen Stufen, nicht lichttechnische Bezugsgrössen. Der Unterschied zwischen "Qualität" und "Grad" sollte klar sein. Die Farbmessung ist nur Hilfsmittel und garantiert nicht die Analyse für die Anschauung.

D. Gulyás

"The invisible harmony is stronger than the visible one"

Heraclitus

The Heraclitusian paradox expresses in a formula the parallelism of harmony between the substantial and the phenomenal, the abstract and the concrete, the immaterial and the real, between the subjective and the objective. What had been an interdependent dichotomy of a two-and-a-half millenia of metaphysical cogitation and naive perception appears nowadays in the divergent modes of scientific-conceptual and artistic-pictorial cognition. The rudiments of contemporary principles of harmony clashed centuries ago after Newton's discoveries. "Does the harmony of colours not stem from the proportions of vibrations that are conveyed to our brains through the fibres of our visual nerve much the same as the harmony and disharmony of sounds stems from vibrations of air", enquired Newton. "For certain colours perceived together affect us in a pleasant manner as, for instance, the golden and the indigo-purple, while others, on the contrary, are disagreeable to us."

The closed circle of the colour spectrum is divided much the same as the musical octave scale resulting in 7 main colours of the rainbow. The fundamental tone "C" corresponds to the red colour, the "D" to the orange, the "E" to the yellow, the "F" to the green, the "G" to the blue, the "A" to the indigo, while the "B" tone has parallel with the lilac.

J.W. Goethe also sought musical parallels to the sum total

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of colours, but connections between colours are established not in succesive order, but rather according to the point-counterpoint principle. The mathematical-physical approach is replaced by the sensual-emotional sphere which is characterized by a quest for contrasts, parallels and oppositions. "We do not altogether concede that it may be easier to harmonize the weak rather than the saturated hues; if the hues are strong, and the colours vivid, then the eye admittedly perceives harmony and disharmony much more markedly". Goethe was the first to examine the harmonizing peculiarities of a negative after-image and a simultaneous contrast chiefly on the basis of his experiences as a painter. Elaborating on this idea, Hegel expounded the colour theses on the forms of expression that were in use from the Renaissance all the way up to the withering away of the Baroque times. In the art of painting, the cohesion of colours was brought to bear through aerial perspective, carnations and the wizzardry of colours. These three techniques serve as the functional appearance of colour. The first, which includes colour perspective, is the aerial perspective, a spatial gradation of colours and forms influencing through linear perspective the structure of objects. The carnations are produced by the vibration of animate matter which creates the rich interplay of cold and warm values of colour both on the surface and in depths. The wizzardry of colours stems from the atmospheric, hovering character of the hues, from the Leonardo-type "sfumato"; the colours blend together shade by shade, the accidental lights glitter, all forms become both a source of light and mirrors infinitely reflecting the images one into the other.

Newton enclosed the component parts of white colour into a circle in order to build up a spectrum from darkness into lightness, whilst Hegel disperses the radiating ray-sheaf of colours in the infinite dimness.

The basic models continue to be reiterated in our century, if in a more differentiated manner. The physical colour-systems

of the 19th century were embodied in W. Ostwald's double-cone model and, parallelly, in Munsell's tree-trunk of colours /1915/ comprising at the time a rich array of mixed and neutral shades. Ostwald's order of colours strives at defining a harmonious gradation by means of extrema and mean ratio which is inserted between the 682 sections in conformity with Weber-Fechner law. /The only problem is that Ostwald's mathematics based on the formula "harmony = order" is impaired already in breaking up the basic colour because of confusing light-colours and body-colours/. The strained mirror-symmetries and the constraint of regularity at all costs is detrimental to the advantageous aspects of the system.

The three masters of the Bauhaus that was established in 1919, Kandinsky, Klee and Itten, explored the regularities of colours. Kandinsky laid down the regularities of expressive colours, whereas Klee elaborated the variational and combinatory sequences in respect of colour-movements in three-dimentional space. The peripheral movement follows the direction from "cold" towards "warm", the diametrical movement is directed towards the complementary colour /i.e., the after-image/, whereas the so-called polar movement runs the length of the grey sequence, through or parallel with the black-white tonalities.

Johannes Itten had something of his own to add to Goethe's and Newton's models as he opposed the Goethean colour-dichotomies or contrasting components and patterned 7 basic contrasts on the sample of 7 fundamental tones. The self-contrast of colour and the scale of dark-light, cold-warm, complementary, qualitative and quantitative contrasts render a reliable yardstick for measuring the psychological impact of colours that develop at a later stage.

If the canons of totality are projected onto the human physiological plane and onto the stages of his biological development there emerges from the sum total of statistical elements the asy-

metrical, disharmonious outgrowth of preference which upsets the balance. The projection of the contrasts-chain delineates more clearly the graphic reliefs of various human characteristics. The 12-part rose-like circle of temperaments elaborated by Goethe exhibits not only an individual character's basic colour tonality, idiosyncratic contrasts and inclinations in terms of colour dynamics and colour associations, but also paves the way to the act of creation.

The majority of artistic creations, whatever they may be - architectural oeuvres, paintings, monuments or other designed objects - are originally engendered not as exercises in harmony, functionless forms "without space-force" or objects whose aim is to elicit harmony through their compositional structures. They may be unbalanced, challenging, embryonically tension-breeding, with dichotomies of harmony-disharmony interpolating and overlapping one another.

It is not by sheer chance that the turn-of-the-century avangarde movements invoked in their manifestoes the fourth dimension, the perception of multiple-layer spatial-temporal processes, the simultaneity of interpenetrating notions. Film-making effects, alternations of genuine and virtual elements gradually enriched the spatial system of colours. This development is strengthened by the increasing role of artificial light-sources and the Janus-faced nature of light colour. In this manner, colour-metrics is also pervaded by the aesthetic plane because there is dormant in it the harmonious perception of colour as was ascertained in E. Schrödinger's study "On the relation of triple- and quadruple colour theory" /1925/.

As Le Corbusier aptly put it, "light and colour gleam with natural spontaneity at creative stages; the academism is a greyly yawning vacuum". Hence, colour harmony cannot be a quest for a single-plane grey. To him, the mathematical formula "MODULOR" is primarily the framework for architecture-music because "mu-

sic is the carrier of joy, whilst noise embodies inhibitions".

In creative design work the elements of space, form, proportion and colour are all shaping factors appearing in colour and, if properly chosen, they become compositions imbued with functional force and content causing form to become substantial and the substance to be formed.

Colours and lights carry the sum total of signs and meanings from the simple colour stimulus to a transformed colour symbol and association, from the aesthetically neutral environmental elements to the condensed and shaped space. The complex colour dynamics should strive to build up an order of vision and perception, to shape the colour sign-system into form, and to give expression to the invisible laws and the visible forms. The artist-designer must choose between enumerating dual contrasts and making continuous differentiations on the one hand, and, on the other, synthesizing more or less decisively the elements proceeding along separate routes and combining them into a simultaneous simplicity of a musical ensemble. This operation of integration may be polished to become the sign-key of space + form + light + colour which is capable of penetrating the never-identical physical, physiological and psychological planes and of turning the separate factors and antagonistical forces into human dimensions.

As the music of our century explored the problems of harmony of the diatonic, equally tempered, pentatonic or Schönberg's scales, so do the investigations of colour harmony-disharmony linked with various orders of proportions and structure exhibit the diverse aspects of colour. It becomes increasingly evident that in the realm of colour the neutralization of white-black /-grey/ does not play an exclusive role. The sequence of contrasts incorporates the various tonalities of fashioning saturation, weight, formation or elimination, the sharp and the soft, as well as the major and the minor scales, whereas in the process-

es of perception the chain of contrasts, alternations and movements brings into being a peculiar field of force in which light and colour become transformed into an otherwise inexpressible and imperceivable, at times even irretrievable experience.

SIMULATION D'AMBIANCE VISUELLE EN ARCHITECTURE

M. A. Dabat

Résumé: La mise au point de méthodes et d'outils de simulation des phénomènes liés à la lumière naturelle (ambiances colorées, confort visuel ...) nous permettent de prendre en compte certains de ces facteurs d'ambiance, lors de la conception d'un projet d'architecture; que ce soit l'aménagement d'espaces intérieurs, extérieurs ou l'étude de l'impact visuel d'un objet dans un environnement naturel ou bâti.

L'ensemble de la méthode a comme support le système CRAIES (Système Combiné de Simulation des Ambiances dues au Rayonnement Solaire) .

Ce système permet la simulation des phénomènes énergétiques et lumineux; il tient compte:

- de l'environnement proche et lointain,
- des paramètres de localisation géographiques et climatiques,
- du projet en tant qu'objet géométrique : volumes, surfaces, percements,....
- de l'aspect visuel : lumière naturelle, réflexions colorées, ...

Cette dernière partie est traitée par une technique de

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projection d'images photographiques ou de dessins dans un simulateur d'ambience visuelle. Le but étant de presenter le projet, en cours ou en fin d'étude, au maître d'ouvrage - client - utilisateur, d'un point de vue qualitatif .

1 - INTRODUCTION

Ce système a été mis au point pour simplifier la prise en compte des facteurs climatiques et pour permettre une visualisation d'un projet d'architecture, lors de son élaboration. Les professionnels de la conception étant confrontés, de plus en plus, à l'évaluation des performances du bâtiment vis à vis du rayonnement solaire, sur le plan énergétique et lumineux. De plus le développement de l'informatique dans le secteur du bâtiment ainsi que la nouvelle image de l'architecture confrontée à un public connaisseur, nous ont amené à proposer une solution élaborée à partir d'éléments existants et à partir d'éléments nouveaux adptés à ce système.

1.1 Du point de vue du concepteur

Actuellement le nombre important de données à prendre en compte, la nécessité d'articuler avec cohérence les informations et d'accelerer le processus de mise en oeuvre ont fait que les outils de représentations traditionnels se relèvent d'un emploi trop lourd ou donnent des résultats insuffisants. Or, pour le concepteur, concevoir et représenter sont des opérations inséparables.

1.2 Du point de vue client-utilisateur

Jusqu'à présent le concepteur avait comme interlocuteur un client-utilisateur généralement peu habitué aux techniques de représentation et dont la compréhension d'un projet ne pouvait se faire que par référence à des modèles culturels connus. Depuis les progrès récents des techniques et

leurs applications: Optique, electronique; ainsi que leur utilisation associée: Objectifs photographiques spécifiques, informatique, vidéo, ...le dialogue Concepteur / Client peut desormais s'établir.

2 - PRESENTATION DU SYSTEME

2.1 La représentation utilisée

La représentation de tous les éléments du système a pour base un type particulier de projection de l'espace sur un plan : La projection Equidistante

Le problème a été étudié par A.Barre et A.Flocon dans "La perspective curviligne" Ed.Flammarion 1957.

a) Le champ de 180° est représenté par un tableau circulaire.
b) Toutes les droites réelles qui passent par l'axe de visée ou lui sont parallèles sont représentées par des droites (Diamètres ou parties de diamètres)
c) Toutes les droites réelles qui passent hors de l'axe de visée sont représentées par des arcs de cercle, lorsqu'ils sont prolongés, ceux-ci aboutissent sur le périmètre du tableau en deux points opposés (extrémités d'un diamètre).
d) La courbure des arcs de cercle qui représentent des droites réelles est d'autant plus accentuée que ceux-ci sont excentriques; à la limite ils se confondent avec le périmètre.
   Cette transformation correspond à la transformation de Postel.

   Optiquement le problème a également été étudié, et a abouti à ce que l'on appelle maintenant communément les objectifs "Fish-Eye" (Oeil de Poisson) : Ces objectifs produisent des images circulaires qui ont un champ de 180°.

Nous utilisons ceux dont la transformation obéit à la regle:
Y = Ka

Y = Distance de l'image du point au centre de la projection
a = Angle que fait le point avec l'axe de l'optique
K = Constante de projection (lié au diamètre d'agrandissement)

2.2 La représentation des éléments utiles à l'architecte.

2.21 L'environnement

La représentation de l'environnement naturel et bati se fait par relevé photogrammétrique grace à l'objectif "Fish-Eye" décrit ci-avant. La prise de vue s'effectue sur le site aux différents points selectionnés pour leur intere; l'agrandissement des clichés doit être fait en tenant compte de la taille des autres outils graphiques utilisés (Diamètre couramment employé : 18 cm).
Pour des raisons techniques et économiques l'emploi de pellicules Noir Blanc est recommandé. (Fig.1)

2.22 Le projet

La représentation du projet se fait soit par photo de la maquette du projet soit par dessin en perspective curviligne; les points de vue correspondent aux points selectionnés sur le site . La technique du dessin est préférable au niveau de l'avant projet. Certaines courbes, pré-dessinées facilitent ces constructions de perspectives. (Fig.2)

L'utilisation d'une maquette, d'un projet plus avancé, est plus interessante pour la verification des performances mais aussi au niveau de l'ambiance visuelle, interieure ou exterieure, dont nous parlerons plus loin.

2.23 Les sources et phénomènes dus au rayonnement solaire

La source principale est le rayonnement solaire direct: que ce soit sur le plan énergétique ou lumineux.
Les sources secondaires et les phénomènes engendrés sont, entre autres, les effets thermiques du rayonnement direct, les rayonnements diffus et réfléchis.

La première chose à savoir en matière de conception architecturale est l'orientation, et donc, la position relative du soleil; pour cela nous avons élaboré, à partir de travaux antérieurs (1), un diagramme de représentation de la course apparente du soleil correspondant à celle adoptée dans le système, diagramme propre à une latitude. (Fig.3)

Suivant le même mode de représentation nous avons établi des diagrammes de luminances du ciel, pour plusieurs cas typiques d'état de ciel; des diagrammes de calcul de l'éclairement énergétique et lumineux direct, pour une surface réceptrice verticale ou horizontale; des diagrammes d'incidence pour divers plans .....(2) (Fig.4)

2.3 Utilisation par le concepteur

L'intervention du concepteur se fait au niveau de l'analyse de cet ensemble de données. Il lui suffit de superposer les éléments dont il a besoin et il obtient par lecture directe ou après quelques calculs simples le résultat qu'il recherche: et avec des unités connues qu'il saura manipuler: ex: Lux, W.m-2, etc.... (Fig.5)

2.4 Le problème de la visualisation du projet

L'un des objectifs poursuivis est la maîtrise des phénomènes du rayonnement électromagnétique en provenance du soleil par la simulation de ceux-ci, dans un projet.

Parmi ces phénomènes, la perception des réflexions lumineuses qui se produisent sur les objets naturels et artificiels est essentielle. De tous temps les architectes s'en sont préoccupé, c'est en effet sur l'aspect des constructions que l'on apprécie l'architecture: Aspect extérieur et intérieur sous les effets de la lumière naturelle, insertion dans un paysage. Nous avons parlé des éléments de représentation, plus ou moins abstraits: Abaques, diagrammes, photos "Fish-Eye", permettant de tester, de manière quantitative un projet. Venons en maintenant à la partie qualitative: L'aspect visuel. Bien des techniques existent mais une seule répond au système choisi: c'est la simulation visuelle par projection sphérique (3).

Le but est de présenter, en cours ou en fin d'étude, le projet au "client", c'est-à-dire à toute personne non initiée, a fortiori lorsqu'il s'agit d'une présentation collective ou publique.

L'outil de simulation est le SAV (Simulateur d'Ambiance Visuelle). Il se compose d'un écran sphérique (de diamètre variable 2 à 3 mètres de diamètre) dans lequel on projette une "Image" du projet en perspective curviligne, soit une photo Fish-Eye de la maquette et de son environnement soit un dessin, à travers une lentille ayant les mêmes caractéristiques qu'un objectif "Fish-Eye". La projection de l'image sur l'écran sphérique donne à l'observateur placé au centre ou à proximité du centre de cette sphère la sensation de "voir" les objets du projet dans leur proportion propre et relative. Ce qui permet à l'observateur de se situer "dans" la maquette, "dans" l'espace projet, à son échelle, en gardant les inconvénients habituels de l'utilisation des photo-montages et des maquettoscopes qui limitent le champ visuel par un cadre et qui donnent une

mauvaise approche de l'objet à cause du rapport d'echelle sujet/objet.

La communication concepteur-client est ainsi établie, en présence d'une représentation du projet compréhensible par les deux interlocuteurs, et les modifications possible envisagées par l'un des deux sont immédiatement traduisibles dans le code architecte.

2.5 Les techniques utilisées pour le SAV

2.51 La prise de vue

Comme nous l'avons vu précédement (2.22), on peut tester un projet par des prises de vues d'une maquette et projection de celles-ci au SAV.

Pour une simulation le plus proche possible de la réalité finale il est souhaitable d'opérer ces prises de vues dans les conditions de situation futures. Dans certains cas cela est possible. On effectue donc des photos de la maquette, in situ, et suivant le cas avec des conditions de rayonnement lumineux interessant l'utilisateur:

- Jour ensoleillé
- le matin, l'après midi
- ciel couvert ....

On a donc, ainsi, un aperçu du projet dans son environnement; et on peut alors apprecier, aussi bien, la relation projet-paysage que l'interieur même du projet dans des conditions variables mais naturelles du site, mais naturelles et propre au site.

Ces photos peuvent servir de base à des dessins et à des modifications de colorations.

2.52 Le dessin

La technique de représentation des ambiances visuelles

la plus employée par les professionnels est le dessin perspectif. Pour le système CHARS c'est la perspective curviligne. (voir ci-avant 2.2)

Cette technique a de nombreux avantages dont celles de couvrir un champ de 180° et celle de respecter les proportions et positions des objets qui sont vus.

2.53 La projection

Pour l'instant 2 techniques sont appliquées:
L'une utilise un miroir parabolique placé au centre de la 1/2 sphère utilisée, celui-ci réfléchit l'image envoyée par un projecteur situé hors de la sphère (Procédé PANRAMA).

L'autre est un système classique de projection directe. Le projecteur est situé au centre de la sphère, l'objectif de projection est le même que celui utilisé pour la prise de vue . (Système CHARS - Groupe ADC)

Une nouvelle technique est à l'étude utilisant le principe du rétroprojecteur, ce qui permettra au concepteur ou au client de modifier certains éléments et de voir "en direct" les effets produits. De même, la superposition des transparents permettra une plus grande latitude et plus de realité dans les essais de coloration.

Le support de la projection est un écran de forme sphérique dont la calotte seulement est nécessaire. En général, l'axe de prise de vue étant horizontal pour les photos d'ambiance, c.a.d. proche de l'axe de vue moyen pour une personne assise ou debout, le grand diamètre de la 1/2 sphère utilisée est donc vertical. Dans certains cas on sera amené à se servir d'axes de vue inclinés.

Les sphères de projections qui nous paraissent interes-

santes ont un diamètre de 4 à 9 mètres.

Avec les développements des systèmes de visualisation on peut envisager des écrans électroniques ou composés de fibres optiques, la part de l'électronique et de l'informatique devenant de plus en plus grande.

5 - L'OUTIL INFORMATIQUE

En collaboration avec le CAUSAU (4), le Groupe ABC (5) dont MM. ELY, FRARD et M-A DABAT, a crée et adapté plusieurs programmes fonctionnant sur micro-ordinateur graphique. Ces programmes effectuent automatiquement les calculs et tracés des diagrammes.

Devant l'évolution du matériel et le nombre grandissant d'utilisateurs, nous étudions des programmes faisant automatiquement l'analyse quantitative, relevant ainsi le concepteur de calculs parfois longs et fastidieux et augmentant, alors, son pouvoir decisionnel.
Pour la simulation visuelle l'informatique est et deviendra de plus en plus importante grace à la liaison avec des périphériques et des systèmes de visualisation très performantes:

- Sorties graphiques en couleur sur écran, papier, film ...
- Couplage avec systèmes vidéo (vidéodisques....)
- Transmissions des images par téléphone, satellite ...

Pour le moment, avec des moyens expérimentaux légers, nous obtenons des premiers résultats encourageants.

6 - MATERIEL UTILISE

Appareil photographique 24 x 36 . Objectif "Fish-Eye"
Ecran Hemisphérique mobile ∅ 2m.

Micro-ordinateur graphique. Logiciels, programmes.
Collection d'abaques et de diagrammes.

5 - NOTES

1) V.OLGYAY - Design with climate - Princeton P.U.1963

2) R.DOCHAUX C.N. BELGE de l'ECAIRAGE - SIC BRUXELLES 64

3) P.JAULGUES in IAN No 84 Octobre 1975

4) CAUSAU : Groupe pour l'application des méthodes scientifiques à l'architecture et l'urbanisme P.QUINTRAND, Directeur.

5) Groupe ABC : Groupe ambience bio climatique - UFA Marseille R.DABAT, Directeur

Fig.1
Représentation de l'environnement d'un point

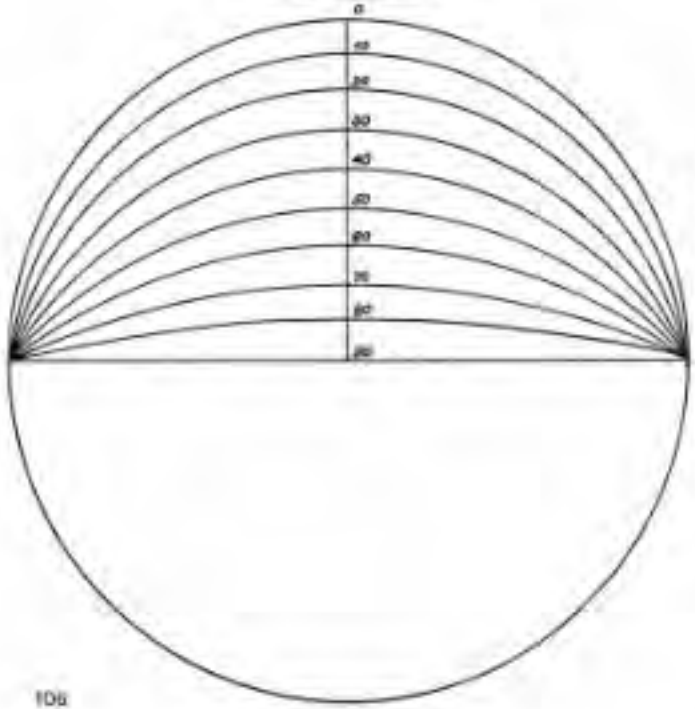

Fig.2
Abaque de tracé des horizontales

Représentation de la course apparente du soleil Lat.45°N superposée aux masques de l'environnement et des bâtiments

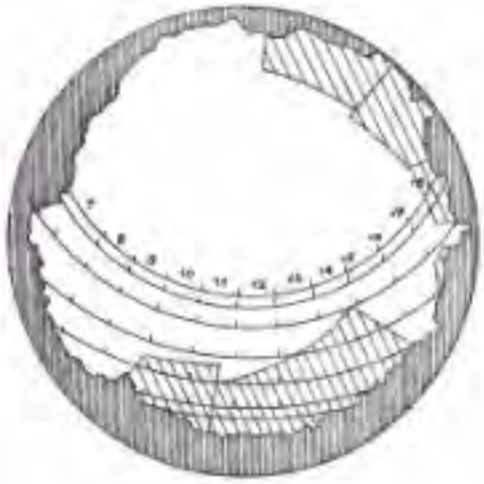

Fig.3
Eclairement lumineux direct reçu par un plan vertical

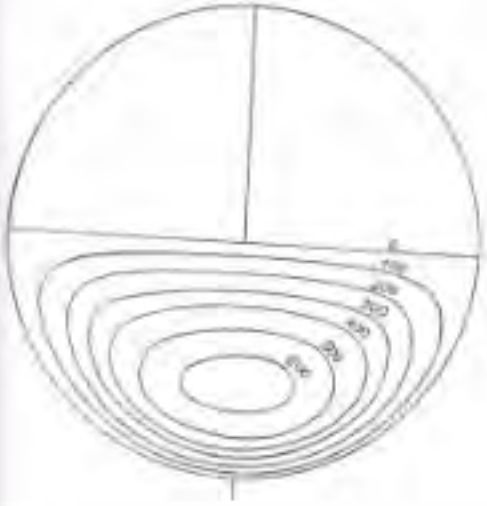

Fig.4
Diagramme d'ensoleillement d'un plan vert

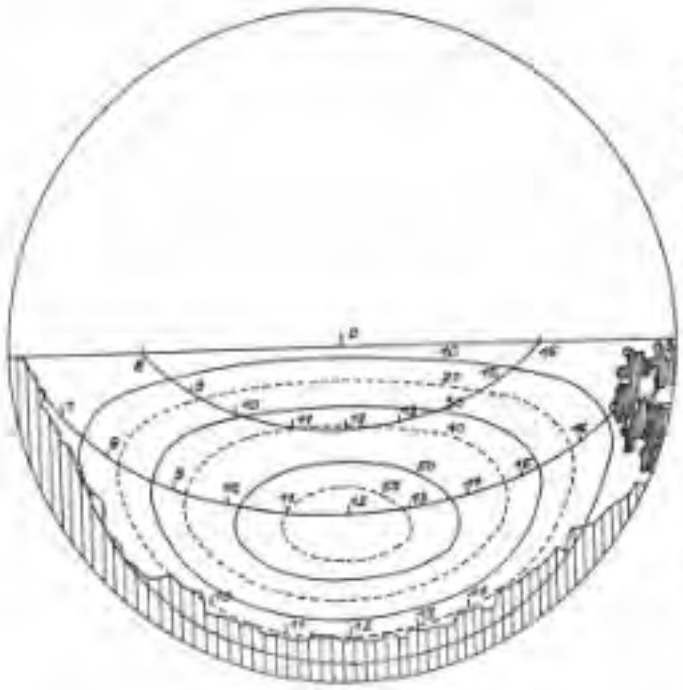

Fig.5

Plan vertical Sud Latitude 43° Nord Lecture à l'intersection des courbes et par approximation Courbes d'isoéclairement en milliers de lux

Course du soleil les

21 juin

21 mars/septembre

21 décembre

ix:le 21 juin à 11 h.

40 000 lux

D. Nagy

The colouring of certain geometrical figures (e.g. of maps, graphs, polyhedra) is well-known in mathematics, but the results of such research fields have generally very little importance for the practice of colour dynamics. Therefore we give only a brief survey of these investigations. There is, however, a less known field on the boundary of mathematics, crystallography, and ornamental arts, the theory of coloured symmetry, which may have some more practical applications. Finally the lecture raises the question of common aesthetic impression of given colours and symmetries.

1. Colour in mathematics

The use of colours for distinction of geometrically equal figures is a well-known idea in the solving of some mathematical problems. The colours make easier the survey of the problems, or give a possibility for an effective reformulation of the questions. Let us consider e.g. the next exercise:

It is given a concrete tessellation (a pavement of a bathroom) with unit squares (Fig.1). Can we form a new tessellation on the same place without gaps and overlappings when we have only rectangle-elements with sides 1 and 2 units?

After a lot of trials we can conjecture that there is no tessellation in question, i.e. we cannot cover without gaps and overlappings the given area of 98 unit squares with 49 suitable rectangles. Naturally these trials can never give a

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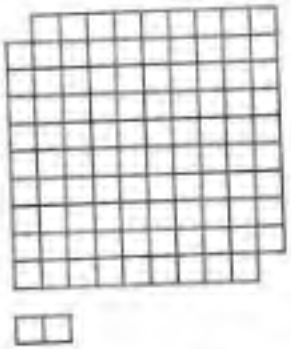

Fig. 1.

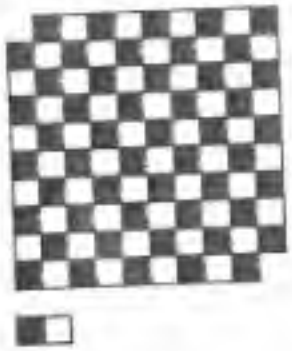

Fig. 2.

The given tessellation (pavement) and the new paving-element originally, and after colouring in chessboard system, respectively.

general proof of the conjectured fact (may be that we are not enough "skillful"). But this fact is evident after colouring the given tessellation in chessboard system (Fig.2). A rectangle covers in all suitable positions exact one white square and one black square, but we have 48 white and 50 black squares (in the corners 2 white squares are missing).

There are some mathematical questions concretely on the chessboard where the colours also play an important role in the solution.

In discrete mathematics and in topology some colouring problems are investigated systematically, e.g. special monographs deal with colouring on graphs and surfaces or map colouring problems /1-3/. Especially the four-colour problem has great literature, see e.g. the books of Ore /4/, and Heesch /5/. The problem is the next (Guthrie, about 1850): Whether four colours always suffice for colouring a map on the plane or on the sphere when we stipulate that different colours are needed wherever two districts (simply connected faces)

share a boundary line. After investigation of lots of concrete maps all researcher conjectured the positive answer for the question, but they could not prove it in general. To the recent time this question was one of the greatest unsolved problems in mathematics. Later Appel and Haken /6/ published a solution of the four-colour problem with application of computer (this method is disputed by a lot of specialists from the point of view of pure mathematics).

Recently the Rubik's cube stimulates a new line for colouring problems. Remark that this cube has connection not only with colour, but with symmetry, too. Namely the suitable turnings can be investigated from the point of view of symmetry operations.

2. Coloured symmetry

The first systematical symmetry theories were formulated in crystallography for geometrical description of periodic structures, where equal elements (atoms, ions, or molecules) are repeated. The main result of the geometric crystallography is the speculative description of all the possible repetition types (or - with mathematical terminology - discrete symmetry groups) in the plane and in space in the end of the 19th century. The terms space groups of Fedorov groups are in use, i.e. In the plane there are 17 such repetition types (planar space groups), which are often quoted - with an obvious analogy - as wall-paper groups (Fig. 3).

Later these results were generalised by German mathematicians and Russian crystallographers. While the classical symmetry theory can be used only for geometrical description of periodic structures, the coloured one takes into consideration the possibility of periodic repetition of some colours on the figure-elements, too. E.g. the 17 (non-coloured) wall-paper groups have 46 (or with degenerated cases 80) dichromatic analogies (Fig. 4). Belov et al. enumerated 15 polychromatic wall-paper groups (Fig. 5). In the crystallography or crystal-

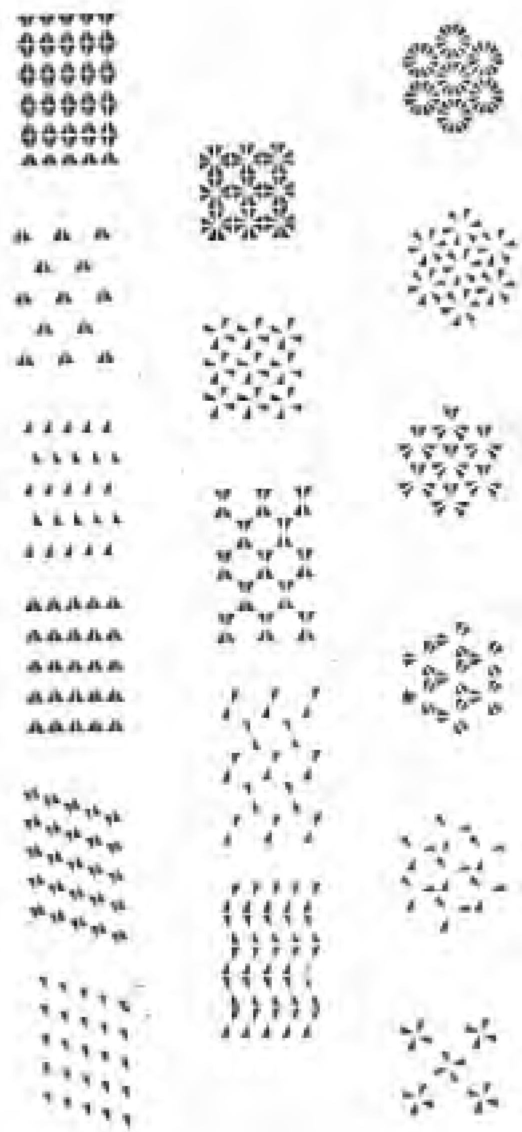

Fig. 3. Patterns for the 17 wall-paper groups (after Buerger).
The corresponding groups are noted with the next symbols in the modern crystallography:

p1 p2 pm pg cm pmm
pmg pgg cmm p4 p4m
p4g p3 p3m1 p31m p6 p6m

where p or c refers to primitve or centred lattice,
1, 2, 3, 4 or 6 refers to the order of rotation, and
m or g refers to mirror or glide reflection, respectively.
Remark that these groups have 7 linear analogous ones (frieze groups).

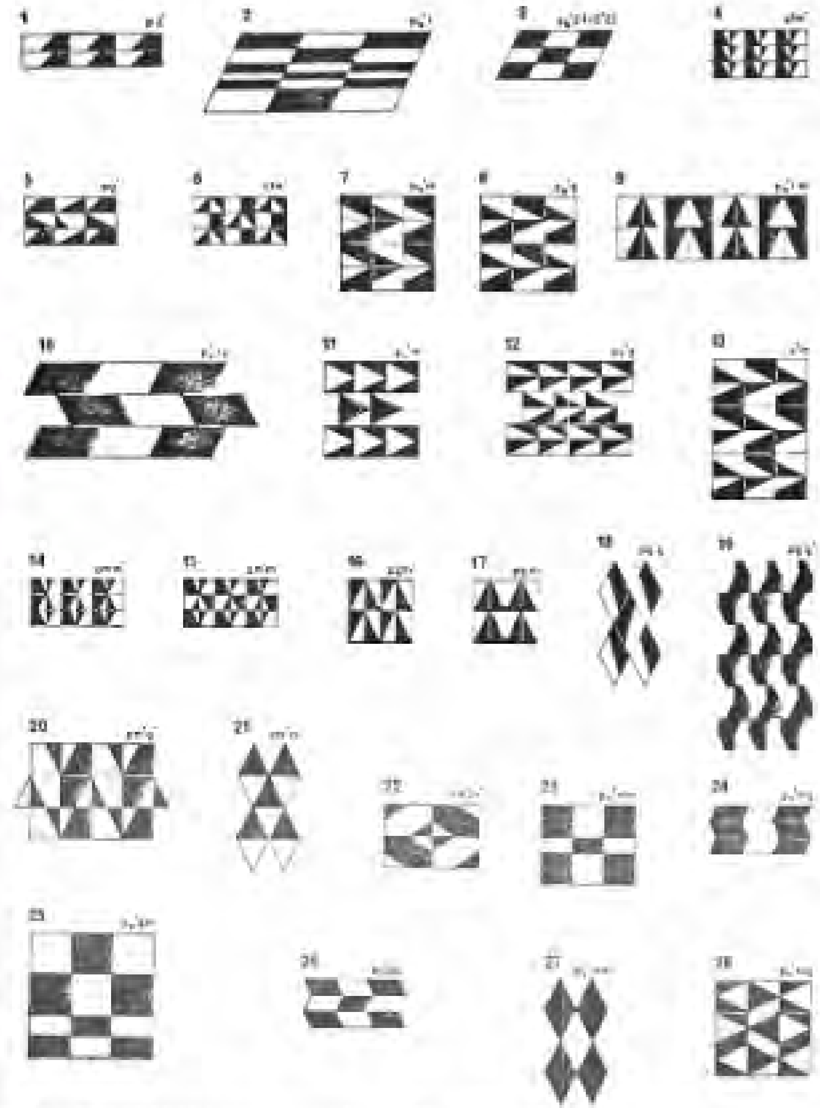

Fig. 4. Tessellations (mosaics) for the 46 dichromatic wall-paper groups (after Belov et al.).
Remark that these groups have 17 linear analogous ones (dichromatic frieze groups).

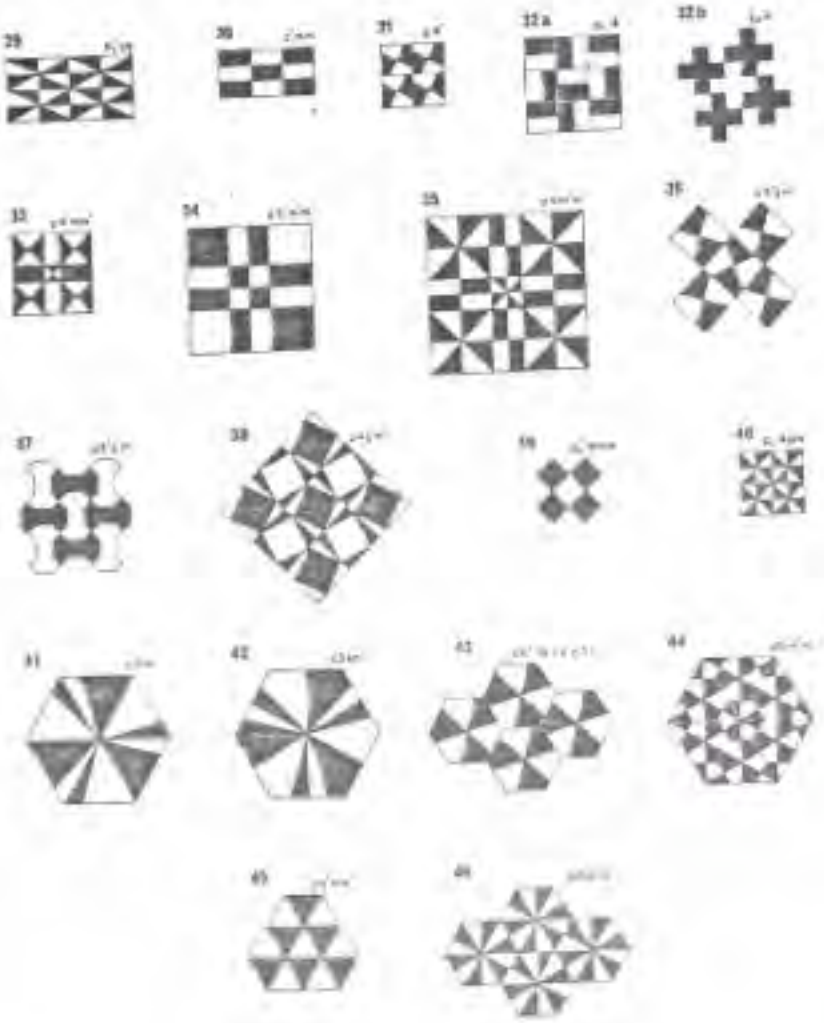

Fig. 4. (continued)

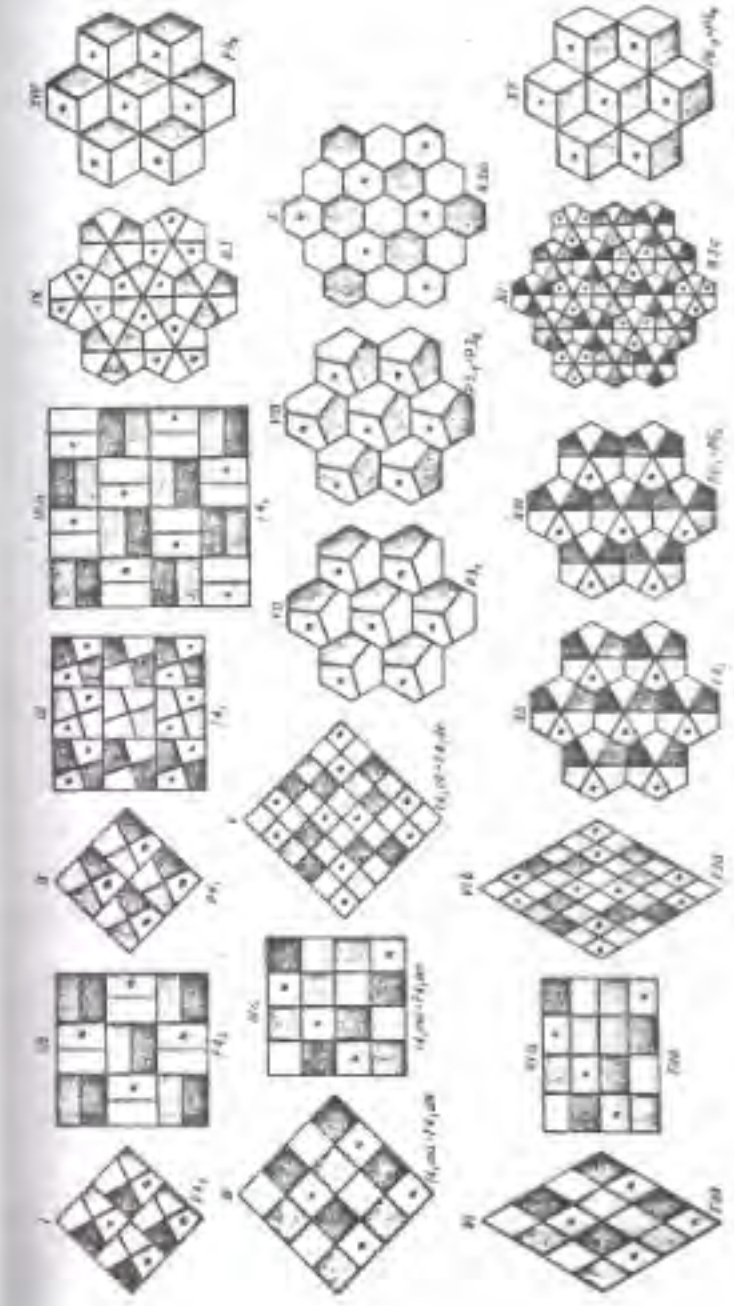

Fig. 5. Tessellations (mosaics) for the 15 polychromatic wall-paper groups of Belov et al.

physics the colours symbolize the different physical properties of the geometrically equivalent elements; e.g. the dichromatic symmetry is used for description of magnetic crystal-structures. From the point of view of dichromatic and polychromatic symmetry the works of Shubnikov and Belov are specially important, respectively /7/. At the recent time many books discuss the questions of coloured symmetry /8-11/.

There is, however, an other "discoverer" of the coloured symmetry, who had a special way to this concept. M.C. Escher (1898-1972), the Dutch graphic artist - after inspiration of the Moorish geometrical ornaments - constructed a lot of periodic drawings (Fig. 6), and came to formulate a personal "layman's theory" on coloured symmetry. The importance of Escher's art for mathematics and crystallography was recognized by some scientists. MacGillavry /12/ published a complete monograph with analysis of these drawings. In this book there is, however, a very surprising fact. The author, a professor of crystallography, could not identify the polychromatic symmetry of two drawings on the base of Belov's enumeration. Later Loeb /9/ started on this track, gave a new list of polychromatic symmetries with the aid of an algorismic process. These artistic-mathematical results of Escher confirm the idea that the concept of coloured symmetry is really on the boundary of mathematics, crystallography, and ornamental arts.

The method of coloured symmetry can be applied in analysis or in planning of coloured ornaments, e.g. mosaics, parquets, wall-masters, wall-papers, needle-works, etc. - from the point of view of the number and arrangement of different colours.

3. Colour and symmetry - a common aesthetic impression

The theory of coloured symmetry - leaving the psychological and physiological impressions out of consideration - does not

Fig. 6. Escher's "Lizards" with 3-coloured symmetry.

exhaust all the possibilities of connection between colour and symmetry. It would be interesting to investigate the common aesthetic impression of given colours and given symmetries (e.g. strengthening or neutralisation of the separate impressions).

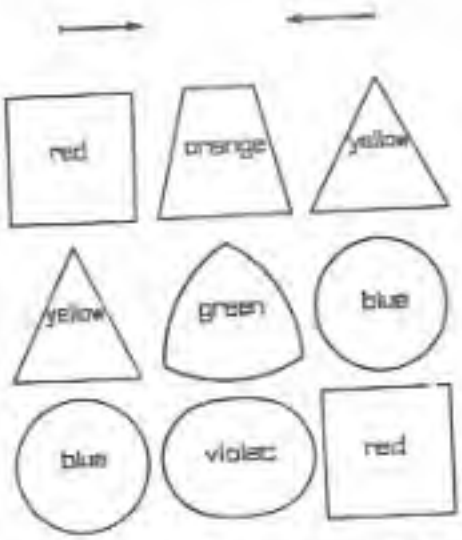

Fig. 7. Colour and form system of Itten.

The first step on this way was made by the investigations of colour and form long ago. E.g. Itten /13/ gave some data (Fig. 7), for which we can give directly a symmetry interpretation, considering instead of the suitable geometric figure its symmetry:

symmetry group of a square (D_4) - red
symmetry group of a regular triangle (D_3) - yellow
symmetry group of a circle (D_∞) - blue
etc.

(Here D means that the groups are dyhedral, i.e. it can be generated by two operations, namely by rotation and mirror reflection; the index shows the order of rotation, e.g. 4 refers to a 4-fold rotation.)

Remarks

The topic of colour and symmetry may give an interesting contribution to

- the line network aspect in "Colour-Gestalt" of A. Hård and L. Sivik (Outlines of a theory of colours in combination, Lecture A1 - 1),
- the structural investigation of "color spaceties" in "planets-color-system" of M. Albert-Vanel (Le planets-color-system, Lecture C2 - 1),
- the mathematical approach of "the four-start spiral (meander)" system of G. Mikóczy (The four-start spiral, Lecture C9 - 4).

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Hadnagy, András */

Individual colour systems are generally based on a distinction of colours according to three properties: lightness /V/, saturation /T/ and tint /S/. Comparative analysis of colour systems has shown that there are discrepancies in the description of these properties in relation to one another. This entails uncertainties in the characterization of the colours, which can be confirmed also visually. So e.g. the CIExy and CIELAB systems show such a divergence, as there can be set such a sequence of increasing saturation according to the CIExy system, whereas the corresponding set according to the CIELAB system will yield a decreasing sequence. Namely, in the CIExy system the spectral colours of maximum saturation are within the xy-colour triangle along the known horseshoe curve, while in the CIELAB system the ideal spectral colours shrink into a focus. It is obvious that the saturation /chroma/ of a colour specimen is interpreted in the two systems in a different way.

We have to underline that our research work in respect of whiteness measurement has led us to the problems of colour systems. We have a uniform concept regarding the various possibilities of characterizing colours. Starting from a practical problem we had to adopt both, induction and deduction. Until 1981 we had brought about more than two hundred colour systems. The first and, we daresay, extremely simplified one was the planar $L_xL_yL_z$ colour system, which constituted the basis of many colour systems.

*/ CAUM Industrial Enterprise for Cosmetics and Household Chemicals, Budapest, Hungary

The DIN5IN colour system is equally based on the planar $L_xL_yL_z$ system. In shaping C-R colority we adopted a so-called sinusoidal internal psychometric function, actually in a dynamic way. We demonstrate the sinusoidal internal psychometric function of normalized L_x, L_y and L_z colour components, which previously was derived from a spherical model. Now it must be emphasized that in dynamic systems normalised colour components are not considered only as stochastic variables, but rather as variable quantities related to the mechanism of vision, too. Variability can be formulated many ways. One of them, which we adopted in DIN5IN, is to take a multiple of an arbitrary constant of normal colour components, then through values co-ordinated according to the psychometric function we get a colority vector in accordance with the planar $L_xL_yL_z$ system. The constant value should be selected in a way that the resulting colority vector, i.e. the T-saturation should be of maximum value. Through this optimation we achieve that an identical colour point will belong to the multiple of the arbitrary constant of normalized colour components on the colour plane. This coincides with the properties of the CIExy system, but is opposed to the peculiarities of the CIELAB system, where the system is nonvariant in respect of the "psychometric quantum".

Now the problem is to co-ordinate a lightness value to the colority. From a purely formal point of view we could co-ordinate the CIE y colour component and would thus obtain the DIN5IN xy Y system. I would, however, not suggest its application for the known reasons, nor would I suggest any psychometric function of it /Fig.1./.

In the figure there can be seen a representation in lines of levels of the MACADAM-body /with the line of spectral colours/. There can be observed the well-known "primary

spine" /thick line connecting blue colour points/, which is an important characteristic line of the colour diagram, a "straightening-out" of which eliminates the "twisted" /distorted/ state of the colour field and enables to feature the colour difference field besides the colour field.

Using the internal psychometric function as an external psychometric function, we adopt the V symmetric expression according to the planar $L_xL_yL_z$ colour system as lightness value. Rearrangement according to V is shown in Fig.2.

The next step is straightening-out the primary spine /Fig.3/ according to the torsion function. Now there exist already two DIN5IN colour bodies, but there exist still more. The colour field twisted according to the torsion function becomes extremely sensitive to colority differences. In Fig.4. there are shown, as an example, the colour points of the Munsell colour chart 7,5 R according to CIELAB and DIN5IN systems as well /this means three different systems/.

Colour differences in DIN5IN colour fields dealt with up to now can be defined also in the Euklidean sense, but it is much more purposeful to adopt hyperbolic geometry. The colour body is reduced to a hundredth and then finally magnified hundredfold. This has calculation-technical reasons. The entire colour body is placed into a sphere of suitably well selected radius. Then we define the S/P,Q/ distance between two optional P and Q points of the colour field in the known way: taking the A and B spherical points of the straight line P-Q to the P and Q points, we compose the absolute value of the half-time logarithm /natural logarithm/ of the binary relation of the four points. This formula is then corrected in an empirical way. Thus we arrive at a formula /Fig.5./, which results in a better approximation of the so-called experimental RS-function, leaving out of consideration for the time being the absolute white range. An inte-

resulting feature of the figure is that we regain the value of the so-called PAULI-constant known from literature. This means another empirical confirmation.

Now we have to report on the problem that, although colour components are variable, the resulting V-T-S quantities are so-called concealed parameters. According to our research in respect of whiteness, further quantities can be derived from V-T-S quantities, which probably may be better colour characteristics /Fig.6./. Based on the diagram shown in the figure, we developed further in SUSS systems, we arrive at colour-dynamic characteristics: the notions of so-called dissonance degree and consonance degree. These are, however, conceptions but partly supported through experiments. But of much greater interest is, according to our recent research comprising also visual experiments, that we succeeded in explaining, may exactly describing contrast phenomena. A uniform discussion of contrast phenomena is of interest not only from the angle of colour dynamics. We obtained another confirmation of that our entirely novel results in connection with colour systems were correct. The basis of the discussion of contrast phenomena is the following definition: The lightness V/A/ and V/B/ of the backgrounds A and B is equal only if the P and I specimen of identical colour, placed into the centre of each of the A and B background situated beside one another, appear visually to be of identical colour. On this basis there results as consequence, and coincides with our research results obtained in other /non colour dynamic/ domains:

1. Y CIE colour component and any function thereof are unsuitable for characterizing lightness.
2. V-lightness must be so-called concealed parameter, i.e. it does not describe the visually stated lightness /white-

ness/ property.

3. Expressions symmetric to $L_x L_y L_z$ normalized colour components, as previously suggested, calculated from X, Y, Z colour components, appear to be suitable for characterizing V-lightness.

Conclusions:

Expounding the DIESIS colour systems we wish to emphasize that the cognition of the fact that the coloured environment affects a colour under examination was not unknown to specialists concerned with colour metrics, alike as its use for the purpose of metrics. On the other hand, we wish to deal only with test results lending themselves for formulation and quantification, because industrial application of cognitions in the domain of colour dynamics and colour metrics is unimaginable otherwise.

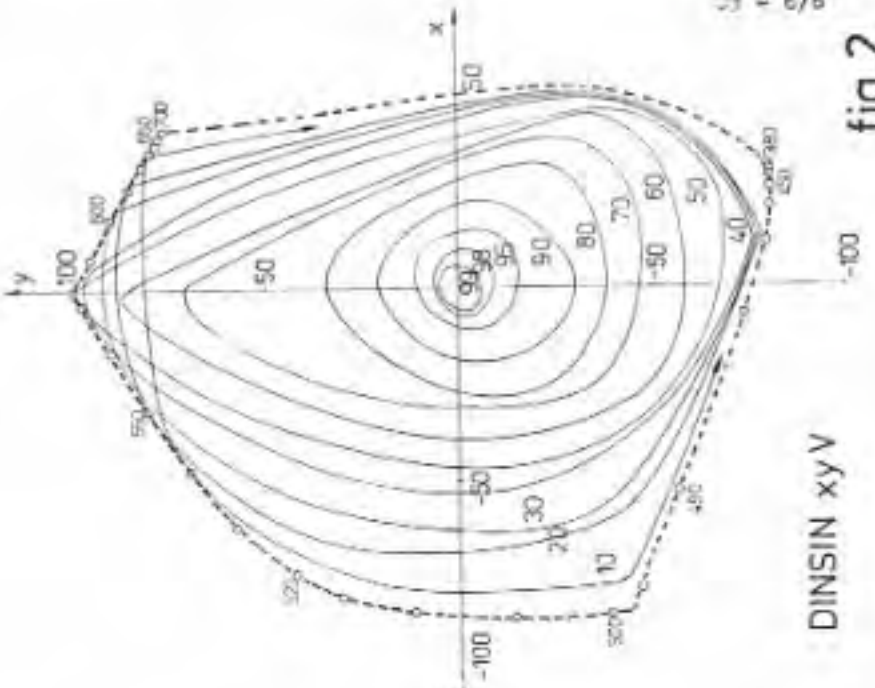


fig.2

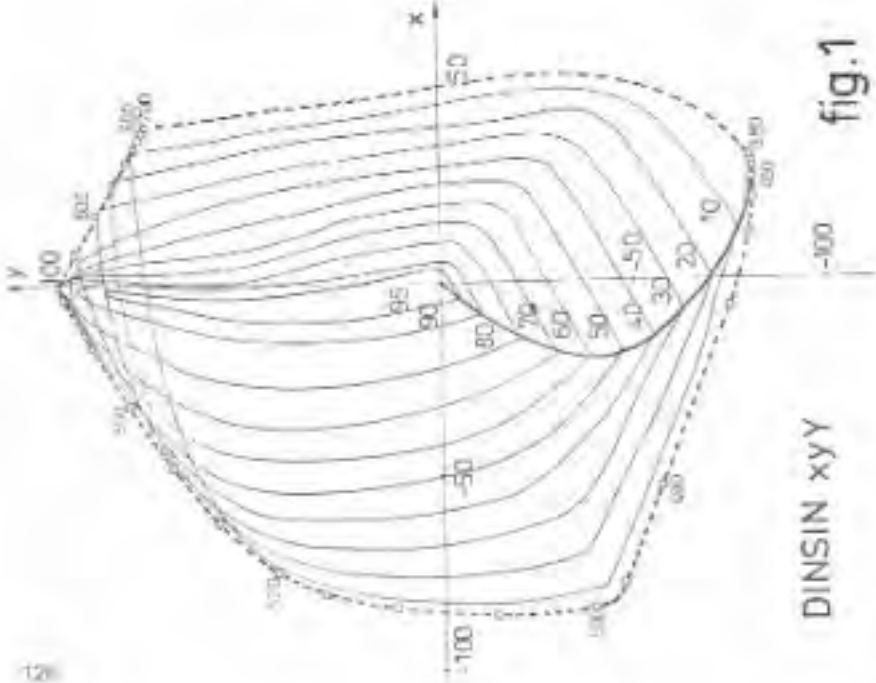


fig.1

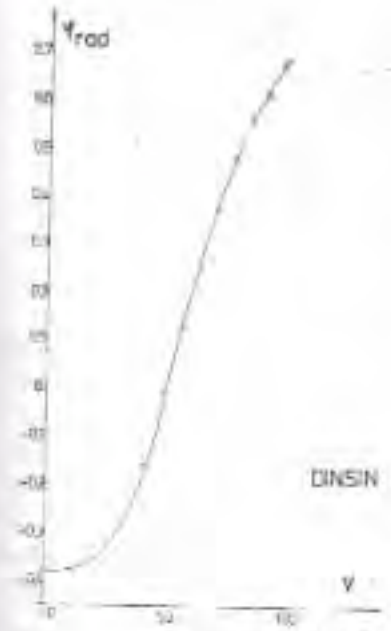


fig.3

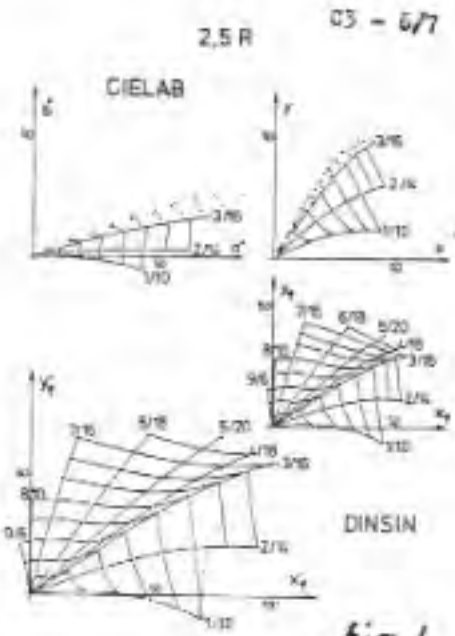


fig.4

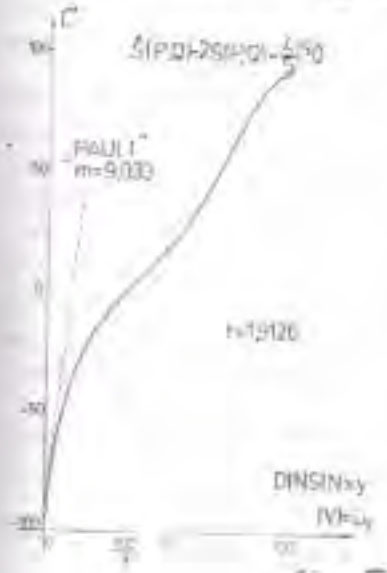


fig.5

$$\Delta W = \Delta V - \Delta T + \Delta S$$
$$\Delta C = \Delta T - \Delta S + \Delta V$$
$$\Delta H = \Delta S - \Delta V + \Delta T$$

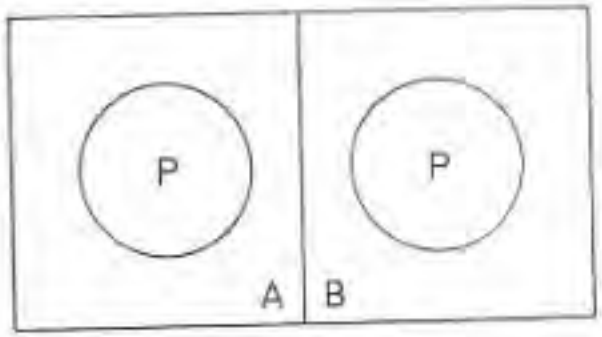
$$\Delta W_L = \Delta W - \Delta C - \Delta H = \Delta V - 3\Delta T + \Delta S$$
$$\Delta C_L = \Delta C - \Delta H - \Delta W = \Delta T - 3\Delta S + \Delta V$$
$$\Delta B_L = \Delta H - \Delta W - \Delta C = \Delta S - 3\Delta V + \Delta T$$

$$3\Delta F = \Delta W_L - \Delta C_L - \Delta B_L = 3\Delta V - 5\Delta T + 3\Delta S$$
$$\Delta F = -\Delta M$$
$$3\Delta SP = \Delta C_L - \Delta B_L - \Delta W_L = 3\Delta T - 5\Delta S + 3\Delta V$$
$$\Delta SP = -\Delta N$$
$$3\Delta G = \Delta B_L - \Delta W_L - \Delta C_L = 3\Delta S - 5\Delta V + 3\Delta T$$
$$\Delta G = -\Delta E$$

$$\Delta \overline{W} = \Delta V - 2\Delta T + \Delta S$$
$$\Delta \overline{C} = \Delta T - 2\Delta S + \Delta V$$
$$\Delta \overline{H} = \Delta S - 2\Delta V + \Delta T$$

$$\frac{|\Delta V + \Delta T + \Delta S|}{|\Delta V| + |\Delta T| + |\Delta S|} = d = 1 - k$$

fig.6



DEF.: $V(A) = V(B)$, ha (if)

$\dot{V}(P_A) = \dot{V}(P_B)$

KÖVETKEZMÉNY: (conclusion)

$V \neq Y$

$V \neq \dot{V}$

$V = V(X,Y,Z)$

fig. 7

FARBGEBUNG IN HISTORISCHEN STADTBEREICHEN
UNTER DENKMALPFLEGERISCHEM ASPEKT -
DAS BEISPIEL WEIMAR

F. Hogge -

Der denkmalpflgerische Anspruchr
Da in der Architekturwahrnehmung /wie bei jedem "Sehen"/ Form und Farbe eine Einheit bilden, kann für die Farbigkeit von Baudenkmalen nur eine der historisch nachweisbaren Fassungen oder Anstriche der Bezugspunkt sein, wenn der Anspruch nach originaler Aussage, nach einem unverfälschten Gesichtsbild erfüllt werden soll. Subjektive Gestaltungsabsichten und Farbmoden sind abzulehnen. Architekten, die oft noch der Position der Materialgerechtigkeit, der "reinen" Form aus dem "Polychromiestreit" Anfang des 19. Jahrhunderts folgen, fällt dieses sich "in den Dienst der Sache stellen" oft nicht leicht.

Entsprechend der gesellschaftlichen Bedeutung des denkmalpflegerischen Anspruches reicht die Skala von freigelegter Originalfassung und ihrer Konservierung über Befundfarbigkeiten bis zu Analogiofassungen und freien Interpretationen.

Die Dominanz des Raumes:
Jede Entscheidung am Einzelobjekt hat das Wesensmerkmal von Architektur, nämlich "Kunst doppelter Raumgestaltung durch Körpergestaltung" zu sein, zu berücksichtigen. Körpergestaltung leitet sich aus Raumgestaltung ab. Da normalerweise kein "Seitschnitt" möglich ist, muss eine gründliche Diskussion und Interpretation der farbigen Einzelergebnisse durchgeführt werden, um den Erfordernissen des Raumes, um der Ensemblewirkung gerecht zu werden, um Baukunst als gestaltete Ganzheit, als

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Lebensraum zu versuchen. Deshalb wird einerseits mit Farbleitplänen gearbeitet, andererseits werden Ordnung und Zufall, Lebendigkeit und Spielerisches mit eingebracht.

M. Hofer

The requirement for colouring architectural areas has been increasing in the latter decades. This phenomenon has been analysed by many people, exploring the objective reasons being connected with the mass methods of building in different ways. The architectural monothony of mass construction can be changed by colouring, for example by using colouring materials added to base plastic surface formation materials. Important is also the consciousness of humans, the change of taste and mode.

In the present study the colouring of public areas will be dealt with, and in this field errors are very frequent. It has to be emphasized that colour and form are in organic connection in creating the outlook of internal areas.

In modern architecture the impoverishment of forms has been caused by the restrictions of architectural technology. In historical architecture the interior space had been created and formed. Nowadays only in some special cases, as e.g. in theatres of really high level we can feel and see that the entrance halls and public areas of large size have been formed.

The architectural hierarchy has been also terminated and became deformed. In historical architecture between large masses, area forms and smaller details as organic unity existed.

If the House of Parlament, an old theatre or church are envisaged, it can be seen that the large entity has been loosened by regular subsystems with a richness of nice details.

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This has been further expressed by means of colour.

The outstanding masters of modern architecture - as e.g. Le Corbusier or Alvar Aalto - are still forming the area with such safe hands, forming the details and setting the colours with the sureness of a painter. In the oeuvre and generally in case of masters of the beginning long period of modern architecture the white colour is prevailing.

In the occurrance of large surfaces form has priority in the architectural surveying elements (concrete, built walls and covers). The secondary elements are perhaps coloured, namely the doors, gates, floor and furniture. In appearance the effect of light and shade is also decisive in the formation of masses. As time passed, the liberty of architects became tighter and tighter, since the technology of architecture became determined, all areas of similar function became gradually similar and the cover, the colouring, the furniture give only a small liberty for an architectural selection.

What is the way to be followed under these circumstances? What is the correct way for forming public areas?

In any case, it is a decisive difference from, for example, the special and individual function of a flat that these areas serve social aims in which active or passive collective activities happen.

The high number of humans present at such locations brings a certain unrest into the atmosphere in advance. Among it the humans differ from each other, too, that is, certain undemonstrative harmony is required here in surveying and colouring.

Perhaps the restaurants and the places of amusement are those, where vivid, exciting colours, the usage of colour contrasts are allowed. The highest resting harmony in surface formation and inner colouring is required in hospitals and other places of hygiene, but the internal colouring of schools and educational institutions should be kept in a less vivid mood as

well. There are areas in which the usage of vivid colour cannot be allowed at all, e.g. such are galleries, certain museums where the effect of the exibited colourful object must not be disturbed by the colours of built surfaces. It is discerning and always a successful method in colouring to follow gradualness keeping the area limiting surfaces white or light gray, and using more vivid colours only on the mobile elements of the space, for example, in textiles, furniture, etc.

In returning to the initial aspect we would like to emphasize the relation between form and colour, since the colour and colouring should not contrast to the character of the applied materials, but it should be in conformity with the forms, the details of surveying and the divisions of surfaces.

There are sure and well proved colour connections, colour scales which are proved well in the colouring of the public buildings, public areas, too.

The white and broken white or light grayish colours of walls and of the ceiling are in good harmony with the brown colours of wood surfaces (wood coverings, openings, perhaps wooden floor). The brown colour of materials like wood looks natural, too, since it looks reasonable and natural. The textiles of rough colour or of soft greens, perhaps yellows, or hot browns join well with this pair of colours, white and brown.

Does such a character exists in our architectural traditions at all and what does it refer to?

In our architectural tradition, the features of a general European style have always appeared. This could have been felt in the Roman age, Gothic art, The Renaissance, Baroque as well as in the classicism having been inspired with the national feeling of the last century. These periods were sometimes delayed by a few years perhaps even decades in Hungary but they had been always passing in conformity with the European taste. Our architecture showed often some puritan, undemonstrative simpleness, deriving partly from the relative

poverty of the owner.

In regard of colours the white has been much more dominating both outside and inside.

The vivid colours have been appearing mainly in textiles, objects, clothes in the folk art and not in the architectural surfaces.

Lately the vivid blue, purple colouring of buildings have been spreading, too. In cases of provincial smaller public buildings it shows certain provincialism. This might be interpreted that our tradition and past have been already forgotten, our popular-national vocation having been transferred from fathers to sons has been failed, but our society has not reached the artistical consciousness in the knowledge of European or national culture of higher level. In this period of development when the choice of materials and paints is good, this possibility is misleading, it is worth thinking of it in advance and to decide only afterwards. Since the environment decisively influences us, our consciousness and spirit, we are responsible for the environment we have to live in.

A. ERIMOV

La solution des problèmes sociaux et fonctionnels de la ville est inséparable de celle des problèmes d'ordre esthétique, en particulier, de sa mise en couleur. De quoi s'agit-il? De contrôler la polychromie de la ville qui se constitue objectivement mais de façon non organisée, d'en mettre au point la stratégie et la tactique. La mise en couleur délibérée et orientée de l'espace urbain tend à le transformer en le lieu potentiellement illimité d'harmonies chromatiques aux bénéfiques effets stimulants sur les grandes concentrations humaines.

Le système cohérent de la pluralité de couleurs qui forme un champ chromatique spatial se modifiant dans le temps et qui est créé conformément aux exigences esthétiques, socio-culturelles et fonctionnelles du moment - voilà ce que nous désignons par l'expression d'environnement chromatique urbain. Cet environnement possède sa structure, soit les rapports qui se nouent entre les masses colorées et leur répartition dans l'espace, et sa teneur chromatique, soit les couleurs qui meublent l'espace urbain. On peut encore l'imaginer comme l'organisme spatio-temporel de la gamme complète des couleurs dont la structure est fonction de la morphologie du relief local et du schéma urbain, de la végétation, des plans d'eau, du bassin aérien, etc.

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Pour ce qui est de la teneur chromatique de cet environnement, elle est déterminée par la palette des matériaux de construction, par les traditions culturelles, par les comportements sociaux en ce domaine, entre autres. C'est un organisme dynamique, du fait essentiellement des changements qui s'opèrent dans l'architecture et l'urbanisme de la ville, des modifications saisonnières de l'environnement naturel et des variations d'éclairage au cours de la journée. Enfin, l'évolution des valeurs et interprétations accordées aux couleurs et à leurs ensembles se traduit par cet effet paradoxal, qu'un milieu chromatique pratiquement invariable donne lieu à des sensibilisations différentes.

Il s'ensuit qu'une seule et même structure correspondant à une teneur chromatique variable fournit diverses solutions du champ coloré, ce que l'histoire de l'urbanisme confirme entièrement. Je propose de comparer ce qu'était le Kremlin de Moscou au XVII^{e} siècle avec la riche polychromie de ses sanctuaires et le vertical rouge et blanche du clocher d'Ivan-le-Grand, cernée de murs blanchis à la chaux, avec son aspect actuel, fondé sur le contraste entre le blanc des sanctuaires et du clocher et l'écrin rouge des murailles et tours en brique.

L'environnement chromatique urbain est donc conçu ici comme un phénomène spatio-temporel qui prend son départ au sein de l'environnement naturel, et qui est conditionné par le développement de la ville et les exigences socio-culturelles de ses habitants. Toute étude en ce domaine se résume donc à une enquête portant sur trois groupes de questions, à savoir: quel est le rôle de l'environnement naturel sur la formation de l'environnement chromatique urbain, comment les processus de développement de la ville et, en particulier, l'état du tissu urbain influent-ils

sur la mise en couleur, et quels effets exercent sur cette dernière les différents facteurs d'ordre socio-culturel.

Dans le passé, les villes étaient bâties essentiellement en matériaux naturels du pays - pierre ou bois, ce qui garantissait la cohésion avec la polychromie de l'environnement naturel. A notre époque, la diffusion dans la grande construction du béton, des matières plastiques, du goudron, lesquels entrent en conflit avec la polychromie du milieu ambiant, a déclenché une tendance à la "décoloration" des villes. La population citadine s'est trouvée pratiquement exclue de l'univers des couleurs, et ceci a poussé les spécialistes à se pencher attentivement sur les raisons de ce phénomène et à proposer des solutions pour y remédier. Une contribution considérable, par exemple, a été faite par le Français J.-Ph. Lenclos, qui a procédé à l'étude systématique des éléments chromatiques d'une série de régions françaises, selon la méthode qu'il a mise au point (1,2). Considérant la couleur comme "le dénominateur commun visuel" du milieu urbain, il suggère de contrôler l'usage des nouveaux matériaux dont fait l'architecture, afin de ne pas détruire l'équilibre qui s'est établi dans les villes historiques entre l'environnement chromatique et l'environnement naturel. En fait, J.-Ph. Lenclos définit là le contexte chromatique naturel qui est objectivement à la base de l'environnement chromatique des villes françaises. De remarquables études du monde des couleurs appartiennent de même aux Français F. et M. Hilar, coloristes prenant part aux études d'aménagement des villes nouvelles (3). Pour eux, la polychromie urbaine est le "plasmat" qui englobe le milieu visuel de la ville, le monde des couleurs naturel en fournissant le matériau chromatique.

Mais à quel point l'environnement chromatique de la ville correspond-t-il à la logique de son évolution, au caractère de la structuration des espaces? La structure architecturée de la ville définit-elle, et dans quelle proportion, le développement de la mise en couleur, peut-elle en retour éprouver l'influence de cette mise en couleur? Le premier à se pencher sur ces questions a été le Français M.Albert-Wanel, qui étudie les interférences des structures cromatiques et urbaines à l'exemple de villes de trois types différents (4). Le premier type est représenté par New-York avec sa réseille de voies orthogonales baignant dans des teintes grises. Le deuxième type est représenté par Paris, dont la structure historique étroitement liée aux particularités du relief local est soulignée par les couleurs adoucies des vieilles toitures, des bronzes, de la pierre. Le troisième est celui d'une petite ville du midi de la France au plan touffu comme un labyrinthe; au caractère pittoresque de la structure correspondent la richesse et le bariolage de la polychromie populaire. A noter que pour toute définition des lois qui régissent l'interaction de l'environnement chromatique de la ville et de sa structure architecturée, il convient de s'abstraire des effets que peuvent avoir sur le premier des facteurs comme l'environnement naturel, les traditions locales et ainsi de suite.

Par exemple, prenons le Saint-Petersbourg de l'époque du classicisme. Le caractère régulier de son tissu urbain et son harmonie avec l'environnement naturel le rapprocheraient de Paris, mais en réalité, la présence de la couleur y est beaucoup plus sensible. Manifestation concrète de l'influence de la culture nationale. Mais si l'on compare maintenant le même Saint-Petersbourg à Moscou de la même époque, on constate que la polychromie moscovite est

à la fois plus active et mieux ordonnée, ce qui découle probablement du plan plus complexe et non régulier de Moscou. Dans un cas, celui de Moscou, l'environnement chromatique est le produit évident de la tradition nationale; dans l'autre, celui de Saint-Petersbourg, il part de la même tradition mais s'avère beaucoup plus modéré en profondeur: l'influence de l'environnement régulier est petite.

La culture nationale en matière de couleur peut influencer la formation de l'environnement chromatique de la ville de deux façons: primo, par le biais de la polychromie des monuments historiques qui cumule le goût des époques passées en matière de couleur et, secundo, par celui des préférences en matière de couleur du citadin d'aujourd'hui, préférences pouvant entrer en un certain conflit avec la tradition.

Précisons à ce propos que la société, consommatrice de couleurs, y est sensible avant tout dans l'espace extérieur, base du lieu matériel et spatial de toutes ses activités. Considérable est ici l'effet sur la polychromie urbaine de la demande sociale qui se réalise à une période historique concrète dans le cadre des possibilités matérielles et techniques réelles.

Le Suédois L.Sivik parvient à la conclusion que l'environnement chromatique de la ville étant apprécié au regard de la pluralité signifiante des couleurs, un tel jugement relève des connotations et des préférences en matière de couleurs (5). Une étude fondamentale des prédilections dans ce domaine et de leur application à l'architecture appartient au Hongrois A.Nemcsics, qui en a établi les particularités dans les diverses régions de la Hongrie (6). A.Nemcsics a de même fait avancer la théorie de l'harmonie chromatique dans ses applications à l'espace architecturé (7).

En U.R.S.S., les études de cet ordre se développent aujourd'hui selon deux directions: l'environnement chromatique des villes historiques et celui des villes nouvelles. A l'Institut de théorie et d'histoire de l'architecture de Moscou, le travail d'étude s'accompagne de suggestions expérimentales. Le cas le plus courant est cependant celui cité d'un ancien noyau historique et connaissant de nos jours une importante expansion.

La polychromie historique de la vieille cité offre d'ordinaire un riche matériel au chercheur qui entend définir l'évolution de l'environnement chromatique et en faire apparaître la tradition. En particulier, des études ayant porté sur le milieu chromatique des quartiers de l'Arbat et du Zamoskvoretchié à Moscou ont permis d'établir les particularités de la mise en couleur du noyau historique de la ville (8,9). Dans le second cas, celui du Zamoskvoretchié, l'inertie de la tradition historique de la polychromie et de son organisation structurelle s'est avérée assez puissante pour dicter le caractère général du milieu chromatique actuel de ce vieux quartier. L'influence des autres facteurs - milieu naturel, fonctions nouvelles, mentalité de la population - s'y est trouvée subordonnée.

Dans la nouvelle construction de la vieille cité, l'environnement chromatique en voie de formation subit certes l'influence de l'ancien, mais beaucoup moins que celle des idées modernes, introduits par la peinture, l'esthétique industrielle, les arts décoratifs de l'heure. La nouvelle organisation de l'architecture et des espaces dans les quartiers neufs demande une structuration non-traditionnelle en matière de couleur. Dans ces quartiers, les enquêtes sociologiques font apparaître l'existence de stéréotypes en matière de préférence chromatique selon

les groupes de population, et mettent en évidence tendances la vitalité, contre le dépérissement des traditions dans le domaine de la couleur. On y enregistre également un rôle plus actif du monde des couleurs de l'environnement naturel, susceptible, du fait d'un contact direct, d'exercer son influence sur l'ordonnance chromatique de la nouvelle construction. Tout ceci a pu être analysé en détail et intégré à l'étude de la mise en couleur expérimentale d'un ensemble résidentiel à Gorki (10).

Ces deux types de travaux reposent essentiellement sur un environnement chromatique de la ville conçu comme un processus en mouvement. L'approche a permis d'esquisser une méthode d'étude, de mettre à profit la pratique des confrères de l'étranger et d'aborder de plain-pied la solution de vaste problème de la couleur dans la grande agglomération, dans le cadre duquel la dynamique du phénomène couleur est spécialement apparente.

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THE ROLE OF COLOURS IN THE PRACTICE OF MONUMENT-REHABILITATION

Gy. Káldi

In the architecture of historic Hungary the role of colours was of great importance in every age; in a large number of our ancient monuments colours were even the carriers of message relating to contents and function. In witness whereof it may be mentioned that in many of our mediaeval churches the murals appeared also on the facade - in accordance with a proper iconographical programme - or that, pursuant to an order of Maria Theresa, the dwelling houses of nationality villages in counties with a nationally mixed population had to be painted blue.

In the category of facade-painting with an expressly decorative character we may include the rhombic, dentilate coloured architecture with diamond ashlar on Gothic urban dwelling-houses, the flower-ornamented sgraffitoes on the Renaissance manor-houses in Northern Hungary and Transylvania, the architectonic world of colours on the Baroque manor-houses and palaces. Such architectonically coloured facades occurred already in Pannonia among the Roman relics (e.g. Savaria), which means that they are traditional. By way of summing up we may conclude that our historic architecture was colourful and that with this property it shows relationship with the architecture of South Europe.

"Discolouration" took place in Hungary, just as all over Europe in general, with the spread of classicism.

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Protection and rehabilitation of the stock of our monuments impose manifold tasks on our experts, one component of these is the problem of colouration. A considerable part of the relics in Hungary are not of a pure style, they are often characterized by the coexistence of several periods of rebuildings in 3-4 different ages. Accordingly, scientific research, wall-examinations preceding rehabilitation are of immense importance, and one of their aims is to explore the one-time colouration of a given building. In the knowledge of results we may consider the methods of rehabilitation which, according to established practice, may be placed in several basic groups in respect of colouration. These groups are the following:

- if a building period is characteristic of a given monument and the original colouration is known, or has become known and can be reconstructed without any doubt, the task is clear-cut and simple. In such a case the task of rehabilitation consists in the restoration of the original colouration.
- if a building period is characteristic of a given monument, but its original colouration has gone, several ways are open to the restoring architect. It is evident in such a case to retain the colouration of a later period since this also may have a value of historic data. If no such data - relating to later colouration - are available, or available data would deteriorate the aesthetical value of the monument, there is the possibility of selecting colours, of drawing up the colouration design of the facade. The harmony of such new colouration should indicate the original, possible colouration of the building in such a way that its origin in the 20th century be evident.
- If several building periods are characteristic of a given monument, and the original colouration in these periods is known, it must be followed. Aesthetical points of view are

of decisive importance in such a case as a matter of course.

- If several building periods are characteristic of a given monument, but the original colouration of only one period is known, there are [illegible] possibilities. If the colouration of a later period is known and an earlier period has been recasted by it probably, the task consists in re-establishing this historic state. If the colouration of the earlier period is known, but that of the later period is not, then distinction of the periods is necessary through reconstruction paying regard to the points of view outlined above.
- If several building periods are characteristic of a given monument, but the original colourations are not known, the colouration of a later, uniform repainting must be retained. If there is no such possibility, a colour plan distinguishing the periods must be prepared.
- If the given monument is in an urban or village environment, the aforesaid points of view must be considered as well and adjustment to the built-up environment, and the general aesthetical impression of the streetscape are of decisive importance in the selection of colours.

In addition to these basic cases it often happens in the practice of monument-rehabilitation that new, visible structures are employed with the intention of certain mass reconstructions, or for the sake of better interpretation.

Distinction of such new structures may take place with material-like surfacing and colouration. In the latter case our intention may be twofold, depending on the given situation:

- colouration of the new completion conforms to (but is not identical with) the original colouration if the completion resembles in respect of material the original,
- colouration of the new completion is distinctive if it departs in material and shaping from the part to be completed.

Special consideration must be given to the colouration and surfacing of entirely new parts of buildings which are added to given monuments according to new requirements. In such cases one must start logically from the world of colours of the given monument when the colour plan is being drawn up.

By way of summing up it may be stated that in the practice of monument-rehabilitation colour-planning is determined and demands the devotion through which historicalness and the ethical unity of aesthetical quality can be realised as the final result of rehabilitations.

THE ROLE OF COLOURS IN STREETSCAPES

S. Tillai

If we regard man-made environment as a background, a "stage" or an elbow-room created through decades by society including man, and if we assume that man and his environment are in a dynamical balance, i.e. change and produce changes, interact on one another and, in the last analysis, mutually inspire one another, then we cannot accept the current visual conception according to which environment is just like a painting which we look at from outside. We only keep looking at it and this spectacle practically evokes, replaces, the magic of continuous artistic pleasure; this means that the more compounded, the more colourful, fashioned and packed with symbols this picture is, the greater effect it will have on the spectator. Hence man-made environment is a message, a creative deed, an artistic gesture, offering incessantly a role to the architect, the sculptor, the industrial artist; it informs the spectator, influences, teaches, educates and transforms him, actually adjusts him to the requirements of the absolute work, practically fits him into the picture, fixes and stiffens him and reduces him to an element of the picture.

But this must not be so. We must realise that environment, but especially the town, is the interference of a variety of demands, possibilities, functions and processes, that it is a polyfunctional, complex, dynamically changing medium in which there may emerge here and there, now and then, a composition of town-planning as the result of rich workmanship and mature formation; yet the essence of the town may be

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summed up as a continuous, mutual relationship developing between the society and the establishments of the town where this relationship is the spatial expression, mark, symbol, framework and image of life-like dynamical factors (traffic, trade, housing, renovation, etc.) that change in time.

It must be emphasized here that this picture changes all the more the livelier urban life is, the greater material, technical and mental capacities are "stuck in it", try to break it open and to transform it.

Thus the townscape, the streetscape, is not principally a picture; it is the complex part of urban life, it is a multidimensional totality of streets, squares, buildings, traffic, shop-windows, posters, people, plants, scents, noise, light and shadow.

If we compare the colour characteristics of various towns we find that the role of colours is different.

The houses of northern towns are of dark - usually soft - colouration and have white window-frames; in the humid, smoky air of the long autumn, winter and spring they become moist and are moist and soiled practically all the year round. Also the bright colours become dirty soon, so it is of no use to apply bright colours with slight grades of tint. Moreover, the tint of frost-resistant materials (stone, wood, brick, black iron) is dark, contrasty and this stands out better in the foggy, snow-bound landscape.

In the South (Greek islands, Spanish villages) the whitewashed walls, cupolas - even pavements! - provide the setting in which the reflections of the sparkling Mediterranean sunshine enhance the blue-green, red-brown colours of flowers, curtains, painted banisters and doors; and whitewashing renewed every year at Eastertide expresses not only this colouration, but also cleanliness, care and the diligence of the master.

This white, hand-laid, spontaneous architecture enhances the

delicate bends and decorative plastic work.

The blue of the firmament and of the sea is pleasantly bordered by this whiteness so rich in tints.

It must not left been unmentioned here that in this truly human and exquisite architectural environment (e.g. the island of Myconos) the richness of spontaneous details, the directly acting tastes, desires and practice of the local inhabitants do not require any composition by a primary architect, neither the setting out of sculptures or street furniture, nor interventions of the design type.

Spontaneous social life is expressed directly in the environment, does not require the adroitness of town-colourers. Man and his environment are one. Colours play no special role here; what is decisive here is the ensemble, the mass, plastic decorations, tints, light and space, and their life-like harmony, in which there is no room for the novel, for the avant-gardist beating about. Several-hundred-year-old traditions of a more than thousand-year-old culture survive here.

Cairo, for example, is at the same uniformly reddish-grey from the dust of the desert; towns in the mountains kept clean by the frequent rainfalls also show that among the acting factors, expressive means of urban environment, colours appear only when and where their role is necessary, their message is a concrete one, and their durability can be ensured.

But even the expressly colourful cities (e.g. Venice, Munich, Saentendre, the centre of Warsaw) are primarily the examples of a uniform colour scale (yellow-ochre-orange-red-brown) and of a colour and tint arrangement of spontaneous dynamism; the overcomposed, artfully conceived colour-groupings, over-designing and decorativeness give the impression of completion and unchangeability and push into the background the dynamical colour "fluctuations" of the living town where the moving vehicles, the often changing cars and the pedestrians always

result in new complexities, new harmonies or disharmonies.

The constant elements in a cityscape provide the framework in which the dynamical factors represent that incessant change, and therefore this "picture" can never be the content, it only can be the form, a form which represents exactly this liveliness.

This framework comprises the applied colours, which change depending on their role, since the same colour appears differently as a material differing in colour, has a different effect on walls of buildings, on windows and doors, on advertisements, benches, inscriptions.

If we want to lay down a rule we must say: "there is only one golden rule, namely that there exist no golden rules", (G.B.Shaw).

Every town-planning situation is a concrete case depending on the topographical and climatic circumstances, on the zone, influenced by material, surfaces, formation and environment, where colours must be applied quite differently from other cases.

Whereas it is established scientifically that man s not with his eyes, but with his brain, and that the spectacle in itself is only the starting-point of the visual process in which accumulated experience, erudition, preconceptions are of the same importance as the image, it cannot be denied that the preferred element of the visual causative factors is exactly colour as the most efficient means of stressing instantly anything in the agglomeration of the spectacle. It is exactly therefore that colour must be used for what it is destined, i.e. for accentuating the essential.

It is not by chance that our eyes have a special equipment for perceiving colours (the cones in the retina).

By way of conclusion we cannot be silent about the analogy that the employment of harsh colour effects (black-and-violet, blue-and-green, red-and-brown) on a large (building) scale

differs hardly from that musical "feat" where a self-appointed "musician" hits the keys of a piano with a hammer

Summary:

Man and society are in a dialectical interaction. A solely visual conception of perceiving and shaping our environment is mistaken. The northern towns of dark colouration, the snow-white southern towns, or the expressly colourful towns teach us that colours must carry concrete messages, must emphasize them, and therefore colouration must be employed with moderation. It is proved scientifically that vision is not photograph-like, that earlier experience, erudition and extradition are of greater importance than the picture we see.

INVESTIGATIONS OF COLOUR PERCEPTION AND COLOUR DYNAMICS

Zs. Tánczos

In determining the colour dynamic function we have to start from the decomposition of the spatial and temporal values of colours and from chromatic adaptation and relations of the contrast mechanism. The values of the spatial and temporal characteristics of colours are determined from the so-called direct brightnesses (received from direct comparisons),/see e.g. Pieron, Fry, Motokawa, etc./. From this we receive the sequence of colours from warm to cold (red, yellow, green, blue). If, however, flicker brightness is considered or the method of coloured borders is used eventually the equality of forming grids is taken into consideration, we get the sequence of saturation (i.e. contrast colours) or more precisely the sequence red-green /Pokorny, Bowen, Williams, Smith, Kaiser, Hertzberg, Boynton, Ingling, Tansley, Valbert, etc./. One can determine that the previous sequence corresponds to the achromatic and chromatic threshold /Purdy/ or to the ratio of the brightness of flicker and direct methods representing the mechanism of the two systems /De Valois, Guth and Lodge/ and the comparison to the white-black system /Hunt/ and according to this they can exemplify the relation of cone-rod sensitivity /Purkinje effect/. The well-known experiment of Koffka and Harrower give an important proof of this ratioing function. To produce colours in the form of so called Mach rings in case of red zero or a minimal increase of brightness is needed, in yellow the brightness increase

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has to be larger while in green and blue an increased brightness decrease (darkness) is necessary. The effect of the first two colours can be equalized by brightening that of the later ones by dimming, i.e. this phenomenon is entirely similar to the brightening effect of red and yellow, as well as to the dimming effect of green and blue in case of colour mixing on a colour disk (in case of colour substitution) /Hering,Matthei/ or in case of pushing to the periphery /Hillebrand/ - which is similar to the indicators of the Purkinje effect.

On the other side it is well-known, specially from the works of Békésy, who used in his experiments Mach rings, that dark has a larger organizing value in time (and space) as bright, thus e.g. in producing the above mentioned rings (50-66 ms instead of 37-50 ms) /Irvin,Williams/. This value can be compared with the phenomenon described of different organizational levels which is produced in case of paired and rhythmic stimulation, i.e. producing a stimulating cycle lasts 20-30 ms, this is the so-called "on" reaction, on the other hand at 50-60 ms the inhibition cycle has its leveling (the so-called "off" reaction) /Ikeda,Eisenbase,Kelly,etc./ and with this the temporal discrimination develops. At this point the indication of contrast colours becomes complete /Keston/. The above mentioned direct brightness equalities, as well as the temporal data received for red and blue by the help of different colour threshold measuring methods and so-called modulation methods give practically the same results, they show a difference of 20-30 ms for red and blue /Diderone, Motokawa,Fry, Walraven and Leebeek, somewhat higher value by Kelly, etc./. In the classical experiments of temporal summation similarly a critical value of 30 ms was found in the red and 60 ms in the blue. A bright background produced a shortening from 60 ms to 30 ms /Sperling and Jolliffe/. From this we can conclude that to perceive blue and partially green in the given situation an inhibition cycle is coupled, i.e. an off reaction and an [illegible] against the dark process is necessary,

on the other hand red and partially yellow has a direct, own excitation effect (monophasic).

Ikeda determined the choice in spectral responsivity produced by short double pulse excitation. On the other hand Sloss and Starnheim investigated the change in spectral responsivity produced by the rapid change of the hue of the background. We can look at the curves shown by these authors to be similar to the spectral responsivity ratio of the cone-rod responsivities. One might mention that De Lange compares the flicker and direct brightness value ratio in his classical sinuous wave excitation modulation experiments to the colour specific series of values discussed above. Kelly determined the spectral responsivities for these specific colour-time values in behalf of the mentioned excitations (1962) and received longer time values for blue and partly for green. His curve that he shows for blue excitation can be regarded as a series of values highly influenced by the effect of rods.

Regan and Tyler got the same conclusion from experiments where they investigated the wavelength dependence of time summation: The time response for blue stimulation is due to the influence of rods. In general van der Berg and Spekreise observed rod influence in case of sinuous wave temporal excitation. Among the view points which describe an opposite position those of Sperling and Jolliffee are of importance. They mention that there is no major difference whether colours are investigated before a bright or a dark background and therefore the influence of rods cannot be of any importance. This is, however, mainly true for the red where the bright background displaces the temporal summation to values less than 30 ms. In case of blue, however, the displacement from 60 ms to 30 ms which is due according to our interpretation to the switching off reaction (inhibition) is definitely due to the bright background.

In case of simultaneous or previous adaptation to long wavelength (white) producing a depression of the blue responsivity

/Stiles, Wallon and Polden, Pugh/, as well as the displacement of the hue into the direction of violet or green /Larimer, Krantz, Cicerone, Eichengreen, Wallon and Pugh, etc./ can be interpreted by the larger brightness and contrast induction of blue in case of normal circumstances /Kinney, Thomson/, or more explicitely to the fact that for the yellow colour a higher brightness induction is needed due to the complementary ratio to produce a contrast colour and this cannot exclude the indirect isotopic influence of the dark background. For this the above mentioned long wavelength (white) adaptation is necessary. The complementarity and the ratio between the contrast colours changes due to the responsivity decrease produced by blue light (or in case of successive effects produced by the increased brightness); according to the deviation series of the so-called contrast colours from the complementary colours (the opposite of the Bezold-Brücke effect) blue is displaced either in the direction of violet showing a larger complementary brightness /Auerbach and Wald, Larimer, etc./ or into the direction of green showing a higher brightness ratio (successive position, Marks and Dornstein, etc.). Here we would like to mention that Courès showed that blue has a minimal participation in brightness or in an achromatic system in his experiments using yellow background. On the other hand Augenstein and Pugh, as well as Wandell and Pugh showed that there is an important time difference between the effect of long and short wavelengths light in case of the appearence of this phenomenon. (Data by Pugh and Larimer on the relative effectivity of blue in this case - compared to the variation of yellow - can also be interpreted on the basis of the complementary ratio.)

It can be determined that blue shows in case of high intensity and dark or nearly dark background a similar temporal (and spatial) resolution as red or green and shows full contrast colour induction. From the curves published by Boynton and Baron as well as Kelly (1973) it can be seen that at high intensities without adaptation, i.e. in darkness a similar

temporal resolution is found as for red or green in case of complementary background /Témcsoc/. Similar statement can be made in connection with the spatial resolution experiments of Brindley (in a complementary surrounding). On the other hand - in contrast to other authors - we have found that in case of rhythmic excitation and dark background, for high excitation intensities (above 2000 Tr.), a full Bezold-Brücke hue shift can be observed /Témcsoc,1975/. The Bezold-Brücke effect - as the displacement in the blue-yellow direction in case of changes in intensity or adaptation - can be interpreted as the normalization of these two colours. On the other hand on the basis of the principle of saturation /Purdy, Judd, Walraven, etc./ it can be interpreted as a manifestation of full cone activity and contrast colour induction.

It is well-known that in case of flicker brightness, minimal colour boarder or grid resolution, additivity is valid. Not so direct brightness comparison experiments. In case of these functions one can find the determining role of the so called receptive field, especially in case of the blue process, which can be interpreted on the basis of a lateral inhibition (7.5' receptive field), due to cone activity. The minimal colour boarder /Sternheim and Glass/, the production of Mach rings for a spatial gradient in case of blue light /Matthews/, the blue blindness of the fovea centralis /Wald/ is of the same order of magnitude and changes with adaptation. - It seems to be plausible that additivity, the spectral saturation function and the contrast colours in their original form (i.e. described on the basis of complementarity) is a manifestation of the total functioning of the cone system and gives the basis for the linear colour mechanism. In the regulation of the lateral inhibition the direct excitation and induction take part in different forms.

For blue and partly for green colours to achieve this level, similarly to the development of the Bezold-Brücke effect (1000 Tr.) the inductive inhibition is usually needed (diphase

reaction). It is an open question whether this effect is based also in case of high frequencies on a real contrast colour induction. The well established models /Kelly,Green,Boynton,etc./ describe that below 10 Hz the visual reaction is non-linear; it depends on adaptation in the creation of contrast colours. In many experiments this effect showed displacements up to 20-45 Hz. Above this value, however, the focused point and the periphery of the receptive field showed synchronous activity and gave a brightness flicker /Bouma and Brenner, Kelly/. This however, cannot mean that the induction process consisting of successive stimulating and inhibiting cycles and showing a linear functioning would not increase as contrast increased. Especially Sperling and Sondhi mention that the effectiveness of the inhibiting cycle increases as the intensity is increased. In case of blue excitation the effect of the increase of cone-rod responsivity difference can be interpreted in a similar way. The latency of the lateral inhibition (14 ms, Levinson) the role of such a value in case of fusion (by off reactions - Ahroth-Cugell) supposes such a function.

On the other hand the relationship between the Bezold-Brücke effect and its opposite which might be interpreted as non-complete cone activity in case of contrast colours, can be regarded as a special functioning of contrast colour sequences as adaptation, intensity is changed. From the well-known data of these effects /Boynton and Gordon, Purdy, Djakonov/ we have determined this relationship and could reach an interpretation of contrast colour pairs and quadruples based on the Bezold-Brücke effect. It seems to be plausible that the contrast colour ratio does not change as rods are included or excluded from the phenomenon at the position of the pure colours or near to the invariante locations. Alternatively we can describe this in the following form: The effect of the cone-rod responsivity in the contrast colour phenomenon, nae, its constancy and direction of change can be interpreted as those values of lateral inhibition which cannot be interpreted as

the spatial-temporal or figural qualities.

The location of the invariante blue can be determined from the ratio of the cone-rod responsivity (we use the numerator of 7.5 as the effectiveness of rods in the receptive field, as done by Willmer, who calculates the periferial spectral responsivity /Weale/. The green invariante location can be received from above ratio without this correction. We can see from above discussion that there is a very thorough connection between the figural and "organic" effectiveness of colours (warm-cold colour, etc.) and the contrast and adaptation mechanism (which is connected to an aesthetic effect) and between the characteristics of additivity. We would like to propose that invariant locations should be shown in the colour triangle for an interpretation which is in accordance to the perception by using the assymetric effect of the white-black system.

DYNAMIC ASPECTS OF BINOCULAR VISION, AS RESULTANT OF MONOCULAR CHROMATIC PERCEPTIONS

L. R. Ronchi, S. Villani, G. Passigli

Colours are necessary to make the interiors attractive, agreeable and inviting. Preferences, symbolism, are traditionally related to psychological realm. However, the influence on eye refraction should not be under evaluated, amongst others because of subtle (subclinical) dependencies of interocular anisometropia, a cue dynamically used by the brain in processing monocular inputs.

1. Aim of the work

Interior decorators are aware that the colour is a strong environmental stimulus. In particular, in a school building, colour can help both the teacher and the learner, so that colours are necessary to make the room attractive, agreeable and inviting. This topic is tackled in several manuals and books (e.g. see refs./1-3/) and there are several experts in this field. However, the beginners have in some way the sensation that there is a gap between the findings of psychological research and the practical application, since precise guidelines are still lacking. This may be due to the complexity of the field, and to the fact that further research is still needed.

The present paper aims at describing some results recently obtained by us during the course of a mass screening, by considering the dynamic interplay of a number of factors.

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2. Materials and Method

We tested four hundred children in four different schools where interior decoration had not been planned according to a precise criterion. Two hundred children (age group 4 - 6 years) attended the Kindergarten, the other two hundred (age group 7 - 10 years), the elementary school. Responses were gathered thanks to the cooperation of teachers who had followed courses on child psychology in the frame of a pedagogic training. Our battery of tests includes:

a) Colour discrimination by the use of Ishihara Plates, P_2 Farnsworth Triten Plate, CUCVT, and, in some case, the F-M 100-Hue Test.

b) Colour preferences by the use of Pfister Pyramid; the trichromatic specifications of the coloured samples are displayed in Table I (to the courtesy of Dr. Sonanda).

c) Painting a drawing, representing a typical classroom, by the use of a set of 24 felt-marker pens. The spectrophotometric data were recorded by the use of an Itachi instrument, followed by a microprocessor to calculate the trichromatic coordinates.

d) Refraction measurement by the use of a modified version of Badal's optometer.

A full account of the recorded data will be given elsewhere. Here we limit ourselves to a general description of the main results.

3. Experimental Findings and Discussion

The data reported below refer to subjects with normal colour discrimination.

Let us consider first the responses to Pfister Pyramid. This test, properly designed to detect the preference in matter of colour, has been widely used, during the past decades, by psychologists looking for a relation between preferred hues and personality /4/. The general conclusion was that the said

relation is not so strict as believed at the beginning, however, colour preferences seem to be consistently related to some factors such as age, sex, mental state, etc.

In matter of age, let us recall that some decades ago it had been stated that small children as well as infants prefer red, blue, green, orange and yellow, in this order. Under incoming maturation, the set of preferences becomes blue, red, green, violet, orange and yellow, in this order. It seems of interest to note that the age where the colour preferred at most shifts from warm to cold or cooler hues has been decreasing, during the past few decades. Forty years ago /1/ it was about six years. More recently /3/ it was found to be about four years. Probably, modern children progress earlier than in the past, from impulsive behaviour to a level of conscious control or adequate adjustment. However, it cannot be excluded that the increased use of coloured toys, waxes, felt-marker pens and similar, both in nursery and in kindergarten, accelerated the outcome of the educational programme.

Our data confirm the above statement: for either age group, 4 - 6 and 7 - 10 years, the "light blue" is more frequently the "colour preferred at most".

Now, to learn what colours are preferred at most by the majority of persons is of little practical value, unless the colour, in each instance, is associated with some definite article or some specific situation /3/. In fact, it has been shown that colour preference is contingent upon many things, not the least of which is an association of ideas. Now, although different colours have certain meanings which are universally accepted, there is a personal and poetic interpretation of colour symbolism. Few colours, in fact, have meanings that are "universally accepted", since colour is dynamically functional, and can have localized meanings.

In an experiment now in course, we are testing children by requesting them to choose coloured ensembles and surface

materials, to coat "their ideal bedroom". But, before it, we have been performing a test where children were given a typical classroom drawn on a sheet of white paper by the use of China ink. Their task consisted in painting it, by choosing (freely) the colours according to their preference.

The validity of this test relys upon statements /1/ like "... As so as graphic expression is attempted (in early childhood), it is governed by certain biological primitive, almost inherent psychological and mental characteristics common to mankind.". "Colour, more than any other single aspect of painting, has been of particular value in children emotional life ...one of the most readily perceived trends in children paintings is that their strong interest in using colour tends to be paralleled by strong emotional drives...".

Our results are shown in Figures 1 to 4. In evaluating painted drawings we considered mainly the furnitures, that is, the desks of the children (labelled P, for pupil) and the desk of the teacher (labelled T).

In a first survey, we soon noticed that the colour assigned to the desk of the child was different, in general, from that assigned to the desk of the teacher. To quantify this effect, we evaluated the percent frequency-of-occurrence of various colours employed. The distribution of representative points of used colours, for frequencies of occurrence no less than 15 %, for either desk, is as shown in Figure 1. The areas enclosing points for P and for T, respectively, are well far apart from one another. We missed intentionally, any reference to brown since, by interviewing children, we realized that when using this colour, they had in mind the material (wood) rather than the colour in itself. In particular, the distributions of yellow and red colours, for either desk, are shown in Figure 2. It might be argued that the majority of children make reference to a symbolic value of colour (a sense which seems to develop very early in the life) /3/.

Now, it seems of interest that Gaffre's guidelines (quoted in ref.2) for classroom painting were based on an equation where the colour to be assigned to the space around the teacher ought to be "warm", being an attention pole, while the remainder of the class ought to be "cold".

The drawings collected by us might be further subdivided into two groups, according to whether they are multicoloured (label Ch, for "chaotic"), since various desks differ in colour from one another, or there is a sort of uniform organization (label O_r), since the same colour is used for the desks of children at least. As is shown in Figure 3, the group "Ch" is more frequent in the 4 - 6 years age group than in the 7 - 10 years one. As an aside, let us recall that multicoloured paintings are positively evaluated by psychologists, as a symptom of originality, activity and good psychological adaptation /4/. In turn, the degree of freedom in expression, whether in drawing or colour, has been closely related to the degree of emotional inhibition, as well as to the intellectual development.

In turn, the group "O_r" (Figure 3) is to be subdivided into two subgroups, according to whether the desk of the teacher differs or not from that of the children. The numerosity of the former (empty area) is greater than that of the latters (dashed areas).

At last, let us consider the frequency distribution of various colours in the drawings of children belonging to the former subgroup. As is shown in Figure 4, the greater frequencies of occurrence are for purple violet and red, in the case of teacher's desk; in the green and yellow, in the case of children desk.

Let us consider now the optometric aspect. Environmental colour is often put in relation with the fine adjustment of eye-lens accommodation, because of the existence of eye chromatic aberration. Ergo-ophthalmologists recommend the in situ prescription of "working spectacles". In this connection, let us

recall that the estimate of the far point is found to depend on the spectral composition of illumination /5/, as is shown, for instance, in Figure 5.

Now, some data recently recorded by us indicate that in addition to the effect on far (and near) points, there is also an effect on anisometropia, the difference (even so small to be regarded as subclinical) of monocular refractions.

In a research now in progress, we are testing even some subtle differences even in monocular 100-Hue test responses, although both normal in score. Thus, we would be inclined to consider that the brain is faced with a dynamic combination of two slightly conflicting monocular inputs.

An agreeable coloured environment is conditioned partly by psychological factors, difficult to be handled and quantified, partly by optometric factors. The ergonomical prescription of working glasses <u>in situ</u> becomes more delicate if in addition to binocular muscular balance, the slightly anisometropia to which the individual is adapted, and which is utilised by his brain, is to be taken into the due account.

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Table I

Trichromatic Specifications of Coloured Samples of Pfister Pirmaid (to the courtesy of Dr. Schanda)

Sample	X	Y	Z	L_x	a	b
Blue	30.13	33.51	58.43	64.57	- 9.89	-19.35
"	22.54	29.50	55.33	61.22	-26.52	-30.49
"	11.77	13.20	41.01	43.06	- 7.91	-38.74
"	8.16	6.19	25.79	29.68	20.57	-38.15
Green	29.15	47.59	18.64	74.56	-22.35	48.05
"	28.07	38.02	15.10	68.03	-32.65	44.17
"	14.97	25.16	14.64	57.23	-48.40	26.55
"	6.16	7.12	7.80	32.07	- 8.45	2.04
Yellow	62.24	66.12	11.24	85.06	- 5.87	82.93
"	61.46	59.65	9.04	81.64	7.05	83.43
Orange	43.91	33.09	7.72	64.23	36.74	57.77
"	36.87	25.52	6.54	55.60	52.27	47.33
Pink	32.11	37.75	30.20	67.82	43.72	17.97
Red	17.17	10.79	6.02	39.22	41.75	21.03
Brown	15.22	11.48	6.66	40.39	35.71	30.54
	8.64	6.09	5.39	29.53	7.60	7.03
Purple-violet	14.49	9.43	11.72	36.78	36.86	- 1.60
	11.42	7.68	5.50	33.30	51.67	17.05
	7.31	6.07	9.05	29.58	15.88	- 6.37
	6.64	5.75	6.35	28.77	10.82	3.77
	47.94	47.65	65.99	74.59	3.47	- 6.99
White	77.00	78.92	82.41	91.20	- 0.58	7.47
Gray	32.05	33.55	36.11	64.60	- 3.04	4.73
Black	5.15	5.31	6.75	27.60	- 0.71	0.09

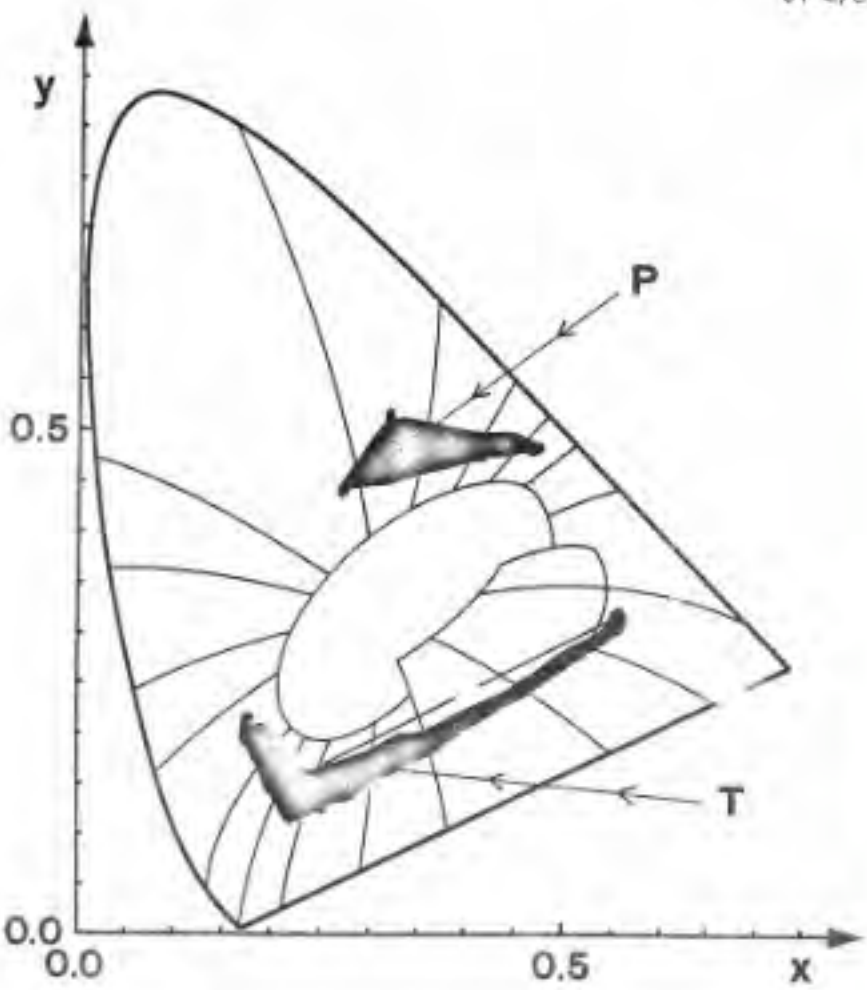

Fig.1 - Black areas cover the representative points of colours used (with a frequency-of-occurrence not less than 15 %) to paint children desks (P) and teacher desk, respectively.

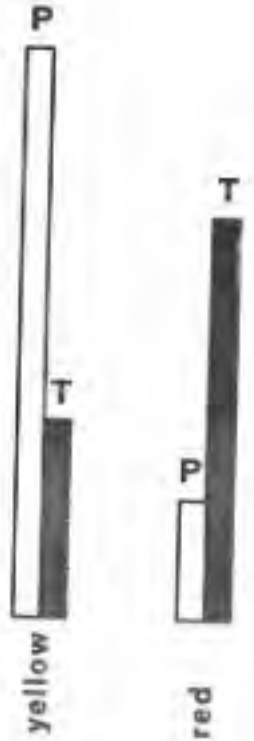

Fig. 2 - Histograms showing the relative frequencies of occurrence of yellow (Y) and of red (R) colours, respectively, to paint children desk (P) and teacher desk (T).

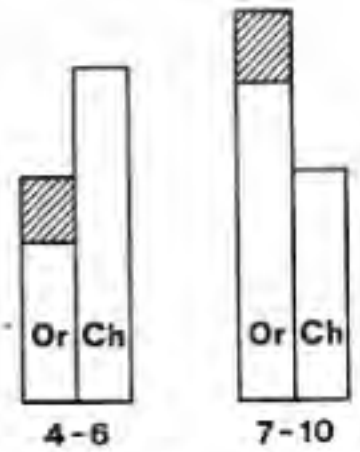

Fig. 3 - Histograms showing the relative frequencies of occurrence of paintings with chaotic distribution of colours (Ch), or uniformly organized (Or), respectively, for either age group. In the "O_r" group, dashed areas refer to the cases where the colour used for teacher desk equals that for the children desk; empty area refers to the case where the colour assigned to the teacher desk is different.

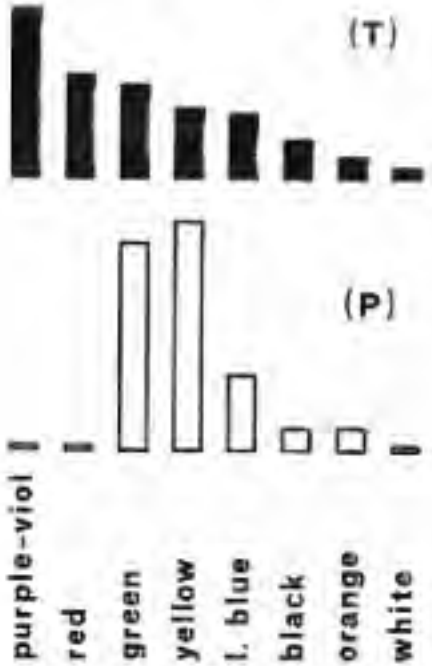

Fig. 4 - Histograms showing the relative frequency-of-occurrence of colours displayed at the bottom, to paint teacher desk (T) and children desk (P), by children belonging to group "O_r", empty area, in Figure 3. The P and T distributions differ significantly from one another (chi-square = 170.0^{6}, df=8-1, $P \ll 0.01$).

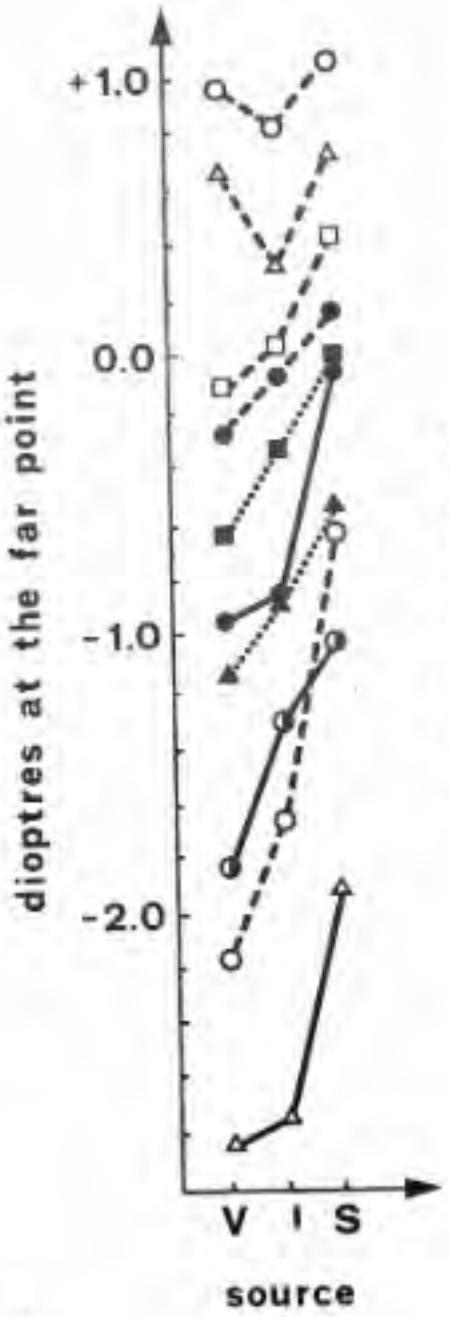

Fig. 5
Ordinates, far point estimate. Abscissae: the kind of light source illuminating the display of Badal's optometer: V, Vitalite, I, incandescent lamp; S, high pressure Sodium lamp. Matched luminance: 10 cd/m^2. Each plot refers to a different subject.

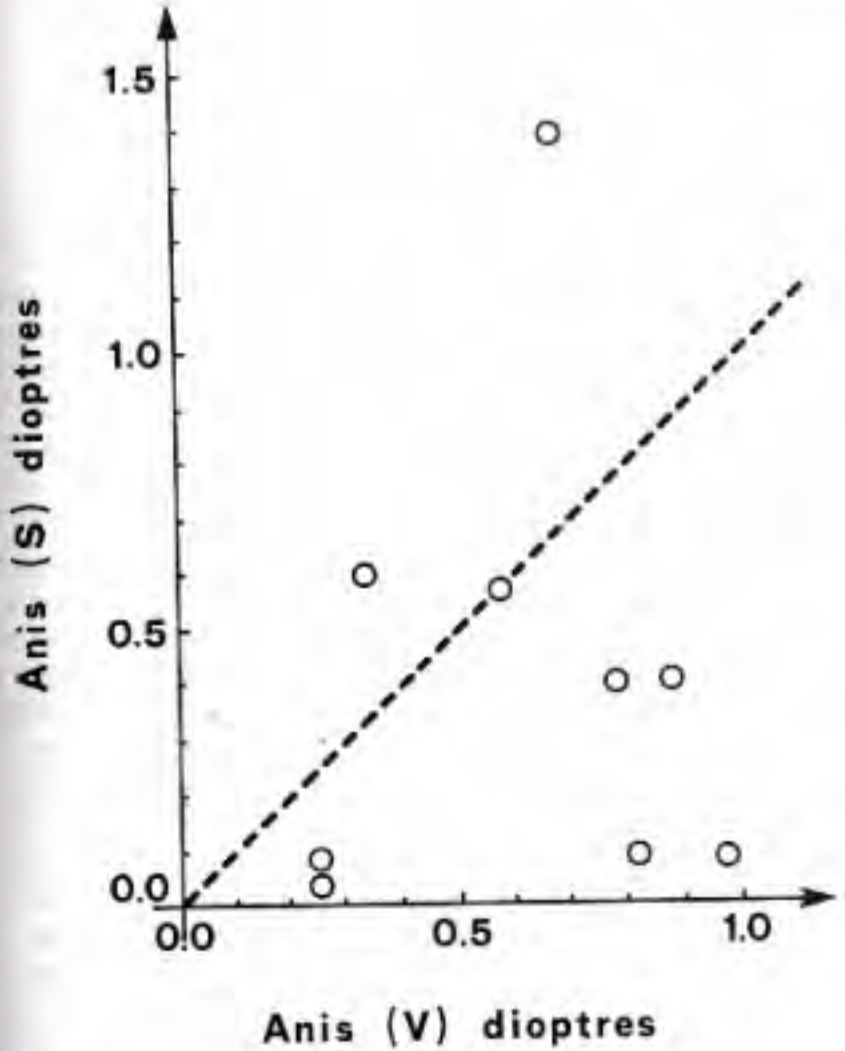

Fig. 6 - On either axis, the difference in refraction at the far point is displayed. Abscissae, the source is a Vitalite. Ordinates, the source is a high pressure Sodium lamp.

PROBLEMS OF COLOUR VISION AND ITS RELATIONSHIP TO COLOUR DYNAMICS

A. Medgyaszay

We assume that our visual system works under all external circumstances well.

Perhaps we think that our visual system has to perform adequately even under those very complicated and difficult circumstances that are produced by modern technology, for this the performance of our eye should stand on a very high level.

Physiological optical investigations performed during the past decades give us the possibility of determining those principles and methods from which the performance of our eye can be determined.

In basic investigations one looks for such methods by which the composed performance characteristics of the eye could be determined and from which the functioning of the visual mechanism could be understood, the single component functions could be related to each other. It is a pity that in practice we do not possess such a well established and generally accepted investigating method. What we are able to perform at the present moment is the investigation of the individual partial functions of the eye.

At present in practical colour vision investigating methods we use the principle that we suppose some performance data we use the principle that we suppose some performance data of the different colour vision tasks and decide on the basis whether these values are reached or not.

Everyday colour tasks are of different character: Sometimes some - perhaps very faint - coloured light has to be detected.

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we have to distinguish among coloured surfaces, the colouring of a surface has to be reproduced or coloured samples have to be sorted out in a very sophisticated laboratory environment on the basis of very small colour differences.

Our investigating methods seem to be far apart from the tasks given by everyday life and often do not permit a definite statement that a given form of colour deficiency will be at the same time the cause of bad performance.

The magnitude of and differences in colour tasks increase and therefore it becomes more and more important to find methods for measuring the colour perception performance. The research of colour vision investigations is focused nowadays on colour perception ability tests. Modern investigations seem to show that this can be accomplished by determining hue threshold differences.

The introduction of above new concepts and instruments to investigate these, introduce some questions as well. If new methods have to be developed, were the tests used up-to-now for investigating colour vision wrong, were the differencial tests used incorrect? Will the new investigating methods serve the understanding of colour vision problems and the practice of their relationship with colour dynamics?

Colour perception investigations are performed by knowing the physiological functioning of light adapted cones with the goal to use the results of these investigations in practice. This is, however, only valid under daylight adaptation conditions. In recent decades the practical circumstances of this question changed considerably. Partly due to the rapid development of techniques (chemical industry, textile industry, telecommunication, colour coding, etc.) and partly due to the fact that night traffic is directed by coloured signes.

Methods of hue discrimination threshold tried to quantify the technique by determining that minimal visual angle in case of which the colour of the reflected or transmitted light can be

seen and determined unambiguously. The core of the problem is just this: the experimenter has to tell the name of the colour. The coloured surface as a physical stimulus can be described by 3 quantities: hue, brightness and saturation. Among these hue, i.e. dominant wavelength, is unambiguously defined, it is a chromatic factor. Light intensity, which is in case of surface colours lightness, is also an unambiguous chromatic factor. At the same time the third factor, saturation, is neither chromatic nor achromatic as saturation describes relationship of the chromatic and achromatic component of the colour. We could describe this with other words, that in case of looking at surfaces under the same illumination showing different hues, the pigments producing colour stimuli can be described by a saturation related to the given hue, i.e. the degree of saturation described in per cent is characteristic for the intensity of the chromatic stimulus in case of an unchanged illumination.

Under dark adaptation conditions, where answers are given more rapidly they are more definite and precise. This can be due to the fact that external disturbing light effects are not present, the point which has to direct the visus is easily visible and the contrasts are higher.

According to our opinion this is only a relative amelioration due to the experimental conditions and basically it is not an amelioration only a decrease of the functioning of the macula lutea, a decrease of its ability to differenciate.

Looking at the light source under dark adaptation conditions glare can occure which will disappear, however, within short. After this the colours with now relatively high intensity and strong contrast take over the governing of any functioning. Without doubt these factors influence the separational ability of the macula lutea.

Our conclusions can be used in practice. It is important to choose the intensity and positioning of the used light source

as well as the colour and illumination of traffic signs correctly, as we have to take into consideration the higher sensitivity of the fovea in case of dark adaptation, and due to this last fact the lower colour discrimination of the eye.

COLOUR METRICS AND COLOUR DYNAMICS

J. Schanda

Introduction

Colour metrics and colour dynamics are two complementary scientific disciplines describing the two faces of the world of colours. Colour dynamics is responsible for shaping our environment, humanizing it and offering mankind a brighter and more colourful surrounding. Colour metrics should give the physical, mathematical and measurement-technical background for this endavour. During the past decades colour metrics evolved from its basic form where it was able to describe only colour equality under standardized illumination conditions to a science where contrasting effects, changes in spectral distribution of the illumination and other external circumstances can be taken into consideration.

The present paper shows by describing a special example of interior design and technical form shaping the application of colour metrics: in recent years working places with video display unit (VDU) became an integral part of our everyday working environment. The use of such VDUs produces, however, a number of questions, where manufacturers of such terminals, the illuminating engineer, the industrial designer, as well as the interior decorator responsible for the colour of the equipment and for the colouring of the environment has to work together.

Modern instruments are equipped with a number of different types of displays and the operators do not need to consult lengthy manuals anymore, the instrument asks for the necessary input information, optimalises system parameters, performs measurements and displays results. For this input information request and data presentation displays (e.g. cathode-ray tube, alpha-numeric electroluminescent, liquid crystal displays) are used, the operator communicated with the instrument via an alpha-numeric and/or numeric keyboard. The task we would like to deal with in this paper discusses the VDU-operator system, describes such background informations that are available in colour metrics and show how these can be applied in setting the requirements to get to an instrument display that is more humanistic, complies with the requirements of visibility and colour dynamics as well. (For more details see our communication in the Proceedings of the IMEKO Congress, 1982, Berlin-West /1/.)

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The VDU-operator system

The difficulty of the visual ergonomic design of the instrument is produced by the fact that each optical information source effects the dinamic state of the eye simultaneously and as the eye is not a linear system, it is hard to predict the state of the eye (accomodation, adaptation) in which it will process the information. Nevertheless there are several physiological and psychological findings that guide these predictions.

Other illuminating engineering investigations showed that the reading task can be performed without strain only if the illumination of the notes is at least 500 lx. This means a mean luminance of 100 cd m^{-2}. The mean luminance of the display and of other objects in the visual field should be of a comparable level to avoid glare (this is the "noise" information from the environment to the eye) and readaptation, if change of eyesight among the display, the notes and other parts of the system (keyboard, samples, etc.) becomes necessary. Such frequent readaptations lead to early eye-fatigue, difficulties in accomodation, etc. The best luminance setting of the display itself is influenced by a number of factors: flicker is one of the most disturbing features of cathode-ray tube displays.

The flicker sensation depends not only on the repetition frequency of picture refreshment, but also on the luminance level: for 50 Hz refresh rate flicker is almost unperceived at a luminance level of 10 cd m^{-2}, but is very annoying at 100 cd m^{-2} /2/. Thus only displays with high refresh rate should be used as instrument terminals.

Another factor influencing the best luminance setting is the so called irradiation effect: If the displayed characters are composed from very thin segments with high luminance their visual picture becomes blurred, producing reading errors. (These errors can be minimized by choosing an appropriate font /3/, but to discuss this would lead too far.) On the other hand segments or dots producing the characters should show sharp contours.

Visual acuity depends on accommodation luminance, calling again for higher luminance levels. For so called "positive contrast" presentation, i.e. when the luminance of the characters (objects: L_o) is higher than that of the background (L_B), this can be achieved only by increasing the background luminance and thus decreasing the contrast, defined as

$$C = \frac{L_o - L_B}{L_B}$$

which affects the visibility adversely.

There are two ways out of this dilemma:

- Using negative contrast (black characters on an "energized" screen) this leads to a lower error rate of display reading and usually also to a higher subjective rating /2/.
- The other possibility is to use a coloured background. A recent study /4/ showed that medium contrast grey background and yellow or blue characters are easily and well recognized, yellow characters on blue background are almost as good as on grey background. As no definite luminance values and only very general colour descriptions were given, it is difficult to compare these results with more basic colorimetric findings.

Brightness, lightness and colour

In photometry and colorimetry it is usual to distinguish between a description of the stimuli and of the perception. The stimulus metric is additive and multiplicative, i.e. if adding two visible radiations, the colour stimulus is the mathematical sum of the two constituents, and doubling the radiance the luminance will be doubled, too. This is described by the basic equation coupling light and colour measurement with radiometry:

$$T_i = K_m \int_{360}^{830} S_\lambda \bar{t}_i(\lambda)\, d\lambda$$

where K_m is a proportionality constant coupling photometry to radiometry: $K_m = 683\ lm\ W^{-1}$

S_λ is the spectral power distribution of the radiometric quantity measured

$\bar{t}_i(\lambda)$ are the colour matching functions:
$\bar{t}_2(\lambda) = \bar{x}(\lambda)$, $\bar{t}_2(\lambda) = \bar{y}(\lambda) \cong V(\lambda)$ the luminosity function for photopic vision,
$\bar{t}_3(\lambda) = \bar{z}(\lambda)$

T_i are the tristimulus values, and for i=2 the photometric quantities.

Visual perceptions are, however, neither additive nor multiplicative functions of the stimuli: brightness sensation is a measure of perceived luminance, and it is roughly proportional to the cube-root of luminance. In visual scenes, where a number of surfaces with different brightness occure, a subconscious mechanism adjusts eye sensitivity to a mean (or rather to a maximum) value. This means that "white" is always perceived as white, and never as grey, although the luminance of a grey surface in one scene might be higher than the luminance of a white surface in another.

This situation is further complicated by the fact that a [illegible] with different hues but the same luminance (Y_i will [illegible]

appear to have different brightness and lightness. Thus it is rather misleading if visual performances are compared using the same luminance, but different hues.

The quantitative description of the brightness and lightness of coloured lights and surfaces is still in an experimental stage /5,6/, but the trends of colour visibility can be predicted using these estimates.

Vector luminance (L^{**}) /5/ is a measure composed of an achromatic (A) signal and two chromatic ones (D, T) where the achromatic is practically equal with T_2. The chromatic signals are linear combinations of the three T_i values. They resemble human colour vision: one of them has high values for red and green, the other for yellow and blue light. Both have low values for white light. Vector luminance is the vectorial sum of the three signals:

$$L^{**} = (A^2 + D^2 + T^2)^{1/2}$$

"Quantitative brightness" (Q^{**}) /6/ is a nonlinear function of luminance taking also the luminance distribution in the visual field into consideration. It can be described by the following expression:

$$Q^{**} = a\,(k\,L^{1/3}) - b$$

where L is the target luminance;

a and b are expressions depending on the spatial distribution of target and background luminances, as well as on the luminance levels;

k depends on the chromaticity (hue and saturation) of the target stimulus.

These colorimetric results were visually tested /7,8/ by investigating the visibility of red, green and yellow LED displays: three digit displays were used, where the luminance of the displayed numbers was set equal. Random numbers were flashed and the number of reading errors counted. Table 1. compares these reading error rates with vector luminance and the lightness value of the OSA colour space /9/.

Table 1.

Error rate of reading LED displays of different colours compared with vector luminance and OSA lightness

	Error rate	Rel. Vect.lum.	Rel. OSA light.
red	0,06	1,38	1,33
yellow	0,025	1,10	1,12
green	0,130	1,00	1,00

As seen both vector luminance and OSA lightness predict a higher visibility and thus a lower error rate for the yellow and red displays. We found, however, in contradiction to expectations based on colorimetric brightness, a lower error rate for yellow displays than for red ones. This can be understood if other non-colorimetric, visual phenomena are also considered: the chromatic aberration of the eye increases both in the red and in the blue spectral regions, thus visual acuity decreases for red displays leading to an increase in error rate.

Fig. 1. shows in a CIE (x,y)-diagram the loci of constant lightness /9/ (for D65 illuminant and a 90 % reflectance grey reference sample). Some characteristic display phosphor chromaticity coordinates are also included in this figure. As seen the red and blue phosphor luminance can be approximately 30 % lower to achieve the same brightness sensation as from a green or yellow phosphor. To achieve this luminance at comparable quantum efficiency the excitation current must of course be higher, as the light producing efficacy of red and blue radiation is lower.

Discussion and conclusions for the instrument manufacturer

The ergonomic design of the interactive terminal of an instrument presents a number of problems for the instrument manufacturer: technic considerations, as e.g. upper limit of the display and keyboard for easy "communication",

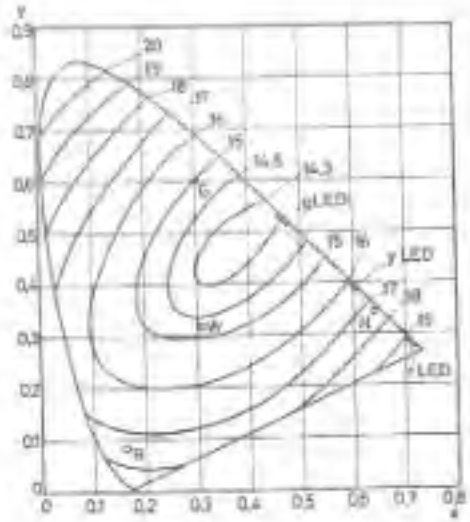

Fig. 1. Equal brightness contours in the CIE (x,y)-diagram calculated according to the OSA lightness scale.
W is the white point, R G B are chromaticity points of cathode-ray tube phosphors; rLED, yLED, gLED are chromaticity points of red, yellow and green LED displays.

geometric optical problems, as e.g. glare free display, keyboard and instrument surfaces, etc. were not discussed in the present paper. We tried to concentrate on the colorimetric and photometric peculiarities. These can be summed up as follows:

To achieve a luminance at the display comparable to that needed on the keyboard and for other measurement tasks (reading of notes, sample identification, adjustment, etc.) the luminance on the display should be relatively high. In this case high refresh rate is needed to avoid flicker.

Negative contrast displays are easier to read but need higher input power. Therefore it is useful if not only luminance contrast but also colour contrast is used to improve legibility.

This has the further advantage that the overall luminance can be reduced. As visual acuity is high for yellow light, yellow character - blue background seems to be a favorable solution. In early display evaluation work the luminance contrast was regarded as performance criterium. Recent investigations have shown that even for monochrome displays using different colours the concept of vector luminance or colorimetric brightness has to be used for a proper comparison of the visual effects.

For multicolour displays the concept of colour difference is to be used instead of luminance contrast (the visually meaningful description of contrasting colours is, however, still lacking).

Colour can be used not only to increase visibility, but also to accentuate different parts of the information. These questions go beyond the display engineering and belong to the realm of the designer. At this stage we would only like to emphasize: too much colour is much more harmful than monochromism. If the display starts annoying the observer with its many, continuously changing coloured information, it will lead to early fatigue and confusion. It has to be understood that evolution developed first an eye with high brightness contrast resolution (many species of vertebrates can distinguish only among brightness and have no colour sensation), and human colour perception is much worse than its brightness perception ability. (Indications exist that the colour perception of the human race increased even during the last millennia.) Colour should be used to help light perception, to make our life gayer and more colourful, but should never be used for art for art's sake.

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SOME QUESTIONS OF REPRODUCING PREFERRED COLOURS IN THE PRINTING INDUSTRY

M. Gara, P. Schulz

In reproductions of different original coloured pictures by the autotype process the hues and shades of picture elements are produced by an ordered structure of tiny elemental picture points which are - under normal viewing conditions unvisible. The "independent variables" of coloured autotype reproduction are the ratios of filling in the basic subtractive pigments. The precise knowledge of the colour effects of these variables is especially important in case of reproductions containing also preferred colours.

The colour effect of the yellow, magenta and cyane basic pigments in different combinative ratios has been investigated. This has been done in the characteristic preferred colour regions using the Neugebauer theory. Interpretation has been done in the CIELAB colour space using a model programme written for the EMG 666 desktop computer.

Results of our theoretical investigations have been compared with colour measurements of test prints prepared by 3 colour prints and with the results of visual testing.

We could show that there exist some unfavourable fillings in ratios where the colour differences became larger than in case of other combinations. On the other hand the permissible colour differences determined by visual evaluation show characteristic orientations of saturation and lightness changes compared to changes in hue.

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THE COLOURS OF VASTRA FLEMINGSBERG; HUDDINGE, SWEDEN

G. Marcus

In this apartment complex the colours do not serve as adornments. The colours articulate the outer and inner distances of the complex by the means of gradation and contrasts. The colour composition is based on entire surfaces. These are established by two scales: one range of fifteen colours at approximately uniform luminosity at a maximum of purity - with a minimum of greyness - and the other range by three white - grey values - with a minimum of colour. By this: these colourdistances compose the urban shape; Vastra Flemingsberg.

The lecture was illustrated with slides.

Dates: Colourplanning and its realisation 1970 - 1974
by G. Marcus, Stockholm
Architect: H. Hatell, Uppsala
Colour coating: AB F. Beckers, Marsta, Sweden

Literature:
A. Enstrom Vastra Flemingsberg Farg Formiss
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LEONARDO, Vol.12, pp.89-95, Pergamon Press, Oxford, 1971

Gert Marcus, Artist, Stockholm, Sweden

EXPERIENCES OF COLOURED ENVIRONMENT DESIGN OF A HOUSING ESTATE REALIZED IN BUDAPEST

M. Bethy

The town planning concept of this housing estate, bordered on four sides by communication and collecting roads, is to have a walking street, free from vehicle traffic, in the direction north-east to south-west. Public institutions placed along the walking street would thus result in forming a linearly arranged town centre.

By duly considering conditions of orientation and inclination, the 11-storied in-line built buildings were built along a line perpendicular to the walking street. Economic provisions for the institutions, and motor vehicles to the residential buildings, can find their way along loop-type lanes branched off from collecting roads running around the housing estate.

One side of the walking street is formed by commercial and servicing establishments, and the other side by communal and health establishments.

The walking street, spatially highly diversified in shape, is located on a raised level thanks to the inclination of ground. It is from here that the public can find access to each institution. This allows likewise to separate optimally the economic services for store-rooms, located on the lower level, of two-storied commercial establishments from the buying space located on the upper level.

Residential buildings of the housing estate are made of constructional elements developed in Hungary, the commercial and

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service buildings are built of prefabricated "TT" panels with reinforced concrete frames to form hall structures, while communal establishments were built along a construction system consisting of small-size panels.

Beyond creating a pleasant-looking, humane atmosphere, the fundamental principles pursued during the coloured environment design of this housing estate included the following:

- emphasis on the concept applied for town planning, and actual construction;
- expression of functional contents of the buildings;
- emphasis on the plastical proportions of buildings;
- compliance with the construction technology of buildings.

(We are convinced that coloured design cannot be casual, serving an end in itself and leaving environmental relations, contents, forms unconsidered.)

The fundamental principles applied in coloured environment design as mentioned above, were realized in the following way:

We tried to emphasize the basic concept for town building by giving stronger contrasts of colours to house fronts along the walking street which forms the main artery and linear axis of the housing estate. The bright colours of the centre of institutions forming a horizontal band, compared with the neutral effects of terminal walls of residential buildings, would highlight the linear direction of the walking street and the latter's varied accommodation to the area.

On the facades of buildings two contrasting colours were used. By changing these two colours we intended to realise the fundamental principles and targets as foreseen and listed above.

The functional contents of buildings were expressed in case of two-storied commercial establishments in a way that the two contrasting colours were used to proportion the commercial houses horizontally and vertically: the lower zones of store-

rooms and the vertical servicing blocks are white, but wall surfaces limiting communal spaces on the upper level carry all shades of brown.

The emphasis on plastical proportioning of buildings was equally expressed by two contrasting colours, and the same method was used to distinguish prefabricated and monolithic structures of buildings in a visual way by means of colours.

Within the principles mentioned attempts were made to use warm colours, in addition to white, for the housing estate as a whole, like rusty brown, orange, chocolate-brown, umber, etc. These colours have appeared mainly on public establishments, but were used on a wider scale for the loggia surfaces of residential buildings as well.

For the colouring of institutions a paint of dispergated synthetic material, called "DEKOLIT", made by the Paint and Synthetic Resin Factory BUDALAKK, was used with coarse-grained mineral additives in unmixed colours.

The housing estate was completed in accordance with the colour design described, and it is hoped that the actual condition is in harmony with the targets set. As a matter of course there is no constructed environment which would exist for itself; colours can be made alive by vegetation, objects, cars, advertisements and, not in the least, by human beings living in it.

THE DWELLING ENVIRONMENT AND THE COLOUR

M. Kapasa

The sense of colour is one of the large and common wealths of humanity. As living creatures the human has been living in natural environment for millions of years, the sense of colour has conformed to the colours of nature and its harmonic or disharmonic character has been determined by its relation with nature.

Nowadays the colour charms of nature, the colours of sky, woods, flowers, birds are considered to be the most beautiful ones and perhaps the association of bright or dark colours can be found in our roots, built in our genes somewhere in the memories of the pleasant or dangerous natural environment and in the colour world of sunny or stormy sky, the alive and the dead living creatures.

Biologically in this extreme short period of history of humanity we have also been living it, driving out gradually and undertaking the role of natural environment, the artificial environment created by the human has developed.

We are dwelling nowadays mainly in an artificial environment. Fortunately it has been recognised that human needs the elements of the primary natural environment, that is, it needs harmonious coloured environment also.

Colour is one of the important factors for approaching the "lost paradise", the natural environment in the built in environment and for the creation of possibilities of har-

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monic life. This recognition may be a key for the consciousness of colour selection. Where the elements of nature have not prevailed yet, where garden, open air, plough-land, woods can be found the colour hunger of human is satisfied to a greater extent and the natural materials and colours in its home namely the whitewashed wall, the wood, the leather, the clay, the bone, the raw wool and the flax are almost the resumption of surrounding world, their influence is interlaced and they exist together with it.

The colour of our tools made of natural materials are found to be beautiful, their common occurrance is mostly harmonic depending on the harmony of nature.

The bright colour serves for the setting off in the environment and drawing attention, in the national costume of young girls and in the fancy work of more precious personal belongings. In the townflats and the dwelling environment the importance of colour selection raises among the narrowed down sky, the vegetation displaced with pavements and the grayed houses. Here the conscious replacement of the colourfullness of natural environment is required by the bold colouring of walls, larger surfaces to replace the sky, the sunshine and the narrowed down nature.

The proportion and the selection of colours mainly depend on the position, orientation and the environment of building and the internal area. But the age, profession and the requirements of the humans dwelling in and among influence these too.

It is well-known that children like the bright colours and the elders prefer the conservative colour harmonies. In this way it is obvious for example, that inside a child-welfare institution, for example creche, the nursery, school or in a children's room a flat requires bolder, brighter and more various colours than the room of adults. It is well illustrated by the Lego play. Its bright colours had been selected

on base of psychological researches but our architects and internal architects consciously take these possibilities.

In streets and flats where the sunshine is not enough, the soft colours, for example, the yellow, orange, red can partly replace this and the "cold" colours, for example, the light blue, are suitable for the decrease of heat sensation. Colours also influence our emotions, they soothe or make us strained, thus their appropriate "feeding" should be taken into consideration.

The exploration of the natural environment gives good start here: that is, the colours of woods, the plough-land, the field, the sky, the water give the large surfaces, the flowers, birds draw attention with their bright colours.

But the eye is also the most colourful in the human itself this attracts our look. Thus it is reasonable also inside the dwelling room if the prime colours are the following: the colours of the floor, the wall, the main furniture remain in the range of soothing colours and the others become of accented and stressed colours, the coloured bookjackets of the library, pictures, flowers and textiles also stand out much better.

The light or just white walls make the colours of objects brighter, they stand out still more.

The limitation of the number of colours or perhaps mixing the different tones of colours dominant may be an effective method for the creation of colour harmony.

It should be taken into consideration not to extend this method for the whole flat since this produces monotony. In this case the prevailing colours of different rooms should be changed. This method had been consciously applied by Goethe in the rooms of his dwelling house in Weimar outstanding them in this respect also.
In this way in our commotion, our requirement for the variety of colours is much better satisfied.

Our sense of orientation is also influenced by the colour. The shape of surfaces can be stressed or kept back. Thus, for example, with deep a dark colour among the bright colours of other surfaces, a wall or a ceiling can almost terminate the stereoscopic effect and the unfavourable high rooms can be visually corrected and the space ratio can be improved.

The plastic of faces can be emphasized with colouring. Nice solutions of historical and popular architecture illustrate this statement too. Stressing the structural unit with colour can also enrich the lucidity of internal areas and their colour world.

Perhaps it is enough to mention the faces or ceiling of wood beam but the different colouring of stone or reinforced concrete is a well formed tradition. The colour is our common property, the coloured world is our natural requirement, the nature is our master if we pay attention to it. The harmony of the coloured world is biologic requirement, it is a factor of our healthy life.

It is an important task that the industrial background, the paints to be bought, the wide range of materials should promote the liberty of colour selection. It should make the recognised, conscious colouring possible for the connoisseurs.

FORMATION DE LA COULEUR DE L'ENVIRONNEMENT LE PLUS PROCHE DE L'HOMME - LE LOGEMENT

A5-4/1

V.Danieçka

L'Institut d'Esthétique Industrielle a entrepris en 1972 le problème d'arrangement de la couleur de l'environnement le plus proche de l'homme que constitue le logement. L'étude concerne tout aussi bien les éléments de finition et d'équipement se trouvant en vente sur le marché que ceux dits d'investition de l'habitat multifamille, qui se caractérise en Pologne par le fait que le futur utilisateur du logement est en principe sans effet sur le choix des matériaux de finissage.

Jusqu'à présent dans la structure d'organisation de l'industrie polonaise il n'y a pas de liaisons entre les diverses branches de production d'articles d'équipement du logement, qui en somme vont être mis en présence dans le même logement. De même la conception plastique des éléments d'équipement de l'intérieur par les diverses cellules d'études sans aucun lien mutuel n'assume pas la possibilité de garantir à la production la coordination de totalité desdits articles.

Une telle situation a fait l'objet de désaffection sociale et elle fut cause de grandes pertes économiques. Dans ces conditions, l'Institut a élaboré un "système de coordination de la couleur", ayant pour but la réaction quant à la teinte des articles industriels lors de leur phase de programmation, de conception et de production, pour qu'en somme le dernier effet puisse assurer la coordination de teinte de l'ensemble de l'assortiment appliqué aux intérieurs du point de vue de produits et matériaux de finissage. Le système de coordination des teintes pour les éléments d'équipement de logements comprend:

- dans la zone habitable avant tout les matériaux de fonds, tels que les revêtements de sol et les revêtements de mur, tenant compte de leur relation de teinte par rapport aux éléments d'équipement mobile du type de tissus, meubles, tapis etc.....

- dans la zone domestique, il comporte les éléments auxiliaires de l'équipement fixe de la cuisine et de la salle de bain.

Ce système adressé aux différents utilisateurs donne en pratique la possibilité de construire des compositions variées de combinaisons régulières de l'intérieur, disant d'une manière générale mettant à profit la monochromatie ou le contraste harmonique des couleurs. Les éléments décisifs du choix des couleurs furent les subordinations psychophysiologiques, les préférences des utilisateurs directs des logements, les possibilités technologiques des producteurs des articles et les matériaux de finissage.

Les principes de systèmes de couleurs ont pris en égard les goûts prononcés populaires purement humain et le phôtisme. Les considérations de teintes ne concernent non seulement la catégorie des couleurs théoriques, mais aussi celle des couleurs de sensation qui tiennent compte du facteur humain. On comprend dans cela les couleurs

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agréables à l'oeil, provocant des associations psychologiques regroupées en collections reconnues populairement comme fondamentales. Aux collections on n'a pas introduit des couleurs pas assez universelles, peux utiles aux intérieurs et difficillement assimilables.

Les couleurs proposées furent soumises aux essais d'inchangeabilité à la lumière diurne et artificielle. Le domaine des couleurs employées a tendance à une limitation telle qu'elle serait claire au moment du transfert des études du coloris aux producteurs des différents éléments, tandis que le choix des couleurs assurerait en action combinée l'élasticité tout aussi bien dans sa propre sphère (monochromatie) que dans les pénétrations mutuelles harmoniques.

Les plan-types complexes dans le domaine des couleurs ont un caractère de longue durée, qui ne surveille pas les tendances momentannées dans le domaine de la couleur, mais qui constitue un essai de construction propre de l'expression esthétique, dirigeant la production et la consommation d'une manière pour autant élastique, qu'il puisse subvenir aux subordinations variables technologiques, avant tout quant aux possibilités de fourniture des colorants par l'industrie.

La division des couleurs dans les diverses zones du logement tient compte du fait que, si dans le cas de l'espace habitable la couleur du recouvrement sol a un caractère de fond pour l'équipement mobile individuel mobile et de perception permanente, dans le cas de l'espace domestique, on a le droit de traiter la couleur plus intensivement.

Le système des couleurs a tendance aux liaisons lisibles en groupes de couleurs chaudes et froides, dont le taux de pourcent pour les recommandations de production est

différencié en fonction de la préférence marquée des utilisateurs.

L'inscription de coloris du système, du fait de la possibilité variée de traiter les couleurs dans le logement, tient compte de la fonction de la couleur comme élément d'intégration ou de séparation des diverses zones, ou même comme facteur d'ennoblissement de l'expression. Le problème fut étudié et analysé sur l'exemple de logements types dans l'habitat multifamilles.

L'étude sur le choix des couleurs était basé sur le système fondamental respectif qui fut réalisé par l'Institut intitulé "Planche de couleurs pour la construction et l'intérieur des logements", comportant des paramètres métrologiques étudiés selon le système international ITE et Leb, soumis aux conceptions générales d'apparition des couleurs dans l'habitat. Le système de coordination des couleurs comporte cinq gammes de couleurs égales.

Quatre jeux de couleurs à dépendances neutre aux gammes de couleurs reconnues comme essentielles, c'est-à-dire, 1-verte, 2-jaune, 3-rouge, 4-bleue et le jeu de couleurs présentant des caractéristiques de neutralité, c'est-à-dire le classique de gamme neutre, constitue l'ensemble. Chacune des gammes comporte 10 couleurs qui y font part d'une manière equivalente. Le choix des couleurs à fort accent de différences de valeure et de saturation de teinte souligne leurs utilités aux éléments de zones habitables diverses. Les couleurs contenues dans cinq gammes constituent la règle pour la production industrielle, par contre dans l'une d'elles - la neutre, on y trouve les couleurs prévues aux éléments de l'équipement d'investition.

Dans chaque gamme on a défini les couleurs pour les

divers matériaux de finissage et pour les articles de l'équipement immobilier, tenant compte de leurs détails, application et possibilités technologiques.

Ces règles furent mises en oeuvre en 1980 dans les ateliers de production de produits finis ainsi que chez les producteurs de peintures, vernis et pigments par leurs institutions principales et de coordination ainsi que par les centres de recherches scientifiques.

L'Institut, par le fait de son rôle de coordinateur dans le domaine des éléments faisants partie de l'équipement des logements, est un facteur de commande des entreprises de l'industrie dans ce domaine. Dans les années les plus proches, du fait des difficultés économiques survenues, la mise en oeuvre des "Règles-IEI 1980" sera réalisée dans une portée transformée limitée à bon escient, commandée de manière à constituer un amendement de l'état actuel.

Actuellement l'Institut propose la réalisation, avant tout de la gamme neutre qui remplit les exigences de l'habitat multifamilles, et celles des utilisateurs individuels. Cette gamme constitue le fond effectif pour les couleurs des autres gammes. Il sera essentiel que lors de l'accession à la production stabilisée et à la sortie graduelle de la crise, la production des matériaux de finissage et d'éléments d'équipement se fasse sur la base des règles du système IEI. Les prémisses de compositions régulières de coloris dans les intérieurs habitables, qui furent le matériel de base pour la construction du système, devraient être présentées aux utilisateurs potentiels pour mener un sondage d'acceptation sociale. L'Institut d'Esthétique Industrielle est en voie de réalisation de cette thèse sur la base de

coopération avec la construction d'habitat. Dans la phase initiale le sondage visera des logements dans un nouvel immeuble en fin de construction du nouveau quartier dit Uraynèv, équipé en matériaux à coloris neutres destinés à la construction d'investition.

Un autre domaine important d'activité de l'Institut d'Esthétique Industrielle - c'est la transmission du savoir faire sur le thème de la culture de l'intérieur habitable, sur les règles qu'elle subit, sur les principes de transformation régulière. A cet effet, l'Institut organise cycliquement des expositions (dans ses propres salles d'exposition) portants sur les expositions locales et étrangères, avec des cours et consultations y attenants. De même la formation consciente du choix régulier des éléments d'équipement y trouve son reflet dans le traité commercial à branches multiples postlié depuis de nombreuses années par l'Institut. Un tel traité basé sur le rassemblement en un espace commun de tous ce qui porte sur l'équipement des intérieurs engendre un contact visuel, qui permettre au client même novice, de faire un choix aisé conscient. Ce choix dirigé par des conseils professionnels solides est le moyen le plus simple, le plus populaire de transmission du savoir sur le thème de la culture de l'environnement le plus proche de l'homme que constitue l'intérieur de chacun de nos logements.

La coordination de la couleur des intérieurs de logements est un des facteurs importants de formation de la culture matérielle de l'environnement de l'homme, mais elle n'épuise pas la totalité du problème. D'après l'expérience des travaux conduits jusqu'à présent il découle indéniablement que l'introduction rigoureuse de nouvis-

sion du coloris de la zone choisie qui constitue, par exemple, le logement - confirme la thèse de justesse et d'indispensabilité de ces activités dans d'autres domaines. Les travaux de l'Institut sur ce thème conduit jusqu'à présent quant à la couleur des éléments de l'environnement le plus proche de l'homme relatifs aux intérieurs habitables pris de manière complexe seront systématiquement élargis.

L'Institut aspire à la formation d'une base théorique qui serait le fondement méthodologique de réalisation de toutes études du domaine de la coordination de la couleur dans les autres sphères d'activité humaine telles que: le travail, l'enseignement, la santé, la culture, la récréation, la communication, les services. Cela conduire à la création de bases méthodologiques à la coordination générale systématique de la couleur dans toute la sphère de production industrielle et à la formation des divers milieux de vie et d'activité sociale.

PROBLEMS OF HOUSING ESTATE ENVIRONMENT AND COLOUR-DYNAMICAL PLANNING

Cs. Klausz

It would be an error to speak of the human, psychological and sociological problems of housing estates, and, in close connection with these, of the town-planning, architectural and colour-dynamical problems of housing estates if we did not make it clear first of all that rapid urbanisation, including mass-housing, is a social and developmental necessity of our age. Thus the question is not whether we should plan and build housing estates or not, but how we should do this on the basis of available experience and with the use of what means.

There are not many themes of town-planning and architecture which should have concerned public opinion so intensely during the last decade – public interest ranged from the people living in housing estates, from the planning and executing professionals, up to the representatives of the authorities determining, financing and approving housing projects. The manner of planning and building housing estates may now certainly be regarded a public affair since there is hardly any public broadcast or telecast report, discussion or analysis which - starting from whatever human environment - should not arrive in some way, after a few steps, at the complex problem of housing estates, should not condemn them from some point of view.

It would be an interesting and very useful effort to elaborate by theses and themes the literature and the debate topics dealing with the problems and, naturally, with the advantages

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of housing estates; including especially the analysis and elaboration of studies dealing with the correlation between housing estates and applications of colouration. There is no possibility of doing this here, of course. Hence we can stress here only a few essential subjects for indicating the importance of these problems, and - I tell you frankly - first of all those which gave and still give cause to numerous misunderstandings in public opinion and also within the profession in connection with colour-dynamical planning and the application possibilities of colours.

While bringing up the subject-matters I try to present both home and foreign examples for indicating that this problem had by now assumed international proportions. The different, fundamental problems are practically the same everywhere.

The first and perhaps most comprehensive problem is that for the people of our days the notion of a "town" means clearly a row of streets and squares where people are walking about, do shopping, have a good time, take a rest and where the "town-experience" unfolds from renewed sights, from the protective impression of squares. The atmosphere of our towns is different, depending on the age, place and style of the town, on the magnitude and intensity of architectural interventions made in the course of their growth; but this atmosphere is conveyed not only through the impression made by streets and squares, it is produced also by the form and plasticity of the buildings and groups of buildings constituting them.

Actual streets and squares taken in the traditional sense have vanished from our housing estates, also as a result of pertinent regulations; they have given place to spacious plains that can no longer be apperceived as squares, to green areas replacing asphalted sidewalks and drive-ways, but all these serve quite different functions of everyday life.

The case is similar with the formal variety of buildings. The points of orientation - and therefore also the differences

of form and mass offering the sense of security - are replaced at housing estates by the effects of uniformity and monotony.

Acknowledging and understanding the engineering, technological and economic causes of all this, we nevertheless must conclude that we may speak of a "town-experience", of an "urban effect" in the case of our housing estates to a very small extent only if at all. This is one of the most essential deficiencies and the source and causative factor of many other problems often mentioned in connection with housing estates.

The unfavourable proportions and siting of trading, servicing, catering and educational establishments within housing estates may lead to a similarly fundamental problem. This unfavourable proportion and distribution of town-planning exists even in the case of housing estates where the number and capacity of the aforesaid establishments is sufficient or adequate in respect of function.

These two illustrations show the functional construction scheme of the housing estate at Ujkert in the town of Debrecen, as well as the facade proportions, i.e. spatial balance relations of the buildings of different function. The size of the circles and squares of the settlement scheme, as well as the size of the shaded surfaces plotted on the logarithmic scale of the graph show that the "spatial magnitude" of the functionally necessary or adequate communal establishments is by no means sufficient for producing the overall effect of a "town-experience" in that housing estate. This problem is further aggravated by the spatial detachment of the servicing buildings at our housing estates.

The absence of streets and squares evoking the town-experience, the urban effect, the formal, plastic monotony and identity of the buildings making up the housing estate, the disproportionately low environmental role and territorial

separation of the servicing establishments give rise jointly to the most often discussed problems of housing estates, namely the absence of adequate possibilities for orientation which is the basis of the feeling of security.

All this, needless to say, may become the source of numerous psychological and sociological problems, but, in the last analysis, this also contributes to the missing of the "town-experience". It is in this way that the housing estate becomes the basis of an intermediate environmental experience between the town in the traditional sense and the garden-suburb; but quite a lot of people, be they dwellers, planners or builders of housing estates, cannot, or can hardly, accept them, feel them their own no matter if they already exist or are still on the drawing desk.

The intention to solve the most fundamental problems of housing estates have led - besides many other factors - the public and the profession alike to the requirement of applying environmental colours, to the introduction of colour-dynamical planning.

Yet this "introduction" is itself already calls our attention to two erroneous views:

- The first is this: In the course of planning a human environment of any scale, magnitude and function the town-planning, architectural materials, structures, forms and their colours must be planned jointly, simultaneously, in their interactions, and not subsequently as an addition. (But what happens in practice as a rule is this: the plans of an environment with a given function are completed after which the pertinent colours were selected depending on the possibilities thus created.)
- The second is this: Colour is one of the architectural means of shaping environment and often depends in this respect on the employed materials, forms, structures and other architectural elements. Hence the effects to be produced by them

depend on the effects of the other architectural means and elements. Thus it is a mere illusion to expect that the primary, fundamental town-planning or architectural mistakes or the unfavourable effects caused by them could be corrected solely with a purposeful application of colour. The unfavourable, complex environmental impression of a housing estate of unfavourable location, with monotonous, unvaried buildings, with a functionally poor structure, cannot be changed merely with an appropriate application of colours to such an extent that the otherwise desirable, expected favourable effect should come about. Given the aforesaid and enumerated attitude of planning only a reduction of unfavourable effects can be expected.

Neglection of the fact that accented colours and changes of colours must be applied only where this is justified architecturally and functionally have likewise resulted in numerous mistaken interpretations and, consequently, in a number of solutions of doubtful value.

All this can be formulated also as follows: colours, changes of colours, must always indicate functional, town-planning and architectural changes; they cannot be made independent of them since colours carry information in every case through their associational contents, their psycho-physiological effect. The space-, form-, and mass-modifying effects of colours can be applied only in accordance with the particular features of buildings, groups of buildings. Colour applications departing from this produce the effect of an extra, are architectural. We find numerous examples of this in our environment, and these are usually intended for making up with colours the lack of architectural space-forming effects, but this is unsuccessful as a rule.

In connection with the subject-matter raised here I should like to call your attention to one more fundamental correlation.

Colours and combinations of colours always contain an informative effect through their popularity, through their faculty of producing association, atmosphere and harmony. In choosing them we must therefore always aim at employing these informative contents in the shaping of our environment, but only in accordance with the informative requirements of town-planning and architecture.

The circumstance that our environment had turned grey some 10-15 years ago produced a reaction: it is the "delight in colours". It was aimed at making our environment colourful, helped with many a positive and negative experience in clarifying the relationship of colour dynamics and architecture, and of the rules emphasised here. The fact that our environments are for the most part more colourful than the former, but their general impression is unfavourable all the same, resulted, and still result, from the neglection or misinterpretation of the aforesaid rules. This applies especially to environments which give rise - over and above the application of colour, or independent of it - to a number of problems, this is the case also with housing estates.

All we have said and presented here was only intended for calling your attention to the fact that

- it is only part of the problems connected with our housing estates that can be lessened with a purposeful application of colours, and, even so, only in close connexion with changing settlement, town-planning and architectural solutions, and by no means independently of them;
- it cannot be expected to solve these problems of our housing estates merely by a purposeful or occasional application of colours without changing suitably the principles, solutions and rules employed so far in the practice of the other professional fields producing housing estates.

Emphasising this correlation formulated from two aspects is necessary because not only the public, but also quite a number of experts believe in the contrary which is evidenced by numerous housing estates of unfavourable impression.

S. Patwardhan

Introduction

The basic elements of design in the visual arts, painting, sculpture and architecture have traditionally been line, form and colour. Painting has always been most initially associated with colour, sculpture with form and architecture with line /1/. However, these divisions overlap. With the modern study of colour science in different fields, in addition to the aesthetic aspect of colour, functional use of colour in all walks of life has become a part and parcel of our every day life. Colour in architecture is not an exception to it. Colour, in combination with form and line with both in the exterior as well as in the interior of the buildings and town planning, has made our environment more lively and colourful.

What is "Colour" in Architecture?

Colour vision is a dynamic process, /2/. Colour perception is a complex phenomenon which involves physical quality of light source, chemical composition of the object, physiological response of the eye and the brain and the psychological interpretation by the observer or in other words we can analyse, Light - is the source of colour
Object - is the cause of colour
Observer - is the recepter or interpreter of colour.

Colour in architecture further involves the role of illumination on the appearance of colour, the effect of physiological and psychological aspects of colour on health and

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productivity, the symbolic use of colour for safety in the structure of industrial architecture, the effect of climatic conditions on the building material, the illumination and the acoustics affected by the interior material, the purpose of use after completing the building, the persons of what type and nature are going to use the structure. In one way these things complicate the planning of architecture and in the other way, give wide scope and challanging job to the young architect for the selection of the building material and arranging it in the most useful but at the same time, pleasant, colourful and appealing way both in the interior and exterior of the architecture.

The History of Colour in Architecture of India

The history of colour in architecture is closely allied to its use in sculpture and painting all over the world. Although there are many different peoples and many different climates in India, religion seems to have overcome these differences and to have determined Indias architecture /3/. Coloured architecture in India was flourished in pre-historic and historic times in the form of temples of God, monasteries - the places of meditation, stupas and stambhas - the monuments of victories - by Hindu, Buddha and Jain, mosques and tombs - by Islamic, Churches - by English, French and Dutch - ruling forces in India from time to time. After renaissance - construction of beautiful palaces all over India is one of the glories of the Indian colourful architecture.

The earliest Indian monuments known are a series of brick ruins recently unearthed in the Indus valley, so called Indus valley civilisation - c3000 to 1500 B.C. /4/. This brick and clay era was further modified to the more stable structure of "Stone" in Buddhist period. The embryo of the most powerful architectural form of Buddhism, the famous stupa - with all, plan, elevation, section and total form derived from circle emerged under the architectural patronage

of Ashoka. This was further extended to Stambhas - at Sarnath, Caves - at Ajanta, Chaityas and Viharas - at Sanchi. Few of the structures are found to be influenced by Roman and Greek Shrine - the double headed eagle - grid of pilasters of Roman composite style at Taxila. The Mahayana Buddhists lavished their wealth on the proven media of rock-cut cave architecture. Apart from carving the traditional sun windows over the main entrances and fascimilies of bamboo gable arches over the doors to the cells, the artist of the Gupta period now proceeded to adorn the walls of the viharas with the world famous "Frescoes of Ajanta" in Tempera Style. To achieve the effect the artist's first step was to cover the rough surface of the exposed stone with a layer of clay and cow-dung mixed with chopped straw and rice husk or animal hair, finished with fine coat of gypsum. The basic design was outlined in red ochre, and coted with transparent monochrome. Then with colours made from natural dyes he depicted elaborate schemes of Kings and queens, soldiers and courtesans, monks and merchants, travellers on horse back, and palanquins, in palaces and houses, gardens and forests set in the flora and fauna of Western India. These frescoes are another example of how the Indian artist with his sharp eye for detail provided living images of social life in ancient India.

Sixty miles away from Ajanta are situated the famous series of caves at Ellora - the Buddhist, Hindu, and Jain architecture. The Kailasa temple is a living rock replica of a structural form larger than could ever have been carved through the stone masonry technology of the 8th century. The sculptures on the plinth were at one time coated with a thin layer of polychromed plaster.

It would seem that the Jain community from Gujarat and Rajasthan was based entirely on commercial trade. While Hindus had been content to build with the local goldern brown sandstone, the Jain had chosen the finest pure white marble as their chief building material. The exquisite ceiling and mandapa of

the Dilwara wherein a hard and adamant stone like marble is made to reproduce the fragility of snow flakes. The number of Gopurams in South India, at Madura, Tirupati, Rameshwaram, Trivendrum are mainly stone structures plastered and painted with polychromatic colours. Few of them are coated with golden plates and shine with bright golden colour in sun light.

In about the year 1001, the Muhammadans had invaded India, by 1526 they had established the Mughal empire and this was the ruling force in mainly Northern India /5/, until the English, Dutch and French arrived in 17th Century. Taj Mahal, one of the wonders of the world - which is built of white Makrana marble inlaid with precious stones in floral patterns, permit us to see the exquisite use of colour by the artisans of this land. Similar patterns are observed in Delhi and Agra. The use of red stone in building huge architectural structure is found in Red Fort at Delhi, Agra fort at Agra, Bulandgate at Sikri etc. The predominance of red colour in the construction of Hawamahal - the palace of wind and in the town planning of Jaipur - resulted in calling it as a "Pink City".

Use of plain and painted mirrors, coloured glasses, carving on the teak wood, decors in ivory, polished ceramic tiles, metal coating of silver and gold is ample in the interior decoration of palaces at Jaipur, Jodhpur, Baroda, Gwalior, Mysore, Kashmir, Indor, Kolhapur etc.

Weaving was one of the most important crafts in India. The textiles for bedspreads, wall hangings, floorings, curtains and other furnishings, painted by hand or by batic technique are being used for interior decoration till today. Brilliant colours were often used in the arts of India as well as in its architecture. However, it should be kept in mind as Hermann Phleps says /7/ - "We are today inclined to judge the original appearance of ancient buildings from the impression they make upon us now after centuries of use. However, one should imagine what they must have looked like at

the time of their construction. Antique temples were then shining with the brightness of their motley robes".

The present picture of colour in architecture of India is a good blend of western and indigenous style, a good combination of natural and manmade material and is based on various colour combination styles. The construction of Council Hall, at Bombay, sky-blue colouring of revolving restaurant of Sea-Rock Hotel, Bombay, use of rich golden and maroon decoration at the Crystal Hall of Taj Mahal Hotel, Bombay, a beautiful carving of the Sandalwood door at Bangalore, multicoloured decor of Nehru Science Centre at Bombay, Vivekanand Memorial at Kanyakumari, beautiful wooden House boats in Dal Lake at Kashmir, Gulden Temple of Amritsar, Birla Temple and Kutub Minar at Delhi, palaces at various places, are some of the pieces of colourful architecture of the 20th century in India.

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W. Auschner

Anwendung von Farbe in Altbaugebieten:
Ausgehend von dem Zustand der Altbauwohngebiete, der Entwicklung und früheren Gestaltung des 18. und 19. Jahrhunderts.
Die Gewohnheiten eines alten Kietzes und deren Nutzung durch die Bevölkerung.
Untersuchungen zur Neugestaltung der Altbau-Wohngebiete mit Farbe, zeichnerischen Darstellungen, Einfangen der Details und ihre Darstellung bis zur Anwendung.

Praktische Erfahrungen bei der Anwendung:
Die bisherige komplexe Gestaltung von Altbau-Wohngebieten bei ungenügender Berücksichtigung des Wohnmilieus durch Abhacken alter Ornamentik und der Gestaltung mit Farbe und Malerei.
Einbeziehung der Neubaugebiete in die Modernisierung, Darstellung der Neubauten durch Gestaltung der Umwelt [illegible].
Anwendung der Farbanstriche und Mittel unter Verwendung historischer Farbwerte, für die Entwicklung städtebaulicher Ensemble unter Einbeziehung der Ornamente.
Gestaltung alter Fassaden mit vorgefertigten Stuckelementen im alten Stil.

Anwendung von industriell hergestellten Architektur- und Schmuckelementen:
Gestaltung von Altbauten im alten Stil mit neuen Elementen.
Dabei wird davon ausgegangen, dass eine Anwendung von Katalog-

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elementen schon vor 150 Jahren stattfand. Die Schaffung von alten Fassaden entsprach alter Prunkfassaden, die das Wohnmilieu des Kietzes bestimmten.
Eingehend auf die Gestaltung, die Vorfertigung und Montage von Architektur- und Schmuckelementen am Beispiel von Dias dargestellt.
Deren rationelle Anwendung bei Altbauten und der denkmalspflegerischen Gebäude, dabei eingehend auf die Kosteneinsparung und Bauzeitverkürzung.

SYSTEMATIC PLANNING OF COLOURS AND MATERIALS IN THE OLD PEOPLE'S HOME IN SEUZACH/WINTERTHUR CH

W. Spillmann

The following report gives insight into a fruitful co-operation of an architect with a colour consultant. This collaboration started earlier than usual, immediately after the architectural competition.

Stages of Colour Design

The process consists of three main stages:

1. Conception
2. Detail Planning
3. Realization

Colour and Material Conception

After investigating the psychological state of the prospective inhabitants and after coming to an understanding of their emotional needs which arise from their particular situation in life, we tried to draw conclusions concerning the choice of colour and material. At this stage of planning a study was carried out on the possible use of wall-to-wall carpeting in the sick bay. This study was based on several publications, on the contact with various hygienic institutes of universities and on the practical experience of head physicians and hospital staff.

On this basis a conception was developed concerning the use of colour and material in the main areas of the building.

Detail Planning: Real Material and Colour Choice

The real material and colour planning including floor cover-

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ing and wall tiles, upholstering materials, curtains etc. took place while the architectural and technical planning was still going on. In the following pictures it will be shown that many of the significant colour impressions don't arise from painted elements, but come out of the collections of various building materials.

Realization

The decisions taken during the detail planning were kept in a register for material and colour samples and in a collection of pages describing the use of them in every room, a most suitable means of work for the foreman during the realization of the building. The explained method on the colour and material planning permits a well formulated general conception, within this framework a good co-ordination of the various decisions concerning the real material and colour choice and a serious time scheduling for the realization procedure. These advantages are of great importance when working on a more complex building project.

Significance and Aims of a Considered Colour and Material Choice

Walter Gropius, one of the pioneers of modern architecture writes: "Functionalism isn't just rational procedure, but it also concerns the psychological problems. We thought that the design should "function" in the physical and the psychological sense. We were convinced that emotional needs were as essential as practical ones and that they demand fulfilment as well."

Colours and building materials of the architectural environment are closely related to human feelings. For this reason they are taken into consideration when deciding upon their use in a home for old people.

Situation of Old People in a Home

One should try to imagine the situation of somebody who has to move into an old people's home. He has to quit his f-

iliar surroundings and rooms, several dear objects, and last but not least his acquaintances. It is understandable that the mere thought of this upheaval brings forth a certain feeling of threatening uprooting. He knows that sooner or later he will be dependant on alien help and he often fears that he will be at the mercy of strange people. To sum up, a strong feeling of insecurity creeps over him and he wants to settle down in a new place where he won't be simply administered. He wishes to feel safe there, to have his peace but also to be active in some way and have the chance of getting to know people and making new friends.

In a few words, the emotional needs of the people in a home can be depicted as follows; according to findings in colour psychology the colours below can be derived:

Major problem: Emotional security in life	
consolidation of human relation	ochre
taking roots in the new place	brown
Minor needs:	
stimulating movement	yellowish orange
getting into contact	orange
vital stimulation	reddish orange
relaxation, calmness, contentment	blue

The task of the colour design is to modify these colours so they can be integrated in the specific building structure and fit the building into the landscape.

Colour Design of the Main Parts of the Building

Outer Parts
(facade)
The outer part of the building gives the first and lasting impression. The home for old people shouldn't look like a jail, but like the place of an anchorage where new contacts can be made and acquaintances can be kept. The colour combination ochre/brown set in the green of the vegetation gives this impression. The varied colour combination originating

from the earth colours contrasts well with the surroundings of meadows and trees.

Private Area
(pensioners' rooms)
The living room is the place where one retreats to privacy. The colour combination brown/beige/blue creates a peaceful atmosphere and a neutral frame for individual arrangement of furniture according to personal taste. Each moving is for the aged a traumatic experience. It is therefore of great importance that at least parts of the accustomed surroundings such as single pieces of furniture, bed covers etc. can be taken along to the home.

Movement Area
(corridors)
The dominating yellowish orange encourages movement and the non-slippery floor covering helps to realise it.
The carpet stripes in contrasting colours accompany the handrail. The sequence of hues reddish blue - blue - bluish green - green - yellowish green - yellow is used to mark each of the several floors. Seating accommodation in brown, matching with blue curtains, point to the quiet corner of the seating area. The brown doors of the rooms depict a firmly closed space and in this way they mark the desired separation between the partly public space and the private one.

Place of Contact
(foyer)
This place conveys the impression of a cheerful atmosphere. The wood panels on the ceiling sustain the feeling of safety and - together with the floor covering and the moss green seating accommodation - invite one to linger. The dominating dimmed orange in variations encourages the making of contacts and the starting of conversation between guests and the other inhabitants. The chosen room colours make the view of the landscape appear more effective.

Place of Social Gathering

(cafeteria, dining-hall)

The room sequence living room - corridor - foyer leads to the cafeteria and the dining-hall.

The main colour combination in modifications of the reddish orange hue is to be seen in the transparently coloured wood ceiling, in the floor carpet and in the upholstering of the chairs in the cafeteria.

The colours vary up to the red-purple seen on the textile wall-hangings. The dimmed colours of the floor and the seating accommodation in the dining-hall invite the inhabitants to seat themselves comfortably at table.

Private Area

(sick bay rooms)

In the old people's home there is also a sick bay for the chronically ill inhabitants.

Moving into the sick bay is for the affected person another traumatic experience. This moving ought not to be rendered more difficult by insensitive room design in the sick bay. The interior design of the sick bay was deliberately treated as far as possible in the same way as the private rooms in the home in order to avoid the well-known hospital atmosphere.

The main perception area is for the chronically ill the room ceiling. It is painted in a calm light blue colour and so the patient isn't left out in the void of white. The ill who are bound to stay in bed have to forego the daily pleasure of going to the foyer and the dining-hall. That's the reason why we used the sunny yellow curtain of the foyer in the sick bay rooms, too, in order to realise a vivid contrast.

Analysis and Colour Set

Colours in architecture shouldn't only have relation to the inhabitants of the building, but they should also match upon other. The derivation of the main colours shows that the colour choice is related to the needs of the inhabitants and

the chart of the colour set clarifies the interrelation of the used colours.

Fundamental Intention of the Colour Design

Human life hovers to and fro between two complementary states, the one of calmness and relaxation and the other of excitement and activity. Man needs privacy but interaction as well.

Reviewing, the main areas can be described as follows:

outer parts	consolidation, taking roots (ochre, brown)
pensioners' rooms	quietness, relaxation (brown, beige, blue)
corridors	movement (yellowish orange)
foyer	animating contact (orange)
cafeteria, dining hall	vital stimulation (reddish orange)

Especially great importance was attached to a rich variation of room atmosphere and the keeping of the necessary continuity with the help of the materials, as most of the inhabitants spend the whole day within the building.

Naturally the conception shown here isn't the only possibility for an old people's home. But important seems to me, that in any case a deep consideration must be taken of the inhabitants' needs.

Final Note

In order to reach an optimum solution a collaboration of the architect with a colour consultant has to start very early. At the latest, this contact should begin immediately after the completion of the building project, at any rate before the treatment of the architectural and technical details.

For, the earlier the space-modifying design means (material and colour) are regarded, the better chances there are that these don't appear to be a cosmetic make-up put on the building, but that they rather are integral elements of the structure.

F. Callmayer

The turn-of-the-century housing estates exhibited monotony, depressive building order, lack of space and constriction, an inconspicuous surrounding which well-nigh suppressed human presence.

The monotony of mass-produced building products brought about a boring lack of sophistication, and it is far from easy to create a humane environment by means of industrialized technology in this context.

It is the declared goal of architecture to create humane environment in terms of technological requirements, but its means are restricted.

To build a school is one of the most sacred responsibilities taking an architect's consciousness. It calls for producing a new, idiosynchratic, distinctive and distinguishable world in the image of, and according to, children's expectations.

Under distinctness and idiosynchrasy I mean a selection of possible means for a quest of identity which will result in the emergence of a property nexus between a created world and the type of personality conjured up by me.
There develops a property nexus between the school and myself if I can speak of it as do those two children from the housing estates one of whom made his way to the "Iliac" school, while the other made for the one called "The White Whale".

Colours play and admittedly great role in the quest for identity. But not all by themselves, let alone exclusively. The indiscriminate colouring of utility buildings is a dangerous game to play because an expressive colour of to-day may give way after fading to another, perhaps quite tasteless colour of to-morrow with its message altered and out of date.

Ferenc Callmayer, Institute of Planning Development and Standard Design, Budapest, Hungary

I believe in another way of seeking identity which has, to my mind, much closer affinity to architecture: I look for and bring together the form and colour of natural materials with due regard to the fact that a building is an integral part of the enormous environmental system called NATURE. I strive to detect and imitate the interrelation between Nature and colours.

Therefore I believe in the white colour which incorporates every other colour and I should like to invoke the other colours therefrom or to leave it to chance whether the other colours are actuated or not.

I consider the white colour to be a neutral background, a sharp frame to an actuated forefront in which the colour is exposed on the elevated level of experience.

Over the period of more than a decade, we have erected numerous schools using standardized design and a light-structure building system. Although we must of necessity take into consideration the limitations of the building system, it is precisely these limitations that actuate the identity-forming guidelines.

The façade is the first surface to establish a direct rapport with the environment, at times clashing with it and conveying a message through a positive-negative form. The natural materials, i.e. gravel and breakstone, are the best and the most practical for application with façade surfaces. Running the length of the whole surface in their structural whiteness, the windows final in, or interrupt, this continuity of surface.

The erected rigidity of the building strains in sharp contrast with the nature's languidity. The magic force of impact a created environment conveys lies in the contrast between animate and inanimate matter. The environment stands not only for a definer of architectural design, but also for its demarcator. The task is to find the kind of building best meshing with the surrounding. The future belongs to a created symbiosis between architecture and the environment.

Buildings surrounded by plants do not call for any additional colouring because it is not impossible to achieve harmony by means of monochromy. The colour-changing nature combined with a stable unchanging building produce a multi-coloured effect, and the miraculous effect is inherent in the architecture's creative technique.

The interior and the exterior of our school buildings are brought into harmony with their environment, this conscientious exercise spanning a bridge between the built-in space and our surroundings.

This is the corner-stone of our architectural philosophy, and therefore we consider only such basic systems of design as dispense with natural ventilation and lighting in full conformity with the preceding exposition. The interior of our buildings is a sterile white. It is here that out of a neutral sterility colours must emerge with elegance; it is a visiting card handed over upon making an acquaintance which helps to discern the individuality of our mass-produced buildings. Form and colour should never break asunder, and the natural materials with their natural colours are a means of producing a versi-coloured effect.

The mass-production of schools is somewhat similar to the auto- or airplane production lines. The designs have grown serial out of individual well-proved drafts compelled by an architectural demand for quality and quantity. Our projects are not utility designs but "products" of an open-ended design system.

The buildings include schools, kindergartens and nurseries. They are mostly built in Hungary's Transdanubian towns and communities amid changing geographical conditions.

The designing technology worked out parallelly with utility projects is aimed at devising a means of satisfying human needs and at instilling the joy of creation to the architect through the open-endedness of creative process.

With the school /or kindergarten/ buildings broken down into their functional units, project drafting became a kind of large-as-life game of build-

ing blocks, whereas the use of conventional materials and colours intensified the variegation of composition.

In their entirety, our buildings are pedagogical means and the carriers of environmental culture.
Our endeavours were unambiguous: the school's functional spaces raise the effectiveness of teaching, therefore we created in a number of cases multi-purpose spaces so as to improve the utilization of industrial premises.

The open adjacency, the interrelationship of spaces and the increasing demand for openness in schools require a humane milieu in terms of school space.

Inculcation of architects' intentions necessitates the establishment of new forms of relationships with the buildings' operators.

It is common Hungarian practice that operators of the buildings lay eyes on the building for the first time when they move in, hence they have no say in how the building is designed. To overcome this contradiction, the so-called "down-to-earth" directions for use were introduced in order to promulgate architectural awareness.

In this context, we have disseminated knowledge of school design principles with the help of slides aquainting the educators with our intentions of improving school buildings and expanding the possibilities of making full use of school space. Concurrently, we wished to encourage the operators of school buildings to develop ways of how to put the finishing touches to schools and how to make them reflect an individuality all their own.

A dangerous spirit has been set free from the bottle. We know full well how many buildings suffered from the deteriorating influence of bad operation. However, the results were good because

- The public space was put to multi-purpose use,

- Children's activity could be employed to improve school space,

- The educators promoted the community-shaping influence of the contribution,

- The children's active contribution helped them to become good managers of their environment,

- The basic colours used by the architects determined the colour harmony of objects, and they also enriched the school atmosphere.

The common "building game" and "colouring" brought the architects and the educators closer together, and the critical comments encouraged by evolving friendships contributed to the constant improvement of space. Playfully, the school building operators have come up with new ideas for improving the premises without the tortuous beaurocratic impediments.

We have come to realize that our buildings are not to become technological masterpieces, much rather they should appeal to the children's souls. A call for more light and air reflects a genuine necessity, co-existence with the Nature is an urgent demand, and the bare spaces compelling self-realization are in much closer touch with human nature than the awe-inspiring and overwhelming architecture of schools.

And in attaining this noble goal, the colours appeal to our sense of beauty both in the Nature and in architecture.

COLOURED MATERIALS FOR HOUSING ESTATES

M. Földvári

The building of housing estates on the base of the guiding principle "much and quickly" wants to meet first of all the quantitative requirements but due to the technical and economic restrictions it is accompanied by sociological, psychological stresses and aesthetical problems.

The small number of buildings of different functions as well as the collective of buildings of identical height, proportions, materials and colours being present make an impression of bleakness. Usually also the squares, small streets normally found in old towns are also missing.

Almost all critics towards housing estates object to the view, the townscape appearance. In the following, an investigating the mass flat-building practice used until now will be examined from this aspect. The experiences of applying one of the basic components of the view i.e. that of the colours will be described.

Colours themselves, of course, make the housing estates neither rich in experience nor variegated but the colour is one of the architectural means helping the orientation, stressing emotional points. The primary question, namely that colours be at all used in housing estates (and in general in the built environment) should unambiguously answered by yes.

Further questions to be answered before making the colour-design are: Where and on which materials what colours should be used, taking into consideration the functional arrangement of the estate and function of the individual buildings as well as applied structural systems?

Melinda Földvári, Central Research and Design Institute for Silicate Industry, Budapest, Hungary

The "Order and variety within it" can be considered as a main principle of colour dynamical design and the large available colour gamut helps the assertion of this principle.

Glancing over the practice of erecting housing estates in Hungary the deliberate and consistent applying of colours can rarely be found. The final form of colour designs is in most cases determined by individual taste, moreover, fashion and last but not least by the choice of the scale of colours available. The ratio and size of coloured surfaces is limited by economic prescriptions, too.

The housing estates were in the beginning (early sixties) erected using cast concrete walls or middle block structures: their plastered facades were gray or faint-coloured, being recently over-painted with strong colours (e.g. Miskolc, Gyöngyös).

The products of the house-factories put into operation in the mid sixties are large panels, the outside crust of which can be made with durable surfacing e.g. with colourful stone crushings, pearl gravels or pulverized paints mixed into the cement (e.g. Budapest Kelenföld, Paks).

Due to the increased choice of the facade paints to be applied additionally at the building site as well as to the effect of the public opinion criticizing the obscurity, more and more colourful, moreover, pied housing estate buildings can be seen in the latest years.

The colour designs of large panel dwelling-houses were elaborated with view to different aspects which can be classified according to the size of the coloured areas and the character of the colour-carrying surface.

- Quite frequently the loggias, the side- and dwarf-walls of balconies are coloured with vivid colours while other parts of the facade remain gray. The stressing of these plastic, architecturally pronounced parts by colours, even if it can-

not eliminate the "grayness" of the housing estates, belongs to the "better" methods since it utilizes the informative property of the colours (e.g. Budapest Kőbánya-Újhegy, Békásmegyer).

- A rather disputed principle is the self-standing colouring of the wall-panel as "smallest unit" independantly of its structural function. The thus occuring, accidental patches of colours in the square-slides on the facades of panel houses may cause aesthetic and orientation problems (e.g. Budapest Kispest, Pestlőrinc).

- A good solution is the moderate colour-applying to the building facade. The coloured and grey panel- and loggia-bands; the raw, painted or coated pedestals; the coloured window-frames as well as coloured materials applied besides painting (e.g. wood, glass, ceramics) may make the groups of buildings more cheerful (e.g. Budapest Rózsakert, Szekszárd, Szombathely, Tatabánya).

- There are also instances of colouring the whole surface of panel dwelling-houses. The collective of strong colours of many kinds has an amazing effect and can be tolerated only in relatively small housing estates (e.g. Kaposvár).

- Exceptionally the extreme mixture of colours may also occur - the panels of the same building are painted with several colours and within this with more shades. The colours actually break the view of the building generating a visual disorder.

- Besides painting other materials, coloured in the factory, are also applied on panel dwelling-houses. The side- and dwarf-structures of loggias may be made of in-material coloured glasses, the light passing the coloured glass gives very pleasant effects (e.g. Miskolc).

- In one housing estate in Pécs the panels were coated with glazed pyrogranite. This noble-surface material will probably

give more durable and resistant colours to the building than painting.

- In the Óbuda housing estate the ground level walls of the houses are covered with small mosaic of beautiful colours and texture. Unfortunately these - being steadily in shade, cannot significantly contribute to the overall view of the estate.

Over and above the panel-structure dwelling-houses, those ones erected by tunnel-casting method - although occuring less frequently - are worth to mention. From the aspect discussed in this paper it is of special importance that these structures do not get a final surface but following the building they have to be heat-insulated, coated and painted. The breast, the loggia dwarf-walls are made additionally and often on the base of individual design. Dwelling-houses made with tunnel-casting method, regarding their groundplan, mass, form, details, coating materials and colours are more variegated than the panel ones.

Besides facade-painting several coloured materials may improve the appearance of the buildings, among these the painted steel-structure elements, the in-material coloured glasses and stained wood should be emphasized here (e.g. Zalaegerszeg, Nyíregyháza, Gyöngyös, Eger).

Turning from dwelling-houses to the communal buildings of housing estates it should be pointed out that for the latter ones their function and structural system is determinant when applying colours on them.

The forming and colouring of dwelling-houses is limited due to economic reasons. That is why the communal ones, which are less in number and smaller in mass, can be formed more individually. This is reasonable functionally too, since the business house, school, nursery, surgery, post, servicing house have great turn-over thus their visual emphasizing with colours is very important.

The structural systems of communal buildings in most cases

provide such surfaces and structural elements on which the applying of colours or coloured materials is functionally reasonable too.

- "Borsodvár" is suitable for erecting communal buildings; its prefabricated but plastically formed structural elements afford variegated colouring possibilities (e.g. Miskolc).
- Department store made of reinforced concrete elements giving a closed mass effect and equipped with a contrastily coloured light steel projecting roof: a good example of colour applying corresponding the function and structure (Kaposvár).
- The educational institutions are in almost all Hungarian housing estates the most colourful buildings using many kinds of coloured materials:
- Metals are made decorative with painting or stoved enameling (e.g. Budapest Békásmegyer, Kaposvár);
- In the roof of a nursery in Pécs simple motives were formed of coloured and white glazed tiles - its playfulness meets very well the function of the building;
- The breast-coating of CLASP light-structure nurseries and schools is generally made of tempered glass the gl.. y surface and high colour of which gives a light appearance to these severely formed buildings (e.g. Székesfehérvár);
- The presently produced form of brick, the traditional building material, mostly serves for facading purposes only. In Pécs the wall of a school is decorated with bricks and coloured, glazed tiles placed in brick-module.

Finally, the advantageous properties of the materials having natural or artificial durable colours should be emphasized: their aesthetic advantages lie in the nobler texture, variegated surface quality and more durable colour effect due to which the costs of later maintenance are also smaller.

The additionally applied paints have a larger colour-scale and the possibilities of colour design are also wider but these are less durable.

The harmonising of the colour assortment of the different materials and paints according to colour dynamical points of view would give great help in the further design work; together with other means this would also promote the more pleasant and evocative developing of housing estates.

A NEW REAL-TIME PSEUDOCOLOR-CODING (PCC) DEVICE APPLIED TO COLOUR DYNAMIC DESIGN

P. Greguss

Introduction

In dealing with the program of integrating colours into the environment, difficulties arise from a lack in organization of light, colour and form, rather than of their absence in the environment. Further, in our endeavor to organize light, colour and form, i.e., in a psychophysical colour dynamic design, we are faced with a circular logical problem, too. The light coming to our eye is mainly the product of the reflectance and illuminance but, on one hand, our eye cannot determine reflectance unless the illuminance is uniform, on the other hand, however, the eye cannot determine illuminance unless reflectance is uniform. It is, e.g., a well-known visual phenomenon that objects with high reflectance look lighter than objects with low reflectance, however, depending on the degree of reflectance in the different wave portions of the illuminating spectrum, the object may look reddish if it has a higher reflectance in the long wavelength, and bluish if in the short wavelength. With other words, the sensation of colour is strongly correlated with reflectance when we view the world around us.

A psychophysically sound colour dynamic design requires therefore determination of reflectance, however, ascerting reflectance in any of the familiar ways requires an operation step which eye cannot take: it cannot insert a comparison standard next to the object which it is regarding. Thus, instruments are needed which measure surface radiant energy not

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only point by point or in average, but also which visualize, preferably in real time, the achromatic stimuli of moderate relative luminescence, i.e., gray scale in two dimensions, on which colour dynamic design is partially - if not mainly - based. The scope of this paper is to describe a new system which achieves this goal by displaying lightness from black to white in pseudocolours.

Description of the PCC System

It has long been known that pseudocolour-coding technique greatly facilitates the interpretation of an output, and makes it more accurate, especially, if it is capable of producing colour-coded equidensities, i.e., isocolour lines. Purely photographic methods are not only difficult but also time-consuming techniques, while those based on digital image processing require expensive equipment.

The system we suggest to be used in colour dynamic design was originally developed to pseudocolour-code gray-scale ultrasonic B images used in medical diagnostics, and to display them on the screen of a commercial colour tv set without influencing its original function.

However, with a slight modification of the original design we succeeded to develop a general pseudocolour-coding system which, when placed between the video output of any device producing black-and-white video signals and the input of a colour tv set, not only displays gray scale in colour, but there is also a possibility of measuring the surface of a preselected equal-density, i.e., isocolour, area. We think that this system may be of great help to organise light, colour and form when designing indoor and outdoor architecture.

We started from the practice that the diffuse reflectance characteristics of surfaces are generally evaluated in terms of sensation they produce when they fall upon the eye of a human observer and he is required to judge equality of brightness. However, experience has proven that it is not easy

- and in many cases it is impossible - to judge brightness equalities of large surface areas. So, e.g., if a gray patch on a surface is surrounded by white, and another gray patch by black, then, in the first case the gray area is judged somewhat darker than in the second case. However, if these steps of the gray scale can be arbitrarily correlated to well defined colours, this and similar problems are solved, so, e.g., in the case of our example, yellow is assigned to the gray patch, anywhere when this step of lightness is present, the observer can recognize it correctly, independently whether it is surrounded by white or black or any other shades, since the sensation of yellow is in first approximation independent of the colour of the surrounding.

Using this philosophy our system, as shown in Fig. 1, consists of a black-and-white video camera, the video output of which is connected to the "black box" seen on the top of the colour tv set. This is not the place to discuss how this "black box" works; it is enough to know that the ingoing video signals are transformed into different colour signals according to the more-or-less equal steps of lightness from black to white, and the resulting colour pattern is displayed on the screen of the colour tv set, as shown in Fig. 2.

Since in this report only black-and-white pictures can be shown, the isocolour areas show up as gray levels, depending on the colour sensitivity of the black-and-white photographic film we used to shoot a picture of the screen.

Although it is true that the range of luminance levels to which the human visual system can adapt is in the order of 10^{10} from scotopic threshold to glare limit, however, it cannot operate over such a range <u>simultaneously</u>. The total range of luminous levels it can distinguish simultaneously is rather small. There is always a luminous level below which all stimuli are perceived as indistinguishable black. This means that the gray steps in an image displayed on the

Fig. 1. The real-time pseudocolour-coding (PCC) system when it displays only gray shades.

screen of a tv set do not correspond to the distinguishable luminance depth obtained under conditions of complete adaptation at each luminance level, but rather it is adapted to a mean luminance level. Therefore, our system is designed in such a way that the brightness area called white limit can be moved to match the mean adaptation level.

Another important feature of our system is that isocolour areas can be visualized separately, i.e., one after the other, and the extent of the area occupied by a given colour, i.e., a shade - which, however, is a function of the diffuse re-

Fig. 2. The real-time pseudocolour-coding (PCC) system when it displays the gray shades in colour.

flectance of the surface – is shown on an alpha numeric display. These values can then be used for computerized colour dynamic research and design.

Summary

The scope of this presentation was to call the attention of those involved in colour dynamic research and designing to a new real-time pseudocolour device which is inexpensive, can be used practically with all commercial colour tv sets without influencing their original function, i.e., by pushing a button one can switch over to the black-and-white or colour program, and needs only an inexpensive black-and-white video camera.

SEUILS DIFFERENTIELS DE COULEUR ET PERCEPTION DE L'ESPACE

F. Parra

Rappel de notions de vision des couleurs.
La couleur peut être abordée sous l'aspect d'un triplet d'ensembles:

- Energie électromagnétique et sources
- Objets modulateurs d'énergie
- Récepteur codeur et décodeur d'énergie - L'oeil cerveau.

L'étude de la vision des couleurs doit se ramener d'une façon large à l'étude de ces trois ensembles de valeurs.

1 – L'ensemble des valeurs spectrales énergétiques qui déterminent l'identité de la source;
2 – L'ensemble des valeurs spectrales du facteur de réflexion ou transmission ou luminance
3 – L'ensemble des valeurs spectrales de la fonction V(λ) d'efficacité lumineuse pour l'oeil moyen ou les valeurs spectrales des fonctions colorimétriques de l'oeil.

Les combinaisons longueur d'onde par longueur d'onde de ces paramètres permettent de définir une réponse de l'oeil, de combiner les effets purement physiologiques et psychologiques qui se relient soit à des corrections pour les effets d'induction soit à d'autres facteurs pour les effets d'adaptation.

La construction d'espaces colorimétriques dérive de

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Paris, France

cette analyse et permet d'étudier certains phénomènes tels que les seuils différentiels.

De ceux-ci on déduit non seulement les performances visuelles, mais la nature de la perception de l'espace qui lui est reliée, car la performance transforme l'ensemble continu des tonalités, saturations, clartés en ensembles dénombrables pour une situation donnée.

Ainsi l'étude de la dynamique des couleurs passe par une capacité de la performance visuelle et ce qui est extrêmement riche dans un espace ouvert étant donné le caractère dynamique de la perception différentielle, peut devenir plus stable en milieu fermé comme l'impose l'architecture intérieure. Cela suppose l'intervention d'harmonies très riches pour pallier la monotonie des perceptions ou de solutions plus mobiles ou changeantes.

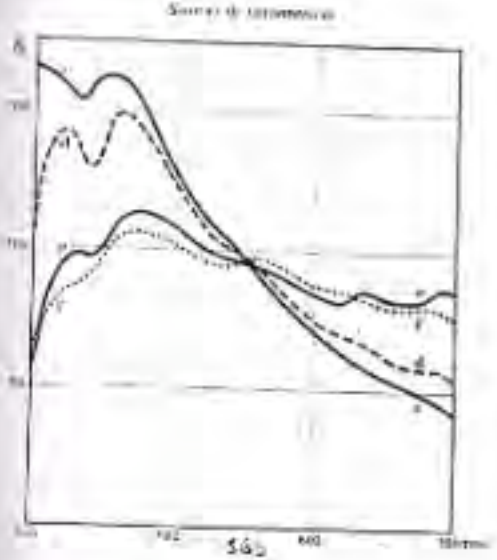

Fig.1

Comparaison des répartitions spectrales de lumières du jour. Toutes les courbes passent par le point 100 correspondant à la longueur d'onde 560 nm

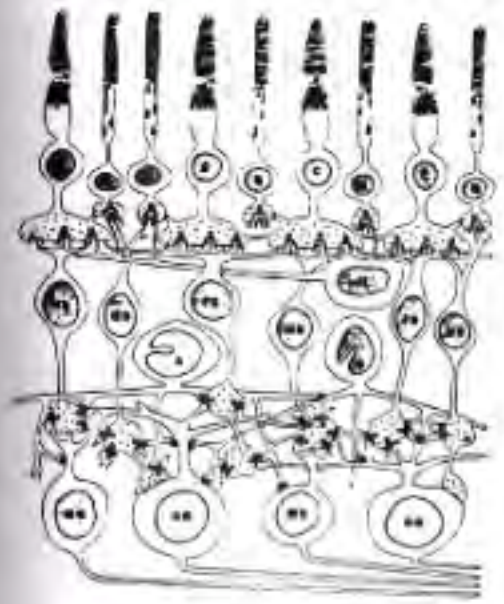

Fig.2

Schéma de la rétine, d'après Dowling et Boycott
(2 1966)

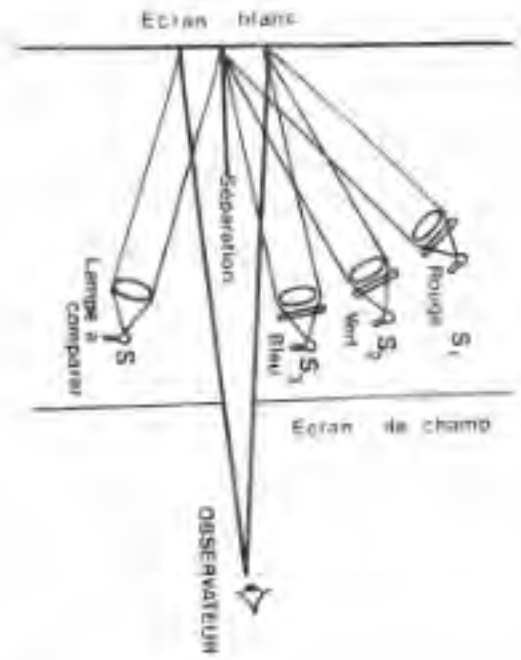

Fig.3

Montage permettant d'obtenir les fonctions colorimétriques de l'oeil
(color mixtures fonctions)

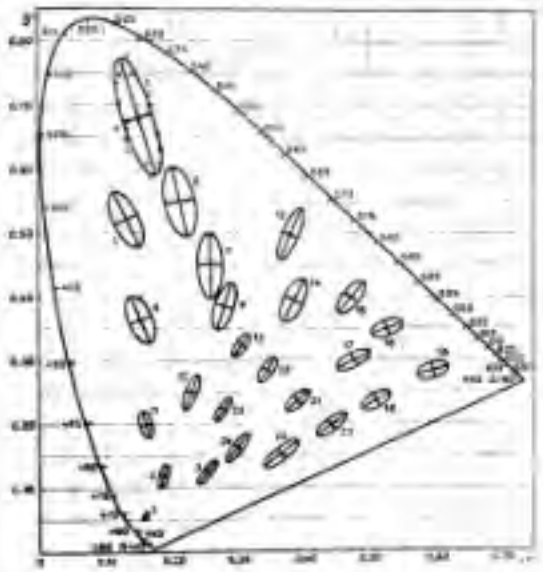

Fig.4

Seuils différentiels selon MacAdam

THE ROLE OF MOVING LIGHT IN CREATING AN ENVIRONMENT

B. Tilles, K. Bodó

A task of ever increasing significance of visual art, in addition to "post festum" reactions, is to intervene in today's, even tomorrow's matters, to participate in shaping men's aesthetic environment. This, however, does not mean aestheticization, but rather establishing the real human scale and the actual place of man within our smaller or broader environment. For this end we deem even the utilization of the most up-to-date means offered by science and technology indispensable.

By presenting work realized indoors and outdoors we shall try to outline practical and theoretical problems that were met in the course of artistic activities in connection with shaping a coloured environment.

The coloured light-mobil wall, entitled "The four seasons", by Károly Bodó, having sizes of 120x900 cm, was placed in an inner space of the Children's Area of the Cultural Centre at Debrecen in 1980. The space accommodating the light-mobil wall is highly divided, being connected to four other space sections and, within these, to staircases. The stairs leading upstairs are too massive and give the room a distorting effect. The eastern wall is too much loaded, accommodating the light-mobil on top, and a white wooden door and a built-in row of closets below. The southern wall has a white marble lining, the western and northern walls are highly proportioned glass walls. The iron-coffered false ceiling is white, and the floor is grey marble.

Béla Tilles and Károly Bodó, Fine artists, painters,
Nyiregyháza, Hungary

This space has double functions: it serves for communication, and forms part of the Children's Area. The inner space is bleak and sterile and is unable to inspire meditation, intimacy or self-forgetfulness without which playing is practically impossible. This divided space, being unsuitable for its function, has been corrected by the artist who made it acceptable even for children by means of his coloured light-mobil.

The work of art consists of two parts:
- a horizontal, elongated 50x530 cm large active surface, rounded-off at the ends, and
- a 60 cm diameter circular active surface.

The elongated rectangular surface has the task to make the "children's area" acceptable by its vigorous, intensive moving colour effect, and also to dissolve the building's rigid sterility and depressive spatial structure for the general visitors. The light-mobil's full cycle time is 3 minutes, and can offer nice experiences even in details. It would affect anyone very intensively because its colours are direct coloured lights and not reflected ones. As a counterpoint to the basically white rigid space the whole program is composed of warm colours (being far from artificial lights), stressing thereby attachment to nature.

This attachment rests upon the subject of the work, which foresaw an association with the changes and periodicity of the four seasons, with the eternally repeated change altogether, by means of atmospheres created with the help of colours, lights and undulation. Movement has a main direction from the right to the left. The movement of forms between the two poles is continuously counterpointed, and follows contrary directions at the two poles. The rhythm is slow and undulating, and has no shocking effect (!). The amount of dark and light shades within the entire program has the proportions of golden section.

The other surface of circular shape is accommodated to the left from the elongated rectangular surface, as a continuation of the latter, within a smaller distorted space under the stairs. It has not the task to offer a vigorous spectacular demonstration, but to make meditation possible. Its program is likewise more complex: lights are hiding and passing above, behind and under each other; they are bringing about strange fields not nearer to, but farther and farther away from the spectator, towards the interior of the work. In character it is a special work of visual art, more alive, more pulsative and also more abstract than the other surface. Its space dilating effect is also smaller. For those who are more exacting visually, it offers a variable program for a longer time since the full program cycle is 3 hours. Colours are less intensive but, thanks to transparencies, are extremely rich in values and tones. The adults entering the building experienced the effects of the light-mobil, working to dissolve tension, catch the visitors' attention and improve their mood. Very many of them would keep standing for a few minutes in front of the light-wall, changing their original intention. What they felt was primarily an aesthetic experience as they put it.

Children were also thrilled by the program, and the sight of the rigid broken shaped room became for them a secondary experience. The undulating atmosphere of moving colours exerted on them a reassuring and relaxing effect. At once they felt ready for making friends and joining common games.

The Chromium-steel light-mobil made by Béla Fülles is located at the golden section point of an L-shaped water basin lying in the northern third of a park at a road crossing along Nép-köztársaság road in Debrecen.

This object of art has the deliberately planned function to accentuate the crossing-point of two important communication roads and to find its integrated place in the rest-park, i.e.,

to be spectacular and reassuring in its effect, and suitable for leading to meditation as well. Criteria chosen for design were therefore vitality, gracefulness and synthesis.

The pure projection of this outdoor sculpture, consisting of 54 spiral units, is a simple puppet form: the two parts are proportioned to each other according to the ratio of the golden section. The units are 40 mm diameter chromium-steel cylinders, having concave endings. The light-mobil turns around eight-times a minute.

High polishing serves well the sensitive reaction to light phenomena of the environment (sun, traffic, coloured advertising lights of shops interacting, reflection of water, etc.). The horizontal cylinders, turning off, would bring about a quasi pulsation upward movement and, with time-lags, a spiral movement now appearing and then vanishing at the endings. Added to these are further changes by rhythmically decreasing and increasing lights of the reflector which would produce an identical pattern only after a longer time because of phase displacement.

Prior to erection of the mobil experiments were made on a provisional platform for testing the possibilities and effects of lighting. During these few weeks one and three reflectors were used with the following colours: white, violet, red and green. The problem posed by the "coloured" light lay heavily on us. The moving spiral is, in fact, not a simple decorative element, but it acts also as a symbol, and so, its primary relationship with nature is determinant. True that being lit by coloured lights the mobil could be made very attractive and was brought closer to the usual lighting of fountains, but this effect proved to be artificial and alienating in each case. At the same time the light-mobil became aggressively dominating over its environment.

The internal formal character, together with the requirements mentioned for the sake of function, gave us to understand that

a "white" 1000 W halogen reflector should be used, which is nearest to natural light. Increasing and decreasing candle power of the light source, with colouring towards red, has brought the mobil nearer to the natural light phenomena (lowermost the morning and evening red, uppermost the midday white). Relationship with nature was enhanced by reflection from the water basin. The shadow cast on one of the neighbouring buildings gave a quasi biological picture of movement of the form. The spiral would rotate by day at periods when it is reached by sunshine, making thereby the relationship between natural and artificial light still more tangible.

The inhabitants of the district did not only get accustomed to see the light-mobil but also came to feel it as their own. Interestingly it was the children and older people who reacted immediately in a positive way. Visitors of ages between 20-40 years saw it first as a technical curiosity, and felt an aesthetic effect only later. Effect of the mobil on the generation mentioned was in accordance with expectations and the targets set. Teenagers were often irritated, which was expressed in aggressive acts in some cases, but this effect is dwindling with the number of passing years. The conservative-minded people of Debrecen accepted the object in a surprisingly short time, and it is today one of the characteristic points of the town.

The analysis of effects of the two works of art described in the foregoing leads us to the conclusion that moving colour and spatial compositions, combined to form meaningful units, would transform entirely the environment and would create a livelier, more cheerful and relaxed atmosphere for the inhabitants. Such effects would be enduring and profound, however, only if the respective work is something more than a pleasant and evocative decoration. It should reflect an attitude and the world as a whole, in short, it should appear as a genuine work of art. It must avoid designing the environment

with a practicist's view, a fault which is often made by the design itself. It is necessary to view things comprehensively on an ecological basis, to show a high degree of artistic and ethical behaviour and to develop a working method suitable for team work. Short of these, even the best values of art would remain partisan actions; and this would prove to be grave and irreparable losses for the art and mankind as well.

LASER-LIGHT IN THE ARTS -
INTERFERENCE TRANSFORMATIONS

A. Csáji

In the Central Physical Research Institute we have since 1977 conducted experiments and studies in connection with the spectacle-creating possibilities of monochromatic, coherent laser-light. The background for the experiments and lectures is provided by Dr.Norbert Kroó, physicist, the leader of Hungarian laser research, who is my collaborator.

Western laser art is concentrated - besides laser environment - mainly on the punctiformity of laser resulting from its high controllability and on its modellability. The so-called swinging-mirror solution has been developed with which the swinging mirrors are steered by computers and produce through them varied, regular forms. I do not touch upon a description of all this since the literature dealing with the artistic employment of optical transformations is immense in our days. Also the interfering capacity of laser-light has been employed (e.g. in The Magic Flute, Munich, 1971), but the swinging-mirror method which is easier to shape and can be reproduced more accurately has surpassed it. We have decided at the beginning of our work to concentrate in the creation of the spectacle on this less explored possibility with laser-light.

*Interference is one of the widely known phenomena produced with the aid of coherent light waves, and their fundamental laws have been clarified by science very long ago, well before the discovery of laser. Consequently the presentation to the general public of interference figures or composed

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spectacle series based on these was no scientific task for the physicist. The real adventure was the translation of this well-known phenomenon into the sphere of fine arts". (Norbert Krod, in Uj Irás of June 1980, "Reflections on an Exhibition")

The figurative examination of the properties of laser-light resulting from its monochromaticism I perceived as a special potential of kinetic art at the very moment I saw this ephemeral phenomenon. Yet for the aforesaid translation - for getting acquainted with the pictorial materiality of laser-light circumstantial analytical work was required. The most important task was this: to explore as fully as possible in the accidental phenomenon the dependence of an effect upon a cause and to accomplish it into a composable possibility of spectacle-creation. Materials and surfaces transilluminated by laser-light had to be understood from entirely novel points of view: selection had to be made not with the eyes of the physicist, but with the eyes of the outsider painter who is especially sensitive to non-figurative forms. The first point of view in selection was the spectacular value of the transilluminated materials and surfaces; this was followed by the examination of the transformation correlations of simple geometrical solids transilluminated with laser. The first phase of this work consisted in photographing. I began to analyse the fixed slides at home. When I made a continuous comparison of the diameter of laser-light, of the transilluminated material and surface form, and of the emerging interference image, a "map" began to take shape gradually before my eyes: it was a network of correlations still to be corrected. This map made it possible for me after some time to regard the surface forms as the plastic coding of interference images. Let me illustrate all this with an example. If laser light, having a smaller diameter than the basic circle of the cone, passes through a small cone on a glass surface, a form of regular central organisation with concentric system of level lines is generated; as soon as laser

light leaves the centre, this form disintegrates. If the two opposite sides of the cone are flattened, central organisation does not take place, but concentricity turns elliptical. I could mention more correlations I have recognised, but this practically static approach to the emerging images satisfied me but partially. The most attractive property of the spectacle was - besides the poetical richness of non-figurative forms - the origination from one another of the interference images, the organic change in time. Without the examination of this organic figurative mobility the new factor, i.e. temporality, cannot be projected, and the phenomenon is exposed to chance events. The facts of the past are now and then revalued by us, put in a new light. Thus it happened that in the occasional, captivatingly enigmatic beauty of the meeting of light-waves there suddenly flashed upon me Kandinski's ideas about figurative self-willingness, about the parallel between non-figurative painting and music. I had the impression that this was the accomplishment of the joint spectacular value of point, line, plane, space, colour and time. And for the painter time is here not solely virtuality, it is the carrier of the essential particularities of figurative organising. The demand for visualising form elements, rhythmical intervals fixed on abstract, non-figurative images arose already in the Bauhaus School. The basic idea of Oskar Schlemmer's mechanical ballet was this: "Let us present in motion, let us free from the flatness of composition the dynamical forces inherent in the forms of abstract painting". And this, the bringing in motion the non-figurative forms, was contained in the phenomenon seen in the laboratory through moving the material transilluminated with laser light. (True, for the time being, in the accidental figurative chaos of the meeting of light-waves.) For making a further step I needed regularity of motion. We began to move the examined materials uniformly with the aid of a minute-motor. A new aspect of observation was born: the regular figurative process of inter-

ference forms. The form-dynamical correlations became the most important with temporality. The "map" was forming further after the analyses - the static scale could turn dynamical, spatial arrangement changed into temporal succession. While I analysed the discs it occurred to me what one of the most essential questions was: the notion solving the possibility of composition, namely that in the knowledge of arranged time factors the surface units can be transformed into time units. Combined with the map and the figurative processes, this contained the germs of the idea of an image plate. On an image plate the multitude of arranged optical informations can be fixed and can be visualised repeatedly. The function of laser light is here similar to that of the needle on a gramophone disc. Following the marked path it projects the fixed optical information.

Already at the time when the image plate was made up of industrially produced glass and partial units it served for shaping compositions of temporal light-montage character. I have mentioned that the map emerging in the course of analyses made it possible for me to regard the surface forms as the plastic coding of interference forms. Having found the suitable materials, and having clarified the working processes, all this made it possible for me to model the image plates myself. These plates were cast in water-clear plastic material and made possible, even demanded, further experiments with forms, over and above the solution of composition. On these image plates I have applied forms and structures whose interference images I did not know, and these enriched my map further. They proved for me from the outset that an extremely wide range of images can be generated and that the possibility of variations is practically infinite. Each image plate is the result of several repetitions and form-shapings with modelling, photographing, casting and transillumination with laser. The image plate was the second important step in creating the laser-light mobile.

The third is the transformation system creating the superposition of the laser interferences. The light-forms of surfaces transilluminated with laser light have a spatial inertia. They have no depth of focus, which is their greatly characteristic and well utilisable property, but the generated light-form is exposed to the position, distance and the angular offset of the screen. I tried to influence this with various optical means, with lenses and mirrors. During these experiments I found that from the conjunction of the means in a certain situation an image was generated which had not originated from the perspective distortion of the interference image, but from something entirely different. The world of forms is characteristically varied. This could be repeated through the accurate fixing of means and of the optical position. A logical method of image-reformulation emerged in this way before me; it was a form-process, to be produced only by laser, which transmitted the visible image of the modelled surface through a multitude of figurative transitions to the pure laser interferences. This is made possible by a flexible system of lenses. The images thus created were later called by the physicists "preholographic images" because they carried from the whole of the transilluminated surface informations that changed with the field of formation and visualised the characteristics of the perceptible structures, and the interference image originating from them at the same time. The motif modelled on the image plate may be an identifiable formation, e.g. an emblem, eye, or flower provided that its shaping takes place with properly formed surface-modifications. Let us call it an "objective image". The fact that these identifiable formations can be projected would mean no novelty in itself since these can be visualised also with other optical means; but it is here that the special materiality, the interference capacity of laser light enters. The projected light source carries not only the characteristics of the objective image, it also carries the connected inter-

ference image in proportions changing with the optical situation. And all this means an unparallelled, rich, poetical transcription of the objective image which cannot be realised without the laser. The organic and continuous figurative changes create before our eyes the transition between the world we can perceive with our eyes without aide and the mathematically accurately describable light interferences. The interferences can be calculated with Fourier's transformation. The greatest potential of this method is the visualisation of the bridge connecting perceptibility with regularity. This made it possible for us, among others, to produce at the end of our show in Finlandia Palace of Helsinki an ancient Finnish guilloche or their heraldic animal, the lion, from the ring of interference forms. What we have said reacted also to the modelling of the image plates, because attention had to be paid not only to the connection between surface modulation and the interference image, but also to the emerging prehologrephic image.

This flexible system of lenses proved to be extremely rich in respect of further development in the course of our experiments. The optical situation becoming more and more complex, and the richly differentiating motions demanded the development of electronic control. With my collaborators we constructed a light mobile with which the required instructions could be recorded on a magnetic tape or branded in a microprocessor if necessary.

Our first important showing took place in the Hungarian National Gallery in January 1980. It was here that laser burst into home consciousness as a rich possibility of creating spectacles. The symphony of light (Struggle) presented here was still based on pure laser interferences. At later showings (Copenhagen, Vienna, Moscow, etc.) we already used the superpositions of the interference images (The symphony of light presented here was the "Cell Crystals"). The designed spectacle was fixed on light-scores.

The laser-light mobiles born through the experiments have an extremely rich possibility of use in the field of refined spectacles. They may appear as an autonomous creation emerging from the synthesis of arts, science and technology, may be suitable for presenting symphonies of light (with background music) as at the aforesaid showings. As an organic part of the piece it may enrich the scenic experience. Contrary to traditional scenery, it may be handled here practically as a dramaturgical element. It can be used in sci-fi films for creating a phantastic light-environment, or in the fields of industrial arts, advertising, etc.

These showings approached the public with spectacles which had in their elements been originally the laboratory experience of scientists. These spectacles are very far from everyday life and are also somewhat mystical. With the laser-light mobiles developed during our experiments this characteristically present-day world of forms, the "hidden face of Nature", leaves the cool atmosphere of the laboratory and becomes an exciting experience to the general public.

It was in the artistic turbulences of the first decades in our century when the idea was born that the painter must get into an intimate relationship with colorimetry, with the clear brilliance of light, the wavelengths of light, with the potentials of artificial sources of light. Moholy Nagy wrote with far-sighted inspiration that "most creations of the future will be the task of the light-painter". The efforts aimed at the artistic employment of the pure colours of the spectrum became especially timely in recent decades through the introduction in the fine arts of laser, this novel source of light with its special properties.

D. Nagy

Analogies between colours and sounds are often mentioned. There is, however, a special field (on the boundary of plastic arts and music) the coloured or light music, which deals with concrete interpretations of colours of music or music of colours. Although these interpretations are, naturally, enough subjective, the investigations of such type formed an interesting interdisciplinar meeting field of science, arts, and techniques. This interdisciplinarity can be observed especially in the works of the Group "Prometei" (Prometheus) in Kazan', leaded by B. Galeev.

1. History of coloured music - a brief survey

- pre-prehistory	- parallels in development of phonological and colour categories (?) - see e.g. Berlin and Kay /1/
- prehistory	- combination of visual and : itive data, description of synaesthesical effects in the ancient time (e.g. in Greek music theory, in east philosophy)
- first instruments	- eye or colour piano of Castel (1688-1757)
- experiments of colour hearing composers	- e.g. Liszt (1811-1886) wanted to show dioramas (of Daguerre) in Dante symphony (Liszt as conductor also used colour

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instructions, see his well-known phrase at an orchestra rehearsal: "Please, gentlemen, a little bluer.." - quoted after Révész /2/

- era of colour or light pianos and organs	- Rimington in 1894 - colour piano, Skryabin in 1910 - musical score of "Prometheus" with "Luce" part, László in 1925 - coloured musical showing in the Festival of Kiel, and publication of a comprehensive monograph /3/
- Bauhaus	- complex approach of arts, see e.g. Moholy-Nagy's score of "Mechanical excentric play" and the idea of the theatre of totality (in Schlemmer, Moholy-Nagy, Molnár, 1925 /4/
- Music-psychological investigations	- works about colour hearing, synaesthesia, and coloured music see e.g. Wellek (1926-27) /5/ and a lot of later publications of the same author
- Kinetic art	- light-sound effects of Schöffer, and others
- Laser age!	- coloured music with laser effects

tendency in the history of coloured music:
application of more and more techniques

The Hungarian contribution to this art field see in the survey paper of Nagy /6/.

2. Colour associations of some composers

are shown in Table 1.

It can be easily observed that Skryabin's colour asso i-

Table 1.

Colour associations of some composers

Tonality	Skryabin /1872-1915/	Rimskii-Korsakov /1844-1908/	Asaf'ev /1884-1949/
C major	red	white	–
G major /1 ♯ /	orange-pink	brownish-golden	emerald of lawns
D major /2 ♯ /	yellow	yellowish	light of the sun
A major /3 ♯ /	green	pink	approach to D major
E major /4 ♯ /	blue-whitish	blue, sapphire	nightly, very starry sky
H major /5 ♯ /	blue-whitish	dark blue with greyish-leaden colour	–
Ges major /6 ♭ /	bright blue	greyish-greenish	peel of a ripe orange
Des major /5 ♭ /	violet	darkish, warm	red glow
As major /4 ♭ /	purple-violet	greyish-violet	colour of broken cherry
Es major /3 ♭ /	metallic glitter	grey-bluish	sky-blue
B major /2 ♭ /	metallic glitter	dark, strong	colour of ivory
F major /1 ♭ /	red, dark	clear-green	–

After Vanechkina (1975, p.33) /7/ with a little correction, and Galeev (1980, pp.67-68) /8/ with some abridgements.

ations from C major to Des major follow the colours of the spectrum from red to violet, and then they get back - through purple-violet and metallic colours - to the red one. (This fact can be interpreted as the creating a colour analogy of the musical quint (fifth) circle of tonality.)

In some cases the colour associations of the quoted composers are very similar (see e.g. at D major), but there are completely different ones, too. These observations give a beautiful evidence that the importance of concrete colour associations must not be under-estimated, and must not be over-estimated...

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DER FARBRAUM FÜR ARBEIT AN DATENSICHTGERÄTEN

H. Frieling

Über Bildschirm-Arbeitsplätze ist schon viel geschrieben worden, vor allem hinsichtlich ergonomischer und lichttechnischer Fragen. Trotz Beachtung optimaler Leuchtdichte-Verhältnisse am Arbeitsplatz kommt es jedoch immer wieder zu Klagen der Beschäftigten (asthenopische Beschwerden, Kopfschmerzen, Unruhe, aggressive Tendenzen und das, was man pauschal als "Stress" bezeichnet).
Auf Anregung der Firma Sperry-Univac wurde ein Versuchsraum als Musterplatz für die Arbeit mit Bildschirmsystemen der Serie UTS 4000 geschaffen, wobei meine Arbeit die farbdynamische war.
Natürlich mussten wir von einer verantwortbaren Beleuchtung ausgehen: die Sehleistung des Auges steigt bekanntlich mit wachsender Luxzahl auf etwa 1100 Lux stetig an und bringt hernach keine weitere Steigerung. Da aber bei zu hoher Beleuchtungsstärke die Leuchtdichte des Schirms zu hoch wird, das Kontrastsehen infolgedessen leidet, einigte man sich bei den Fachleuten auf eine Beleuchtungsstärke von minimal 300 und maximal 500 Lux (Nennwert). Dabei wird die Leuchtdichte der Zeichen (in unserem Falle grüne Phosphore etwa der dominanten Wellenlänge von 520 nm) mit 90 - 120 cd/m^2, die Leuchtdichte des Bildschirmgrundes nicht unter 10 cd/m^2 angenommen, was einem Kontrastverhältnis von etwa 8 : 1 entspricht.
Um weitgehende Direkt- und Infeldblendung auszuschalten, musste auf gute Blendungsbegrenzungswerte geachtet werden, auf hohe Deckenreflexionswerte, auf nicht glänzende Platz-

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und Geräteflächen - gerade auch Tastaturen! - und einen möglichst geringen Neigungswinkel der Monitoren, der hier mit 10 Grad noch als günstig angesehen werden durfte.
Für die Beleuchtung wurde ein von C.O.Meinerz entwickeltes Kombinationslicht (NL-Leuchtstofflampen + Glühlampen) erstellt, das sowohl im kurzwelligen Gebiet wie auch im langwelligen ein breitestmögliches Spektralgebiet anbot, auf das der beratende Ophthalmologe (Fritz Hollwich) Wert legte, um dem Organismus höchstmögliche Energie über das Auge zuzuführen.
Unter der gegebenen Voraussetzung bester ergonomischer Bedingungen konnten wir dann folgendes Farb-Raumkonzept erstellen:
Der Versuchsraum hatte auf einer Seite Fenster, in deren Nähe bei Tag natürlich sehr hohe Beleuchtungsstärken herrschten. Deshalb brachten wir über die ganze Fensterbreite und von oben her bis zur Fensterbank reichende Stores mit hoher Lichtdurchlässigkeit an. Himmels- und Sonnenlicht aus dem oberen Drittel der Fensterscheiben wurden durch Rollis regelliert, wobei jeder Flügel individuell eingestellt werden konnte. Das Material der Rollos war durchscheinend. Übergardinen dienten nur der evtl. Notwendigkeit einer totalen Verdunkelung. Zurückgezogen wirken solche Gardinen als Farbträger und Rhythmuselement im Raum.
Als farbtragendes Material der Wände (auch für Stellwände in einem Grossbüro erforderlich) wurde eine rauhe, gewirkte Tapete mit vertikaler Fadenrichtung benutzt. Dazu wurden die staubabweisenden Flächen ebenfalls rauh und matt gewählt, um jegliche Spiegelung zu vermeiden. Das Blickfeld hinter dem Sehirm, der selbstverständlich gegen die Wand und nicht etwa gegen das Fenster gerichtet sein muss, durfte durch Kalender, persönliche Bilder oder Merkzettel nicht gestört werden, weshalb hier in Arbeitshöhe ein Plattenrelief angebracht wurde, das die Anbringung solcher Bilder um. verhindern sollte. Der Deckung dieses persönlichen Schmuckbedürfnisses wurde deshalb eine Pandfläche empfohlen, die

nicht im Sehbereich der am Monitor Arbeitenden liegt.
Der Fussboden wurde mit einen Velourteppich ausgestattet.
Da nun nicht nur leuchtdichtemässig, sondern auch farbpsychologisch richtig vorgehen zu können, gingen wir von folgenden W a h r n e h m u n g s d a t e n aus:
Die sehr häufige Betrachtung des Datensichtgerätes mit Ablesen grüner Zeichen von einer relativ dunklen Mattscheibe und der immer wieder erforderliche Blick auf die Tastatur und den Beleg, bedeuten eine vom gewöhnlichen Schreiben oder Lesen stark abweichende Betätigung für das Auge. Vor allem ist die Neueinstellung des Auges auf Vertikale und Horizontale in verschiedener Entfernung ein ständiges Problem von Akkommodation und Adaptation. (Brillenträger haben deshalb besondere Schwierigkeiten!) Ausserdem ist das Ablesen von einen (leicht flimmernden) leuchtenden Schirm mit begrenzter Spektralbreite (Grün) etwas anderes als das Ablesen oder Erzeugen dunkler Schrift auf weissem Grund! P. HOLLWICH hält all diese geschilderten Verhältnisse mit Recht für belastend, noch dazu, wenn einseitige Schwachsichtigkeit, Schielen oder ungleiche Brechkraft der Linse vorliegen. Aber auch bei strenger Auswahl der an Bildschirmarbeitsplätze Sch enden gibt es Beanstandungen physischer und psychischer Art.
Belastungen haben bekanntlich sehr oft ihre Ursache in der E i n s e i t i g k e i t des Reizes bzw. darin, dass diese Einseitigkeit nicht ausgeglichen wird oder werden kann. Wir haben deshalb in erster Linie unser Farbkonzept auf die E r r e i c h u n g einer T o t a l i t ä t eingestellt.
Wenn man ein grünes Zeichen auf dem Bildschirm notwendigerweise mehr oder weniger fixieren muss, spielen sich im Auge und Sehsystem Erregungserscheinungen ab, die zu den bekannten Phänomen des g e g e n f a r b i g e n N a c h b i l d e s führen. Dieses wird noch deutlicher als Realität erlebt, wenn der Blick von einseitiger Farbfläche auf eine z.B. weisse Fläche den Umfeldes fällt. In anderen Fall entsteht aber ein purpurvioletter Nachbild. Die Damen an Bildschirmen werden dies ihrem Gesamtteint natürlich nicht

bewusst, waren aber sehr erstaunt, als man es ihnen im Experiment unter exakten Bedingungen zeigte. Die Klage der Versuchspersonen, die vorher in einem weiss getünchten Raum am Bildschirm arbeiten mussten, betraf ja auch ein "Schwimmen" oder eine allgemeine Irritation, die eben durch das nicht erfasste Nachbildsehen hervorgerufen werden konnte.

Vielfach argumentierte man bisher nun so, dass eben anstelle einer weissen Raumumgebung eine grüne gewählt werden müsse, da erstens "Grün beruhige" (was nur sehr bedingt zutrifft und hier ja gerade das Grün des Phosphors eher erregt, zumal da es Aufmerksamkeitsquelle ist) und zweitens in Grün ein purpurfarbiges Nachbild vergraut, also verschleiert.

Damit ist aber die Einseitigkeit der Belastung noch nicht aufgehoben! Es gibt dann auch keinen Gegenreiz, der die dauernde Grünfähigkeit des Auges durch ständige neue Aufladung-Energie gewähren könnte.
Mit anderen Worten, wir müssen die Umgebung gerade in jenen Purpurton kleiden, der als Nachbildfarbe von Natur aus entsteht! Natürlich kommt ein gesättigter oder auch nur hellklar ins Rosige fallender Farbton nicht in betracht – schon aus ästhetischen Gründen, aber die genannte Tapete muss immerhin violettrötliche (durch zwei verschiedene Töne z.B. mehr additiv erlebte) Töne aufweisen, wenn auch wenig gesättigt und mehr verhüllt. Der erforderliche Reflexionswert im ganzen Leuchtdichtekonzept liegt hier bei etwa 30 %. Untere Raumteile können geringere Werte zeigen und auch ins Bräunliche übergehen.
Die über dem Sichthintergrund liegenden Teile können natürlich viel heller gestrichen werden, aber niemals rein weiss sein, da dieses Weiss eben Nachbildträger werden würde. Ausserdem ergeben sich weitere Schwierigkeiten durch den Simultankontrast im Raum: Für den Eintretenden (und nicht am Platz Arbeitenden) erscheinen weisse Flächen gegenüber den verwendeten rötlichvioletten Ton geradezu grünstichig. Sogar Fensterglätze, Storen usw. können also nicht rein

weise verwendet werden. Sie erzeugen aber den Eindruck von Weiss (und nicht von Hellgrau!), wenn sie mit dem Grundfarbton gebrochen sind.
Doch auch mit diesem Farbkonzept ist noch nicht alles gewonnen! Die Gerüste selbst wie auch die Tabulatoren, die Tischauflage usw. sollten nicht weiss oder grauweiss aussehen, sondern eine leicht ins Ölig-gelbliche weisende Farbe zeigen, wie es in unserem Modellfall auch war. Auf dieser Farbe werden die purpurnen Nachbilder vergrant. Die umgebenden Wände hingegen liefern den purpurnen Aufladungsreiz für eben das Gegenfarben! Durch Purpur und Grün ist aber das ganze Spektrum erfasst! Die Totalität - unter Vermeidung eines Dichten mit breitem Spektrum! - ist erreicht.
Übrigens haben wir die Bodenfarbe (Velour) ebenfalls dunkelgrau gewählt, wenn auch wesentlich dunkler als die Gerüstfarben.
Der Auftraggeber für diesen Modellversuch, bei dem die arbeitenden Damen ständig ärztlich kontrolliert werden, begründete in Vertretung der von seiner Firma herausgegebenen Publikation unseren Vorschlägen folgendes:
"Für die laufende ärztliche Kontrolle der Benutzer an diesen Arbeitsplätzen müssen Licht und Farbe die obigen Ergebnisse gebracht:
1. Sehleistungen verbessern,
2. Sehleistungen gleichbleibender Arbeiten auch in angespannter und unter Zeitdruck befindlicher Situationen,
3. Allgemein körperlichen Wohlbefinden."

Quantitative wie von den Damen, die hier als Versuchspersonen sehr gern mitarbeiteten, bestätigt, dass eine von ihnen, die vorher im alten Raum als aggressiv und als "Quirl" auffiel, jetzt deutlich ruhiger und ausgeglichener geworden ist.
Dieser Versuch sollte ermutigen, ihn einerseits mit weiteren ganz Versuchspersonen in grösseren Räumen zu wiederholen, andererseits die Signifikanz der Erfolgsaussagen zu

erhöhen, und andererseits auch in anderen industriellen Bereichen Verständnis für farbdynamische Arbeit zu erhalten.
Vielleicht zeigt diese Studie auch, dass die Gestaltung von Arbeitsplätzen nicht nur eine Sache der Ingenieure und Architekten, der Ergonomen und Licht-Techniker sein kann, sondern dass Mediziner und Psychologen ebenfalls in die zu leistende Teamarbeit einzubeziehen sind. Ich möchte auch gern, dass aus diesem bescheidenen Beispiel Konsequenzen gezogen werden für Art und Tiefe der Ausbildung von Farbberatern.

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A. Németh

The increased velocity of technology, the high degree of mechanisation of technological functions and automation observed worldwide produce new demands in the complex design of the micro-environment of working places, of the interior design of industrial environments.

The workman spends nowadays a large part of his life in the factory. At present the industrial enterprise is not only the most rational form of production, but the most important recognition of the present time is that the human being is the most important factor of the industrial process and the working environment performs a direct beneficial or unfavourable influence on his activity and personality.

The industrial workshop as micro-environment, the working person and the manufacturing devices form a dynamic open loop system and effect each other mutually. Man is not only the acceptor of his environment but he plays here the most important role, a role which is motivated by his individual, social and cultural motivations. It is very important how the human being is experiencing his environment. The sources of environmental stimuli are partly of physical-biological and partly of psychological nature.

The personality of the worker and in connection with this his productivity are highly influenced, according to the statements of researches of work psychology as well as ergonomics by the

- personal working conditions (knowledge, ability, character),
- conditions depending on the working process (fatigue, monotony),

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- general conditions determined by the working place (working environment, etc.).

Colour and colour dynamics used in a conscious way in developing the industrial micro-climate can get a very important role in the shaping of the working environment. Naturally in designing the general working environment further physical-biological factors have also a high importance, thus e.g. the climatic situation of the micro-environment, the noise, vibrations and the most important contribution to colour, the illumination (natural and artificial).

All these factors have the influence on the human being together with other important areas of forming the architectural structures as e.g. the relationship between natural and artificial environment, designing of the space, relationship between masses and space, the architectural content and form, theory of signing, the relationship between the total system and its parts, the relations between surface and material.

Colours used in an industrial working environment can perform threefold functions just as the other factors influencing the micro-climate. The function is partly determined by the use, partly they have an informatic function, but in the third line their function is also aesthetic.

The aesthetic function is a more abstract property of the environmental elements which shows beyond the use and information content of these elements and influences the human behaviour, the well-being (and by this the productivity as well). The language of colour dynamics has a biological loading, it is an international language just as music, as it is based on the laws of nature. Although we have to weak the importance of colour in an industrial micro-environment on the first place in the importance of usage and information, we cannot neglect the function of colour in organising the aesthetic environment, its role in counteracting or compensating some other [illegible] system will) produce in it.

industrial environment a higher degree of safety, will forewarn, will decrease the perception of fatigue, it will make a more precise work possible, will increase the productivity and love of work and will be the source of aesthetic joy.

Summing up we can state that colour dynamics has an important role in producing the optimal working conditions, as it is a component of the working environment and therefore of physiological and psychological sources of stimuli (both favourable and unfavourable) and therefore should play an important role in developing optimal working conditions. This is not only a way to protect the human being but it is also an important factor in increasing productivity. All these belong to the most important tasks of industrial architecture and colour dynamics and if these factors are considered then an industrial working place will be not only the hull of the used technology. Work will be transformed from merely sustaining existence into the source of creativity and gayness.

SYSTEM-ORIENTED COLOUR DYNAMICAL DESIGN OF LARGE SCALE INDUSTRIAL WORKING ENVIRONMENT

S. Király

Industrial jobs together with their inner and outer spaces built of construction structures, accompanied with objects of sanitary installations and manufacturing technology, also with systems of means for transport, control and information, form in a combined way the physical environment for one of the most important life scenes of men living in today's society. Industrial environment forms an integral part of the so-called artificial (created) environment.

By creating the up-to-date industrial production systems man has carried out an activity which is useful in social, technical, economic respects, but he is also responsible for the harmful effects of his artificial environment on his wider natural environment and on himself.

The changes being unfavourable from humane respect are well reflected by the quantitative increase in visual information from industrial environments, and by the overall optical picture of labour spaces becoming complicated. This is often accompanied with the fact that the mass of information from the environment is unarranged, which would result in what could be characterized summarily as the visual impurity.

To assess the harmful environmental factors described above, which endanger at present the biological existence and "ecological balance" of man, and to fight them, it would be necessary to organize international scientific research on one hand, and to carry out concerned action and protective

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activity on the other. For this reason the people dealing professionally with planning, expertise and realisation tasks connected with establishing an optimum industrial working environment should not restrict themselves to selecting and using the most up-to-date technical and technological solutions, but should try to practise compensating and preventive methods obtained as a result of objective research on harms of the newly created technological environment and on protective methods.

Systems of means used for preventing the negative effects of working environment include colour dynamical methods for shaping the environment. These methods can be described with the help of some specialised branches of science and application fields.

The basic intention of the applied colour dynamics is to analyze all conditions and relationships underlying the functioning of the various large-scale industrial production systems and to arrive at a complex visual design of the aspect of man's optimum physical and intellectual working environment by means of creative planning. Within this, colour dynamics is used to organise the conditions of forms, lights and colours that would be in compliance with the destination, technical-technological requirements and functions of space partitioning and support structures of working environment and also of mechanical-structural elements of the technical-technological subsystem. This would mean in short the creation of a so-called compensated systematic order. The other purpose of environmental design by colours is to establish optimum working conditions based on human requirements and also to increase man's physical and intellectual capacities, which means ultimately a visual environmental protection, ensuring man's ecological equilibrium.

A system-oriented colour dynamical planning, trying to define the visual aspects of new or renewed industrial projects, is

a highly complex chain of activities. It embodies a most efficient and economical organising activity for industrial production processes, human labour activities and energies, materials, structural forms, lights and lighting and colour conditions.

Realisation of the purpose in question would be impossible without taking into consideration the entire habitude, anatomical, biological, psychological endowments and requirements, communication and aesthetic demand of man. Highly determining for this planning activity is the attitude which recognizes the necessary consideration of relationships and mutual effects between environmental factors, and is conscious of thinking in terms of such relationships and mutual effects, amounting ultimately to a system-oriented planning.

K. Schöne

Das Wohlbefinden und die Leistungsfähigkeit des arbeitenden Menschen sind abhängig von der physischen und psychischen Belastung im Arbeitsprozeß. Diese Belastung entsteht einmal infolge der körperlichen und geistigen Beanspruchungen durch den Arbeitsvorgang und zum anderen erfolgen Belastungen durch die Umweltfaktoren, die vor allem durch die Sinnesorgane auf den Organismus einwirken.
Unsere besondere Aufmerksamkeit gilt der Beseitigung, bzw. Minderung dieser Belastungen.
Zur Lösung stehen uns die verschiedensten Verordnungen, Standards und die aus Forschungsergebnissen gewonnenen Erfahrungen zur Verfügung.
In diesem Zusammenhang gewinnt auch die Farbe ihre Bedeutung und ist ihr Einsatz in der Arbeitsumwelt zu sehen.
Es ist von entscheidender Bedeutung, dass der gezielte Einsatz von Farben im Betrieb beitragen kann zur:
- Sicherheit und Ordnung am Arbeitsplatz und damit zur Vermeidung von Unfällen
- Verbesserung der Sehbedingungen und damit zur Vermeidung von Ermüdung
- Verbesserung des Wohlbefindens der Werktätigen und damit zur Erhöhung der Arbeitsfreude.

Gleichzeitig werden die Architektur der Räume, die Maschinen und Arbeitsmittel durch die Herausbildung ästhetischer Wertmaßstäbe beeinflusst.
Zur Gewährleistung von Sicherheit und Ordnung stehen die entsprechenden Verordnungen und Standards zur Verfügung (Sicherheitsfarben und -zeichen, Schutzleitungsfarben usw.).

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Sie sind hinreichend bekannt und werden auch weitgehend angewendet.
Zur Verbesserung der Sehbedingungen gibt es vorwiegend Festlegungen im Zusammenhang mit der künstlichen Beleuchtung, wobei eine genaue Abstimmung der Farb- und Helligkeitskontraste dann besonders erforderlich ist, wenn hohe Sehleistungen zu erbringen sind und das kleinste Sehobjekt unter 1 mm liegt sowie unter ausgesprochen feine bis sehr feine Arbeiten eingeordnet wird. Die Leuchtdichtekontraste, die zwischen Arbeitsgegenstand und Untergrund anzustreben sind, sollten die Verhältnisse 1:3 bzw. 0,3:1 nicht überschreiten.
Für die ästhetische Gestaltung der Arbeitsumwelt, als einen wesentlichen Faktor für die Verbesserung des Wohlbefindens der Werktätigen gibt es keine Festlegungen durch Standards oder Verordnungen. Dieser Bereich ist das Arbeitsfeld des Farbgestalters. Dabei muss er sich bewusst sein, dass er nicht nur ästhetische Bedürfnisse zu befriedigen hat, sondern durch seine Arbeit wesentlich die Herausbildung ästhetischer Wertvorstellungen und Normen prägt.
Mit dem verstärkten Einsatz von automatischen Anlagen und der Vergrößerung der Produktionshallen entstehen gleichzeitig größere Anhäufungen von Maschinen und Anlagen gleichen Typs. In der Regel wird eine Maschine oder eine technologische Anlage ohne den Bezug zum Einsatzort farbig gestaltet. Das ist bei Serienmaschinen, bis auf wenige Ausnahmen, auch kaum möglich. Bei dieser Art der Farbfestlegungen kann natürlich der später entstehende Raumeindruck in keiner Weise Berücksichtigung finden und zum anderen werden für Farbveränderungen und -ergänzungen kein Spielraum gelassen. Ist die Einzelmaschine noch gut gestaltet und farbig abgestimmt, so entstehen bei deren Addierung im Raum Monotonieerscheinungen durch eine übergroße Menge gleicher Farben.
In solchen Fällen kann nur der gezielte Einsatz der Farben ungünstige Quantitätsverhältnisse ausgleichen und damit den Gesamteindruck verbessern.

Dabei ist zu untersuchen, wie durch Schaffung farbiger Gruppen ein massiver Farbkomplex aufgelockert wird.
Anhand einiger Beispiele, soll diese Problematik der Farbgestaltung aufgezeigt werden.
Bei der farblichen Gestaltung einer Blechpresserei stellte sich heraus, dass alle Pressen in gleicher Farbe vorgesehen waren. Die Produktionshalle hatte somit nur einen Farbton.
Zur Auflockerung der Anlage und um eine Orientierung im Arbeitsablauf zu ermöglichen, wurden die Eingabepressen der Pressenstrassen farbig betont. Es wurde ein grosser Farbkontrast gewählt und zum Blaugrau der Pressen die Eingabepressen gegenfarbig in Ocker abgesetzt.
Ein anderes Beispiel zeigt, wie die Farbe die Gruppierung ganzer Maschinenkomplexe unterstützt. Hierbei wurde ein kleiner Farbkontrast gewählt und die beiden Maschinengruppen Tur in Ton gehalten.
Bei der farbigen Gestaltung der Produktionshallen eines Kabelwerkes traten ähnliche Probleme auf.
Durch die Grosszügigkeit der Produktionshallen sind die bautechnischen Elemente als Raumbegrenzungsflächen soweit zurückgedrängt, dass sie nur noch als Hintergrund für die Ausrüstung dienen. Dadurch wird das optische Erscheinungsbild der Produktionshallen weitgehend durch die Maschinen und Anlagen bestimmt.
Für alle Maschinen und einen Grossteil der Anlagen war nur ein Farbton, Vistagrün, vorgesehen. Solche nicht nach farbgestalterischen Ordnungsprinzipien behandelte Maschinen hinterlassen in ihrer Addition innerhalb grösserer Produktionseinheiten einen monotonen Gesamteindruck.
Bei der Analyse von einigen Kabelwerken und Ausstellungsmodellen für Messen wurden noch andere Farbkombinationen mit günstigeren funktionell-ästhetischen Wirkungen ermittelt:
- Blau-Hellgrau
- Beige-Rotbraun
- Birkengrau-Olivgrün.

Da die zu verrichtenden Arbeiten keine hohen Sehleistungen erfordern, konnten grosse Kontrastverhältnisse zwischen Ausrüstung und Hintergrund festgelegt werden.
Die dafür entwickelten Prinzipdarstellungen waren Ausgangspunkt für eine differenzierte Gestaltungslösung.
Die Farbkonzeption für die Maschinen und Anlagen wurde durch Farben mit überwiegend mittleren Helligkeiten aus dem warmen und kalten Farbbereich bestimmt (Reflexionswert im Durchschnitt um 40%). Der Sockelbereich und die Abdeckungen erhielten dunkle Farben.
Entsprechend dem technologischen Prozess kommen drei Maschinengruppen zum Einsatz. Die Gestaltungslösung sieht für diese drei Maschinengruppen der Hauptproduktion nach ihren Funktionen (Ziehmaschinen, Verseilmaschinen, Kabelummantelungsanlagen) unterschiedliche Farbgruppen vor.
Ziehmaschinen = Chromgrau-Ocker
Verseilmaschinen = Beigegrün-Olivgrün
Kabelummantelungsanlagen = Vistablau, hell – Vistablau, dunkel
Die beweglichen und rotierenden Teile wurden aus sicherheitstechnischen Gründen durch kräftiges Gelb und Orange gekennzeichnet. Ebenso wurden die Transportmittel und Hebezeuge als bewegliche Elemente behandelt, die Lagermittel und Werkzeugschränke dazu als stationäre Elemente in Mittelton.
Auch für die Kabelspulen wurden kräftige Farben aus dem warmen Farbbereich vorgesehen. Die kleinen Spulen bis 600 mm erhielten eine Oberfläche in Karminrot und die grösseren in Maisgelb.
Unter dem Gesichtspunkt rationeller Fertigung wurden gleichartige Funktionsgruppen innerhalb unterschiedlicher Fertigungsbereiche farblich analog behandelt. Dadurch wurde die funktionelle Ordnung der Ausrüstungstechnologie unterstrichen und neben der Austauschbarkeit der Ausrüstung auch eine ökonomische Behandlung gewährleistet.
Die Decken- und Wandelemente, die als Hintergrund dienen, wurden in hellen Beigetönen gehalten. Einen mittleren Ton-

ten erhielt die Strahlkonstruktion. C6-4/5

Waren diese Beispiele durch Grosserumigkeit der Produktionshallen geprägt, so zeigt das nächste Objekt, bedingt durch die Fertigungstechnologie, in sich abgeschlossene Bereich.

Die Farbstudie für die Produktionsräume eines Dieselmotorenwerkes sollte die Komplexität des Innenraumes mit folgenden Schwerpunkten erfassen:

- Bauwerksteile (Decken, Binder, Wände, Stützen, Sockel, Fussboden, Fenster, Türen)
- Arbeitsmittel (Maschinen, Anlagen, Behältersystem, Lagereinrichtungen, Transportmittel)
- Vorschläge zur Gestaltung der Kommunikationselemente

Die einzelnen Teilbereiche der komplexen Fertigung bestehen aus: Vorbehandlung, Kurbelgehäusefertigung, Endmontage, Prüfstand, Endfarbgebung, Versand.

Sie sind, wie bereits erwähnt, durch massive Trennwände voneinander abgeschlossene Produktionsräume.

Die durchzuführenden Arbeiten sind, bis auf die Kontrolltätigkeit am Prüfstand, normale Metallbearbeitung und Montagearbeiten. Sie stellen keine erhöhten Anforderungen an die Sehleistungen.

Unter Vermeidung grosser Kontraste zwischen bautechnischen und produktionstechnologischen Elementen wurde für alle Teilbereiche eine warmfarbige Konzeption gewählt, die im wesentlichen durch nachbarliche Kontraste geprägt ist.

Zwischen den einzelnen Teilbereichen erfolgte eine farbliche Differenzierung der Maschinen und Anlagen in warmen Farben mit kaltfarbigen Details.

Durch die überwiegend hellen Anstriche der bautechnischen Elemente wurde eine hohe Lichtausbeute in den Innenräumen erreicht. Ausserdem bildet der helle Wandfarbton einen guten Hintergrund für die Maschinen, technologischen Einrichtungen und Transportmittel. Der Deckenbereich wurde am hellsten gehalten, da hier durch Rohrleitungen, LTA-Kanäle usw. eine grosse Anzahl von technologischen Einrichtungen vorhanden

waren, die zu grossen Abschattungen führten. Für die Maschinen wurden Farben nach dem Farbbereichstandard, Chromgrau und Chromoxidgrün, vorgesehen. Dazu für die Sondermaschinen kräftige Gelbtöne und Oker. Die Farbe der Stahlkonstruktion zu den Maschinen wurde zu den warmfarbigen Maschinen und Wandfarben als tragende Elemente zum dem Kaltbereich gewählt.

Auch für die Lagermittel (Regale, Ablagen, Werkzeugschränke, usw.) wurden blaue und blaugrüne Farben vorgesehen.

Die Erkennbarkeit der Transportmittel und Hebezeuge als bewegliche Elemente wurde durch kräftige Farben gewährleistet. Die Hauptfarbe Orange und Ergänzungsfarbe Gelb.

Die Türen und Tore im Gebäudeinnern bildeten durch kräftige Farben und hohe Sättigung das notwendige Gegengewicht zu den anderen bautechnischen Elementen. Damit wurde das durchgängige Gestaltungsprinzip der warmfarbigen bautechnischen Elemente sichtbar.

Sie wurden entsprechend der Funktion in 3 Gruppen eingeteilt und dienten gleichzeitig als Informations- und als Gestaltungselement

- Blau = Türen zum Aussenraum und Verbindungstüren zwischen den Produktionsbereichen dazu Orange = Schutztüren
- Mittelgrün = Türen zum Treppenhaus, Büro- und Feuerraum, WC usw.
- Siena = Türen zu den Prüfboxen und Messräumen.

Die Kennzeichnung der Türen und Tore erfolgte durch Symbole oder Beschriftung in Malsgelb.

Abgeleitet von dieser Farbkombination erfolgte eine Farbfestlegung für die Piktogramm in Gelb/Blau.

Als wesentliches Gestaltungselement wurden die Büroeinbauten, die durch Form und Konstruktion den Raumeindruck beeinflussen, als aktiven Sichtpunkte aufgewertet. Im Bereich Zurbelgehäusefertigung in Grüntönen und im Bereich Endmontage in Gelbtönen. Anhand von Dia-Positiven werden die Gestaltungsbeispiele dargestellt und erläutert.

Damit wird ein kleiner Einblick in die Arbeit des Gestalters gegeben und seine Einflussnahme auf die ästhetische und funktionelle Farbgestaltung der Arbeitsumwelt aufgezeigt. Die Erkenntnisse über die Bedeutung der Gestaltung - in diesem Zusammenhang der Farbgestaltung - führen zu der Schlussfolgerung, dass ein sporadisches, planloses Einbeziehen dieser Disziplin in den Produktions- und Reproduktionsprozess nicht vertretbar ist, sondern nur durch die Integration in den Gesamtprozess der Arbeitsumweltgestaltung wirksam werden kann.

COLOURING OF INDUSTRIAL BUILDINGS

1. Copy

I am an architect whose special field of interest lies in designing industrial buildings. Yesterday afternoon Professor of Architecture Miklós Hofer dealt in his lecture with colouring of civil buildings, whereas to-day I would like to take up the issues of colouring that are deemed important in designing industrial buildings from an architect's point of view.

1. Designing from the viewpoint of environmental structures

In interpreting the structure of industrial environment, we consider as essential its dual character, i.e.

- on the one hand, the structure of activity-process within the industrial environment,
- on the other hand, the physical framework of the aforesaid within the industrial environment.

The term "structure" was borrowed from the terminology of information science of design based on systems theory.

Component parts of activity-process structures may be described in conformity with the dynamics of component processes and, accordingly, the component structures of the "physical framework" may also be grouped as follows:

- the static zone,

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@ the zone of built-in component parts,

@ the zone of mobile structures,

@ the zone of fixtures and installations.

It is up to this point that the designing of industrial technologies is of importance for the architect; in other words, if he succeeds in defining these structures in space, he turns the focus of his attention to the topologically definable component structures:

@ to the infrastructure /which is linked with other structures beyond the environmental limits/,

@ to spatial demarcations, and

@ to the programme, i.e. the micro-environment of technology.

In defining the component structures of the activity process and in their material visualization, the functional designer are fulfilled by the technologist, the industrial designer and the ergonomist, whereas the topological component structures are created by a team led by an architect whose frames of reference are restricted to determining colours; however, in industrial premises which dispose of technological spaces of increasingly large measurements and an ever higher degree of utilization, the surfaces of building constructions tend to disappear as far as their specificity is concerned, and hence, the impact is created by technological equipment.

2. DESIGNING FROM THE STANDPOINT OF INFORMATION-CARRYING MEDIA

The architect's value judgement is conveyed by means of messages incorporated in the project. The messages may include the following items:

@ inscriptions, designations, attention-commanding messages /these are interchangeable signs of identical meaning/,

@ symbolic signs whose characteristics are interchangeable if they are linked with signs of identical meaning, and non-interchangeable if they are linked with situational messages,

@ the third group of messages consists of situational messages, i.e. semantic contents implicit in the placement or arrangement of objects.

As he incorporates these messages into the project, the architect is aware of the fact that within certain groups of people men react to these messages identically which is explained by

@ man's spontaneous demand for physiognomical projections /one is fond of contemplating objects as visualizations of one's own face that reflects sentiments/,

@ experiences acquired in the field of symbolling /man is conscious of the effect elicited by various signs/,

@ man's compulsion to set his consciousness in order,

@ the associative treasure-house of one's ego.

As a matter of fact, colouring is never an architect's means in itself, but only if it is linked with attention-commanding or symbolic messages.

3. While examining the structures of industrial environment and the information-carrying media, it can therefore be ascertained that in single-purpose buildings /industrial plants, cold-storage plants, storehouses, green-houses, or even, in the

case may be, a church/ the significance of symbolic signs in architectural terms increases to become almost exclusive.

- because the definition of component structures of the activity-process is not an architect's responsibility, but rather the result of scientific /cognitive/ activity,

- because although the architect takes part in the creation of dynamically characterized component structures of the physical framework, he has a limited role to play in creating objects; rather, an architect is primarily concerned with selecting and arranging objects, whereas designing is the preoccupation of construction engineers,

- because out of the topologically determined component structures, he is preoccupied only with the façade, and

- because to determine the placement of inscriptions and attention-commanding messages is the responsibility of the advertizing designer.

Within the intricate system of designing an industrial environment, the architects should not only concern themselves with situational messages materialized in the spatial arrangement of objects, but also place greater emphasis on the evolvement of the façade of an industrial building basing the colour symbolism of the façades on physiological projections, symbiotic findings and the wealth of human associations.

The afore-said does not hold true of multi-purpose buildings. May I note parenthetically that in case of such buildings the technique of demarcating the environment may lie in the disjunctive design method whose stages include:

- dissociation of environmental objects and their components in topological terms and in conformity with the dynamics

of component structures of the activity process.

- arrangement of components alongside with the activity aimed at creating and selecting the objects,

- dissociation of information-carrying media and evolvement of symbolic designations so as to associate them with complex internal and external /as regards the demarcation of the environment/ messages pertaining to the arrangement and other symbolic, physiognomical kinds of information.

We have applied the procedure described above in modernizing a Táploszél-based plant of the Pharmaceutical Company "KGYV". Several buildings have been erected. Some shots are displayed in the exhibition hall down-stairs. Architecturally, the façade of the buildings has been brought to the focus of attention; as the façades have been fashioned to resemble emblems they cause the observer to associate them with both the designers and the programme of the plant. The buildings carry symbolic, physiognomical and attention-commanding signs which are required for buildings associated with both Condor and KGYV.

From the outset, we have relied on the help of painter-artist Jénos Fajó.

COLOUR DESIGN TASKS IN THE TOWN OF TATABÁNYA

I. Horváth

Tatabánya shows a heterogeneous townscape because it became a town by joining a number of mining villages. The architectural picture of the town is heterogeneous as well, in its image one can find the buildings created during the 1950th in the so called socreal building style, just as the new housing estates built by using the technology of house building factories. Quarters built 20 - 30 years ago have to be renovated. The colour design of the new quarters, where the technology of house building factories is used, is prepared parallel with the architectural design and production.

A homogeneous colour design goes back only to 3-4 years, since then it is supported by the municipal government and the Cooperative of the Housing Estates of Tatabánya, who is responsible for the renovations.

A five years plan contains the tasks of the renovations. In the colouring design elements of the total programme are incorporated as a whole. In this the smaller units which have been reconstructed already form in itself closed units, but at the same time are parts of the total concept of reconstructing the quarter of the town.

The results of this practice of designing the total environment show interesting results also for the person, who is only traveling across the town. The social requirement, the design and the practical constructions are all aiming to a common goal that Tatabánya should give a message both for

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the inhabitants of the town and for those who are only traveling across it: the message of harmonic environmental design, where the townscape is homogeneously functioned within the natural environment, despite the environmental pollution present there.

SPECIAL FRONTAGE PROBLEMS IN THE REHABILITATION OF HISTORIC TOWNS; COLOURING PROBLEMS OF MONUMENT GROUPS AND HISTORIC STREETSCAPES

L. Zádor

Rehabilitation of our historic towns has recently made favourable progress and therefore the interest of concerned professional organisations and experts is concentrated on these problems. Based on numerous international conferences and on theoretical and practical activities in Hungary we may conclude that in our days the most intensely discussed methodological problem in the rehabilitation of monuments and man-made environment is perhaps the colouration of buildings and groups of monuments. This, on the one hand, we must welcome since it indicates an increasingly successful solution of more difficult problems (e.g. the proper valuation of the relationship between the "old" and the "new"; or the interpretation of the present function of historic town quarters; or the method of preliminary complex examinations including the new procedures of technical, building-diagnostical examinations which, after ten years of our efforts, had by now perhaps reached the stage of theoretical recognition and practical application; or the solution of the protection against wall-moistness, practically an "endemic" disease in our cases, etc.). On the other hand, however, it was an extremely important factor in respect of the visual effect of monuments, their intense educational function in tourism, that came into the centre of debates.

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These debates affect both important sides of painting frontages: the proper principle of selecting the colours, as well as the lasting surface-coating and protective function of paints.

Of these two factors I shall discuss in this brief article only the second. In connection with the colouration questions mentioned first I only should like to remark that I do not agree either with those who wish to solve the colouration of individual buildings solely on the basis of the patterns of entire painted streetscapes, nor with those who regard the spontaneous selection of colours by the designers of individual buildings as the sole feasible solution. My opinion is that in the course of a thorough diagnostical examination of every building we must try to find and to re-establish the historically authentic colouration. And where this is not possible, we must regard the buildings of authentically re-establishable colouration as a fixed point, taking into account the colour harmonies of the entire streetscape. And then the colours of given buildings must be determined on the opinion of architects versed in the exact methods of colour dynamics and tasks, having suitable theoretical and practical erudition, and with the expert decision of the authority for the protection of monuments. It must not be fetishised nor neglected that in our days it is not the rehabilitation of individual buildings, but the simultaneous restoration and colouring of large cityscape ensembles that goes on all over the world. A special problem is presented by the frontages of already rehabilitated and, at the same time, coloured buildings. In such a case, if this colouration is wrong in respect of historic authenticity, or is inadequate for some other reason, or disturbs the harmony of the streetscape, the colouration plan must be drawn up in consultation with the rehabilitation of the building's former designer, or the authority of monument protection must reach a decision. (All this is of course a practice that applies to every question

of the rehabilitation of monuments, since we correct the mistakes of former restorations in numerous cases of rehabilitations carried out today.)

Coming now to the subject of the much-debated technical problem of selecting the material of the paint, I should like to raise a few ideas in the following.

Our technical-scientific research team for the protection of monuments worked from 1973 in the Polytechnical University of Budapest upon commission by the Hungarian government; as a result of this activity we have concluded that for the colouration of monuments only such paints can be used as meet the special requirements of this field. On the other hand we have in every individual case determined by up-to-date, special diagnostical examinations the applicability of paints to given buildings.

These special requirements are the following: plaster-consolidating effect; special covering capacity (because of the different chemical and physical properties of often repaired plasterings of different age); excellent diffusion of moisture vapour (which may reduce the original by not more than 15 %); good water-repellent capacity because of our climatic conditions, the annual 40 - 100 frost cycle; elasticity; good penetrative capacity; ensuring lustreless (dull) surfaces and, in general, frontage appearance similar to painting with traditional whiting. Needless to say, the paints to be applied to our most valuable stock of buildings must meet excellently the general requirements of this field.

As concerns the <u>special diagnostical examinations</u>, I cannot venture to describe them here in detail. I only should like to remark that we evidently cannot reach a decision on the material of the paint without a historical examination of the following: pollution of ambient air, atmospheric humidity, climatic conditions, orientation, minor inner wall humidity to be taken into account even after compulsory subsequent

wall insulation, condition of the basic plaster, structural and architectonical shaping of the frontage, and preceding colouration.

We could ascertain the correctness of our aforesaid principles when we drew up our study-project for the frontage rehabilitations of Hungarian historic towns, of the Castle Quarter of Buda first of all. During the preparation of this great public task - aimed at giving within a few years a "new vesture" to our entire group of monuments consisting of about 200 buildings - it became clear that the lastingness of paints must be solved here with special care. This view was supported by the fact that the first plastic paints - still at a rather low stage of development and applied in the early 1960's - decayed rapidly; and it was also supported by the circumstance that we could no longer take into account continued painting or white-washing that was usual about every year in olden times (and is perhaps still usual in some places).

This latter question is perhaps the most controversial, i.e. whether traditional lime water colours can still be used in our days. This question is aggravated in Hungary by the hydrated lime of old quality, by our difficulties connected with providing oxides of suitable shade and skilled labour. Still greater problems are caused by the pollution of air, mainly by its carbon dioxide content which, converted with precipitation into sulphuric acid, dissolves calcium carbonate. The high number of annual frost cycles, the frequent occurrence of afternoon precipitation and nightly frost, and the "defencelessness" of non-hydrophobic surfaces result in destructions of physical nature, in perish by frost. (This conclusion was reached also in a recent study by the Hungarian Quality Control Institute of Public Construction.)

At the same time a considerable part of our monument experts regard lime water colours as belonging to the buildings traditionally and organically, and recommend their appli.a-

tion to them (contrary, for example, to artificial stone which we apply widely instead of ashlar). Their standpoint cannot be contested in cases where there is no possibility of repairing or replacing a very poor basic plaster, or of subsequent wall insulation; namely it is of no use here to paint originally non-lasting frontage surfaces with plastic paints which are expensive and non-lasting in such a case. (It is our opinion that the latter "principle" can be accepted by no means; considering the cultural-political and touristic importance of monuments, the real cyclical period of their repainting, our efforts must absolutely be aimed at the most lasting solution.)

But it is our opinion at the same time that the distrust of our experts in the protection of monuments towards plastic paints is not unjustified; this is proved by numerous bad examples. There are very few plastic paints which meet the system of requirements mentioned above. But this is not to say that we found not one paint of whose outer appearance even the firm believers in lime water colour could tell whether it was a plastic paint or not; and, besides, its water-repelling capacity and vapour-diffusion resistance did not decrease by more than 15 - 20 % compared to that of the unpainted surfaces. (Exmmples of meeting this requirement are to be found mainly among the water-dispersion paints.)

In our study drawn up in this subject-matter - as well as in the draft study on the Castle Quarter of Buda - we also recommended the application of traditional mineral paints (KEIM Mineralfarben) and of hydrophobised distemper. In our semi-plant experiment of 1975 (on the partition-wall of Bánk bán utca 7, Budapest XI) the latter was also present in addition to eight other different paints (with not much success, due perhaps to deficiencies of execution). The band of 1976, and the band painted subsequently with distemper, turned entirely grey, decayed. On the other hand - apart from the faults of the basic plaster - the various plastic paints and

the band painted with silicate colour proved to be good.

If we have to take into account minor wall humidity (I think it is 6 - 10 weight per cent in the case of a brick wall) where subsequent wall insulation (or its repair) is not necessary and does not take place either, it is likewise not advisable to apply any type of plastic paint. In such cases it is recommended to apply silicate paint or distemper, but - given our special climatic conditions - provided with an invisible hydrophobic protective coating.

Our recommendations contain also the application of silicone paints which are quasi a transition between inorganic and organic paints, between plastic and silicate paints. (Their application resembles somewhat to the practice seen in dressing nowadays: plastics are replaced in certain fields by the combination of plastics with natural materials, partly in the course of their required blending, partly during the finishing of natural materials in production.)

Application of silicone paints is justified first of all by their excellent vapour permeability. The optimum value of water absorption and vapour permeability (A) is this:

$$Sd.A \quad 0,1 \quad kg.m.h.^{0,5}$$

The smaller this product or multiplication is, the better is the pertinent property of the given paint. Data

$$A \quad 0,3 \quad kg/m^2 .h^{0,5}$$
$$Sd \quad 3 \quad m$$

in the case of the Nouvenil silicone paint (which was in practice first applied on the building at I. Ormánság u.20), the three values are the following:

$$A = 0,1 \quad kg/m^2 . h^{0,5}$$
$$Sd = 0,04 \quad m.$$

The product of these is $Sd.A = 0,004 \quad kg/m.h.^{0,5}$

This value is about ten times better than the comparable [illegible] dispersion paints, which, however,

also meet the above requirements satisfactorily.

It is therefore that we regard with special expectations towards the application of silicone paints, hoping, of course, for success only if we do not make mistakes in the preparation of surfaces and in technology. If we apply them properly we can ensure for the period between two renovations the lastingness of the frontage colouration with special regard to the fact that renovation will not take place after the decay of the paints, but after the expiration of the predetermined cyclical period.

The accelerated decay of frontage colours, the increase of environmental damage urge us not to content ourselves with the discovery of the "old" as something new; we must continue our efforts to satisfy the requirements of the protection of monuments at the maximum, but must at the same time try to find solutions which provide effective and lasting protection and are truly new. Within the scope of this work we examine available materials with our own methods in our own laboratory, as well as in semi-plant experiments, and are in addition engaged through basic research in the development of a "monument paint" of novel type. We hope that we can report on the results of this research project before long.

The increasing necessity of protecting natural and artificial (man-built) environment is the great - and mostly involuntary - "discovery" of our age.

As concerns Hungary, the upswing of environmental protection gives at the same time rise to problems which impede in the form of extraordinary economic difficulties the successful accomplishment of this task even with the given collaboration of society as a whole. This problem is still more acute in the case of man-built environment since this is under the control of another high authority (the Ministry of Public Construction and Town Development) and its solution is in-

fluenced by the reality of many other factors even if the forces ravaging man and his buildings are the same in many a case. On the other hand it is a good thing that the progress in the protection of our monuments mobilises theoretical, legal, organisational and social forces, that the importance of maintenance construction increases in our days, and that its widening financial basis makes possible speedier development in the shaping and protection of our man-made environment. The planned rehabilitation of cityscapes, streetscapes and monumental ensembles is an integral part of this developmental process.

FARBIGE FASSADENGESTALTUNG DURCH FLÜSSIGE BESCHICHTUNGSSTOFFE

H. Harteneck

Die Firma INDULA Farben- und Kunststoffwerk GmbH in München beschäftigt sich seit 55 Jahren mit der Herstellung von Fassadenbeschichtungen für neue und alte Fassaden. In letzter Zeit überwiegen die ganz hochwertigen Systeme für Renovierung, Sanierung und Vollwärmeschutz.

Ziel dieses Vortrages ist es, darzustellen, dass die Farbschönheit und die Farbdynamik zwar ein Hauptzweck der Fassadengestaltung ist. Diese berechtigten Wünsche und Zielsetzungen der Farbgestaltung wollen wir selbstverständlich im Rahmen unserer Tätigkeit berücksichtigen, ohne uns im übrigen über ästhetische Fragen, über die wir nur eine laienhafte Meinung haben, ein Urteil zu erlauben.

Neben diesen Fragen der Farbgestaltung müssen unsere Produkte aber noch viel mehr können: sie müssen sich rationell verarbeiten lassen, sollten langjährig halten und dies auch in bezug auf die Farbechtheit und Farbschönheit. Weiterhin müssen sie die Fassade vor Regen und Kondenswasser schützen. Sie müssen Fehlstellen und Risse nach Möglichkeit überdecken und sollen dadurch, dass die Fassade trocken gehalten wird, auch energiesparend wirken.

Schliesslich möchte ich mit diesem Vortrag darauf hinweisen, dass mancher verständliche Wunsch des Farbgestalters nicht dauerhaft und sinnvoll zu verwirklichen ist oder dass seine Verwirklichung andere technisch bedingte Anforderungen an den Fassadenschutz beeinträchtigt.

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Die farbige Gestaltung von Fassaden ist in fast allen Epochen und höher entwickelten Kulturen ein gebräuchliches Mittel architektonischer Gestaltung gewesen. Dabei waren auch fast immer verschiedenartige Anstrichstoffe zum Einsatz.

Die ästhetischen Möglichkeiten der farbigen Fassadengestaltung lassen sich sicherlich ganz griffig in 3 Kategorien zusammenfassen:

- Die Hervorhebung bestimmter architektonischer Elemente und ihre Abgrenzung von anderen, z.B. den Sockelanstrich dunkel, die Fassade heller.
- Den Ersatz architektonischer Elemente durch farbige Darstellung, z.B. dadurch, dass Säulen nur aufgemalt statt eingebaut sind. Hierher gehören auch die Gebiete der Ornamentik bis hin zur illusionistischen Malerei, die besonders an kahlen fensterlosen Brandmauern zu sehr hübschen und erfreulichen Ergebnissen führen kann.
- Farbliche Gliederung, Abgrenzung und Harmonie innerhalb städtebaulicher Ensembles, wie sie sowohl durch historische Strassenzüge und Stadtkerne als auch durch moderne Neubausiedlungen gegeben sein können.

Dies alles konnte und kann die farbige Fassadengestaltung durch flüssige Beschichtungsstoffe schon immer. Wo sie in früheren Zeiten und auch heute häufig noch versagt, ist in bezug auf die Beständigkeit gegen Niederschläge und gegen UV-Strahlen, im Schutz der Baustoffe gegen Umweltbelastungen und in der Energieeinsparung durch Trockenhaltung der Fassaden. Ausserdem sind die herkömmlichen Techniken der farbigen Fassadengestaltung oft sehr arbeitsaufwendig und bei steigenden Lohnkosten immer schwieriger zu rechtfertigen.

Der technische Aufschwung, den die Herstellung von Bindemitteln und Pigmenten seit dem letzten Weltkrieg genommen haben und der verfeinerte Erkenntnisstand der Bauphysik haben auch die Möglichkeiten der farbigen Fassadengestaltung durch flüssige Beschichtungsstoffe erweitert.

Dies gilt zunächst im Hinblick auf die grössere Freiheit, die sie dem Architekten und Farbgestalter geben.

- Die modernen Bindemittel sind in ihrer Anwendbarkeit so einfach und universell geworden, dass man heute fast alle vorkommenden Untergründe fertig gestalten kann und dies dazu häufig noch mit ein und demselben Flüssigbeschichtungsmaterial. Auch erlauben es diese Bindemittelsysteme, bei der Beschichtungsarbeit weit geringere Ansprüche an das handwerkliche Geschick der Verarbeiter ebenso wie an Wetterbedingungen, Untergrundvoraussetzungen und Trocknungszeiten zu stellen als dies bei traditionellen Anstrichsystemen der Fall war.

- Moderne flüssige Beschichtungsstoffe haben in aller Regel wasserklare, farblose Bindemittel und sind im ph-Wert neutral, so dass man die farbige Pigmentierung in fast jedem gewünschten lichtechten Farbton vornehmen kann und dadurch viel grössere Gestaltungsmöglichkeiten in viel intensiveren Farben hat als früher. Diese erweiterten Möglichkeiten für die Farbdynamik rufen natürlich nach verstärkter Einschaltung von geschulten Fachleuten, denn sonst kommt es leicht zu fürchterlichen Farbdissonanzen und Geschmacksverirrungen.

- Moderne flüssige Beschichtungsstoffe geben auch dem Architekten die Möglichkeit freizügigerer konstruktiver Gestaltung. Dies ist ein Resultat der stark verbesserten Schutzfunktion dieser Systeme gegenüber den traditionellen Systemen. Während man früher genötigt war, durch konstruktive Vorkehrungen Bautenschutz zu treiben, kann man heute den Erfordernissen des Bautenschutzes durch nachträgliche Beschichtungsmassnahmen Genüge tun. Dies allerdings im Bewusstsein, dass ein guter konstruktiver Bautenschutz keiner Renovierung bedarf, während Bautenschutz durch Beschichtungsstoffe regelmässig gewartet und erneuert werden muss.

Darüber hinaus sollte der moderne und universell denkende Farbgestalter auch daran denken, dass die moderne Umwelt

durch gestiegene Energiepreise und erhöhte Umweltbelastung sowie hohe Lohnkosten auch hochwertige flüssige Beschichtungsmittel erfordert, die eine trockene Fassade, Schutz vor zerstörenden Abgasen und lange Lebensdauer bis zur nächsten Renovierung gewährleisten. In bezug auf Farbgestaltung ist ferner daran zu denken, dass dunkle Farbtöne sich in der Sonneneinstrahlung wesentlich stärker aufheizen als helle Farbtöne, was für gewisse moderne Baustoffe bedenklich ist. So sollte man moderne mit PS - Hartschaum gedämmte Fassaden ebenso wie Gasbetonelemente und Bims- und Schlackenbetonsteine jedenfalls in Farbtönen mit Hellbezugswerten über 60 % streichen, damit die grossen Temperaturschwankungen keine Rissbildung verursachen. Bei gut wärmeleitenden Fassadenbaustoffen - Beton, Putz, herkömmliches Mauerwerk - ist dagegen eher ein gedeckter kräftiger Farbton vorzuziehen, weil er bei der heutigen Umweltverschmutzung länger farbstark und ansehnlich stehen bleibt.

Zusammenarbeit zwischen Farbgestalter und Beschichtungshersteller:

Jeder Hersteller moderner und hochwertiger Beschichtungsstoffe verfügt über ein bestimmtes Sortiment an Farbtönen. Dieses Sortiment wird dem Farbgestalter zur Verfügung gestellt in Gestalt von Farbtonblocks und Musteraufstrichen. Es dient der Zusammenarbeit zwischen Farbgestalter und Beschichtungshersteller, wenn sich der Farbgestalter zunächst im Sortiment des Beschichtungsherstellers nach geeigneten Farbtönen umsieht. Manche Beschichtungshersteller machen es sich sehr leicht, indem sie von wenigen Basisfarbtönen ausgehend durch Aufhellungen, Abdunklungen und Grautönen ein sehr umfangreiches Farbtonsortiment vortäuschen. Der erfahrene Farbgestalter sieht jedoch bei näherem Hinsehen sofort, dass die meisten dieser durch Konjugation mit Weiss-, Schwarz- und Grautönen erzeugten Varianten eines Farbtones für die praktische Farbgestaltung an der Fassade völlig unbrauchbar sind und nur theoretischen Wert haben.

Mehr ist hier schon zu halten von Sortimenten aus künstlerisch entwickelten Farbtönen, die nach einigen Jahren der Praxiserprobung Aufnahme ins Standardsortiment des Beschichtungsherstellers gefunden haben. Sie als Fachleute wissen recht gut, dass erst ein Farbtonsortiment von vielen tausend Farbtönen ausreichen würde, um alle möglichen Farbtonwünsche in etwa abzudecken. Hier würde die Sortimentsgestaltung aber an zwingende wirtschaftliche Grenzen stossen. Deshalb zeigt sich in der richtigen Beschränkung der Meister!

Wo das Standardsortiment des Beschichtungsherstellers nicht ausreicht und wo besondere Anforderungen des Farbgestalters den erheblich höheren Aufwand rechtfertigen, ist auch eine individuelle Massanfertigung denkbar. Voraussetzung dafür ist normalerweise ein Mischversuch durch den Farbgestalter. Hierbei ist aber wesentlich, dass der Farbgestalter für den Mischversuch in seinem Studio nur von solchen Farbsystemen und Pigmenten ausgeht, die auch für die Anwendung an der Fassade genügende Echtheit aufweisen. Am besten wäre es, er würde tatsächlich von den beim Beschichtungshersteller eingesetzten Volltönfarben ausgehend den gewünschten Farbton gestalten. Aufgrund solcher Mischversuche können dann Probeflächen am Objekt ebenso angefertigt werden wie Musteraufstriche auf Karton im Briefbogenformat, die als Vorlage für die Abtönung der Sonderherstellung im Werk des Beschichtungsherstellers dienen können.

Ein qualitätsbewusster Farbgestalter und ein Hersteller hochwertiger Beschichtungsstoffe wird es auf jeden Fall nicht gerne sehen, dass die Abtönung der gesamten für den Fassadenanstrich benötigten Menge des Anstrichstoffs erst auf der Baustelle und nicht schon im Werk passiert. Dies einmal deswegen, weil an der Baustelle kaum mehr als 200 Liter Beschichtungsstoff auf einmal gemischt werden können. Zum zweiten deshalb, weil für die Abtönung an der Baustelle häufig aus Unkenntnis Abtönfarben eingesetzt werden, deren Echtheit nicht den hohen Anforderungen an der Fassade entspricht und drittens weil

eine gründliche Durchmischung des Beschichtungsstoffes an der Baustelle wenn überhaupt, dann nur nach übermässiger Verdünnung des Anstrichstoffes möglich ist.

Wenn der Farbgestalter diese ganzen Themenkreise mit dem Berater des Beschichtungsmittelherstellers an der Fassade verhandelt, dann kann auch gleichzeitig dafür gesorgt werden, dass die technisch erforderlichen Arbeitsgänge festgelegt werden. Es ist eine Binsenweisheit in unserer Industrie, dass jeder Anstrich und jede Beschichtung nur so gut sind wie der Untergrund, seine Vorbehandlung und Grundierung. Ausserdem bewährt es sich gerade bei technisch schwierigen alten Fassaden und denkmalgeschützten Objekten sehr, wenn der Hersteller des Beschichtungsstoffes auch ein Auge auf die Verarbeitung seines Produktes haben kann.

Die Farbgestaltung und Farbdynamik ist eine schöpferische Leistung, die sehr zur Lebensqualität und zur menschlichen Gestaltung unserer Umwelt beiträgt. Unser Wunsch als Hersteller von Beschichtungsstoffen ist, dass diese schöpferische Leistung des Farbgestalters möglichst dauerhaft und unverändert den späteren Generationen überliefert wird. Was hilft eine noch so schön gestaltete Fassade mit harmonischem Farbenzusammenklang, wenn die Farbtöne durch Verblassen oder Fleckigwerden schon nach einem halben Jahr nichtsmehr von der schöpferischen Leistung des Farbgestalters erkennen lassen? Oder was hilft eine noch so schön gestaltete Fassade, wenn wegen unzureichender Qualität von Beschichtungsmaterial und Anstrichausführung schon nach dem ersten Winter die ersten Feuchtigkeitsschäden, Abblätterungen und Abplatzungen die Fassade verunstalten? Hier ist nach unserer Auffassung der Punkt, wo der künstlerische Farbgestalter ebenso wie der Bauingenieur und der nüchtern rechnende Buchhalter das gleiche Interesse haben an einer schönen, dauerhaften und wirtschaftlichen farbigen Fassadengestaltung.

MEASUREMENT AND METHOD OF COMPARISON OF THE COLOUR ASSORTMENT

M. Földvári

In our architectural practice two extremes are existing in the colour design: one is the deliberate colour-forming of the environment (colour-dynamical design), the other one being the spontaneous "choosing of the colour".

The colour dynamical design, considering the physiological, psychological and aesthetical aspects creates colour-groups and tries to select them of the available coloured materials, give prescriptions for the producing factories or in some cases mix it of existing paints.

The spontaneous colour design is characterized by choosing the colours on the base of subjective taste using as an only help the colour catalogues, colour sample collections of the factories.

The procedure of a colour design and its result is highly influenced by the amount of colour assortment being at the designers disposal.

Comparing the possibilities of a painter and an architect in using colours the difference is striking. (In this case let us disregard the fact that their taste and aim, thus their means are also different, only their relation to colours should be considered.)

The creator of a painting manually mixes the proper colour shade; he has at his disposal practically the whole colour gamut; the same colour shade is needed on a relative small area only; the painting can be modified during the certain period of time.

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The possibilities, however, of a design architect are much more limited: he cannot mix the paints for the buildings himself but using colour-numbers he must give information about the desired colour to the constructor or specialist making the coating; the surfaces to be painted or coated can amount to some thousands of square metres, i.e. the colour-mixing on the site could be solved only with special machinery; the colours of the building are formed not only with paints but with other naturally or artificially coloured materials – the colours of the latter ones can only in exceptional cases be "designed" and cannot at all be modified later on.

Making the survey and evaluation of the colour assortment of paints and coloured materials (influencing by all means the result of the colour design) a very good overlook can be developed about the colour-design freedom provided by the individual sorts of materials and paints.

The characteristic and basic parameter of the colour assortment is the number of elements of different colours - but by simply increasing this the "value" of the colour assortment, the freedom of colour design, does not increase proportionally. It is of basic importance that the available colours should be positioned uniformly in an equidistant colour space, e.g. in the MUNSELL colour system and that several basic colours, saturation and lightness variations of the main colours should be there in the collection.

Having the quantitative and qualitative data of the present colour assortment the "ideal" colour assortment can be theoretically be designed, which, by its elements of definite number and different colour provides the possible greatest freedom of artistic design and by which the largest number of harmonic colour group combination can be developed among the samples.

It would be an economic nonsense to produce all kinds of materials in every available shade but this is not necessary either. The design of the colour assortment, the "harmonizing"

of the different materials appearing on the buildings simultaneously - considering the human aspects of colour dynamics and the technical limits of colouring - is reasonable and important first of all for such materials which get their colours during the production.

The elements of the "ideal" colour assortment are, for our study, equidistantially spaced in the SZINOID colour system, - in the practice, however, several factors may modify this uniformity:

- technical limits of colouring the material
  (some hue-, saturation- or lightness shades cannot be prepared of certain materials /or only very expensively/. In these cases it should be endeavoured that the assortment be uniform according to at least one or two of the 3 colour characteristics.)
- colour preference
  (The designed colour assortment should meet the average colour-liking of the population. In the range of the less popular, unsaturated dark colours it is not important to create a dense scale, but a wider choice is desire or the light and warm colours.)
- associations and emotions connected with the material
  (On different materials, depending on their surface structure, the same colours produce different effects, therefore the data of colour preference should individually be applied to each material. The effect and the generated emotions are different e.g. when looking at a dark grey or black marble, at a glass or solid wall of the same colour.)

Before asserting these aspects the existing, effective colour assortment as well as quantitative and qualitative characteristics of our available paints and coloured materials should be determined.

In order to evaluate qualitatively the colour assortment the elements of different colours are plotted in a coordinate-

system where the vertical axis shows the number of elements (n) and on the horizontal one those spacings (k) are marked where the elements can be positioned.

The number characterizing the quality of the colour assortment depends on

- the number of elements of the given collection (N)
- the uniformity of the positions of the elements in the investigated dimension, the difference between the numbers of elements being in the individual spacings (k).

$$\sum n_i = N; \qquad i = 1,2,\ldots\ldots k$$

The suggested formula to compute the number (S) characterizing the quality of colour assortment is:

$$S = \frac{N^2}{N + D}$$

$$D = \sqrt{\sum (n_i - n_j)^2} \qquad \begin{matrix} i = 1,\ldots\ldots k-1 \\ j = i+1,\ldots\ldots k \end{matrix}$$

S is a dimensionless number and can be interpreted related to N only. The more it approaches N, the more favourable is its value.

The function can be plotted in such a coordinate-system where the horizontal axis shows the increasing number of elements (N) while the vertical one gives the number (S) characterizing the quality of colour assortment.

The maximum of the function is a 45^0 straight line consequently the uniformly distributing colour assortment is the collection of "full value".

The minimum of the function is a straight line with a small slope. The colour assortment is "minimal" if in one dimension all elements (N) are at only one of the possible positions.

The distribution of the colour assortment should be made individually according to the three colour characteristics (A, E, H).

The colours of our environment make their effect as a whole since in practice there are existing groups of colours only, all colours are surrounded by other ones.

In our built world too, the outside facades, inside rooms and fittings of the buildings are bordered by structures, surfaces of different materials and colours. One task to be solved in environmental design is to create harmonic groups of materials of different character and colour.

Consequently the colour assortment of materials cannot be evaluated by itself, but a method is needed by which the colour assortment of a material type can be compared with that of an other. The purpose of this comparison is to gain data in order to harmonize or modify the colour collection of materials.

The number (S) characterizing the colour assortment can be interpreted related to the number of elements (N) of the given collection but these numbers necessarily differ for two or more materials from one another.

The position of the point showing the quality of the colour assortment may be in that part of the plane which is between the maximum and minimum of the colour assortment function. In this coordinate-system tangent-values belong to the points showing the colour assortment value of each material type:

$$tg\alpha_A = \frac{S_A}{N_A} ; \quad tg\alpha_T = \frac{S_T}{N_T} ; \quad tg\alpha_V = \frac{S_V}{N_V} ;$$

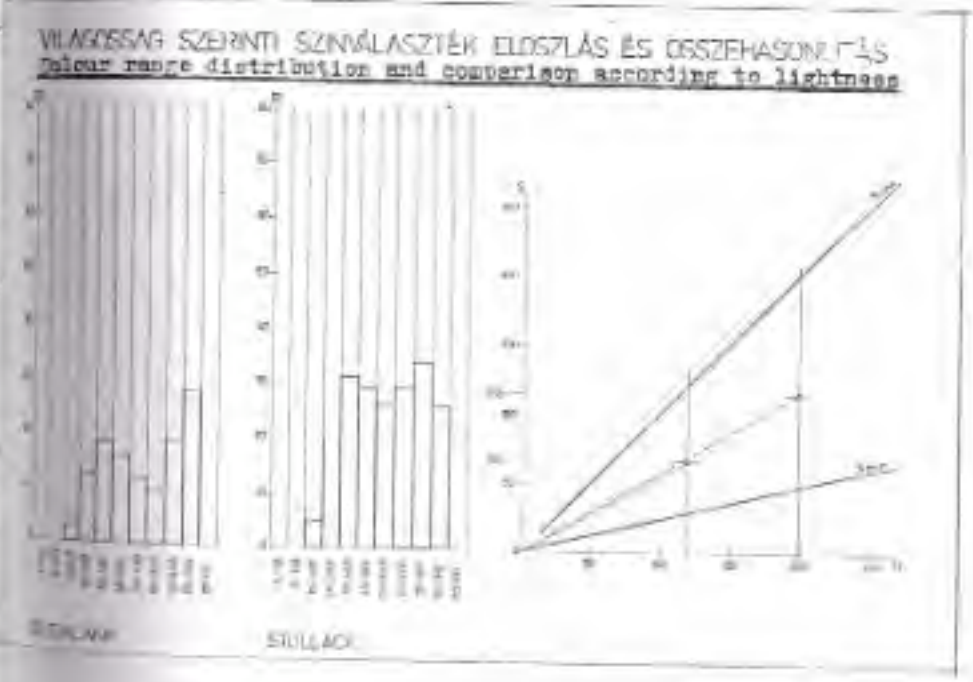
The $tg\alpha$-values are, however, comparable, and can be evaluated independently of the original number of elements of the colour-collection according to their uniformity of distribution i.e. depending on the extent as $tg\alpha$ approaches 1,0.

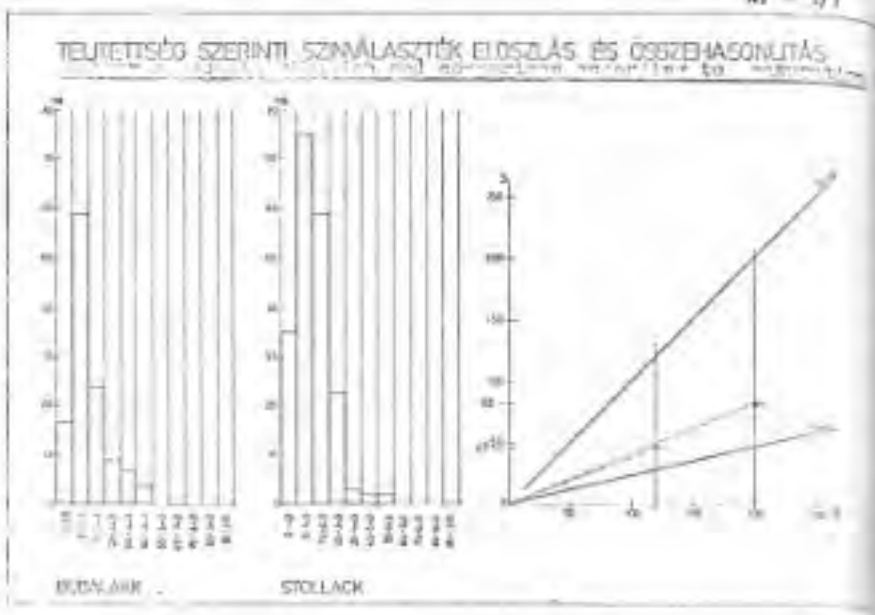
The comparison of the colour assortment of two facade paints applied frequently in Hungary (Budalakk Dekolit, Modakril és Stellack Flamucolor) is cited here as example.

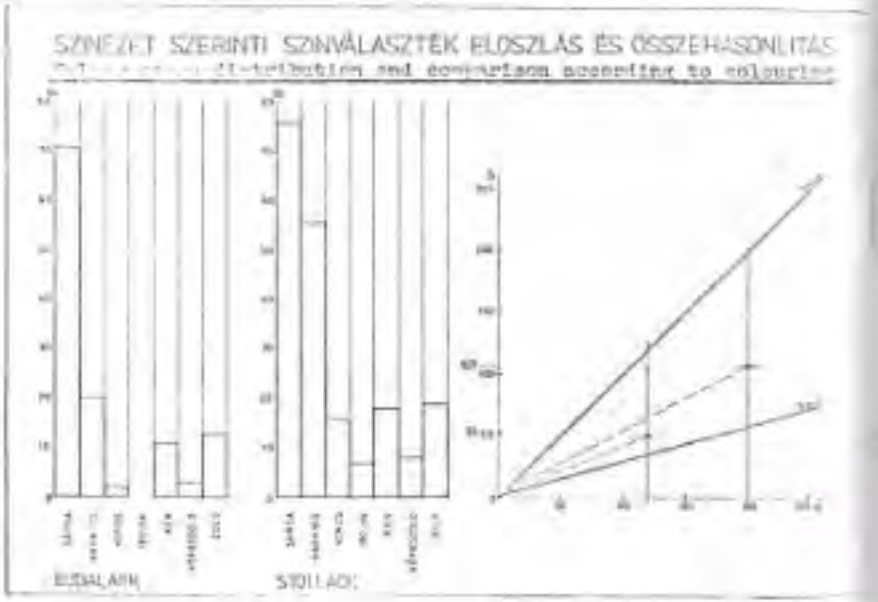
By the method of measurement and comparison of the colour

assortment I tried to prove that the unsystematized colour assortment provides acceptable colour design possibilities only in that case if its number of elements is large enough.

It is reasonable also from an economic point of view to develop relative smaller number of elements - in this case, however, the colour assortment has to be designed. The relatively smaller but in the SZINOID colour body nearly uniformly distributed colour assortment is more valuable and advantageous for the designer than the large ones of incidental distribution.







THE ROLE OF THE CHOICE OF PIGMENTS IN COLOURED ENVIRONMENTAL DESIGN

I. Jákó

The pretentious and lasting surface protection of the facades of buildings requires the application of up-to-date plastic-base frontage paints.

The new type frontage paints manufactured at the BUDALAKK Factory of Paints and Artificial Resins according to a process licensed from HARDING Company /Germany, F.R./

- DEKOLIT water-dispersion plastic plaster,
- CHALIN 66 solvent-containing frontage paint,
- MODAKRIL water-dispersion frontage paint,

entirely satisfy the requirements set against modern facade coatings.

These up-to-date frontage coating materials are available in a wide range. A dynamical variation of their high and pastel colours, respectively, on frontages, in streets and squares will transform the enviroment.

Beyond their advantageous building-physical properities /lasting weather-proofness, resistance to light and frost, vapour permeability/ the colour range available with them offers new facilities for the designer, both in internal and external spaces, to render more colourful the monotonous, grey townscape.

Ildikó Jákó, BUDALAKK Factory of Paints and Artificial Resins, Budapest, Hungary

COLOURING PLAN OF CITY STREETS IN KAPOSVÁR

A7-3/1-

Á. Kővári

In our country the problem of town reconstruction becomes more and more a social task. As a result of the speeding up urbanization the clarification of the position and role of old town centres is a more and more pressing task. In our country the statement has become general that the preservation and the reconstruction of cultural and mental values of our historical towns should be our common aim.

According to this in recent years a high number of town reconstruction plans have been prepared. Among the works of town planning an important part is the planning of the renovation of the street image and the face colouring.

The main aim of this reconstruction colour planning is to preserve truly the character of these nice and precious buildings. Among these tasks it is also important to assure the precious overlining of historical divisions of towns for the people of our time, too. Of course, this will get its total value only with utilizing our full technical-scientific knowledges of the present time.

Thus the task is to establish such a harmony in our towns by the renovation of fronts, which rely on the values of the past millenia by means of colours which become reliable for the human of the present time to the whole extent.

"As our physical existence is built on the genetic sample of long generations, as the language we speak, consists of ideas created and forgotten long ago, as the space-perception of our visual world relies on the image forming, creating discoveries of people, who lived long ago, in the backgrounds of

Ágota Kővári, Architect, SOMOGYTERV, Kaposvár, Hungary

new sight the ancient comprehensions and intuitions can always be found." (György Kepes)

In 1980 our enterprise, the Council Designing Enterprise of Somogy County received an appointment for preparing a colour plan for those streets of Kaposvár, where the buildings remained unchanged in the long run. In conformity of the planning program the colouring of the fasades of about 110 houses should have been determined on a study level in a scale M 1:200.

Before introducing the colour planning, may we tell something about the centre of Somogy county, Kaposvár. Kaposvár is a small town lying in the southern part of Hungary. The centre of the town had been built in the lower third of a plateau slowly rising in northern direction from the river Kapos. The town has a relatively small amount of monuments, its one outstanding monument is the Megyeháza in a classicist style.

Its other buildings are characterized by the eclectic, romantic style. The townscape is characterized by the Május 1 and Ady Endre streets forming two linear elements, among these is the central square of the town, the Kossuth Square and its five-branch street junction. The colour plan is eventually made on this linear axis and the streets joining here.

It is worth having a look into the future of Kaposvár, too, as in colouring the above mentioned streets the plan having been already prepared for the reconstruction of the town centre was an important influencing factor.

The plan of reconstruction includes roughly the followings: only pedestrian traffic is proposed for the Május 1 street. On both sides of this street the commercial establishments will be important town structural and emotional elements, arranged in a linear system.

The development of this commercial centre, the development of a main pedestrian street in the E-W axis is scheduled

by the plan. This main pedestrian street of N-S axis will lead to the inner area: the houses from Nr.15 to 33 on the Május 1 street, where the cultural and administrative centre are being built. The traffic will be solved through a gate in the form of a house behind the row of these houses.

Before the colour plans were established it was required to explore the past colour world characteristic for Kaposvár and Somogy county.

For this purpose old paintings unveiling the colours of the past were collected. During the research in the gallery in Kaposvár paintings having been prepared in the beginning of this century by painter Kapits have been found. By studying these paintings it could have been established that Kaposvár was at the beginning of this century characterised by the shades of yellow and white colours. Among these, it has been known, too, that the homespans of Somogy county are characterised by the white colour.

Perhaps it is worth telling something about Kaposvár in the near past, too, that is, the past decade. Unfortunately, during these years the town has become gray. Colours have been selected for repainting the houses which have run into one another. But it is true that this produced clashes between the colouring experts and the inhabitants of the town.

During the past 3-4 years colouring experiments have got much more attention, positive and negative critics. The renovated houses have appeared in a colourful dress differring from the traditional one. The colouring of these houses has been made without special designing, by the decision on the spot. In this way it is obvious that once more successful solutions and at another times less successful solutions have appeared. But regardless from the unsuccessfulness by these attempts it was proved that the population has noticed the houses of the town.

The appearance of these better and worse colouring attempts

was a decisive factor that our Designing Company was authorised to prepar the colouring plan of the whole town centre. This has meant a complex task. A plan was required giving a colouring study for the town centre. Based on this study the short-term plan of facade reconstruction for different houses was made recently. In this study the colour character of certain houses was determined by taking the colour of the other houses being in the same street into consideration. Since the houses selected for colouring are situated on both sides of a street, these facades create an area.

The sensation of this area was very important. It is produced by the width of the street and the height of the houses on both sides. To sense these areas as required, a maquette of the town centre of M1:200 was prepared. In this way information was received as the street was narrowing and widening. From this it could be determined where the space modifying effect of colours was required.

It was an important designing aspect to know the orientation of certain rows of streets. On this basis the lack of the effect of sunshine on the northern side of the street can be replaced. Light and shade was enhanced with the application of hot and light colours. During the first stadium of planning the colour of certain buildings was determined using different colours. Our work was based on the colours of MUNSELL colour system having been worked out in our country and from these colours the tetrade harmonies were assembled.

Of course, the application of different colours on the buildings was a strong abstraction from the reality but from it useful conclusion could have been drawn.

One important conclusion is that at colouring the town the hues of blue and purple have not to utilise. By using of these colours the town would get a formal and gloomy outlook. Our aim was to establish a smiling, provincial picture by means of colours.

Another conclusion was that by using the whole colour gamut unconditionally, it would produce confusion, a fair like outlook of the town. We strived to create a uniform colour tone.

Therefore for further planning of the townscape greens, yellows, reds, browns were used. The harmonic progression has been established from these colours and the colour sequence for the different streets has been formed. Lighter and darker shades of the colours have been used to create even rhythm on the facades.

Our aim was to establish a uniform, harmonic colour composition for the whole town centre but in such a way that the individual buildings should live full life in themselves. More emphasis was laid on the more valuable buildings by means of colours, where it was necessary it was tried to improve the architectural ratios by means of colours. Of course, to produce a simple, less ambiguous plan was a major task.

The so called STOLLOCÉN paints were used as these show the largest variety among the paints produced in our country. But even this relatively large selection of colours has not considerable limitation. Due to the fact that from the STOLLOCÉN paint collection in a number of hues more lightness and saturation shades are available it was possible to utilise these in differentiating among those parts of a facade which needed more or less emphasis.

The colouring of the town centre is a continuing task, our company is preparing the short-term plan documentation to build up the original development plan. During planning my colleague was Judit Szilágyi. The Hungarian Colour Committee with guidance of Dr. Antal Semsics has offered large help to our work.

REQUIREMENTS CONNECTED WITH THE VAPOUR PERMEABILITY OF PLASTIC DISTEMPER PAINTS

M. Kelemen, B. Balásovich, I. Medgyesi

One way of shaping a colourful environment is to provide the frontages of buildings with coloured plastic surface coating; but colouration plans drawn up with great care are in vain if it remains questionable whether the plastic paints applied today are able to meet the present increased technical and aesthetical requirements.

The measures of energy-economy have in recent years given prominence to the problems connected with the heating engineering and moisture vapour diffusion of wall structures since the moisture content of the surface-limiting structures influences the heat protection of buildings considerably. If the moisture content of the wall structure grows, then the thermal insulating value of the wall decreases, while the accumulating moisture can cause various kinds of damage in the wall structure.

The vapour diffusion resistance of a wall structure is of great importance in the building-physical respect, and the value of resistance must not be altered considerably through the application of a certain distemper paint.

Distemper paints are expected to meet various requirements such as adequate bonding strength, abrasive resistance, elasticity, hardness, colour fastness, vapour diffusion resistance, etc. Of these parameters we regard vapour diffusion resistance as very important since it influences the quality of the frontage fundamentally, even if the other properties

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of the distemper paint are excellent.

As a result of developmental efforts the most widely employed distemper paints usually meet the aforesaid requirements with the exception of vapour diffusion resistance; we therefore should like to discuss this in some more detail.

It is a well-known fact that plastic coatings increase the vapour diffusion resistance of wall structures considerably and if such surface coatings are employed the building-physical control calculation prescribed by MSz-04.140/2 (Hungarian Standard) for wall structures must be carried out.

Figure 1 shows the building-physical conditions in the winter season of a 38 cm thick brick wall plastered on both sides. Considerable temperature differences appear in this case between the exterior and interior surface of the wall. Since the moisture content of the air of heated rooms is much higher than outdoors, this difference tends to be compensated whereby a continuous flow of heat and moisture starts through the wall structure. When at a certain point of the wall the partial pressure of vapour reaches the saturation pressure corresponding to the temperature there, vapour condenses. As is seen from curve p_1, a brick wall plastered at both sides and having no distemper paint behaves faultlessly in respect of vapour diffusion, curve p_1 touches curve p_s nowhere. If distemper paint is applied whose vapour diffusion resistance is of 10^6-10^7 m^2mPa/g magnitude, curves p_2 and p_s intersect considerably and this indicates the condensation of moisture and the possibility of its accumulation.

Our older colleagues can perhaps recall that the frontage of numerous buildings was painted with the Wallkyd paint when it was introduced. But this paint blistered and scaled off the coat of plaster in a very short time.

Examinations have established the cause of the failure: owing to the very high vapour diffusion resistance of the paint coating, the moisture condensing and accumulating in the wa-

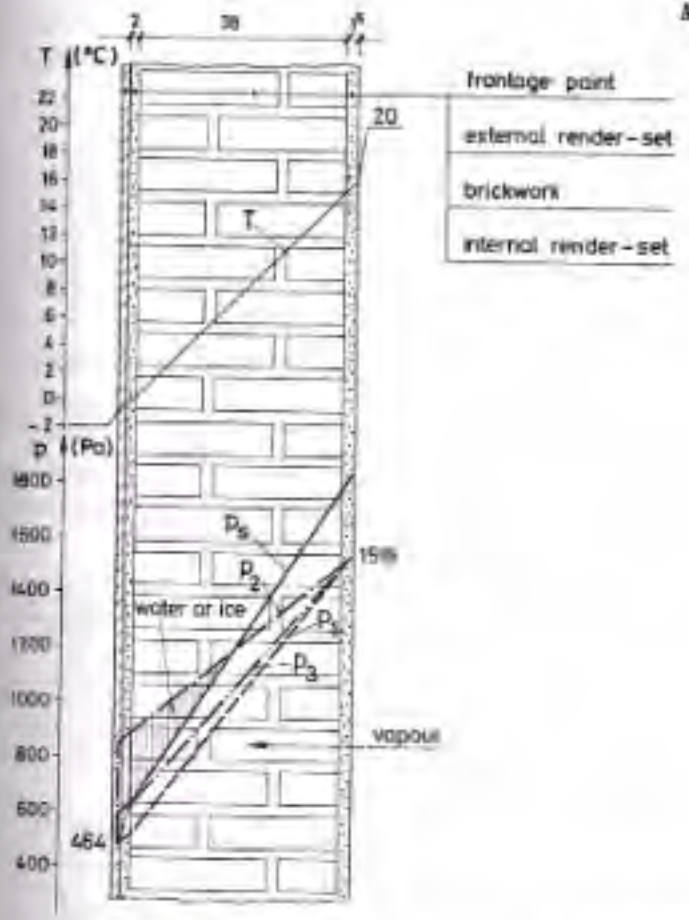

Fig. 1. Building-physical conditions of a 38 cm thick brick wall plastered on both sides

Curves: T - temperature decrease; p_s - saturation pressure decrease; p_1 - partial pressure decrease of vapour in wall structures having no distemper paint; p_2 - partial pressure decrease of vapour in wall structures coated with distemper paint; p_3 - the permissible partial pressure decrease

structure is converted into steam in summer when the frontage is warming up, and this results in the blistering and scaling off of the paint.

Since no such extensive blistering and scaling off takes place in the case of recent plastic distemper paints, it seemed for a while that a considerable decrease in vapour diffusion need not be taken into account with these new paints. But recent examinations show that an effect reducing vapour diffusion appears also with these paints, only in a different form because of the different properties of these paints.

The binding material of the Wallkyd paint is modified alkyd resin which may saponify through the alkalivity of the moistened plaster whereby the paint scales off the plaster and blisters through the pressure of steam generated in this way.

On the other hand, the binding material of recent plastic distemper paints has an adequate alkaline resistance, adhesion of these paints to the plaster usually surpasses even the tensile strength of the Hvh 10-class plasters, consequently the extensive scaling off the plaster and blistering cannot take place if the coating has been applied to a clean surface.

Failure of these paints takes place only if the plaster is of poor quality, or gets ruined as a consequence of the frost cycles and becomes pouched under the pressure of steam, i.e. the scaling off takes place within the coat of plaster. Since the precondition of decay is the poor quality of plaster or subsequent damage to it, failures in the frontage appear, depending on the quality of plaster, only after a relatively longer time, but this does not involve the paint scaling off a large surface or, in other words, that a considerable part of the coating preventing vapour diffusion would disappear; the consequence is the increased danger of the condensed and accumulated moisture deteriorating the heating-engineering properties of the wall structure, and the stain of dampness

resulting on the inner side providing an appropriate medium for microorganisms.

Plastic distemper paints reduce vapour diffusion considerably; this effect can be perceived directly in certain cases, especially when it is neglected that such distemper paints may only be applied to flawless bases, or where elastic plastic coating is applied to cracked plaster, or plaster repaired with plastic patches. In unfavourable circumstances when vapour diffusion is reduced not only by the paint, but also by the combined action of paint and the smoothing patch, moisture condenses and accumulates in the outer layer of the wall, is converted into steam in summer heat, whereby an air pocket saturated with overpressured steam is formed in the crack (Figure 2.). Under the action of overpressure the elastic coating blisters along the crack (Figure 3), and the blister opens up after some time (Figure 4). This is harmful also because a plastic surface coating can protect the wall structure from various damaging effects only if it forms an unbroken coat on the plaster. Namely moisture getting from the outdoor environment through the cracks under the paint can leave the plaster only at a much slower rate than it had entered it, and therefore moisture causes sooner or later the decay, the destruction by frost of the plaster.

As we have seen, plastic coatings increase the vapour diffusion resistance of wall structures considerably; we therefore determined by calculations what the maximum vapour diffusion resistance of distemper paints may be - as a function of the temperature and relative humidity content of indoor air - in the case of brick walls of various thickness plastered on both sides where vapour condensation does not yet take place in the wall structure, (Table 1). When also patching is employed for repairing the coat of plaster, the combined vapour diffusion resistance of patch and paint must be higher than the specified value.

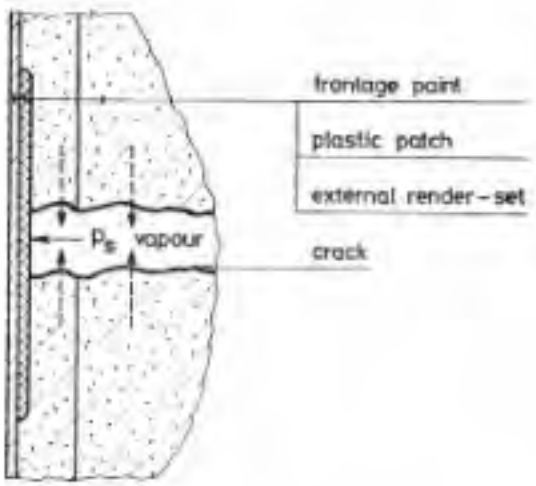

Fig. 2

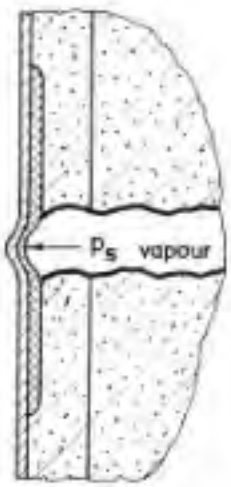

Fig. 3

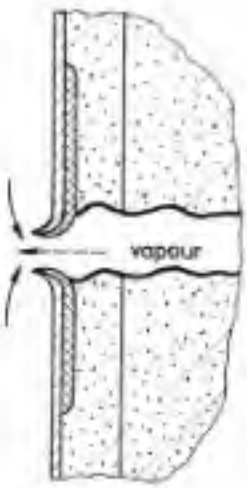

Fig. 4

Maximum permissible vapour diffusion resistance of distemper paints (m^2 xPa/gx10^6) as a function of wall thickness and the parameters of indoor air. Brick wall.

1: Layer structure: 1,5 cm lime mortar
25-103 cm solid brick wall
2,0 cm lime cement mortar
distemper paint

Table 1

Thickness of brick wall (cm)	Temperature of indoor air 16 C° Relative humidity content % 90	80	70	65	60	50	40	20 C° Relative humidity content % 90	80	70	65	60	50	40	24 C° Relative humidity content % 90	80	70	65	60	50	40
	vapour diffusion resistance (m^2 xPa/gx10^6)							vapour diffusion resistance (m^2 xPa/gx10^6)							vapour diffusion resistance (m^2 xPa/gx10^6)						
25	x	x	1,5	1,9	2,4	3,9	8,8	x	x	0,9	1,2	1,5	2,5	4,2	x	x	0,7	0,9	1,6	2,7	
38	x	1,2	1,8	2,2	2,7	4,6	9,8	x	x	1,3	1,6	1,9	3,0	4,9	x	x	0,9	1,0	1,3	2,0	3,2
51	x	1,7	2,4	2,9	3,4	5,2	10,7	x	1,2	1,6	1,9	2,3	3,4	5,5	x	x	1,0	1,3	1,5	2,3	3,6
64	x	2,0	2,8	3,3	3,9	5,9	12,0	x	1,4	1,9	2,2	2,6	3,7	6,0	x	0,9	1,3	1,5	1,8	3,6	4,0
77	x	2,3	3,1	3,7	4,3	6,4	12,9	x	1,6	2,0	2,4	2,9	4,2	6,7	x	1,0	1,4	1,7	2,0	2,9	4,3
90	2,0	2,6	3,4	4,0	4,8	7,1	14,1	x	1,7	2,3	2,7	3,2	4,5	7,3	x	1,2	1,6	1,9	2,2	3,2	4,7
103	2,2	2,9	3,8	4,4	5,2	7,7	15,2	x	1,9	2,5	2,9	3,5	4,9	7,8	x	1,4	1,8	2,1	2,4	3,5	5,1

Legend: x = vapour condensation on the inner wall surface

As a final conclusion it is our opinion that the vapour diffusion resistance of distemper paints used at present must be reduced by one order of magnitude at least in order that a brick wall plastered on both sides and otherwise adequate in respect of heating engineering should meet the building-physical standards even if coated with distemper paint.

A8 ANALYSIS OF SIMULTANEOUS CONTRAST

L. Horváth

When introducing simultaneous contrasts, it is customary to give the colour units in simple patterns. The use of pairs of double squares is common /1/. In this case, the effect of simultaneous contrast is apparent in the following colour sets:

a/1 - the outside colours are the same
the inside ones are different,
a/2 - the two inside colours are the same
the outside ones are different,
a/3 - one of the inside colours and the outside colour facing it are the same
the rest are different,
a/4 - the inside colours are different
and both of them agree with the outside colour facing them.

To receive all the arrangements listed it is necessary to use at least three different colours. All three colours will appear as different due to the effect of simultaneous contrast. It is a question whether the colour variants seen in the different pairs of double squares could be compared, i.e., if they could be serially arranged.

As an example white (K), gray (L) and black (M) are chosen. The double squares can be produced:

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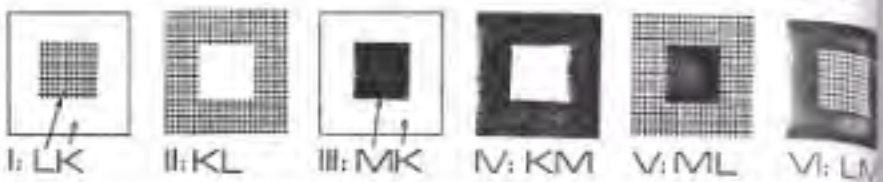


The following pairs can be obtained (in case the order of double squares is disregarded in the pairs, and the same double square cannot appear twice in the same pair):

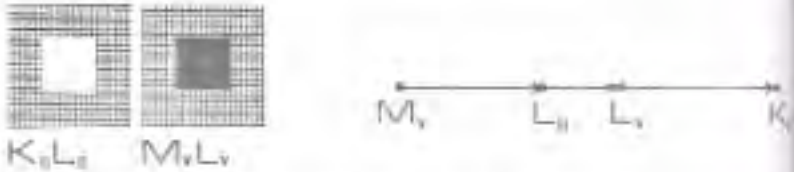
I-II I-III I-IV I-V I-VI
II-III II-IV II-V II-VI
III-IV III-V III-VI
IV-V IV-VI
V-VI

The following can be observed in the arrangement setup:

a) two colours seem instead of one (four instead of three)

a/1 - the same outside colour looks different

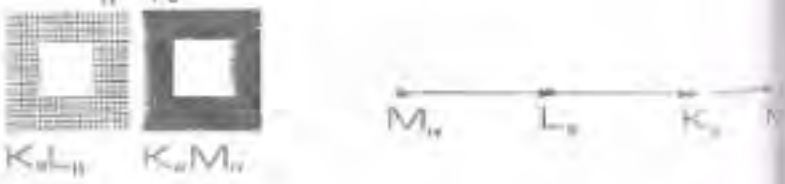
e.g.: II—V



(The lower index shows which double square (variant) the variant of the given colour. The direction of brightening is indicated with an arrow (——>) (which is brighter than).)

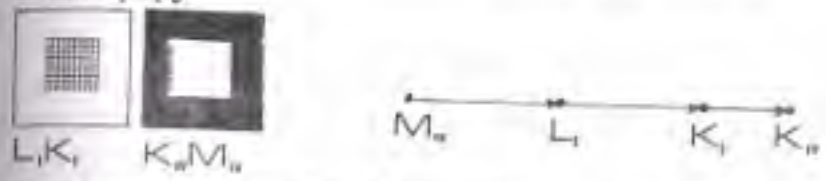
a/2 - the same inside colour looks different

e.g.: II—IV



b/ - the same colour looks different inside than outside

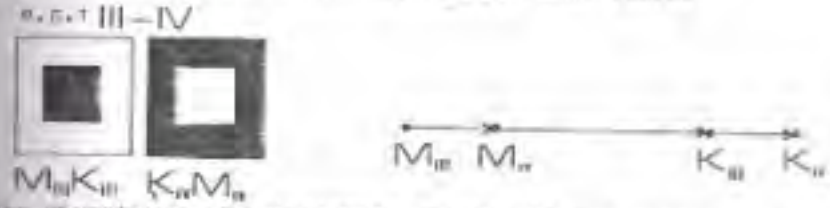
e.g.: I—IV



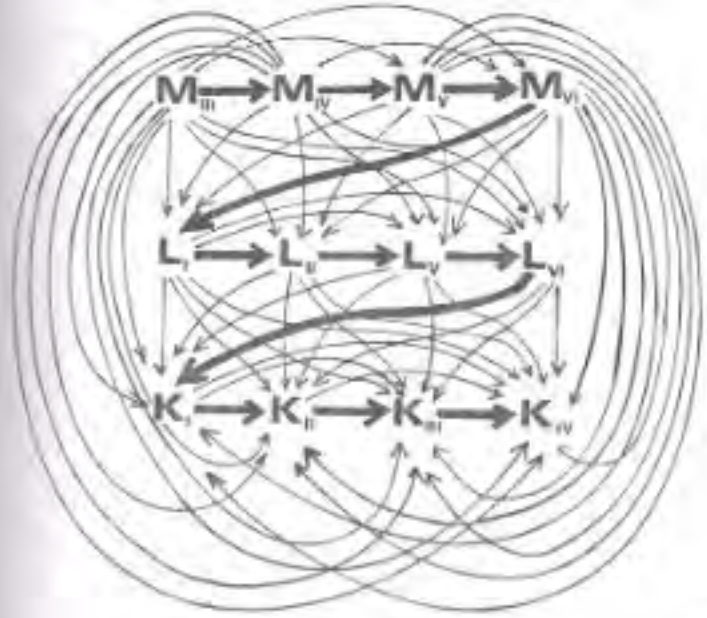
(i two colours appear as four (one appears as two)

b/1 - both colours look different outside than inside

e.g.: III—IV



(i) the directions of brightening within all the visualized duality pairs can be modelled in a directed graph /5/, which may take the following shape:



The bold type arrows indicate the order of brightness in all the colour tones seen, i.e. they are indicated by the Hamilton-line in the graph.

Further values may be added to the three indifferent colours (K, L and M) originally selected. By establishing further double squares and pairs of double squares it can be ensured that the newly selected colours will show various degrees of brightness through simultaneous contrast. Evidently, the earlier three tones can be also paired with the new colours, with a consequent wider diversity.

It seems necessary to assess all the possible changes of all the tones in a highly diverse gray scale, by judgements based on sensory comparison. In the course of the experiment and assessment it will definitely occur that two neighbouring or close tones in the scale (let the two tones be indicated by X and Y, and let X$\leftarrow$Y) will appear the same ($X_p = Y_q$), or the darker will look brighter ($X_p \longrightarrow Y_q$) through simultaneous contrast. Ordering of the apparent tones, i.e. the construction of Hamilton-lines in the appropriate directed graphs can be suitably achieved by the so called process of Latin multiplication or binding procedure.

If the colour modifications due to simultaneous contrast are also analyzed in pied colour sequences, all three colour characters (hue, saturation and brightness) should be expected to change.

Due to this, we can order an "elementary movement space" to any given colour points defined by the A-T-V coordinates in the OSTWALD colour system, where the individual colours, due to the interaction of simultaneous contrast, will realize colour modification limited by the given circumstances.

It is assumed that all this is to be solved in the course of colour ordering with regard to colour dynamics in order to achieve a dynamic structure of colour systems.

With the above considerations in mind, a Scientific Student Research Group at Janus Pannonius University, Faculty of Teacher Training and a Fine Arts Study Group at the Pécs Ifjúsági Ház Workshop started the analysis of simultaneous contrast in Pécs.

The colour sequence selected involves four related colours, with a SIMULTANEOUS CONTRAST silk screen folder No.I, already prepared, operating with three colours. It assesses the possible changes of a yellow, an orange and a red colour among fixed circumstances through sensory comparison.

In arranging the colours in pairs of double squares, besides harmonically selected space ratio, there are various innovations; optical connections have been applied, disturbing contrast effects have been eliminated through the "shape" of squares, as well as a "tonality-sluice" system being elaborated. The latter means that the environment for the pairs of double squares is selected to fit the tonality features of the outside colours in an indifferent gray colour, thus, it is possible to ignore modification of tone resulting from background effects.

The results achieved so far are based on only one experimental assessment, thus they can only indicate a tendency. A thorough follow-up analysis and the incorporation of new colour sequences into the experiment are in progress.

Practical application runs parallel with the experiment. There are pages to this effect, as well as a toy design, a model in perspective for modification in sensing distortions due to simultaneous contrast and pictures in graphic art in silk screen folder I. Silk screen folder II, in preparation, involves a larger number of pages with similar purposes.

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COLOUR-DYNAMIC DESIGN OF THE DIÓSGYŐR COMBINED STEEL WORKS AND CASE STUDY OF ITS REALIZATION

G. Király

The investments in connection with the large-scale siderurgical works of LKM at Diósgyőr, the preparative engineering and architectural activities necessarily made it imperative to ensure optimum artificial and human environmental conditions for the practical utilisation of the up-to-date, partly novel technological equipment. This included the introduction of work-organizational and psychological methods, systems of technical means to ensure, among others, protection against deleterious industrial contaminations and insalubrities. An integral part of this task was planning the colour-dynamic design and the information system of the steel works.

Planning was performed by collaborators of the ICOLOR team in close co-operation with design engineers of KOHÉPTERV Project Institute and specialists involved in the LKM investment. The team work consisted in a collective co-operation of industrial designers, interior designers and pattern design specialists.

Colour-dynamic design was performed in two separate phases:
- The first phase was the colour-dynamic design of the external appearance, the frontages of the Combined Steel Works and related establishments.
- The second phase comprised the indoor colour-dynamic design of the works' hall and connected technical and social establishments, including colour proposals for architectural structures, technical-technological equipment, means of transport etc., as well as for the planned information system.

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respect of the system of architectural, material and information means; moreover to elaborate a uniform scheme of planning the visual environment, the main objectives of colour-dynamic design, its system of requirements and order of documentation.

The colour range of materials for painting, coating, etc. as a basic condition of colour-dynamic design and realization should be adequately synchronized, taking into consideration the colours demanded for the various fields of application.

Equally important is to ensure and educate an adequate number of specialists who would warrant the correct realisation of colour-dynamic designs in identical tint.

The few conditions emphasized here are indispensable for shaping up-to-date environments of work within large industrial establishments in a satisfactory colour-dynamic execution.

INDUSTRIAL PROPERTY PROTECTION AND COLOUR DYNAMICS

G. Szathmáry

Methodical remarks

Dadaistic painters invented the method according to which ready objects should be glued onto the canvas because the intended message can be formed also in this way. The ready objects preserving themselves disclosed more when arranged one beside the other than could be expected from the result of their simple addition. I hope that the subject matter of colour dynamics complete in itself and the subject matter of the protection of industrial property complete in itself will reveal much more about themselves than the positive sign put between them.

On colour dynamics in general

The light has colour-generating force, colour dynamics. The colours have force enough to change the space and forms but their effect develops differently by day and by night.

By day, we react mainly to the red and green colours, when namely the uniform lighting separates, brings forward or pushes more in the background, i.e. renders plain-like the objects, makes shorter the space. By night, we take notice of the bluish colours which, transforming into light-dark shades depending on the varying lighting merge, push into the depth the objects transformed into plastic state.

If the colour of objects, of the interiors and exteriors of buildings, moreover, of the appearance of towns is chosen in such a manner that at the same time we consider its effect

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exerted on our blood pressure, pulse, frequency of respiratio
our sense of space, our feelings and emotions, we shall notic
that the ability to efforts and relaxing of the users of ob-
jects and building spaces will increase. The colour dynamics
deals with the application of colours according to these
aspects.

Diagnosis of the protection of industrial property orientes
colour dynamics

1. Coloured object and the protection of industrial property.

What does the famous Paris Convention on the protection of in-
dustrial property say about the coloured objects? As a matter
of fact, nothing. Article I solemnly declares that the member
states of the Union protect the inventions, utility models,
industrial designs, trademarks and any other forms of indus-
trial property which are uninteresting when dealing with col
dynamics. Since they are the designs and models which come
nearer the currently used concept of coloured object, the
search for the reply shall be also started here. Article
5quinquies of the Convention discloses as much as protection
due to the industrial designs in each member state of the Con
vention. The best solution is therefore to resort to the na
tional statutory provisions on the protection of industrial
design. For this purpose the Hungarian law seems to be suit-
able, being quite new and containing which is generally expe
from the legal product of such subject in the most part of
states.

However, here I shall make a detour. When in the early seven-
ties the amendment of the Hungarian Statutory provision of I
on the protection of industrial design was put on the agenda
in the public debate two conceptions developed. One of them
wanted to restrict the design protection to the exterior of
industrial product - i.e. industrial design. The other conce
tion suggested the shelving of industrial design, the accep
ance of industrial designing as an art, more precisely, the

putting under the protection of copyright of its creations,
adding, however, that the necessarily originating technical
solutions of the product of designing, of the industrial pro-
duct should be protected by the already mentioned utility
model.

The first conception has won.

The question immediately arises: whether the colour-dynamical-
ly chosen colouration of a product (= object) belongs to the
external form? Whether the form and the colour are notions
substituting each other?

The products (= objects), the spaces and masses mean some-
thing also in themselves, i.e. colourless. This is especially
true for their basic patterns (square, triangle, circle, etc.)
The fundamental message of certain basic forms may be inten-
sified by certain colours and may be softened by others.
Therefore, the colours function as independent factors when
shaping the objects, masses and spaces. The forms, spaces and
masses must be approached, however, not only as the objects
(surfaces) or the selection of colour but also the shaping of
the form, space and mass is entitled to the selection of col-
our without taking into consideration the colour dynamics.
(In this respect the whole existence of colour dynamics is
subject to the change of taste!) It may be stated that the
form, the mass and the space cannot at all be identified with
the colour.

Obviously, neither the colour dynamics and the designing can
be identified. Therefore, if the product is not designed, its
colour-dynamically treated surface does not render it to be
an industrial design. If, on the other hand, the product is
designed, the protection of colour dynamics cannot be drawn
into the protection of the planar and spacial shaping or the
former simply fade into the latter.

As a matter of fact, in the published attitudes the head of
department judging the design applications of the National

Office of Inventions usually observes that the external execution of the product may manifest itself also in the colour composition, in the opinion of the head of legal department of the National Office of Inventions, however, no design protection may be granted to the colour in itself of the product. In case of colours - expounds the head of legal department of the Office - the design protection means the protection of the same form expressible by various colouring. Therefore, in his opinion incapable of being protected is e.g. the coating instead of blue colour with violet or red colour of the bodywork of Ikarus bus. The rules of the protection of industrial property do not speak unambiguously of the coloured objects. Only some of the experts of industrial property protection attribute such meaning to the law on industrial design that this might be referred to the colour composition of the industrial product.

The official dealing with the industrial design applications of the National Office of Inventions does not fail to emphasize in his public statements, what a considerable result was that it succeeded to eliminate from the wording of the law decree the reference to the attractiveness, artistic level or the novelty of external form, saying that these criteria are subjective and with the judgement of protectability they will be ignored at any rate. Unfortunately, the inconsistencies of this deliberately chosen solution will be more and more obvious. There must be something which directs the spectator (the judging official) during the judgement of design consisting of comparisons, even if the law keeps silent thereabout. This something is the taste. The taste is oriented by a certain artistic notion developed on the form. The motivation of the law - in contradiction with the wording of the law - expressively recognises that the novelty examining official of the National Office of Inventions has pledged himself to the taste followed in the industrial designing, to the notion of industrial form creating art.

Therefore, the law exploded in vain the attractiveness at all, these criteria called subjective from the judgement of protectability of external form of industrial designs, the subjectivity remained concealedly in the novelty examination also in the wording of the law. The searched legal solution turned against itself. It eliminated the measure of the judgement of novelty from the wording, and did not initiate the designing specialists in the novelty examination of forms. Thereby it made the way free for the bad taste, i.e. rendered the novelty examination still more subjective.

2. The coloured interior and exterior of buildings are not protected by the statutory provisions on the protection of industrial property.

3. Colour dynamics, industrial designing art, the architecture and the industrial property protection

It was shown that the protection of industrial design deals with the selections of colours only inasmuch as they have a bearing upon the designing, more precisely, industrial form shaping. The formation of space and mass, the associated selection of colour does not even lay claim to the protection of industrial property.

However, the colour selecting activity, the colour dynamics lay claim to that according to their own laws they could regard both the form and the inner space and outer mass as a surface to be coloured. What can protect the colour selecting activity, as a homogeneous whole, if the protection of industrial property does not take it upon itself? Well, it depends on what kind of activity the colour selection is considered. A scientific activity? Whether the selection of colour is preceded by the measurable and foreseeable utilization and planning of the objective physical laws of colour? Since the physical laws of colour do not have any part in the selection of colour, and according to the biology its effects take birth in ourselves, in the subject, this may not be stated. In this case, however,

the selection of colour is not a technical projecting activity, belonging to the range of applied natural sciences but a subjective composing activity. The composing activity can be hardly regarded as other than a creation, i.e. an artistic creation. According to par.1 (1) of the order No.9/1969 (XII.29.) KM of the Cultural Minister the project of all creations produced by painting, further the architectural creation, the projects of building ensembles and town-building ensembles as works of art fall under the protection of copyright, independently of the fact whether the copyright law calls them by name or not.

What will and what can the law offer for for colour dynamics

1. Let us take now the legal facts.

According to Article 6 of the Law Decree No.28 of 1978 on the protection of industrial design, the owner of industrial design has exclusive right to produce and to exploit the industrial design, as well as to grant licence to third person for the production of his industrial design. According to Article 4, he can demand a compensation for all those [illegible] exploiter, namely from the moment - says Article 5 - when the National Office of Inventions has found the applied design capable of being protected and ordered its registration. This right of the owner of design is reserved for at most 10 years according to the above mentioned Article.

According to Article 15 of the Law No.III of 1969 on copyright whatever utilization of the projects of works of art produced by painting, as well as of projects of building ensembles, of town-building ensembles the consent of the author is required. Remuneration is due to the author even in such cases - says Article 27 - when it is not obligatory to acquire the consent of the author to the utilization. It is unnecessary to establish the title of remuneration by an application filed with any authority, its duration makes out the life-time of the author [illegible] additional 50 years - according to Article 3

the author of the industrial design may apply for protection at the court against third parties who contest his quality as author - points out Article 2 of the Law Decree No.28 of 1978. The colour-dynamical designer of the building interior and building mass may claim the same according to Article 9 of the law No.III of 1969.

1. What can the law afford to the colour dynamics economically?

The protection of industrial design can provide for a monopolistic position for the person who stands the costs of official registration in order to propagate the colour composition bought from the colour-dynamical designer against compensation on the most possible objects, building interiors or exteriors.

The copyright protection offers perhaps reputation and some kind of moral monopoly for the colour-dynamical designer himself, if he does not establish a colour-dynamical studio, does not experiment with the registration of industrial design and who takes good care to avoid the plagiarism of his colour composition by third person. If he grants the utilization of his colour composition against compensation to a third party, a remuneration is, of course, due to him.

Therefore, the person who strives after the exploitation of industrial or trade character of his composition, will choose the protection of industrial design. The other person, who aims at the individual solutions and at their utilization as a creative artist, will turn to the copyright. None of them should, however, forget the above outlined unsteadiness of the availability of legal services.

COLOUR DYNAMICS OF LANDSCAPE ARCHITECTURE

J. Heckenast

Landscape architecture is also an art of space formation. Its principal means is the live and changing vegetation which needs to be constantly provided with ecological conditions to ensure its flowering.

Landscape architecture which has as long a history as the town itself bears testimony to the fact that colour dynamics always constituted an important factor in dispatching this kind of activity.

Nowadays the embellishing function of green areas gives ground to utility factors of which the crucial role from the point of view of urban communities belongs to ensuring the conditions for public rest and recreation.

Everyday, weekend and yearly relaxations differ from one another first of all in their duration and only in the second place can one observe a broad scale of overlappings all the way to full coincidence.

Among the factors conducive to well-organized recreation in green areas, issues of colour dynamics are related to the layout, utility and outward appearance.

Parks can meet the requirements for climatic, hygienic, aesthetic and recreational functions and for assuring favourable ecological conditions only if they spread over a large area. It is advantageous if a large, so-called central town park is flanked by other green areas and becomes part and parcel of a green belt encircling the whole town.

The central town park may fulfil many functions. To enumerate but the most important and recurrent ones: it can serve as a venue for mass rallies, recreation, education, physical exercise, occupation of child-

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ren, quiet rest, open-air hobbies. It is easy to see that part of these functions could be discharged together, with territorial overlappings, whereas another part requires careful isolation.

The most divergent types of recreational pastimes should be located at the farthest distance and with the most careful isolation from one another. The noisiest diversions include motor modelling, fun-fairs and beat music; the quietest require conditions for rest and sleep of adults and children, whereas small babies call for utmost protection.

There are a number of hobbies which imply relatively neutral functions, such as taking walks, talking, noiseless rythmic bodily exercise /running, jogging, gymnastics/. Areas assigned for discharging neutral functions may be used as buffer-zones sandwiched between park-plots where isolatable activities are carried on.

Areas for discharging dynamic functions require a demarcation floral zone capable of withstanding the wear. The plants demanding much care may be grown around quiet areas.

As is implied by their name, the green areas, when flowering, possess green as an overwhelming and dominating colour with its diverse shades. The other colours, be it of plants, fixtures or the covering surface, are modelled in this green background.

From the point of view of colour composition, there may occur 4 possible cases, i.e.

- The overwhelming domination of the green colour /areas covered with grass, forests, etc./,
- The predominance of the green colour with other colours interspersed /flower fringes, coloured plants standing alone against an expanse of green areas, etc./,
- The approximately identical occurence of the green and other colours, their balance, shrubberies with multi-coloured foliage, squares

densely planted with trees, etc./,

- the predominance of other colours /special ornamental gardens, sidewalks, playgrounds and sports grounds flanked with green shrubberies, etc./.

A fundamental requirement one has in an artificial environment is that for orientation. In vast expanses of green areas the component elements of demarcation should be devised not only functionally but also visually. From the scenery's point of view, the peculiarity of vegetation and architectural elements lies not only in their definite configuration but also in their coloured appearance.

The human brain registers divergences in colour more readily and easily and in a more concrete manner than the differences in form. Therefore it is of utmost importance to convey a message of colour dynamics to the demarcation elements.

In this respect, there are actuated the general phenomena of colour perception and colour memorizing. From the point of view of landscape architecture, the following phenomena are the most important:

- Characterizations are the property of distinctly perceivable colour differences, whereas various hues and shades of colour are of no importance in this respect,

- Certain entities of colour have an influence which is commensurate with their gravity and manifestation,

- Idiosychratic form and colour strengthen each other's effect,

- More than three colours generally impair the idiosynchratic manifestation, and over a certain number /notably, five/ they exhibit themselves as a <u>varicoloured</u> formula perceived as a single colour; the same effect may already take place in case of three colours provided that they interchange not linearly, but as a dotted structure.

The colour dynamics of landscape architecture undergoes changes in time in most parts of the world with the possible exception of some tropical areas. There are peculiar peak-seasons, with a more subdued realm of colour witnessed in between. In parks of the moderate climatic zone, the occurence of idiosynchratically different spring and autumn peak-seasons is a common feature.

In spring it is the blossoming, in autumn the ripe yields of fruit and the colour of the foliage that creates a rich colour dynamics as compared to the vivid green of summer and the winter's obtuse colours which are interspersed with brown patches and at times dominated by an expanse of white.

When designing the colour dynamics of green areas, one peak-season, notably spring, is generally taken into consideration. Designing of smaller units, primarily flower-beds, requires taking into account the whole flowering season, but but it always hinges on the botanical properties of plants.

Three fundamental factors exercise an influence on the appearance of green areas, notably

- Formal composition,

- The realm of colour,

- Slovenliness or tidiness.

Plants with a coloured foliage are relatively few; it is their great advantage that with the exception of annual plants they generally require little care and their colour impact remains in force over several seasons or even all throughout the year.

The scope of colour of plants with vari-coloured blossoms and fruit is infinite, their colour effect being actuated during the short period of

blossoming, with most of them offering a sorrow sight after the flowers have withered away, their fruit usually possessing no perceivable aesthetic effect whereas the annual plants require a great deal of care throughout the year.

To attain an attractive sight, it is necessary to concentrate striking colour effects and to carefully apportion the concentrated colour-dabbed spots.

The upkeep, revamping and rehabilitation of historical gardens and parks imply a range of peculiar problems. For lack of adequate experience, valuable solutions of colour dynamics and graphical design have come into being which are adjusted to the erstwhile milieu, yet spreading the impression of a very modern atmosphere.

"PARACHROMATISM-WARRANTED"
(Contradictory discerning markings of Hungarian and international standards)

I. Visontay

The well-known, immeasurably rapid development of industry, and within it machines, kinds, conditions, technology, what is more, products of welding have brought about fundamental changes and spreading of new ideas in comparison to past decades.

This significant development has also affected the less conspicuous field of gas-welding, flame-cutting and allied processes - in short autogenous techniques that have, for a long time, and all over the world, been applying colour-marking in order to discern different types of gases and provide adequate information.

This is a fundamental concomitant of technology due to which almost ideal conditions have come about in Europe, where these colours are, for the most part, identical, and, in this way a certain emotional effect has appeared as well.

Considering that different colours had already been determined in the old regulations and a dynamic stereotype had developed in the workers towards colours it seemed that conditions of labour safety were developing, too.

At the beginning of industrial development it was sufficient to employ only a few colours for the sake of distinction, so the first systems were based exclusively on colour marking, without any additional lettering. At factories of a uniform profile it seemed to be enough even in case of a large number of pipelines.

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these were standardised and employed by the professional field. However, there were contradictory prevailing standards, but the separation was solved during many years due to the diversity of techniques of application in different special fields.

However, development of industry, establishment of central gas supply systems have extended the scope of utilisation, and in this way technological overlapping has, at the same time, led to duality in marking.

Employment of combustible gases differing from acetylene

Among changes in technology the extension of the scope of combustible gases is also considerable: natural gas, LPG and other types of gases. Traditional and nontraditional appliances are both run with these types of gases, with the advantage that in the course of their development introduction of safety-techniques has simultaneously received a role. Naturally, this has a repercussion on the employment of colour marking, because recent combustible gases require a wider range of colours. Recently, a technical guide-line has been issued on flame-cutting. Here, following international recommendation and example, employment of orange colour is suggested for marking LPG. This, descending to particulars, may lead to the fact that the original colouring of a correctly constructed equipment from the point of view of safety would differ from both the conducting piping, and the marking of oxygen cylinders providing supply of basic energy.

Health services are concerned as well!

As in each field of life, so in the present case, too, only such regulations can result in success, where provisions based on high technical level are made.

Industry and health services, what is more two of the many branches of mechanical engineering cannot be separated by administrative methods. Regulations for health services cannot be separated from standards relating to industrial

cylinders, but their common use cannot be permitted either. The situation becomes critical, when gas cylinders and pressure-reducers are used at health institutions, because in this case, again another, a third standardised colour marking system is employed. Our National Ambulance Service has the alarming experience, how extremely difficult it is to avoid mixing up cylinders marked with blue and green in the badly illuminated ambulance cars so as not to give the patient narcotic gas or nitrogen, instead of oxygen!

Uncertain safety colour-marking

Confusion of the original situation was further increased by standardization of a colour marking system, that originated from lack of internal information but was driven to absurdity, and thus turned uncertainty to chaos.

At present three valid standards can be found for discerning colour marking of different types of gases in case the fourth prescription related to safety colour and form marking need not be taken into consideration (MSZ 17066).

Colour marking of pipe-systems

In spite of establishment of pipe-systems not being a task of autogenous techniques, yet there is often a demand for building them, first of all in the course of assuring energy-requirements of flame cutting machines fixed to place. According to MSZ 6299, the colour-marking of an LPG cutting torch is red, but according to MSZ 2980 its piping is already yellow.

In case of shielding-gas type welding procedures building of pipe-lines is necessary from the cylinder manifold to the gas-mixing unit, then from the gas-mixing unit to the welding equipment.

Similarly, gas pipe-lines are necessary in glass-technical areas for some kind of combustible-gas and oxygen system that, according to relevant MSZ 2980 are equally to be marked in yellow.

In chemical works, in the course of establishing nitrogen cylinder manifold the colour marking of cylinders was green, and that of pipe-lines starting from them was yellow. Special attention has to be paid to markings of central gas-supply systems at health institutions for there have already been at least three different standards referring to them.

Colour marking of a hospital oxygen cylinder is white, but that of the pipe-line is uncertain, for it is not sure that regulations valid for industrial works refer to them as well.

It has already occurred that pipe-lines of autogenous techniques were running parallel with those having other functions, in a way, that, different substances were flowing in pipe-lines of the same colour and the same diameter.

Welding Protective Measures may be given as an example Clause 4.4103 of which prescribes colour-markings of "Safety Regulations of gas Cylinders" as compulsory, while for the pipe-lines of the same techcology, - according to Clause 4.4374 - provisions of Standard No. MSZ 2980 are valid.

Absurdity of the situation is that colour-marking of industrial establishments is used for example in a hospital pipe-line tunnel. In addition, for hygienic reasons the dominant colour of health institutions is white! After this, who will be able to tell what is flowing in the pipes?

There is something wrong with colour marking

On the basis of provisions of three standards, analysis of some colour gives tragi-comical results:

- blue may be air, oxygen and nitrogen oxyde
- green may be water, nitrogen
- violet may be acid or alkali, compressed air, ethylene
- etc.

Colour markings prescribed by different Hungarian Standards are shown in Table 1., international prescriptions are shown in Table 2.

Table 1.

Summary of colour marking of gases

G A S :		COLOUR MARKING		
Naming	Formula	MSZ 2980	MSZ* 6269	MSZ 11970
Oxygen	O_2	yellow	blue	white
Nitrous oxide	N_2O	yellow	gray	blue
Cyclopropane	C_3H_6	yellow	red	orange
Carbon dioxide	CO_2	yellow	gray	gray
Ethylene	C_2H_4	yellow	red	violet
Helium	He	yellow	gray	brown
Nitrogen	N_2	yellow	green	black
Air	-	azure-blue	violet	white-black
Water	H_2O	leaf-green		
Water-vapour		silver		
Gas (incl.oxygen)		lemon-yellow		
Acids-alkali		violet		
Oil, combustible liquid		tobacco-brown		
Other liquids		black		
Acetylene	C_2H_2	yellow	yellow	
Hydrogen and combustible gases		yellow	yellow	

*Identical with Safety Regulations concerning gas cylinders. Completed with further details by MSZ-09-57041

Table 2.

Comparison of colour-marking of international standards

Colour	ISO R 508	ISO R 509	COMECON SZT 508	COMECON SZT 509
green	water	water	with blue: pure water	safe neutral substances
red	-	steam	*fire-protection equipment	*inflammable and explosive substance
silver-green	steam	-		
blue	-	air	with green: pure water	
light-blue	air	-		
orange	-	acids		
violet	alkali acids	alkali		
yellow	combustible and incombustible gases	combustible and incombustible gases	**danger	poisonous and asphyxiating substances
brown	combustible liquids	combustible and incombustible liquids		
black	incombustible liquids and other substances	-		
according to national standard	-	other and fire-protection substances		

*red **black stripe round

Whichever example we may take in Table 1, neither means application of identical colour, with the exception of acetylene.

The Standing Committee for chemical industry of COMECON developed and published as early as in May 1975 general planning regulations concerning the transport of oxygen gas by pipe-lines, but these can at best only be taken into consideration in case of transport from building to building, but "does not refer to oxygen networks within units" as laid down in Clause 4. of the document quoted.

Requirements of standardisation

Further development and spreading of heavy-duty flame-cutting and similar equipments will likely be accompanied by accumulation of anomalies that so far have only presented themselves sporadically.

The outcome of incorrect regulations may cause serious damage from both, safety and economical aspects. Staying with gas-cylinders the situation is further aggravated by staining them with stripes of different colours to mark combustion gases, or the measure of cleaning.

The efforts of ISO in the interest of standardisation have not solved everyday problems. COMECON recommendations about the same topics have only increased misinterpretations. The many types and deviating character of marking systems misled workers and may easily and frequently cause accidents.

In employing new substances and large, extending transmissions colour-marking can seem completed by supplementary inscriptions and other marking. In our days, pale marking systems are most widely spread.

According to the viewpoint of the demands of modern industry and industrial processes a third system would be the most suitable, one where inscriptions are fundamental markings, colour should only be employed for complementary purposes, if necessary.

Doubtlessly, the task of standardization is not an easy one, and considerable compromise is needed in the interest of a satisfactory arrangement.

Some experience

In the USA this process took 15 years and only afterwards did they issue the projects of standardization that based the marking of the contents of pipe-lines on the name, or the sign of the substance, instead of colours. When colours are used, it is a fundamental requirement that it shall be possible to distinguish them in case of any illumination. This standard was taken over by Poland as a basis of its own standard.

Recommendations

It is necessary to begin domestic arrangements within the shortest possible time, for passing time and industrial development only creates newer forced markings, and delayed changes cause from day to day more, and more difficult problems.

Publication of No.47/79 MT. decree and following modifications offer significant possibilities.

Several concepts have been recommended, such as:
- groups of colours, according to types of gases supplied,
- staining the pipe-line with a definite neutral colour and marking the flowing substance with the help of coloured labels,
- distinction of pipe-lines by both, marking and inscription,
- use of auxiliary groups of colours for marking.

In case there is another-contradictory-prescription, the marking function has priority.

Natural colours, that is their functional-emotional role have to be preserved.

Summary

07-5/9

Great efforts are being made in the interests of international standardization, for the application of colours in establishing safe working conditions, in the interests of ergonomy and labour safety.

These basic principles have to be implemented as soon as possible, and with particular care, so that instead of already defined, fixed and identified marks, ideas and symbols no misinterpretation of prescriptions shall occur, not even by accident.

From this point of view it is necessary to assess the present situation according to basic principles of colour dynamics, ergonomy, safety, and emotion and to organize its long-term management by making use of a carefully planned transition period.

It is needless to emphasize that present great migration of labour-power, looseness of technological discipline further complicate the situation already confused. With full knowledge of all those facts we must, today, begin the undoubtedly difficult, apparently hopeless arrangement for maybe tomorrow widows and orphans will be calling us to account for the delay.

JURY OF COLOUR-DYNAMIC DESIGNS AT THE LECTORATE OF FINE ARTS AND INDUSTRIAL ART

I. Pusztai

The Lectorate of Fine Arts and Industrial Art, as indicated by its denomination, is a State Agency in the domain of fine arts in Hungary, having the task to care for indigeneous fine arts, to promote the creation of art work.

However our tasks are successively extended in the course of our activities, since an art work in itself will not resolve the problem of an aesthetic shaping of the environment. There are needed well designed functional objects, well-founded plans of landscape gardening, etc. But, as well and aesthetical as a given space should be shaped, the main determining factor always is the architectural space, the building, framing and determining the sight with its formal appearance, dreariness or riseance, dullness or colours. Colours play an important role in determining the environment, be it the interior of a communal establishment, or a complex of residential buildings.

The Lectorate of Fine Arts and Industrial Art endeavours to help the creation of a more human aesthetic complex environment: outlining design objectives, suggesting designers, furnishing judgements, opinions about the quality and applicability of plans and designs, based on the expert estimate of professional teams consisting of artists, designers and architects.

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STANDPOINT OF ÉVM* IN CONNECTION WITH COLOUR-DYNAMICAL DESIGN

A. Schlmer

I am not authorized to report officially on the standpoint of ÉVM in connection with colour-dynamical design, partly because existing legal regulations are embodying it, partly because amendments of these regulations to be expected in relation with the development of design planning will contain it as well.

However, as Head of the Department of Settlement and Environment Planning of the Ministry, I am going to outline with pleasure my personal opinion in connection with colour-dynamical design, within the given narrow limits.

The Ministry of Building and Urbanization, as the competent state administration of Hungarian architecture and construction, has devoted special attention to the theoretical and practical development of colour dynamics, and will continue to do so, in order to improve the physical and human features of our environment.

We do not intend to limit our activities to the appearance of townscape, of buildings and interior design, etc., but rather extend colour dynamical design to the entire physical area and the environment of our social life, to be considered as an integral unity.

We also adhere to the thesis, affirmed and discussed since Loranz, according to which a (dialectic) unity of function and form is the basis of architecture. As a fact, form as-

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serts itself at any time through the effects of light and shade, the quality and the colours of surfaces.

Assigning form and colour, i.e. colour dynamic design is to be linked to architectural design.

A detailed city-planning project is a plan comprising the synthesis of town structure, giving suggestions in respect of building-up, of the mass and appearance of existing and projected establishments. Through its assessments it presents the assets of existing environment and makes suggestions for their preservation and enrichment, as well as for the arrangement in space of the new functions.

The proposals are extended to the character of forms, their monotonous features, to accentuations and stressings. The formal appearance of masses asserts itself in the effects of light and shade, in surface finishes and coloration. To this kind of plan there should belong obviously only an accentuation graph of the appraisal of limiting town walls and their fundamental colour character.

The project of building up and the investment programme is elaborated for elements or units of city planning involved in the detailed city-planning project, conform with the features of mass and form approved in it. This plan is extended to the execution of all essential structural and formal elements of the project, including stepping up of masses, material and quality of coating surfaces and, within the framework of the colour character provided for, the harmony of colours of surfaces encountered with the entire establishment.

The plan of approval and the plan of construction determines the entirety of the building, external and internal appearance in detail all surfaces of structures and coatings, their colouration.

The significance of buildings is determined by the human environment as a whole and thus is the required profoundness of

colour-dynamic design. Namely, it is obvious that in public proceedings quite different considerations must prevail in respect of the coloration of a family house located and hidden in a typical green area and that of a group of buildings of different age (Middle-Ages, baroque, classicistic, eclectic, modern, etc.) met with within the street network of a middle-aged town centre.

These two extreme cases indicate also those of planning work. In the first case it is not an intervention of a qualified expert to be looked for primarily to improve our environment, but one rather may expect results from improving the general formal and visual (drawing) culture of our society. On the contrary, in the latter case plans and designs of creative experts and a jury system of similarly high level, warranting public critics, may warrant assurance (e.g. sub-committees of city planning and architecture acting beside city councils).

We intend to integrate all these ideas into the methods of planning, content requirements and procedures of approbation to be updated very soon.

It appears to be necessary here to elucidate the synthesis of shaping the environment. Namely, it is our conviction that creative architectural activity is an indivisible entirety, having had priority in shaping human environment, which priority should be maintained, and on the other hand, that the level of architecture has determined the quality of human environment at any time. This means at the same time that architecture should reflect in a natural interaction social pretentions and that our human environment should be shaped through the channels of architectural art. However, this can only be realized fruitfully if allied arts and crafts, keeping their relative independence, would serve the entire purpose at any time, i.e. the physical space of our social life, our human environment.

RELATIONS OF BUDAPEST'S CONSTRUCTION MANAGEMENT TO PLANNING COLOURED ENVIRONMENT

A. Kovács

Man is an offspring of nature, part of the natural system, the universe. His endowments and talents are rooted in it, his engrams date back to nature. Human beings feel also a harmony of natural colours. Man torn away from nature creates a system for himself, submitted to his own rules. In the course of his creative activity man tries to alter nature, creates a man-made environment, which, however, cannot dispense with primary elements of nature, its colours. Man reconceives the colours of nature, unveils their regularities and utilizes his experience in his coloration work performed.

Coloration of buildings has changed from age to age in both respects, material and popularity of colours, but the fact of coloration still constitutes a continuous chain. In the Middle Ages, and still in the Baroque too, we meet powerful colorations of frontages. In the classicist and romantic style even less and lighter colours are met with on the buildings. At the time of dominating typical construction of blocks of flats about the end of the century, frontages of buildings in Budapest, alike in other cities of Europe, were painted half-tone grey, since they would anyhow become darker soon from soot. This is why cities, among them Budapest, are of monotonous, dull, colourless appearance. In this way colours of the primary and secondary environment become ever more alienated. A feeling of lack was the source of the desire of town-dwellers, arising with ever increasing power since a few decades, for a colourful townscape and environment.

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However, care must be taken in fighting against the dull grey townscape, not to turn our cities into an abominable disarray, a harmonious, cheerful, coloured townscape into a shoddy farce.

Coloration of buildings along main roads of the Capital cannot be solved with the conventional method of an architect to select colours on the spot. The centrally coordinated and directed row-redecoration along main roads of Budapest successively enforced an improvement and development of the role of municipal councils and actually no publicly co-ordinated action can be fancied without. One may perceive the importance of the evolution started in 1976 with the row-redecoration, as early as that, of Rákóczi út and accomplished since, maybe with exaggerations but necessarily realized. Colour design extended in a town magnitude seems to be a novel process characterizing our age, the conditions, methods, work requirements, experts, partial problems and many other factors of which are just searched for yet. In the course of unfolding the proper task there must be created the principles, the theory, the methods as well as the means and ways of judging colour designs, and a system of conditions.

The Budapest City Planning and Architectural Projects Jury Commission established under the sponsorship of the City Planning and Architectural Directorate of the Executive Committee of the Budapest City Council has, among others, the task to pronounce judgement on colour designs proposed for the coloration of buildings along main roads, prior to the procedure of approval. The Jury Commission consists of permanent and occasionally invited members. There are participating at the sessions representants of professional and social organizations (Association of Hungarian Architects, Hungarian Society of Fine Arts), as well as those of the proprietor, the authority competent for granting the licence, and of the Directorate. The sessions are headed by the chief architect of Budapest. An opponent invited by the Directorate, a theoretical and practical expert in this field of design also takes part in forming

the opinion. This opinion arrived at in the Commission, its point of standing is not qualified as an official decision, but must be taken into account in the course of the subsequent procedure of approval and in passing the decision. This commission examined the colour design project of buildings along the annular-radial main road system of Budapest. The projected pictures show colour experience acquired from nature, photos taken from colour designs made for Mártirok útja in Buda, as well as the Nagykörut (Grand Boulevard) in Pest, individual moments of the actual work proper, photos of old and already coloured frontages, however without any claim for completeness since only within these sectors of main roads colour designs were elaborated for some 370 buildings. The realization of these has been partly completed, partly is still proceeding at present.

The points of view serving as a basis for the proceedings of the Commission in judging colour designs are, among others, as follows:

- Examination of the position of the route to be coloured within the structure of the town, its width, air-space, orientation of limiting walls, their division, conditions of light and shade, reflected radiance to be expected.
- The age of buildings along the street, their frontage features, structure, plasticity, materials.
- Determination of the elements of priority of the route from the angle of townscape.
- Assessment of buildings or groups of buildings, if any, under protection of monuments in the street,
- whether there are trees in the street.
- Evaluation of the visibility, coming into sight of the individual buildings, and whether the designer had correctly contemplated its significance.
- Proportions of surfaces to be coloured of the individual buildings.

- Is the spatial limitation of the colour design in accordance with the boundary line of a group of buildings comprising one actual aspect of the townscape?
- Was the decision of the designer correct in selecting the prime colour, the tint of the individual buildings?
- Are there not arising unpleasant tint contrasts between neighbouring buildings?
- Does the selection of complementary colours and tints for stressing certain partial elements of the buildings warrant a harmonious townscape?
- Does the coloration of cornices, slettes, wall streaks, wall faces, frames of windows and doors represent their architectural tenor?
- In utilizing the alteration effects of colours, has the designer made suggestions concerning the reduction of incidental formal contrasts?
- Has the selection of colouring matter been done purposeful?
- Was the selection of colours for solving details been done? (shutters, eaves, outlets, portals, sun-blinds, shades).

Elaboration of colour designs parted as a fact from architectural designing and, at a higher level of development, tends sink into the domain of city planning. In an aesthetical sense, colour designs serve primarily the evolvement of daytime townscape. Requirements concerning the contents of projects are ever expanding. A programme of renewal entails different attractions on the individual areas which have to be cleared up and resolved in a comprehensive way according to town-form directives as a task of the entire society. Finally this affects our colour designs, our aesthetical considerations fundamentally. Consequently, colour designs have to be looked upon as an integral part of a comprehensive conception, the general strategy of renewal, of town rehabilitation, and must be further developed as to their methods accordingly.

Of renewal of the surface, provided that cleanliness and

orderliness also improves together with the effect of colours, means a refreshment of the city, a renewal and higher culture of her system of marks, which inevitably affect the town-dwellers. Their life expands with the coloured environment, is enriched, approaches the origin, the primary natural environment, and an appraisal of revaluated environmental assets. In the last analysis this is the aim of the discovery of colours, of the new science of their application and of the creative practice which has found novel means.

COLOUR DYNAMIC DESIGN PROPOSALS OF THE ASSOCIATION OF HUNGARIAN FINE ARTISTS (MAHIK)

J. Somogyi

Allow me to forward greetings and best wishes on behalf of the Association of Hungarian Fine Artists, expecting that the proceedings will yield good results.

Grasping the challenge of having been invited, our Association is going to submit some suggestions hoping that they might be enlightening under the actual international situation of the development of environmental culture, in spite of worries reflecting our specific domestic problems and position.

With a view to better understanding our suggestions, it seems to be advisable to briefly survey the efforts our Association performed within the limits of its organization in shaping aesthetically our natural and man-made environment.

In 1977 our Association jointly with the Association of Soviet Fine Artists organized a Conference in Budapest, attended also by both the Hungarian and the Soviet Association of Architects, to actively unveil common problems. The conference entitled: 'Tasks of mural paintings in socialist fine arts' covered all problems which, according to experience on both sides, arose in connection with social and technical progress, increased tasks of mass production and possible application of new materials. The discussion at the conference gave also outlines of the difficulties rooting in organizational and regulational limitations which hamper the development of joint activities of architecture and fine as well as industrial arts. Although

János Somogyi, fine artist, painter, Budapest, Hungary

the conference advocated searching new ways and means of co-operation on both sides, and our national institutions also supported these endeavours, no major results were realized.

One year later, in 1978 the Association of Soviet Fine Artists organised an international conference of architects and fine artists in Moscow, where artists from 11 countries participated. Both MKISZ and MÉSZ (Association of Hungarian Architects) were represented by delegations and delivered contributions. The three-days conference unveiled the various requirements of social progress, the problems of the way of living, the social role of personality, the feasibilities of forming collectivities, as well as factors hindering them. All these problems were discussed in the light of novel urbanization developments, of possibilities offered by the way of life at housing estates, and consequences were derived on this basis for formulating tasks of architecture and fine art. As early as at this occasion, international experience confirmed that endeavours towards co-operation and complex solutions were correct. Within the process of social progress preferencial attention was attributed to the fact that examination with priority of building housing settlements, of new forms of shaping the environment, according to complex requirements, on the basis of values resulting from the teachings of the research work of all fellow disciplines was imperative. The conference advocated the assessment of problems derived from practical life, a more systematic continuation of an exchange of views between architects, fine and industrial artists. Even the requirement was mentioned that insufficient as good-will on a social level to care for and try to adjust problems of our age was, it is indispensable to assess and necessarily improve possibilities on a state administration level in order that our human environment should evolve adequately.

It seems that international experience in the field of shaping our environment have called the attention also in [illegible]

provided for wide publicity of these problems in recent times, creating a forum of discussion of actual problems of urbanization with the participation of authorities of international renown.

May be this evolution, together with other circumstances, helped town-councillors of our city to realize that it is time to open the way for more circumspect and well-founded suggestions in respect of allocation of visual art in the period of the 6th Five Years' Plan. In 1980 working commissions consisting of architects of project institutes, members of the Association of Architects and of the Association of Fine Artists, co-operating with one another under the sponsorship of the Directorate of Art of the Budapest City Council, assessed the actual situation concerning the entire territory of Budapest, together with conceptions within the limits of feasibilities.

From the outset on an unanimous opinion was arrived at, according to which architecture and visual art should be shaped jointly, almost as early as in the initial phase of planning. City planning cannot dispense with a more human character of architecture; development of personality within the framework of the entire social progress intensively demand occasion for satisfying aesthetical requirements too, not only quantitative values brought into existence through mass-production.

The assessment through joint activities confirmed that there is something wrong with the townscape concept in our urbanization efforts, with the adaptation of planned and built towns or quarters to the proportions, the scale of earlier townscape, developed through ages. One hardly is able to find out present proportions and scales. There asserted itself again the requirement of complexity, in both respects, survey and performance; and according to experience even the expectation or demand of the amendment of certain regulations or decrees. We also came across sufficient justification of that a man, as actual man wishes to contemplate his present and future

life consciously and clearly, in this context the environment in which he lives, or rather intends to shape the environment through giving voice publicly of his claims.

In the light of the activities referred to, we intended to evidence that there is no question of isolated phenomena, but of complex problems involving societies emerging in locally and historically different forms, and asserting themselves almost all over the world. They rise the question of a new way of approach, to be undertaken also on behalf of our social institutions, if there is the slightest possibility. Realising the situation, our association MKISZ concluded a co-operation agreement with MÉSZ in 1980 and with MUT (Hungarian Society of Urbanistics) in 1981.

Taking advantage of the opportunity I will quote now a few points of these agreements, quasi supporting in this way in anticipation the actuality and reality of our suggestions.

On behalf of our association MKISZ we would recommend to the attention of both competent ministries, that the realization of a creative unity of architecture, fine and industrial art is no longer feasible through social power. Provisions in this sense on behalf of our state administrations are indispensable. It appears necessary to ensure that investments for art genres should become integral part of the investments of economic units, including design and execution. An integral part of the investment budget should be the investment of fine and industrial art work, in general the financial resources of creating aesthetical assets. It should be still added, that this integrity should mean also that this item should not be neglectible, left out, in case allocations of investment should necessarily be reduced.

We suggest further that the two ministries should establish, help the creation of the organizational and financial bases of the co-operation of architecture and allied arts, from the outset of the phase of planning.

Emphasising one point of the agreement concluded with MÉSZ, we recommend to the attention of our state organs and social institutions also from this place, to make it a general practice to call for common, complex competitions as a basis of assignments, and to have them evaluated involving broad publicity.

SUGGESTIONS OF THE ASSOCIATION OF HUNGARIAN ARCHITECTS (MÉSZ) IN CONNECTION WITH COLOUR-DYNAMIC DESIGN

J. Kapy

The General Meeting for re-election of officials of MÉSZ (Association of Hungarian Architects) had taken place two weeks ago, where the new Board and Presidence was elected and working groups reorganized.

I got my appointment from Dr. János Böhönyei, President of the Association of Hungarian Architects prior to the General Meeting. The new Presidium confirmed it and so there is nothing in the way to submit my suggestions here on behalf of the MÉSZ. Allow me at the same time to convey best wishes and regards of our Association.

There are serious problems actually in Hungary in respect of colour-dynamic design. Many lectures have dealt with them at this Conference as well. Colour-dynamic design takes place in Hungary at random. The level of projects is very different. There do not exist prescriptions concerning contents and form of designs, jury is incidental. Even if judging is done involving fine artists through the Supervising Committee, the jury members are not experts of the special domain. Complex teams at project institutes do not comprise colour-dynamics specialists.

Remuneration for colour-dynamic designs is not regulated. There is a great gulf between exaggerated regulations, the fixed rates of architectural design, of project institute practice on the one hand, and the organizational background of specialists

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e.g. painters, performing colour-dynamic planning, on the other.

Actually a project institute cannot involve a colour-dynamics specialist as sub-contractor in planning work. Even if sort of form could be achieved for joint design within the project institute, or in the form of an order from the investor through the Supervising Committee, the feasibility of a creative co-operation of architect and fine artist, their relationship is not warranted on an organisational level.

Another major problem is, as János Pajó, painter, had outlined in his lecture yesterday, that the colour range of paints, of coloured building materials is not satisfactory, colours are not uniform and quality also leaves much to be improved.

Obviously such a situation cannot be changed through suggestions submitted within the framework of a lecture. The standpoint of MÉSZ is that we shall try to establish an ad hoc commission within our own organization, which following up the activities of other working commissions, e.g. those for architecture of work places, for environmental control and city planning, for information, press and publicity, shall make attempts to build up relations to allied organizations, in the first line with the Association of Fine Artists (MKISZ). We suggest that this ad hoc commission should then develop to such an inter-trade commission which would represent the two allied associations jointly.

Task of this commission would be to clear up most efficiently all actual problems in connection with colour-dynamic design, and to elaborate actual proposals in co-operation with the colour-dynamics commission of the Scientific Society for Building (ÉTE), (member-society of the Federation of Technical and Scientific Societies (MTESZ)), concerning juridical, financial organizational solutions, to be submitted to supervising state administrations, e.g. Ministry of Building and Urbanization, Ministry of Cultural Affairs. (Creating new organizational con-

ditions, involving the Scientific Society for Building, the Hungarian Society of Urbanistics (MUT), establishing a Chamber of Engineers; Jury of colour-dynamic designs, headed by the Chief Architect of Budapest, among members of the Association of Hungarian Architects and the Hungarian Society for Urbanistics to be represented; joint competitions according to the agreement for co-operation concluded in 1981 between the Association of Hungarian Architects and the Association of Hungarian Fine Artists.)

COLOUR IN HOSPITAL PASSAGEWAYS AND CORRIDORS AS AN INTEGRAL PART OF THE FUNCTION, STRUCTURE, AND HUMAN DIMENSION OF SPACE

J. Rutenberg

Hospital corridors and passageways are part of the patients' "outside world"; hence their importance in the creation of a healing environment.

The physical structure of these spaces is usually monotonous and depressing. Colour design in these spaces improves their functionality, granting them a human dimension while utilizing their physical characteristics and enriching their sensory input.

A number of colour design projects for various hospital corridors and passageways, represent the methodology of colour design.

In each of the following projects, we shall emphasize one aspect of colour design with the aim of reaching an exhaustive description of the many possibilities of enriching these areas from a physical, emotional, psychological, and intellectual standpoint.

1. Colour design of the inside corridor of the Child Psychiatry Ward, Hadassah Hospital, Ein Karem, Jerusalem

Function: The corridor is a passageway which also serves as an area for examining children's motor activity, orientation, and visual perception.

The users: Patients aged 1 1/2 to 6 years.

1. Preferred colours and why to use them

High-chroma primary colours give the child a feeling of security, facilitating free behavior.

Mrs. Judith Rutenberg, Ramat Gan, Israel

Natural colours - blue, green, yellow, orange - create the illusion of outside light and a feeling of spaciousness and freedom.

B. Preferred shapes and why to use them

Shapes which provide a feeling of security: soft, non-aggressive shapes (concave and convex lines) reminiscent of the womb.

Coloured areas with simple shapes that do not attract particular attention, and whose visual perception does not require effort, create a feeling of security stemming from a "familiar" environment.

C. Desirable interrelations between colour and activity

A dynamic atmosphere, encouraging movement, with colour comprising a background for activity without distracting the child.

D. Desirable interrelations between colour and physical characteristics of the space

Good lighting (proper reflection coefficient).

Compatibility with the shape of the space, to prevent distortion of space perception.

Coloured areas should be harmonious to prevent a feeling of discomfort.

Aiding orientation: clear differentiation between sections of the corridor and secondary corridors branching from it.

Design solution:

A. Use of preferred colours: High-chroma primary colours and natural hues: greens, orangee, orange-yellows, blues.

B. Use of preferred shapes: The circle, a soft and simple shape, is easily perceived, softens the sharp linear structure of the corridor, and grants a feeling of spaciousness.

C. Interrelations between activity and colours: Clear colours and contrasts create a dynamic atmosphere, encouraging motor activity.

Colours create an orientation code among the secondary corridors and have a therapeutic role in examining perception and discrimination.

D. Interrelations between colours and space: Artificial lighting along the white wall of the corridor, is reflected by the wall with maximum efficiency: the white ceiling prevents blinding.

Proportions: Coloured areas reach the height of the ceilings of the secondary corridors, which are lower than that of the main corridor, creating a space more suitable to children's size and preserving tridimensionality. The graphic form (white circles) prevents a feeling of heaviness liable to be created by areas of strong colour.

Tridimensionality of space is preserved by the corridor's clear division of colour: ceiling, wall, and upper section of the coloured wall are white, and the coloured wall "floats in space."

Creating interest and a "human dimension": The clear colour division of each section of corridor into two close hues (monochrome) - e.g., orange and orange-yellow in different proportions for each section, adds a high degree of sophistication and creates a less linear and more interesting space.

Summary

The above design comprises a change in functionality of space through the sole means of colour, without changing the space's physical characteristics; colour creates a new physical layout and a new atmosphere.

2. Colour design of the inter-ward corridor of the pediatric ward, Tel Giborim Hospital, Holon

Function: A passageway connecting two pediatric wards. The colour plan must give the corridor a special "childlike" character and improve its function as an axis of motion.

Main users: Visitors, staff, and children: a heterogeneous population with conflicting needs.

A. Preferred colours and why to use them

Clean, high-chroma primary colours beloved by children and identified with them, to create a feeling of security.

"Natural colours" strengthen the feeling of a bond with the outside.
Incorporating lower chromas in the colour scheme creates a high degree of sophistication for the enjoyment of the adults (staff and visitors).

B. Preferred shapes and why to use them
Simple coloured areas which facilitate visual perception and do not comprise their own "message," but which are not too monotonous. Shapes with clear boundaries which subdivide the corridor, creating visual rhythm to accompany motion.

C. Desirable interrelations between activity and colours
Creation of a dynamic atmosphere and a sensation of rhythm of movement.
Facilitation of orientation between the two ends of the corridor and along its length.
Creation of points of interest along the corridor to "shorten" it, together with the creation of relatively complex visual inputs to enable enjoyment over a span of time.

D. Desirable interrelations between colours and physical characteristics of the space
Strengthening the sensation of open space through strong natural lighting.
Visually "shortening" the corridor, as well as broadening changing linear proportion.

Design solutions:

A. Use of preferred colours: Natural colours with high and low chromas (greens, oranges, yellows), to achieve optimistic, sophisticated colour harmony (a sensation of sunlight).

B. Use of preferred shapes: The letters of the word "PEDIATRIC" on the wall, create areas of colour which are abstract, disjointed, and rhythmic, and whose meaning is revealed only upon rather careful scrutiny. Subtle transitions between colours (between the letter and its background) prevent an aggressive atmosphere.

C. Interrelations between colours and activity/physical structure: The two ends of the corridor are poles of con-

trasting colour - warm orange and cool green - between which colours are arranged gradually and continuously. The colour layout creates a sensation of progress and of regular rhythmic change.
Distribution of form subdivides the corridor and creates continual change.
Graduation "shortens" the corridor since the pedestrian knows clearly what colour he will encounter at each section; the various shapes of the coloured areas comprise unexpected secondary points of interest which distract attention from the desire to reach the end of the corridor.
The coloured wall comprises an area which projects coloured light in various hues, toward the ceiling (it is parallel to the window wall), thereby strengthening the "outside sensation" and creating changing "colour frameworks" which enrich the experience of passage.
The various colours create a sensation of changing width, enriching the corridor from the standpoint of form.

Summary
The above colour design enriches the physical form and sensory input of the corridor, thereby improving its structure and function.

1. Colour design of day hospital corridors, Rothschild Hospital, Haifa
Function: Improving the functionality of the corridor while facilitating orientation, creating a sensation of comfort and an "optimistic" atmosphere rather than an "institutional" one in a space which is problematic - a basement lacking openings to the outside.
Main users: Patients whose treatment is generally continuous and lengthy.

A. Preferred colours and why to use them
Warm, positive, optimistic colours: "sunny colours" to create a sensation of natural light.

Colours of high chroma to create a dynamic, stimulating, and "surprising" atmosphere.
A well-understood continuity of colours without sharp contrasts, to prevent discomfort.

B. Preferred shapes and why to use them
Clear, repeated shapes.
Shapes expressing direction.

C. Desirable interrelations between colours and activity
Expression of the various areas of the ward, together with a sensation of progress toward the various divisions: infirmaries and surgical theaters.
Accompaniment of passage along the corridor through the rhythm and character of colour change.

D. Desirable interrelations between colours and the physical characteristics of the space
Creation of a sensation of daylight and a feeling of changing level and colour of light, to create variety and interest.
Coordination of the rhythm of colour change with the rectangular structure of the corridor, to facilitate and direct orientation.

Design solution:

A. Use of preferred colours:
Infirmaries:
colours from yellows to orange-reds, graduated, with high chroma.
Surgical theater area:
blue hues on a white background.

B. Use of preferred shapes:
Infirmaries: broad, parallel arrows indicate direction and demarcate colours. They divide the corridor into regular sections which dictate rhythm and direction of passage.
In the surgical theater area, coloured areas of the corridor become narrower, and larger white sections of wall are revealed.

C. Interrelations between colours and activity:
Colours express the various areas of the ward as well as the sensation of progress toward the various divisions: yellow hues, associated with sunlight, start from the entrance and become progressively warmer along the length of the infirmary section, turning orange-red toward the entrance to the surgical theater section. High chromas achieve a relatively strong level of stimulation, needed in a space without windows which serves a population under emotional stress.
Moderate, regular transitions between colours, create comfort. In the section of corridor leading to the surgical theaters, the rate of change increases as the colours become more "dynamic" (orange-red).
In the surgical theater section, blue hues on a white background strengthen the sensation of "order and cleanliness."

D. Interrelations between colours and the physical characteristics of the space:
Lighting: The colour of the black background to the coloured bare pipes on the ceiling, makes the ceiling disappear, creating a sensation of spaciousness and "outdoors."
Colour on walls appears only on the perimeter wall; the warm light projected by the wall is reflected by the parallel white wall, the corridor wall enclosing the central section.
The balance created by the white wall opposite the coloured wall, provides a pleasant tensionless sensation of space.
The changing colours, from yellows to oranges to orange-reds, causes different sensations of space in different areas of the corridor by creating different levels of lighting. This effect aids orientation and definition of the areas of the corridor.

Summary
A complete coordination with the problematic physical en-

vironment (a basement), we have created a space embodying a human dimension: easy orientation, a dynamic, stimulating atmosphere to draw attention outwards and relieve the sensation of enclosure.

4. Colour design of a covered passageway, Assaf Ha-Sofer Hospital, Zerifin

Function: An outdoor covered passageway, built of wooden columns and asbestos ceiling panels, between hospitalization pavilions, serving as a main axis from which the entrances to the pavilions branch.

Main users: Visitors, staff, and patients (patients are often wheeled reclining to either the wards or the X-ray department which is at the end of the passageway).

A. Preferred colours and why to use them:

High-chroma primary colours with maximum contrast between them, as well as between them and their background at key points, to enable location and identification from afar.

Colours must give a "respectable" appearance to a structure of meager appearance.

B. Preferred shapes and why to use them:

Ceiling panels create regular rectangular areas, which dictate the form of the coloured areas (additional colour distribution would be liable to create visual confusion).

C. Desirable interrelations between colours and activity

Identification of pavilion entrances from afar should be facilitated.

Passage through the corridor should be pleasant and interesting and patients' attention should be drawn toward the outside environment.

D. Desirable interrelations between colours and the physical characteristics of the space:

An improvement in the outside appearance of the hospital, thereby improving the attitude of the users.

A change in the monotonous sensation created by the building, effected through a visual change of the ceiling height within the covered passageway.

Design solution:

A. Use of preferred colours:

At intersection points, ceiling panels were painted in primary colours: red, blue, yellow.

Between intersection points, ceiling panels were painted in graduated neutral grays.

B. Use of preferred shapes:

Rectangular coloured areas stemming from the structure of the ceiling panels, create clear, well-understood distribution and add a sensation of order and rhythm.

C. Interrelations between colours and activity:

Colours in maximum contrast enable identification of intersection points from afar.

Graduated grays create interest and rhythm of motion and emphasize the coloured intersection points.

D. Interrelations between colours and the physical characteristics of the space:

Graduated gray areas between the areas of strong colour, create a sensation of changing ceiling height and break up the monotonous structure of the passageway.

The white row of columns and rails, reduces to a minimum the sensation of crowding and of visual strain, and causes the ceiling to "float".

The white colour creates a sensation of order and cleanliness suitable to a hospital, and encourages users to keep the area clean.

The unambiguous classic combination of the three primary colours, creates an elegant, respectable appearance.

Summary:

Improving the appearance, and consequently improving the environment, create a pleasant environment and encourage the attitudes of the people.

5. Bridge connecting old and new buildings, Rothschild Hospital, Haifa

Function: Passageway between two buildings.

Main users: Staff, visitors, patients.

A. Preferred colours and why to use them

Warm colours to compensate for cool northern light penetrating the entire length of the corridor through the windows.

Graduated colours to create a dynamic atmosphere and a feeling of progressive motion, and to speed passage and thereby "shorten" the corridor.

B. Preferred shapes and why to use them

Sharp, clear, regular shapes provide a sense of direction and subdivide the corridor into repeated, uniform sections, serving as a background for the change created by the graduated colour scheme and the directionality of shapes.

C. Desirable interrelations between colours and activity

A feeling of progressive motion.

Creation of interest.

A dynamic, warm, and positive atmosphere.

D. Desirable interrelations between colours and physical characteristics

Shortening the corridor.

Reflection of warm light.

Visual "tridimensionalization" of the long wall.

Design solution:

A. Use of preferred colours: Graduated warm, high-chroma colours, from yellows to orange-reds, reflect warm light and create a dynamic, friendly atmosphere.

B. Use of preferred shapes: Dividing the corridor into identical squares, creates uniform rhythm. Subdivision of squares into two identical triangles, dictates directionality.

C. Interrelations between colours and activity:

A dynamic atmosphere spurs motion.

The graduated colour scheme "shortens" the bridge and enables estimation of its length.

D. Interrelations between colours and physical structure:

The wall painted in a warm colour (orange) visually shortens the corridor.

The gradual transition of colours and of the shapes of the coloured areas along the corridor wall, give it a three-dimensional, airy appearance suitable to a bridge overlooking the bay.

Summary:

The colour design solution incorporates a form-oriented colour scheme with a physical structure to create spatial wholeness. Creation of change on the basis of regularly repeated elements within a single colour family, establishes the balance necessary to create an aesthetic and harmonious sensation.

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M. Vehér

Colour is not only an aesthetic factor. Rooms where colours have been used for designing may have an effect on those residing there that comes near to a therapy and would give reason to speak about colour hygiene as such. Effective use of colour hygiene must be based on a thorough knowledge of the harmony of colours.

People feel generally highly influenced under the effect of colours.

Human performance and health conditions are likewise influenced by colours.

According to Eisner the psychosomatic disease is an endemic epidemy which is caused by the fact that some elementary human requirements, like the thirst for colour harmony, cannot be satisfied.

According to M. Eisner the colours of different spectral values affect human being invariably. This can be confirmed by the fact listed below:

1. Fluctuations in the number of eosinophile cells in blood,
2. Fluctuations in coalhydrate household (blood sugar level, etc.)
3. Fluctuations in decomposition of the melatonine hormon,
4. Fluctuations under the effect of blue light with small children suffering from hyper bilirubin-anaemia (reduction of plasma, bilirubin level),
5. Fluctuations; effect on the conductivity of palm (galvanic skin reaction),

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6. Fluctuations in effects on blood pressure,
7. Fluctuations in effects on pulse rate,
8. Fluctuations in effects on breathing frequency,
9. Fluctuations in effects on electric reactions of brain (EEG, etc.).

On our work, carried out as experiments with several colleagues (Vehér, Nemcsics, Alföldi), concerning the effects of colours on pulse, blood pressure, breathing frequency, secretion of gastric juices and gastric acid conditions, we have reported in forms of lectures and papers. Colour dynamics, being the use of colour psychology in practice, should be aimed at defending civilised mankind, being considerably loaded psychosomatically, against undesired harmful effects like monotonous greyness or, what is often meant as a correction, against an overcompensated orgy of colours.

Since undesirable current peristatic effects have been increased by errors from the past like life made monotonous and dull, the task of those trying to create an appropriate colour harmony has been made more difficult.

In Hungary a great portion of public health institutions has become out-of-date, and require considerable refurbishing. New institutions replacing the old ones cannot be built in the short term. Health investments represent a heavy burden even for reach countries of equal population, which have enjoyed a longer peace period (e.g. Sweden). Even large industrial countries have sanitary institutions which do not reach the up-to-date mark. There were serious reasons why the new Copenhagen Hospital, admirably planned and overequipped had to stop short before completing the construction of a few storeys, etc. The current shortage of beds in the health field could be eased somewhat by organizational measures, but the fact is that colouring and painting in hospitals, where this work ought to have been completed at an early date, are being realised with delays and in "fractions" because of difficulties connected

with evacuation. There is still no special building company for hospitals, and other building companies are reluctant to undertake the overhaul and maintenance of hospitals for the above-mentioned and other reasons. Difficulties arise mainly in case of full reconstruction.

Based on international literature and on our own data we try to summarize those colour effects which should certainly taken into account during colour design applied for hospitals.

In the majority of cases and generally light and warm colours are preferred everywhere for the painting of rooms. In a nutshell a few colours will be mentioned to exemplify human reactions to the same.

Shades of yellow make the walls appear massive, give them a powerful spatial effect without reducing or narrowing down the room in size. Yellow will make incident light look definitely friendlier and will influence even artificial light favourably.

Mixed colours of red and yellow affect people actively, reflect vitality and movement, convey a stimulating ... cheerful effect.

Red colour represents self-consciousness; it is the most aggressive of all colours. In a single room, too strong red colour creates restlessness; it makes one feel easily irritable, being shut-in and enclosed. It may have an exciting effect even positively. It is excellently suitable as a paint for decoration purposes.

Green colour has a reassuring, balancing and noise absorbing effect. It is therefore suitable for being used in delivery-rooms and in new-born babies wards. It is only light green that has a refreshing, exhilarating and stimulating effect, while heavy green gives one the feeling of acting like a poison.

Blue colour gives a more reassuring impression than green does. It is suitable for operating rooms and intensive sick-wards. It is the colour that promotes carefulness and concentration, and is therefore favourable for the painting of laboratories and medical libraries. In highly lit rooms the medium-blue colour would pleasantly cool the flood-light and would create an active atmosphere.

Brown is the symbol of earthly existence. It gives the room the character of a cave, but medium-brown appears generally as dull. Shades of light and pale brown produce a warm and pleasant atmosphere, and can be combined with the surrounding colours in form of friendly harmony. No animating effect can be expected from the brown colour.

Violet has a solemn and grave effect, and may create sadness and even depression. It should be used as a paint for rooms only where people are not staying permanently.

White is elusive and unexpressive when applied alone. It can be used for the painting of narrow, low-built and small-sized rooms. It is equally good when used in dark rooms. If combined with gay colours in the neighbourhood, it would raise a rarely animating effect.

Black is a compact, heavy colour, and has a compulsory, but objective and also a noble effect.

The reconstruction of our sick-wards, resulting from broad daylight produced by doors and windows, etc., has been determined by the old building, ground area, volumes.

Concerning our wards for gastro-enterological patients a comparison of existing and our own experiences could be made so far in respects of the white, blue and green colours (Antal Tomcsics, Mihály Fehér).

The effect of lemon-yellow colour on the secretion of the digestive system in the patients' dining-room, and the reassuring effect of a pleasant light-green colour in the sick-

wards, was very favourable. The noise-reducing effect of green colour could be experienced following the completion of green tiling and green painting of gastro-enterological sick-wards.

Our patients suffering from colitis ulcerosa, when sent back for repeated treatment, indicated that, compared with their earlier hospitalization, they were no more disturbed in their sleep by the tram rattling along nearby, with the type of treatment and conditions of street traffic being unchanged.

All this happened prior to the change of tram rails.

Our patients were provided with sleeping pills in very rare cases.

It cannot be stressed too frequently that in diagnostic rooms it is the doctor's interests, while in therapeutic rooms it is the patients' interests that have to be given preference. For a capital like Budapest a most useful long-term solution would be to provide the city's population with a mammoth-size health establishment, located somewhere in the wooded hills of Buda, well within the reach of transport lines, built according to the current hotel system, where the operating and diagnostic wings could be erected with much less costs than complete up-to-date hospitals built in overcrowded unhealthy town districts or in industrial quarters with less good air. For the patients the wooded environment with its good air alone would prove to be health-giving, while in the new hospital buildings the conditions for colour harmony could be realized most usefully, including their inherent therapeutic effect. Even if disliked by visitors, they would feel the visits to the hospital as health-promoting. From longer distances special transport services could be run during visits, like those operated for home-bound visitors from theatrical performances. Such establishments could excellently serve the cause of regular and extension training of medical doctors. Until then we have to face the hard reality that reconstruction would follow after a full evacuation of the building. Reconstruction then would allow a maximum exploitation of colours.

Our work dealing with colour hygiene was presented by films and slides made by the Budapest Technical University.

Doctors of my department, separately or in collaboration with other institutions, have taken up the problems of colour hygiene as a subject on several occasions.

THE INFLUENCE OF COLOURS ON THE GENERAL CONDITION OF HOSPITAL PATIENTS

A. Csépányi

Until the 1960-s colour schemes in hospitals were limited to white doors, whitewashed walls. The walls below shoulder-height were painted brown or the different shades of gray on which dirt could not be seen easily.

From the 1970-s it became a real tendency to take into consideration that colours - through the nervous system - have influence on the emotions of people (in hospitals on ill people).

Modern medical science revealed that the cause of numerous organic diseases is found in the nervous system, especially in the disharmonic functioning of the vegetative nervous system. Thus, through the nervous system, colours may have influence on the general condition of patients and also on the functioning of the different organs.

Colours according to Baierl can be classified into 4 groups:

1. Cold and warm colours: Cold colours are blue and blueish-green, warm colours spread from yellow to red.
2. Exciting colours and tranquillizing colours: Warm colours are generally exciting, while cold ones have a tranquillising effect.
3. Light and heavy colours: Bright colours give the impression of ease, while dark ones arise hard emotions.
4. Approaching and distant colours: Objects painted in dark and warm colours are felt nearer to the observer than objects of the same size and same distance but painted in light and cold colours.

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It is observed that most women prefer red, drab, so generally the warm colours, while men find blue, blueish-green and the tranquillizing colours more attractive.

Different age-groups may like different colours. The elderly people prefer soft colours, young people like bright colours.

Taking all these into consideration the objects of colouring in hospitals are:

1. To make the hospital a bright and cheerful place to which the patient can come in confidence, remain in cheerful surroundings, and leave without thoughts of escaping from a dark and difficult period in his life.
2. To make the hospital a pleasant place in which staff can work. It is an accepted principle that colour is effective in promoting staff relations and increasing staff efficiency.
3. To ensure that dirt can be seen. It is axiomatic that if dirt cannot be seen it will be allowed to accumulate. Bacteriologists can easily prove the disadvantages of drab colours.

In accordance with these our task is to determine the colours we are to use in painting our hospitals.

Birren (1950), who looked at the problem from the psychologist's viewpoint, found that, in general, potential extroverts prefer exciting colours while potential introverts prefer cool colours. H.A. Wells attempted to determine the moods which people associate with colours - as examples he found that deep orange is the most exciting colour and green the most tranquillizing. In a Massachusetts mental hospital experiments with coloured lights showed that blue, and yellow had a quieting effect on patients. In general we can say that blue, green and yellow seem to be most satisfactory for hospitals. It needs no psychological training to realize that drab colours are depressing and light, cheerful colours stimulating.

In the ophthalmic unit brightness and cleanliness are to be achieved.

In the medical and surgical wards bright primary colours are to be used on the walls and ceilings, and contrasting colours on the lockers and over-bed lights. This has a stimulating effect on the patients.

The diagnostic rooms, the out-patient departments, the main corridors and the medical administration offices may be painted in contrasting, clear colours.

We can handle the question of the paediatric departments quite independently. Our aim must be to provide a more pleasing and less institutional environment for the children. For this purpose we may use drawing and graphics on the walls which rouse the imagination of children. The graphics may also include educational elements.

The influence of the colours on the human psyche is proved by those experiments which suggest that colours have effect on the output, the appetite and the ability of concentrating the attention, etc.

Today in some illnesses colour effects are used as a remedy besides medicinal treatment. Such a therapy is based upon its effect on the vegetative nervous system.

In spite of all these the usage of colours in our health institutions is not deliberate. It would be desirable to think of this question emphatically, since the ill people are much more sensitive to impressions from the outside world, and also because the influence of colours on our life is much more important than one would think today.

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PRACTICE OF COLOUR DYNAMICS AT THE BUDAPEST WATERWORKS

S. Kantzky

Colours mean for me the approaching of nature, its proximity to us. It is difficult to investigate by scientific means this subjective impression. Even if we are thinking about the psychological effects of colours which they exercise on the human being, in first line on our emotions. The impressions living in us are better communicated by arts. May I formulate it in that form that the function of colour is to reproduce; using them the visible perceived world becomes more complete, they help to understand our surroundings.

In humanizing the working environment therefore the application of colour is a very exciting task. To keep the psychosomatic balance the external and internal harmony is important. If we do not take this into consideration this leads to an increase of stress, finally it will increase above the permissible levels and it will lead to fatigue, to concentration and to the most different forms of illness. If we consider the core of activity, the optimum colour design will help not only to eliminate the causes of stress but will help in producing a better standard of life.

The position of the Budapest Waterworks is in this respect quite special. The enterprise supplies for the past 114 years for Budapest water which is essential to keep our life. This basic function is reproduced in the plants as well. We can find the century old tradition of humanizing the working environment taking Aesthetic view points into consideration

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in all its plants. Cleanliness and order is not only a must in such an enterprise, but by the help of this we tried always to explain everything that is associated to water and what is belonging to its nature. The Budapest Waterworks try to accentuate this also in forming the picture of their plants. (Some pictures will show this to you as well.)

Before I can turn to my subject in discussing the practice of colour dynamics and the short history of this work, permit me to show you in a very short form the process of producing water. As mentioned we are a servicing enterprise where we are well aware of the fact that water is a basic need for mankind. Budapest receives its water to the greatest extent from the water gaining region by the natural filtering of this region, but - especially in peak period - water gets into the network also from the Danube, through surface water intake, of course after the necessary filtering. The length of the water network carrying the water to the users is longer than 4000 km and the maximum water supply by the enterprise is higher than 1 million m^3/day.

Employing a work psychologist and the incorporation of his activity into the structure of the enterprise was an important step in elaborating the above mentioned function of humanization. According to the functioning scheme that has been mutually agreed between the work psychologist - and his team - as well as the technical and economical leaders of the enterprise, he is working according to the demand set by the technical-economical directorate. This ensures that there is no contradiction between the tasks and needs to be solved, their relation is a sound one. To validate the basic requirements of colour dynamics in designing the environment of the different plants was requested by the directorate of the enterprise.

And now something on the precedents. Colouring of the buildings was prepared according to century old customs. The colour perception of people who had to perform the task, their

taste and the pigments available defined which colours were used side by side, which of them got a dominant role in the working environment. One can get accustomed even to tastelessness and earlier or later it might become a model to be followed. We had to calculate with this danger as we started our work.

It is well-known that the quality of the working place, its character will influence the colours which have to be applied. In our case the working place, where colour dynamics had to be applied, is not a productive one - and I would like to call your attention to this, - but it can be characterised to be an aesthetic environment with the special requirement that through the visual impression we should get information on the product: the "internal core" of water. Most of our tasks were to produce a colour dynamic design to pump stations and booster stations. The effective working task of a workman in the pump station (to start a machine, to stop it, to adjust it, to read some instruments, to keep the environment clean, etc.) takes only 5-6 minutes per hour. This represents well what we would like to say on the quality and character of the working environment.

Only 7 - 9 % of the tasks given to us contained the need to prepare colour dynamic design. We can state, however, that its importance is much higher as this type of work is connected with the visual effect; the result can be seen by everybody by the workers of the enterprize, but as well by the guests and the guests can see here the use of psychological functions, the importance of this in an industrial enterprize, in a working environment. This was very important for us also in connection with the situation of working psychology in Hungary and its further development.

Before we would like to give you further details on this type of work, we would like to show you the interior of some of the pump stations, where colour dynamic designs prepared by us were used. (Colour slides will be projected.)

And now may we communicate to you the most important data. In the time period between 1971-78 we received 30 tasks from the leaders of the enterprise, mainly from those, who are directly responsible for the working plants. Peak season for this was 1973-74, during this period we received 43 % of the orders. This was the period when the management of the enterprise got really interested in our work and tried to motivate it in every respect, where they found it important. A decision of the management board prescribed with binding force that colour dynamics has to be applied in repainting, modernising our plants. A second important period was 1976-78 when we received 35 % of our orders. After this time the number of new orders decreased, but analyzing this decline we could determine that not the interest decreased but a change in applying our methods took place.

This, however, has to be explained. We have to give an answer to the question what makes it possible to use colour dynamics in practice and what circumstances prescribe it. These are the following:

Either a new plant has to be constructed or a reconstruction takes place, perhaps during a maintenance work the plant has to be repainted. The decline in the number of new orders can be found in the fact - and this shows actually the well-established use of colour dynamics - that the management of the different plants use automatically the previously prepared colour combinations in repainting their pump stations and booster stations. Just these plants enumerated to 73 % in all the orders we received. However, we would like to mention that similar designs were prepared for reservoirs, for chimney wells, tube chambers, water towers, dispatcher rooms and for productive plants as well as for our Rocla tube factory.

And now may we turn to the practically well-established working process. The first phase of our design work is to make a local survey, a sketch is made of the buildings of the plant together with a detailed description of the working plan,

the machines, other equipments, etc., together with the external circumstances (illumination, location of the building, etc.). Special requirements are also noted. In the colour dynamic proposal prepared on the basis of above documentation we describe the paints to be used, as the present situation of our paint production does not make the use of colour chips possible. The next step is the practical production of the recommended paints, the determination of the appropriate hue and lightness - together with the workman - again on the spot. This is the most important step of our work because here in the real surrounding we will see what the value of our design prepared on paper will be. We knew in advance that without the help of the practical painting workmen it is almost certain that we will not succeed, our new method will fail. We were glad that we received even more than the help of these people, they were really interested in it and were enthusiastic in applying it. This attitude was the guarantee of the success of the third phase of the design because these people were those who produced in practice what has been determined in the colour dynamic design as they made the practical painting work. Up-to-now it was never important to control the work but in a number of cases they asked that we should inspect the work and they wanter to consult with us.

CS-4/5

In the first period we, and not the designing architect prepared the colour scheme of the objects. In case of reconstructions and maintenance this is the common practice nowadays as well. For new plants at present it is usual that the design office prepares the colour scheme and in this case our task is to consult on the colour dynamic documentation and supervise it. For the Waterworks of Csepel our task was also to prepare the colour scheme for the machines and other equipment (in the oral presentation this is shown by the help of some slides).

The initiated function of the enterprise, its openness to modern methods was very important in incorporating the new design method without any conflict. Also the attitude of the workmen changed and new forms of cooperation developed. In this respect we have to mention the mutual exchange of experience, the processing of the reactions of those who used the new plants. We estimate that the use of colour dynamic design helped to produce a positive image of our enterprise.

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SOME EXPERIENCES OF DESIGNING COLOURED WORKING ROOMS

CB-5/1

J. Dulin

It is a very thankless task to discuss the development of coloured rooms or experiences gathered with them without illustrating them, purely attempting to summarize the experience obtained during a working process lasting more than 12 years in one of the largest factories in Hungary.

From the middle of the fifties, it was above all in the training of labour-safety experts and their extension-training that the subject of possibilities and advantages of colour technical designs has been playing an important part. Chiefly owing to the activities of Rudolf Hruska, Sándor Szepesi, József Pungor and Ferenc Taky the design of coloured rooms under working circumstances gained ground. The reasons for this were determined by more factors. Thus, popularity of the above-named textbooks, popularizing works or ending of an extensive phase of economic development during this period can be mentioned.

The psychic functions in the group of emotions assuring appropriateness of mood are considered as conditions for efficient working. In some people's mind, application of colour dynamics - on the basis of the former idea - results absolutely in increasing productivity. It is clear, however, that positive change in productivity cannot be achieved by applying colour dynamical designs alone.

The solution of problems in work organization, development, technology is much more needed and later or at the same time the design of coloured rooms can be carried out. Thus, popu-

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larity of preparing colour designs is derived much more from aesthetic demands of economic managers and workers. It can safely be stated that the working conditions favourable for all the workers are established as a result of well designed environmental effects. While summarising the events preceeding the application of colour designs, a stress must be laid on the fact that its popularity was first of all a result of aesthetic requirements, of progress in knowledge.

This original period was followed by the period of performing colour designs with artistic demand. In particular, from the middle of the sixties the Csepel Works began large-scale technical, technological developments involving building of new plants, factories more suitable for the requirements of the industrial development at that time. From among these establishments one of the plants of the Tube Factory and the high-precision plant of the Machine-tool Factory must be mentioned. The demand for artistic colour design can be characterized by the fact that the colour dynamic design of the high-precision plant was carried out by Sándor Király and his co-operators, working on the basis of the industrial commission. Their activity was concentrated on a harmonic design of colour carrier surfaces and first of all the elements of most importance in respect of operational functions were separated. High quality of their activity was proved by the fact that they carried out not only the room designs, but also those of working-clothes and footwear and rendered a serious help to their practical application. Their work received a consid[illegible]able recognition, as not only the workers of the Csepel Works, but also the Hungarian and foreign guests visiting the Works got acquainted with the work in the plant and at the same time with the magnificent solution of the colour design.

During that period several articles were published outlining investments of capital importance, always pointing to this serious possibility of environment design.

At that time the second phase of colour designing works came to an end at the Csepel Works. The popularity, however, made it possible to start a more extensive work in this field. But financial conditions limited this effort as it was impossible to give regular commissions to experts following the profession of performing colour dynamic designs.

It was at that time (1968) that the economic management of the Csepel Works entrusted the Laboratory for Industrial Psychology with the task of meeting such demands of the Csepel Works. We performed a special research the essential feature of which was the autodidactic solution. In our research Antal Nemcsics, Pál Esztergár, Zsolt Táncsos rendered us a considerable help. The International AIC Conference held in Budapest in 1976 was also of great importance for us.

During the original period we had carried out only smaller designs and later in proportion of the increase of our experience we began to perform designs requiring more extensive knowledge. During the past 14 years we carried out some 15 more considerable designs and about 50 smaller ones. We never made secret of the fact that we wished above all to meet ordering demands and that it was only secondarily that during our colour designing works we expected a favourable change in productivity.

In the last years we gained much experience, using it on the one part for improving our work and on the other reporting on our knowledge at conferences. At present we should like to outline some of these.

It can be found that the structure, field and variety of the Csepel Works would necessitate employing two full-time experts at the chief architect in the interest of the colour design influencing the exterior and interior of the trust. It has not yet been realized. Instead of this, as a compromise, such works of the Laboratory for Industrial Psychology are supported.

On several occasions it has been made clear that the preparation of a particular colour design is not enough. Its realization must be aided on the spot.

According to our experience if we work with groups consisting of the same skilled workers for a long time the assistance on the spot will take less and less time.

We know by experience that while accepting the designs the subjective judgements are prevailed; it means in practice that the managers of the units (factory, shop) judge our work according to taste.

It is a limiting factor that while preparing the colour designs we must accommodate to too many unchangeable circumstances; they belong above all to work organization, environmental and architectural character.

At the Csepel Works more units were built the colour designs of which were performed by a designing company and these designs did not prove to be suitable, so later their modification was very expensive.

On some occasions we prepared a colour description for the painting of machines, equipment ordered from abroad, but we have never managed to mix colours given in the original description. That is why we must come to the conclusion that the application of more important colour systems is not yet uniform. Hereby we call the attention to this fact.

COLOURATION PLANS FOR THE DIAGON-500 PRODUCTION SYSTEM (case-study)

T. Szentpéteri

The Development Institute of the Machine Tool Industry Works established a CNC controlled production system consisting of four processing cells at the site of the Institute at Halásztelek, in accordance with the development projects of this branch of industry and with the directives for development of OMFB (State Office of Technical Development).

The system serving the factories of the Machine Tool Industry Works operates for purposes of demonstrations as well.

The DIAGON production system based on machining centres Model MC-500 lends itself for machining box-type cast iron elements of 500 mm typical size. Further production systems can be established according to the system concept for processing other sets of workpieces.

Beyond the task of direct production, the establishment aims at obtaining experience in respect of design and operation and performs education of specialists of customers within the framework of the Works' activities as prime contractor.

Industrial design and coloration had progressed parallel with engineering in the sense of systematic attitude. The preliminary objective was to create such a joint work site surrounding and co-ordinated system of objects, the components of which permit several versions of build-up, serve didactic requirements, have an aesthetical appearance, and can moreover be adapted to actual given local conditions.

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Planning work was initiated with an examination of the main processes of the system and an analysis of the activities of people participating in the experience, with a view to clearing up the factors of effects to be compensated and the feasible colour-carrying elements.

Main processes of the DIAGON system
(before, during and after the machining system)

1. Main machining process:
   preliminary machining - machining - finishing
2. Workpiece process:
   preparation of work, mounting with fixture on palette, motion, storage, stripping
3. Tool process:
   preparation - machining - after treatment
4. Auxiliary process e.g.
   Removal of chips from the working area and the system
5. Control process:
   Data specification, programming, process control, analysis, programme upkeep.

The main machining process has a role of priority, as integrator of all other processes, the manufacturing task of the entire DIAGON system. The typical activities of workers involved assert themselves here: e.g. mounting the palette, measurement, adjustment, correction, machining trials, control, supervision, tool changes, maintenance, etc.

It can be stated that there are met with intellectual and physical activities mixed-up in the same space, however their ratio in the day and night shifts of continuous operation, respectively, is different.

The processes and their elements determine special requirements of planning:

1. The typical work site of the technological process consists of the four machining "cells", where the MC-500 machining

centres and their auxiliary units (hydraulics, palette-exchanger, chip extractor, control) are organized into one unit.

Owing to the CNC technique staying and working in the working area takes place in irregular intervals, periodically, alternately of physical or intellectual character and even the person of the attendant is changing (engineer, machine-setter, maintenance man, etc.). Motions of the machines proceed according to the programme even without human intervention, this particularly means accident hazard and requires increased protection and warning coloration. (Duties to be performed are no routine work, the persons being present are not trained.)

2. Characteristic for the workpiece process is that the works are moving within the system mounted with fixtures upon so-called palettes, at the mounting, measuring, adjusting, delivering and receiving stations with the help of the loading machine and the high-space storing room. Handling of in and out going unit charges is equally going on here.

   The system of objects of the flow of palettes, the surroundings of reception and fixing of palettes must necessarily be provided with uniform protection and salient coloration. Due to danger hazard the space of motion of the loader and the side of the high store towards the "cell" require safety guards as well.

3. In the case of tool process the space of motion of tool posts and tool changers embodies a source of accidents and must necessarily be enclosed with a blocked safety guard and marked with a warning colour.

Recapitulating, the following factors of shaping the work site must be taken into consideration in the above sense:

- Instead of direct machine-man relations, human interventions of decreasing and changing duration and character are typical.

- Loading is not stable, the requirement of concentrating attention is variable (data recording, trial run, high accuracy finish working, control, adjustment, maintenance, etc.)
- Operation day and night; mixed natural and artificial illumination, generally and locally.
- Space not completely conditioned (cyclical stay), partially tempered.
- Monotonous room noise and cyclical work noises.
- Interaction of the spaces of motion of cranes, balancers, transport vehicles and of the communication zones of persons.

General aesthetical considerations in respect of coloration of machinery, of metal cutting machine tools

Requirements of coloration from the angle of manufacturers: Unifying, rationalising coloration is preferred for type-series of products, or partial units, incidentally for characterising the genuine machine builder (eventually satisfying works, branch, national or international standard specifications or recommendations).

Requirements of coloration from the angle of the end-user: Uniform coloration (maintenance), protecting colour, accommodating to requirements of local colour scheme, fashions.

Possibilities and levels of satisfying these requirements in practice:

- coloration of one machine for itself, analysing it by parts and as a whole,
- coloration taking into consideration a type series or a group of machinery consisting of several members,
- coloration extended to entire systems of work environments (environment planning, accommodation to surroundings),
- coloration for special requirements: emphasis on a particular group of machinery within the work's arrangement.

- distinction of advertising value from competition at exhibitions (which may have the same intention)
- didactic coloration emphasizing processes or build-up.

Many basic principles may be established for the colour parcelling of machine tools (in general machinery and environmental elements):

- Enhancing the feeling of weight, e.g. the heavier base part darker, or looking for an inverse effect,
- according to visual "mass" expansion, e.g. large elements are more passive, smaller ones more intensive, darker, etc.,
- according to motion, e.g. distinguishing passive resting and active moving parts,
- accentuation of operating functions, emphasis on the passive and operational character, respectively, of processes, special purpose forms,
- visual demonstration of build-up, e.g. differentiation between load-carrying framework and spatial limiting cover,
- asserting changes of material and design, complexity, separability,
- orientation derived from man-machine relations, places of display and intervention, information, as well as accentuation of accident hazards,
- shaping a system of objects or a complex of environment, by elements, fitting them into the surroundings.

In the coloration practice all this means either the use of a uniformly characteristic basis colour and besides of a minimum quantity of designation colours, or that of several colours in different proportions.

During the last years the following standard solutions arose according to principles of machine coloration within colour schemes of entire environments of working sites:

- green lines + white, yellow, orange, etc.
- bluish-grey lines + orange, red, etc.
- soft grey - beige - yellow

other more bright colours, different from these, are mainly used for advertising purposes, for decorating machinery to be exhibited.

Colour design of DIAGON 500 integrated production system

The coloration system had to satisfy, besides aesthetical pretentions, the following general and special requirements of shaping work sites:

- Combining into a uniform order the special plastic effects of the elements of the production system, the architectural features of the establishment together with the technical and work-organisational solutions of the production process.
- Co-ordination of existing and new elements.
- Compensation of the psychical and physiological stresses of the process of work.
- Procuring the sensation of comfort.

Stages of colour design

In addition to general requirements, colour design meets three further levels of requirements:

1. General suggestions for building the producing shop:

   Economical values of equalized illumination of cold and warm effect are reasonable.

   The character of human staying in depends on the degree of automation of the sub-systems of the system. In accordance with this changes the ratio of pretentious physical intervention work and mainly but supervising intellectual work. In less elaborate systems the aspects of the work assert themselves. In cases of build-ups of higher automation interventions are minimal and colour restrictions of moving around are less.

2. Production system operating with a demonstrative character

   Demonstrations, education of own labour, training of external specialists within the framework of sales service, require a clear-cut representation readily surveyable even

for casual onlookers, didactically visualizing the build-up and the processes.

A more distinct visual presentation is needed using more intense colours to divide the processes more emphatically. The change of persons, frequent technological experiments and tool changes enhance accident hazards.

3. Spatial visual aid for decision-making
A rearrangeable model (1:10 scale) permits studying versions of further development.

Assessment of the effects needing compensation

- Requirements of technical design, data of technological processes,
- Character of work, data of plant organization and shift schedule,
- Aspects of health protection and accident prevention,
- Assessment of typical colour carriers, surface proportions, values of visual fields,
- Alternatives of principled objectives, coloration concepts based on the three requirements, according to shades of importance between components:

1st alternative – Emphasizing main processes: flow of works, flow of tools, demonstrating auxiliary processes.

2nd alternative – Division according to main functional units: processing side, incidentally indication of the "cells" within this framework; preparative side, tending processes.

3rd alternative – Distinction of structures:
elements of transport and material handling,
elements of storage,
elements of machining process,
elements of power supply and auxiliaries,
elements of control.

4th alternative – Assertion of human relations with emphasis; relations of working area, workpiece, background and illumination;
enhanced approach of colour popularity and of feeling comfortable;
emphasis on the visual indicators of the machine-man system together with their surroundings;
powerful stressing of accident hazards.

Partial tasks of practical design work

- determination of colours (data from RAL and Stollack)
- suggestions for shaping elements of information and appearance,
- documentation.

Detailed motivation of colours of greater importance

- a typical colour for machines is RAL 1024 ochre. It is advantageous since the characteristic colour of workpieces varies from rust shades through graphite-grey to greyish metal colour, and furnishes a suitable contrast to the colours of palette surfaces and conduits (wires) in the working spaces. RAL 1024 is suitable also from the point of view of the higher colour temperature of high-pressure, gas discharge lamps of high luminous flux in general illumination.
- RAL 1018 yellow was chosen beside ochre as stressing marker colour, as it clearly dissociates from background colours.
- The painting of the concrete flooring to greyish turquoise, that of the high store and the framework elements with RAL 5014 turquoise, as well as that of side and end walls to whitish turquoise appear as sort of background.

The longitudinal axis of the central hall, serving previously for other purposes, lies in North-South direction and both sides along the longitudinal axis are fully windowed, thus the considerably disturbing sunshine had to be counteracted.

With sunshades adopted inside and outside the windows the disturbing counterlights and shades could be eliminated. As the incoming scattered sunshine is further scattered at the high store as an internal grid, while during night colder light arrives here in vertical direction upon softer colours of machines, colour sensation during day and night time became similar.

According to our opinion the documented versions combine the advantageous partial solutions of the preliminary principled alternatives. In the course of further realisation the utilization of elements of appearance and information, as well as the use of suggested working clothes should still be introduced.

H. Hammitzsch

Mit einen Beitrag über eine realisierte Farbgestaltung im VEB Schwermaschinenbaukombinat TAKRAF, dem bedeutendsten Produzenten auf dem Gebiet der Fördertechnik in der DDR, möchte ich Sie im folgenden bekanntmachen:

Eine Vielfalt der verschiedensten Erzeugnisse kennzeichnet das Produktionsprogramm dieses Kombinates.

Die Palette reicht vom Kleinhebezeug über Eisenbahndrehkrane, Hafenkrane, Brückenkrane und Portalkrane bis zur kompletten Ausrüstung für Tagebaubetriebe.

Dieser Umfang muss genannt werden, um die Kompliziertheit der Ausgangsposition für eine Aufgabenstellung zur Farbgestaltung zu verdeutlichen.

Einen weiteren Schwierigkeitsgrad bilden die verschiedenen Produktionsstätten mit den unterschiedlichen technologischen Bedingungen.

Unter Einbeziehung dieser Voraussetzungen wurde von der Kombinatsleitung die Aufgabe gestellt, eine einheitliche Farbgestaltung zu erarbeiten.

Die Aufgabe wurde dem Fachgebiet Design des Kombinates mit der folgenden Zielstellung übertragen:
- einheitliche Farbgebung für alle Erzeugnisse
- Erarbeitung eines Farbbaukastens nach den Regeln der Farbgestaltung und den volkswirtschaftlichen Erfordernissen
- Reduzierung der zu diesem Zeitpunkt verwendeten 23 Farbtöne
- weitere Erhöhung des Wiedererkennungseffektes und des TAKRAF-Image.

Hermann Hammitzsch, VEB Schwermaschinenbaukombinat TAKRAF

Bei den Ausgangsüberlegungen wurde von folgenden Gesichtspunkten ausgegangen:

1. Farbgestaltung für die direkte Arbeit mit dem Erzeugnis, z. B. durch das Bedienpersonal.
2. Farbgestaltung für die indirekte Arbeit mit dem Erzeugnis, z. B. für den Verkauf, die Werbung u. ä.
3. Farbgestaltung für die auf jeden Betrachter ausgeübte Gesamtwirkung des Erzeugnisses, auch im Ensemble.

Aus diesen Überlegungen resultiert, dass nicht die Funktionsbaugruppen, sondern der menschbezogene Bereich den Primat hat. Aus diesem Grunde wurde in den weiteren Betrachtungen von Klebern und dem übrigen Erzeugnis als zwei Bestandteilen ausgegangen.

In einem Forderungsprogramm wurden die Bedingungen fixiert, die sich aus dem Arbeitsbereich der Erzeugnisse, der vorhandenen Technologie, der farbigen Gestaltung u. a. Faktoren ergaben. Als Kriterien für die Farbtonauswahl wurde der Verwendungszweck und Einsatzbereich der Erzeugnisse berücksichtigt.

Dabei spielte die Dimension der Erzeugnisse und der Gefährdungsgrad aus arbeitsschutztechnischer Sicht eine Rolle in Bezug auf den Farbton und die Einschränkung der Gesamtfarbtöne.

Um diesen Kriterien zu begegnen, mussten helle und dunkle Farben Verwendung finden.

Weiterhin war aus dieser Sicht die Frage der Sehfeldgrenze von Bedeutung.

Auch der Kontrast zur Umwelt spielte eine entscheidende Rolle bei der Wahl des Farbtones. Aus der Beachtung der aus der Literatur bekannten Auswirkungen der Farben auf das Vegetativum folgerte, dass trübe Farben und langweilige Farben grosser Sättigung zu meiden und der Einsatz mehrerer Farbtöne, angepasst an die Erzeugnisse, zu bevorzugen sind.

Auch Fragen der Möglichkeit des gestaltenden Ordnens mit Hilfe von Farben wurden berücksichtigt. Die emotionale Seite wurde mit Hilfe von Erkenntnissen aus der Farbpräferenz nach Dr. Semesics bewertet. Es wurden Zielgruppen nach Alter und Geschlecht gebildet, die einem geschätzten Mittel der Bedienenden entsprachen. Weiterhin wurde die allgemeine Präferenz von Exportländern berücksichtigt.

Auch den Proben der Assoziation wurde versucht Rechnung zu tragen, indem die Eigenschaften der Erzeugnisse mit bekannten Symbolwirkungen der Farben in Übereinstimmung gebracht wurden. Letztendlich musste der Frage des moralischen Verschleisses gebührende Beachtung geschenkt werden. Als Gebrauchswert verkörpert er eine fixierbare Grösse. Für den Schwermaschinenbau liegt der moralische Verschleiss erfahrungsgemäss bei etwa 10 bis 15 Jahren.

Aus all diesen Anforderungen wurde ein Farbbaukasten mit 4 Grundtönen, sowie Farbtönen entwickelt.

Diese Farben werden für die Erzeugnisse in verschiedenen Varianten verwendet.

Es handelt sich dabei um die Farbtöne

chromgelb
rötlichblau
mittelgrün
schwarz und
weiss.

Die ausgewählten Farbtöne wurden nun den verschiedensten Tests unterzogen.

So erfolgte eine Bewertung der verschiedenen Farbvarianten mit dem "COLINOID" an der Technischen Universität Budapest. Die Ergebnisse waren nicht gleichmässig gut, doch rechtfertigte die Gesamtaussage eine Befürwortung.

Ein weiterer Test über die Erkennbarkeit der gewählten Farbtöne in der Dämmerung bei Nebel und bei verschiedenartiger

Verschmutzung schloss sich an. Die Bewertung der Tests erfolgte nach der Expertenmethode und verlief positiv für die Realisierungsentscheidung.

Der Farbbaukasten lässt durch die einfache Kombination der Farbtöne eine Reihe von Varianten zu.

Um eine optimale Variante für ein bestimmtes Erzeugnis zu erhalten, war es erforderlich, ein Bewertungssystem auszuarbeiten. Nach dem bekannten Wichtungsprinzip wird nach den Zahlen 0 - 3, getrennt nach menschbezogenem Bereich und Erzeugnis die Wertung additiv vorgenommen.

Zur Bewertung dienen dabei folgende Kriterien:

- Gestalterische Ordnung, Kontrast, Harmonie
- Kompensation oder Ausnutzung von Nachbildern
- Verringerung der Übermüdung z.B. bei Auflesern
- Beachtung der Sehfeldgrenzen für die Gesamterscheinung und den Funktionsteil
- Gesamtwirkung auf das Vegetativum
- Steigerung der Arbeitsgeschwindigkeit: kurzzeitig und langzeitig, das Reaktionsvermögen betreffend
- Verringerung von Augenermüdung
- Verbeeffekt
- Sichtbarkeit bei Nebel oder in der Dämmerung
- Monotoniekompensation
- Kompensation von Hitze, Kälte oder Zugluft
- Sinnvolle Kompensation der visuellen Empfindungen von leicht und schwer
- Sinnvolle Bedeutungsbewertung der Farbtöne untereinander zum arbeitsschutztechnischen Bereichen wie unmittelbare Gefahr, mittelbare Gefahr oder geringe Gefahr
- Kontrast oder Harmonie zur Umwelt bei überwiegend Industriegelände, Werkhalle, Stadt und Verkehr, Himmel, Kulturlandschaft, entkultivierte Landschaft, z.B. Tagebau, Bohnbereich oder Winterlandschaft
- Kontrast von Fördergut dunkel oder hell

- Sichtbarkeit der Farbe bei Verschmutzung
- Ästhetischer Eindruck trotz Verschmutzung
- Lösung der Exportschwierigkeiten bei Ablehnung von Farbtönen gelb, grün oder blau
- Kosten

Die im Ergebnis des Vergleichen verschiedener Varianten errechneten Punktzahlen ermöglichen eine Entscheidung.

Ausnahmefälle, wie sie zum Beispiel aus Gründen der Korrosion bei Tagebaugroßgeräten vorkommen, können mit Hilfe der vorliegenden Betrachtungsweise trotzdem zu einer ästhetisch vertretbaren Lösung geführt werden.

Es ist in diesem Anwendungsfalle nicht möglich, den Grundanstrich mit Pigmenten der gewünschten Farbtöne zu versehen. Durch das Absetzen der Kabinen, Sozialtrakte, Leitern und Geländer in einer hellen Farbe des Baukastens wird eine ästhetische Gliederung des Gesamterzeugnisses und eine klare Übersichtlichkeit, gemäss dem gewählten Prinzip, erreicht.

Mit Hilfe eines Kombinatsstandards wurden die Ergebnisse in die Praxis überführt und bewähren sich seit Jahren.

Es kann als Tatsache angesehen werden, dass die Auswahl der richtigen Farbtöne nicht vom persönlichen Geschmack, sondern auf der Anwendung wissenschaftlicher und ästhetischer Erkenntnisse beruht.

Mit der ästhetischen Farbgestaltung verbessert sich auch die Qualitätseinschätzung der Erzeugnisse durch Dritte und führt zur positiven Beeinflussung des Bedienenden, der Akzeptanz, von Expertisen u. ä. Ein wichtiger Aspekt der vorliegenden Farbgestaltung ist die betonte Überordnung des Menschen mit seinem Arbeitsbereich, wie Kabine, Geländer, Aufstiege u. a. Die ausgewählten Farbtöne entsprechen dem Charakter der Bauarbeit und assoziieren Eigenschaften wie solide, sachlich und extrovertiert.

G. Lissák

The significance of colours in the process of industrial design is well known to specialists. However, it is not so easy to apprehend theoretically the function of coloration in the practical work of industrial design. Even engineering specialists often consider coloration as the last phase of production, as suggested by the technological sequence. Yet for industrial designers coloration constitutes an integral part of shaping, not just the finishing action.

Industrial design underlines the main nodal points of motion, the structural and functional relations, in this way it exceeds engineering desantropomorph modelling. It is known from the everyday work of practical industrial designers that their activity is of scientific motivation, i.e. desantropomorph on the one hand, but related to human, on the other, i.e. antropomorph.

In the course of industrial design, shaping is preceded by technical research within the speciality, by getting an eyeless from the point of view of utility. This activity, similarly to engineering work, is desantropomorph, actually in many cases somewhat work of scientific level, as e.g. is a conscious application of colour dynamics, as well.

Forming the desantropomorph construction, thus arrived at, into human visuality is the second phase of the design work. The industrial designer visually stresses the structural elements in relation to the user. Such emphasis gives the object ready visualization, makes the technically purposefull readily surveyable and comfortable to be handled by the human. Beauty

György Lissák, Metallurgical Engineering Corp.
Budapest, Hungary

created by industrial design thus combines direct with usefulness. This activity is antropomorphistic, is emphatically related to human.

I am industrial designer and know that such a dual conception of design work is a simplification of the process of creation, since technical research within the speciality is a priori aimed at artistic shaping. However this abstraction of notions helps to apprehend the function of coloration within the process of industrial design.

Industrial design work utilizes the same abstract forms as all other visual arts: the rythm, the proportionality, the symmetry and asymmetry and the coloration. These elements are to be met with in any visual art composition as organizing principles. These abstract shaping principles emphasise in industrial design the essential features of serviceability separately, in relation to the user, as against the other hidden technical, structural elements of the object. In this way they become perceptible for the onlooker, for the user and lend the feeling of pleasingness.

The selection of correct colours has a decisive importance within this process. Here we again encounter the theoretical duality: since colour dynamics are desantropomorph, their theses can be scientifically confirmed.

Colours will preserve their desantropomorph character in the product of industrial design, but at the same time go beyond. The industrial designer employs the psychological effect of colours to serve visualization and here occurs the jump of coloration activity to become an art. The product of industrial design will namely become aesthetic, if the perception of its internal relations and structural elements turned into visualization; if, among others, the visually realized system of colours, their harmony were able to make the function of the object a directly perceptible phenomenon for us.

Coloration in design is never purpose in itself, rather submitted to contents determined by an actual product. The objects in our surroundings, their coloration unfortunately so not always meet this strict principle. A colour sometimes starts an independent life on some object, notwithstanding the function of this letter. Such objects are appearing pleasant at the first glance, however fitted into their wider environment are "unmasked" and display through their dissonant appearance the endeavour of the manufacturer to sell under any condition. In this way coloration can become a means of commercial manipulation.

Industrial designers are anyway bound to appraise the consequences of the choice of colours, whether the colour of the product represents genuine demands, or in an extreme case is degraded to a factor of increasing profit.

The essential specificity in industrial design is that the colour of the product, its actual organizing principle is determined by the mode of usage of the product by the individual, according to his direct requirements. The importance of the feeling of pleasedness generated by colours is rooted just in this: a commodity with pleasant colour excites a feeling of joy, and this strengthens us. Thus through this particular "by-pass" industrial design realises the human character of coloration.

K. Gaul

The DESIGN CENTER (an information centre for industrial design) is affiliated with the Hungarian Chamber of Commerce. Its regular activities began in 1977, following the resolution No. 1005/1975. (7.3.) of the Council of Ministers.

The basic tasks and objectives of the Center consist of supporting and assisting the development of designing activities with a view to improving the quality and competitiveness of Hungarian industrial products, as well as to enhancing cultural standards in relation to the material world and the environment. The Center will contribute towards the solution of this double - economic as well as cultural - task essentially with the means of information. It aims to provide assistance, through its available services, to all those who are engaged in shaping of the environment, viz. to the designers, producers, distributors and users of industrial items.

With this in mind, the Center collects and processes all information relating to industrial design, subsequently making it available to interested persons. Its specialized library carries - among others - blueprints, research data, theoretical and methodological works, as well as compendia on the practical achievements of design. In addition, the readers will find 80 Hungarian and foreign periodicals. Its reference library offers a general survey of the international literature of design, in the form of abstracts and digests. The Center's Product Register comprises, in addition to the documentation of consumer articles manufactured in Hungary,

Emil Gaul, Design Center of the Hungarian Chamber of Commerce, Budapest, Hungary

a rich assortment of foreign product catalogues. In its collection of slides it is possible to view the documents of the outstanding achievements of Hungarian design.

The Design Center keeps a watch on the activities of Hungarian design artists and records their achievements. Its Register of Designers, featuring the personal data of nearly a thousand specialists, enables every manufacturer, cooperative and other patrons to find the suitable partner for the solution of their problems in designing.

Upon request, the Center will assist the work of specialists engaged in improving the shape and quality of industrial products, by offering consulting services, by staging professional encounters or inquiries.

The Center will stage exhibitions and shows for the popularisation of the merits of design, and for the dissemination of experience gathered abroad. When requested by other bodies, it will offer advice on the organization and programme of similar events.

Professional information destined for a broader audience will be divulgated in ad hoc issues as well as in the bi-monthly periodical entitled Ipari Forma (Industrial Design).

For the sake of efficient service, the Center maintains close contacts with the institutions of design both home and abroad, - striving at a permanent cooperation with all such organizations.

DIE VERARBEITUNG DER EMOTIONEN GESCHIEHT FARBIG

J. B. Den Tandt

Auf unseren Farbkongressen werden wir überwiegend mit messbaren Erscheinungen konfrontiert.
Heute möchte ich Ihnen eine scheinbar illusionäre Arbeit vorstellen, damit Sie, nach richtiger Überlegung, feststellen können, ob es eine Illusion ist oder nicht.
Ich habe extra auf diesen Kongress gewartet, da mehrere Kongresse denen ich in Ungarn beiwohnen durfte zeigten, dass es hier ehrenwürdige Kollegen gibt, die sich für die Chromotherapie interessieren, nicht über jeden Versuch lachen, sondern durch meine Darstellung vielleicht neue Wege in diesem Teil der Psychochromotherapie finden werden.
Was ich heute bringe ist nur ein Ausschnitt aus meiner Arbeit auf diesem Gebiet, und wird farbig zeigen wie der Mensch eine Emotion verarbeitet. Emotionen erleben wir Tag und Nacht und erleiden oft psychisch und physisch die Folgen.
Ich werde Ihnen heute die Basis meiner Chromotherapie zeigen, aber auch die Basis [illegible] mit einer Reihe Zufallsfaktoren [illegible] die Faktoren so aufeinander abgestimmt und [illegible], dass ich an einen Zufall nicht glauben kann.
Ausgegangen bin ich von der Anima- und Animustheorie von Jung, da sie in Farbbegriffe umgesetzt werden kann. Gefühle können wir mit bestimmten Farben verknüpfen, in Übereinstimmung mit Aspekte von Jung's Anima-Animustheorie, denn der Mensch kann seinen emotionellen Eindruck verarbeiten ohne das Anima oder Animus darin zu beziehen. Wie unterschiedlich die Faktoren auch sein mögen, zur Verarbeitung

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Prof. J. B. Den Tandt, Psychochromoloog,
Gieren, Belgien

folgen sie alle demselben Weg. Die Faktoren sind stets zweierlei: ein Objektiver und ein Subjektiver. Der Objektive ist eine motorische Energie und ist verantwortlich für die Verarbeitung der Aktion, und der Subjektive ist der Schalter, der die motorische Aktion führt.

Nur um regelmässig auftretenden Missverständnissen vorzubeugen, folgendes: wenn ich in diesem Referat über Farben spreche, geht es niemals um physisch genau bestimmte Farben. Not ist z.B. in Beziehung mit dieser Aufstellung kein genau bestimmtes rot, aber bedeutet den ganzen roten Spektralbereich; und das gleiche gilt für alle Farben, die in diesem Referat aufgeführt werden.

Die Aktion zur Verarbeitung eines emotionellen Eindrucks umfasst sechs Sektoren.

/1/ Der erste Sektor ist der Geistessektor, symbolisiert durch gelb, und für beide Geschlechter der gleiche. Er ist durch seine elektrischen Impulse überwiegend objektiv, aber entwickelt trotzdem unsere Sinneswahrnehmung.

/2/ Der zweite Sektor ist für den Mann seine Anima, oder weibliche Charakterzüge, und durch blau symbolisiert. Für die Frau ist es ihr Animus, durch rot symbolisiert. Es sind ihre männlichen Charakterzüge.

/3/ Der dritte Sektor ist die Persona; oder der Teil unserer Psyche der das Geschlecht bestimmt. Für den Mann ist dieser Sektor rot und für die Frau blau.

/4/ Den vierten Sektor habe ich die "psychische Kraft" genannt, und sie ist ungefähr, was Jung das Libido nennt. Diese Kraft sind wir nicht in der Lage zu messen oder zu lokalisieren, aber Anzeichen sind da, dass sie existiert, und selbst nicht zu unterschätzen ist, denn sie hat die Führung über alle Gefühlsaktionen und mehr oder weniger einen Einfluss auf das vegetative Nervensystem.

Ich nehme an, aber habe dafür keine schwarz auf weiss Beweise, dass es eine elektro-magnetische Strahlung ist, von die Aktion nur in unserer inneren Struktur stattfindet. Sie übt keinen Einfluss auf die Umgebung aus, aber erfährt

sehr stark den Einfluss der Umgebung.

/5/ Fünf ist der Gleichgewichtssektor. Er besteht aus Materie und ist in der Lage, durch Vermittlung der psychischen Kraft, zwischen Sektoren eins und zwei eine Verbindung zu realisieren. Seine Funktion ist einen Stoff herauszustellen zur Verarbeitung des emotionellen Eindrucks. Die Aktion dauert so lange bis das Gleichgewicht in der Persona wieder hergestellt ist. Dieser Stoff ist ein Geschlechtshormon, das Testosteron. Es enthält ein radioaktives Chloratom, und Chlor ist grünempfindlich.

/6/ Bei der Frau ist dieser Sektor orangefarbig. Ihr Geschlechtshormon ist das Oestrogen, und empfindlich für orange; denn das Ovarium nimmt gerne Calcium und Phosphor auf, und die haben eine beachtliche Strahlung in dem Orange-Gebiet.

/7/ Schliesslich gibt es den sechsten Sektor, wo die Endaktivität zum externalen der Emotion stattfindet. Grünempfindliche Materie soll in diesem Sektor wiederum zu elektro-magnetischer Strahlung umgesetzt werden, und dadurch Gefühlsfaktoren stimulieren, die für das Gleichgewicht in der Persona sorgen. Für den Mann nenne ich das den Triebsektor, denn hier soll der Kontakt zwischen rot und grün realisiert werden.

/8/ Für die Frau ist es ihr Herzsektor, wo der Kontakt zwischen blau und orange realisiert, und damit das Gleichgewicht in der Persona wieder hergestellt wird.

Nur ein Paar Worte zu der Bedeutung der Farben. Zu die rote Farbe hat der Mensch viele Gefühle geknüpft: rot ist kompakt, lebendig aber ebenfalls unruhig. Es ist zielgerichtet und aktiv bestimmend. Es ist die vitale Energie. Rot symbolisiert die Aufregung, den Trieb und die Agression. Blau verknüpfen wir an den Gedanken, nicht von den Geist ausgehend aber von dem Gefühl. Blau ist nach innen gewendet, und erregt tiefere Gefühle als rot. Psychochromologisch nennen wir blau die Tiefarbe; diesmal Herz nicht als Organ gesehen aber als Gefühlsquelle.

Die männliche Persona wird durch den Triebsektor wieder in Gleichgewicht gebracht, und daher ist dieser Sektor ebenfalls rot. Der Kampf zwischen rot und grün wird stets kräftig sein, da rot und grün zwei äusserste sind. Daher zeigt der Mann beim Verarbeiten einer Emotion einen kräftigen Trieb- und Tatendurst, und seine Reaktionen sind oft agressiv. Eine Frau erleidet dieselbe Emotion zarter und weniger agressiv. Der Ausdruck "Die männlichen Gefühle sitzen unter dem Nabel und die weiblichen oberhalb" ist keine leere Floskel.

Leider kommen die weiblichen Gefühle dadurch unter stärkeren Druck, aber die Natur hat hierzu eine Grenze gestellt, womit die Gefahr psychischer Schwierigkeiten beschränkt bleibt. Ein richtiger Weinkrampf ist etwas mehr als einige Tränen fliessen lassen. Medisch ist festgestellt: "Weinen erleichtert nicht nur den Kummer, es ist auch körperlich Gesund. Tränen spülen die Stressgifte aus dem Körper, die bei starker Erregung vom Körper gebildet werden. Versuchspersonen, die beim Anschauen eines rührseligen Films weinten, hatten erheblich mehr Stresshormone und andere Eiweiss-Stoffe in den Tränen als andere, die beim Zwiebelschneiden weinten. Weil Männer weniger weinen sind sie auch anfälliger für stressbedingte Erkrankungen".

Jede Emotion gibt dem Individuum einen psychischen Schock. Wir haben alle schon erfahren, dass eine Emotion eine Kettenreaktion auslöst, und diese Reaktion ist Molekülär. Nur haben Molekule kein Verantwortungsgefühl und bevorzugen Unordnung über Ordnung. Trotzdem soll die Ordnung wieder hergestellt werden, und dafür haben wir in unserer Struktur die psychische Kraft. Sie verfügt über eine Ordnungsmöglichkeit, die kräftiger ist als das primitive Urgesetz der Unordnung der Moleküle.

Wie lange eine Verarbeitung dauert bevor sie abgeklungen ist, ist für jede Emotion und Individuum verschieden. Zuviel hineinkommende variable Faktoren haben Teil daran, und daher ist es unmöglich glaubwürdige Diagramme und Tabellen aufzustellen.

Und jetzt möchte ich mit den Hauptpunkt dieses Referats beginnen, u.zw. "Wie verarbeitet ein psychisch stabiler Mensch eine Emotion?" Psychisch stabil bedeutet ein Gleichgewichtsverhalten zwischen Persona und Anima oder Animus, denn ein Missverhältnis darin ist oft die Ursache für psychische und somatische Krankheitserscheinungen.

/9/ Wir sehen erst den Mann. Seine Persona bekommt die Emotion zu spüren und bringt es aus dem Gleichgewicht. Durch den Ordnungszwang von Geist und Bewusstsein aber ebenfalls die Möglichkeit Initiative zu nehmen soll unsere Struktur so schnell wie möglich zum Gleichgewicht kommen.

Der Geistessektor wird dafür als erster aktiviert, aber in er zum Teil Materie ist, ist er nicht in der Lage von dort allein aus die Aktion zu realisieren, denn bei der Verarbeitung werden ebenfalls Gefühlsfaktoren bezogen, und in Farbe gesehen: Gelb ist kein Komplementär von Rot. /9a/

/10/ Das Anima muss hinzukommen, denn die zwei Begriffe Gelb und Blau geben den Begriff Grün. Die Kraft von dieser Halb-Materie und Halb-Nichtmaterie Grün kann zu einem Materiegrün führen.

/11/ Dafür sorgt die psychische-Kraft. Dieser Grünbegriff wird durch die psychische Kraft zum Gleichgewichtssektor geführt, wo es das Materiegrün im Testosteron findet.

/12/ Die Testosteron-Aktivierung, und das ist wissenschaftlich festgestellt, ist in Kraft gleich der Aufregungslage in der Persona, und das Ende dieser Aktion findet in dem Triebsektor statt. Er ist die Verbindung zwischen Gleichgewichts- und Personasektor, denn da sollen die Nicht Materie-Gefühle von der Persona, durch die Emotion in Aufregung gebracht, durch das Materie-Testosteron wieder in Gleichgewicht gebracht werden.

Nur wenn die Verarbeitung zu lange dauert, und auch zu oft wiederholt, bekommt der sonst psychisch stabile Mann Schwierigkeiten auf sexueller Ebene, und ist eine vorübergehende Impotenz nicht ausgeschlossen. Sein Testosteron oder Geschlechtshormon verbraucht dann zuviel Energie an Gefühls-

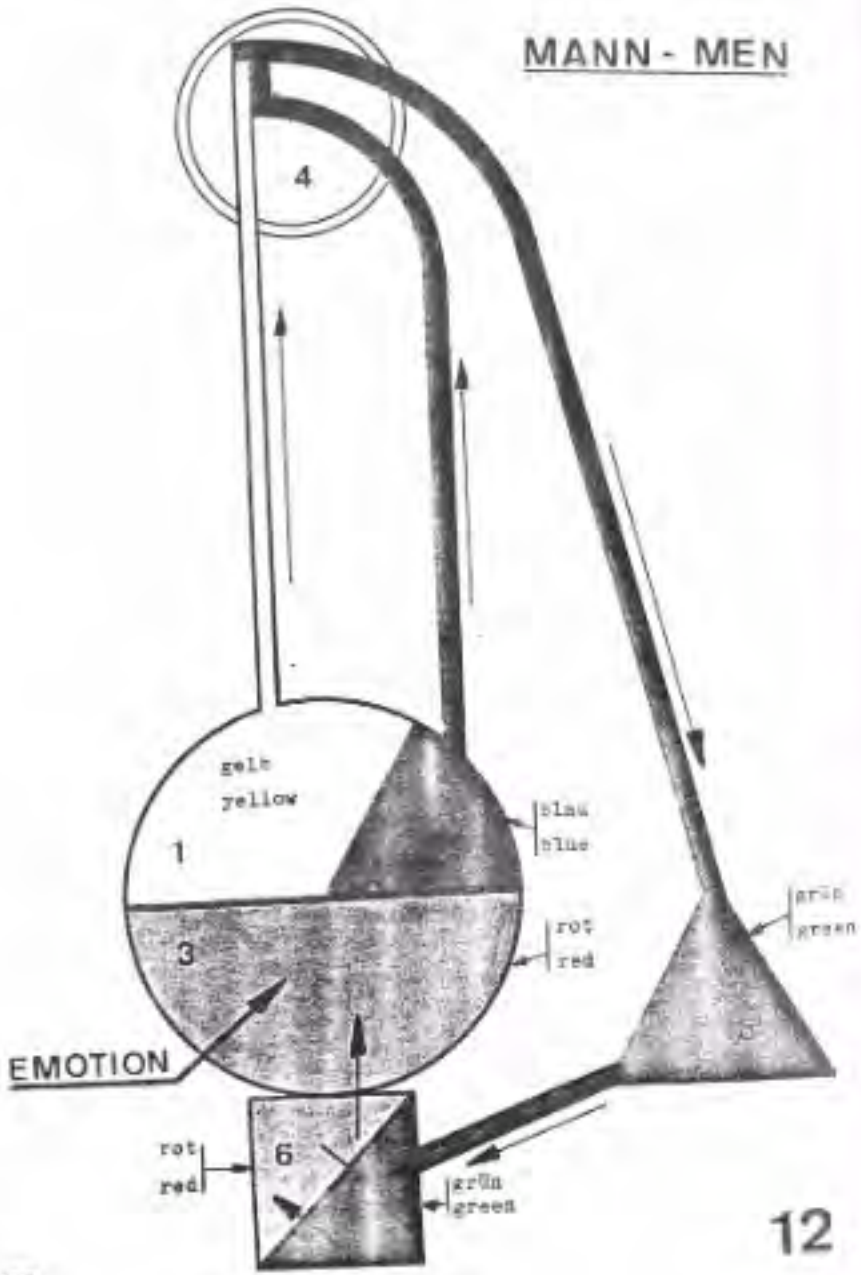
faktoren, die ausserhalb der sexuellen Bedingungen liegen.
/13/ Bei der psychisch stabilen Frau ist der Verlauf ähnlich, nur Materie und Farben sind anders. Die blaue weibliche Persona erleidet als erste die Emotion.
Auch hier wird der Geistessektor als erster aktiviert, und da er allein nicht in der Lage ist eine Gleichgewichtsaktion in Gang zu setzen, denn gelb ist nicht genau das Komplementär von blau, muss das Animus hinzukommen. /13a/
/14/ Der Animus und Geistessektor stellen sich die psychische-Kraft, damit die Mischung zu dem Begriff Orange stattfindet.
/15/ Dieses Orange wird durch die psychische Energie zum Gleichgewichtssektor gefördert, wo es das Geschlechtshormon Oestrogen, empfindlich für Orange, zur Aktivität angetrieben wird.
/16/ Schliesslich führt der Gleichgewichtssektor diese Energie zum Herzsektor, wo genau wie beim Mann Nicht-Materie-Gefühle durch die Emotion in Aufregung gebracht, durch die Materie Oestrogen wieder in Gleichgewicht gebracht wird.
Dies Alles nur insoweit es sich um psychisch stabile Strukturen handelt. Aber es gibt auch Nicht-Stabile, und eine dieser Möglichkeiten einer mehr oder weniger nicht-stabilen Psyche ist eine dominierende Anima oder Animus, was eine Verschiebung in der Personarichtung mit sich bringt.
/17/ Es kann geschehen, dass sich eine derartige Verschiebung in die Richtung des Geistessektors vollzieht. In diesem Fall glaube ich von einer psychopatischen Abweichung sprechen zu können, und ich denke, dass zu einem solchen Verlauf die Schizofrenie gehört.
/18/ Aber wie ist der Verlauf bei einem Mann, wo das Anima dominiert, und heute ist das keine Ausnahme.
Ein dominierendes Anima kann akzidentell entstehen. z.B. durch Kastrierung oder sexueller Impotenz und durch andere Ursachen. Aber am meisten liegt die Ursache bei einer falschen Erziehung.
Wenn Eltern sehnsüchtevoll ein Mädchen wünschen und es wird

ein Junge, versuchen sie oft unbewusst jeden weiblichen Charakterzug zu stimulieren, was leider oft gelingt. Diese Eltern sind sich nicht bewusst, dass diese falsche Erziehung zu einer psychisch bedingten Impotenz führen kann, aber ebenfalls oft die Basis für einen späteren Herzinfarkt sein kann. Wird ein solcher Mann durch eine Emotion berührt, kommen seine Persona und Anima in Aufregung und nicht nur seine Persona. Zum Verarbeiten von dieser Emotion bleibt nur der Geistessektor, und gelb ist nicht Komplementär zu blau und rot. In diesem Fall hat die psychische Kraft nur einen Sektor zur Verfügung, womit sie ihre Aktion starten muss, und das geht nicht. Also braucht sie für die Verarbeitung einen zweiten Sektor, und sie wird diesen irgendwo anders im Körper suchen. Wo? - Das weiss ich nicht. Bis heute ist mir noch keine Möglichkeit geboten worden dies zu erforschen.
Jedenfalls, da die Verarbeitung der Emotion nicht entlang des normalen Weges geschehen kann, wird sie auch langsamer verlaufen und die Persona länger in Aufregung bleiben, was schliesslich zu psychischen und somatischen Störungen führen kann.
/19/ Bei einer Frau, wo das Animus dominiert, gibt es ebenfalls Schwierigkeiten, denn ihre Persona und Animus, blau und rot, werden zur selben Zeit durch die Emotion in Aufregung gebracht und wie schon gesagt, gelb ist kein Komplementär von blau und rot. Ihr Oestrogen kommt langsamer zur Aktivität und die Emotion hat eine längere Wirkung. Eine derartige Frau wird selbst bei derselben Emotion längere Zeit als der Mann benötigen für die Verarbeitung bis zum Gleichgewicht.
Die für Rot empfindlichen Elemente, die von irgendwo herkommen müssen, sind eher geneigt die Aufregung zu stimulieren als für ein Gleichgewicht zu sorgen. Wenn eine derartige Situation zu oft auftretet, kann es zu einer hysterischen Lage kommen, und Hysterie ist tatsächlich eine überwiegend weibliche Gefühlsstörung. Hysterie ist nur dem Mann nicht fremd, bei dem seine zu starke Anima zu Impotenzstörungen

führt. Und jetzt möchte ich mit einem Beispiel den Zusammenhang zwischen Moleküle und Chromotherapie erklären versuchen, und bleibe dafür bei der Hysterie.
Dafür denke ich an das Kalium in unserer Zellenstruktur. Kalium ist sehr radioaktiv, und jede Menschenzelle enthält ungefähr 8 Millionen Kaliumatome. Dieses Kalium hat zwei starke Spektrallinien: eine im Roten, an der äussersten rechten Spektrumseite und eine Violette an der äussersten linken Spektralseite.
Nehmen wir an, dass von der Kaliummoleküle oder vielleicht Atome durch eine starke Emotion der für Rot empfindliche Teil aktiviert wird. Bei einer psychisch labilen Frau ist durch ein dominierendes Animus - und ich habe schon angeführt, dass ihr Animus seine normale Arbeit dann nicht erfüllen kann, - ein Verlauf zur Hysterie nicht ausgeschlossen. Ein psychisch stabiler Mann dementgegen ist durch seine rote Persona für den negativen Einfluss von dem roten Teil von Kalium geschützt, und dadurch ebenfalls für Hysterie.
Aber wenn die Emotion zu lange dauert, und ihm deprimierende Gefühle treffen, wird der z.B. violette Teil von Kalium irritiert und das kann Mann und Frau schaden. /20/ Violett ist keine komplementäre Farbe von beiden /21/ Personafarben, und psychochromologisch symbolisiert Violett Trauer, Depression, das Fehlen an Lebenslust. Dies kann zu einem Neurastenieleiden führen und diese emotionelle Abweichung ist im Mann und Frau festgestellt.
Ich kann hierauf noch etwas weiter eingehen. Bei Hysterie wird oft eine starke Steigung von Cholesterol festgestellt, aber kein grösserer Niederschlag von Cholestrine in die coronäre-Arterien. Cholesterol ist überwiegend aus CHO-Atomen zusammengestellt, und in Farbe umgesetzt bedeutet das eine Dominierung im blauen Spektralbereich.
Die Persona von einer Hysterieleiderin ist blau und ihr Gleichgewichtssektor organe, das ändert sich niemals. Diese beiden Farben sorgen dafür, dass die demolierende Wirkung von blau dominierenden Cholesterol schnell vorwich geht,

ohne beachtenswerte Cholestrine-Bestante in den Arterien zurückzulassen.
Andererseits die Persona von Mann ist rot, und er verfügt daher nicht über einen orangefarbigen Gleichgewichtssektor, oder nur in sehr geringem Masse. Die Verarbeitung von Cholesterol in seinen Blutkreislauf dauert viel länger und das Cholesterol hat mehr Zeit zur Cholestrineabscheidung in die Arterien. Daher ist grössere Gefahr für Herzinfarkt. Der Herzinfarkt ist also auch eine Männerkrankheit bis zu einem bestimmten Alter.
Diese vereinzelten Faktoren zeigen, dass es sich lohnen würde die menschliche Struktur, molekulär dann, tiefgehend zu untersuchen und die Feststellungen in Farben zu sehen, sowohl als Materie aber auch als Gefühle. Es ist ein ausgedehntes Gebiet, momentan nur sporadisch betreten. Vieles von dem könnte in Bezug auf den Mensch als Materie- und Psychoobjekt und seiner gegenseitigen Beeinflussung vielleicht verdeutlicht werden. Ihre Aufmerksamkeit auf diesen neuen Weg zu lenken war daher der Sinn dieses Referats.

MANN - MEN



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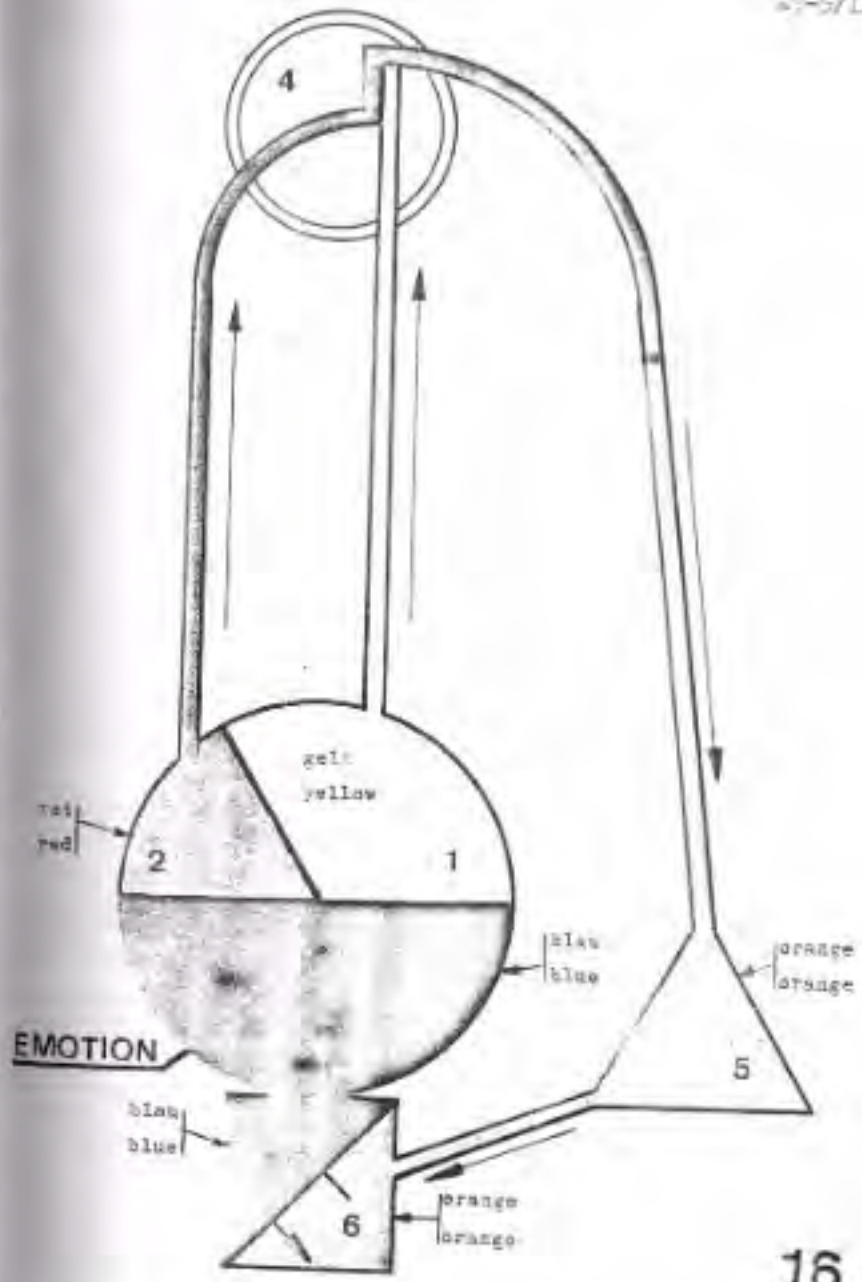

16

RELATIONS BETWEEN CHOOSING COLOURS, DELIQUENCY AND HEALTH

M. Turóczi

Since 1948 I have performed continuous serial examinations with the help of a test chart containing 24 colour shades. The basis was a series of tests carried out with 1200 secondary school boys and 1200 secondary school girls. The several thousand colour preference tests performed since individually, with the exclusion of a possible interaction, and combined with personal talks offered possibilities to unveil many coherances, which may clear up relations between personal constitution, health and family circumstances on the one hand, and colour selection, colour preference, on the other. I am going to emphasize some of them here. (Numbers in brackets following the denominations of colours are the serial numbers of colours used in the test chart.)

In the course of colour preference tests performed with condemned men (79 experimental subjects) the liked colour selected in the largest number was dark warm ultra marine blue (amounting to 22,7%). The percentage of preference of this colour in the case of secondary school students was 9,2 %.

The second colour in the row selected by condemned men was red in a proportion of 12,9 %, against 35,0 % in the case of secondary school students.

The different selection of colours of the individual groups of criminals was as follows:

- Condemned for burglary, theft (34 persons, age 22-49, 43%)
  I. red (No.3) - 9 persons in the first place
  II. dark or ultra marine blue (No.19) - 8 persons

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  III. grass green (No.12) - 4 persons
  IV. yellow (No.1) - 2 persons
  V. mustard-yellow (No.7) - 2 persons
  (Other choices were one colour each)

- Condemned for immoral offense (20 persons, age 25-42, 24%)
  I. yellow (No.1) - 4 persons in the first place
  II. black (No.24) - 3 persons
  III. red (No.3) - 2 persons
  IV. bluish green (No.14) - 2 persons
  (Other choices were one colour each)

- Condemned for murder (14 persons, age 25-51, 17,7%)
  I. dark warm ultra marine blue (No.19) - 5 persons in the first place
  II. red (No.3) - 3 persons
  III. purple (No.4) - 2 persons
  (Other choices were one colour each)

- Condemned for ravages (9 persons, age 22-45, 11,3%)
  I. yellow (No.1) - 3 persons in the first place
  II. dark warm ultra marine blue (No.19) - 3 persons
  (Other choices were one colour each)

- Condemned for illegal border crossing (2 persons)
  One person: purple (No.4)
  Other person: dark warm ultra marine blue (No.19)

In order to point out contrasts I mention that within a group of students of Kazinczy Gymnasium at Győr, comprising 536 pupils, those of best behaviour chose light yellow (No.1). This colour was chosen by 0,75% of 1200 girl students and none of boy students. Among criminals none had chosen this colour as liked colour either. During the same series of tests the students who chose the black colour (No.24) were the most undisciplined and their average school achievement was 2,6.

Examining the relations of colour selection and health it was striking that students in whose family there had occured cases

of cancer (father, mother, grandparents) are inclined at a high percentage towards the red colour and its various shades. 56% of 60 students had chosen the red colour (No.3) they liked.

During 1951-53 tests were performed with 125 patients having internal diseases at the Municipal Hospital at Győr. Test results unveiled interesting coherances between the disease of the subjects of tests and their choice of colours.

Interviewed patients suffering from TBC had chosen the red colour they liked at a rate of 57.8%, while cardiopathics, among whom the presentation of the colour chart caused excitement in 31,8% of cases, chose the red colour only in 13,6% of cases in the first place. Here the colours blue, black and brown appear to be preferred ones.

Similarly unequivocal data, prompting to continued monitoring and testing were obtained concerning relations between the magnitude of deviation from healthy body weight in connection with the height of students, the various vital functions (blood-pressure, pulse, fatigableness, etc.), children who got over infectious children's disease, on the one hand and colours selected as liked ones, on the other.

The purpose of actual and future research is to unveil the reasons, the bases of coherances experienced in the course of colour preference tests between the psychological and physiological constitution and state of subjects of tests and their preference for colours. Only the recognition of these may lead to the result that, knowing the colour preferences, these latter should be suitable for prediction, discernments, education and perhaps even for medication.

THE EFFECT OF COLOURS ON CREATIVE PERSONALITY GROWTH

A. Hanschburg, J.A. Fehér

Colours as sources of mental energy

According to the well-known fact that all living beings receive their energy directly or indirectly from the Sun, solar energy is a pre-requisite of human somato-biological activity as well. Heat and brightness are stimulators of metabolic processes, meanwhile brightness and colour regulate the human beings' mental state by stimulating its activity (e.g. moods, rest, etc.)

Way of living and psychic recreation

The mental activity and passivity of the living beings, furthermore the consumption and recreation of psychical energies are strictly bound to the periodicity of illumination, and the alternation of the day and night.
Due to such factors the contemporary, especially urban way of living, the use of artificial illumination and the looking of television, man's natural experiences of light and colour become subjects of violent changes, which lead to profound biological and psychological modifications (e.g. the fail to perceive being exhausted, or deficiency in colour discrimination) and several somato-psychic and psycho-somatic diseases.

Developing a creative personality

In accordance with the above mentioned facts, in the methodological research on creative personality growth we put stress on the man-colour relation. We take as our starting point the

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fact that in reality the colours are not phenomena perceptible by themselves but as white light gets divided into perceptible colours during its physical interaction with the objects and their background.

In the process of the psycho-physical perception, which contains the act of comparison of the object and its background, the colours tend to "fill up" the object, meanwhile for the personal experience or individual emotional attitude they "put life" into it, since the integration into the conscious of the perceived elements is not the only momentum of the psycho-physical process (see Gestalt-principle). The mind as an individual entity, or "personality", coordinates the interaction of the individual variances and the environment, while it maintains the continuity of the Ego as well. In accordance with this not only the various colours produce different impact on the same person but different persons give various responses on the same colour. The variations of their reactions are in relation to the constant and variable features of the personality. The colour and shape tests of the clinical psychology (e.g. Lüscher, Rorschach), or the results of research in the fields of colour dynamics and the dynamics of works of art (e.g. J. Itten, M. Moulound, B. Gyulai, etc.) also refer to this.

The dynamic interpretation of these items discussed above from the point of view of the personality, leads to the conclusion that the personality can be developed not only by external colour effects. If the individual himself projecting his internal mental states, so to say, colours into reality, we can help him to get familiar with and develop himself through the projection of his characteristic internal colours.

In accordance with this we have developed our method in order to mobilise the personality's ability of self-developing by complex means of motivation, discrimination and integration, as opposed to the onesidedness of the contemporary way of living.

Methods of motivation:

helping to get familiar with natural colours, using natural objects (e.g. minerals)
getting familiar with artistic colours, using artistic objects
getting familiar with one's own colours, through training of self-expression (e.g. dramatic play).

Methods of discrimination:

getting familiar with the persons own dynamics of colours by means of characterising exercises based on the complementarity principle.

Methods of integration:

getting the objective and subjective dynamics of colours meet by means of the laws demonstrated by colouring abstract shapes.

Experimental groups:

our family (from 1972 on)
groups of children between 3-10 years of age (1976-80)
university and high school students (from 1980 on).

INFLUENCING COLOUR PERCEPTION BY SURFACE STRUCTURE

P. Gáborjáni

At the Budapest Technical University an analytic test series has been started investigating architectural surfaces according to different viewpoints. Essentials of our method consisted of preparing life-size and reduced size models of building surface elements and exposing them to light effects corresponding to those in real architectural environments. Measurements were completed by physiologic and psychologic tests. Results have been plotted in diagrams. This can be a means to improve the characteristics of the buildings, to overcome inherent monotony of standardisation and in final account, to solve townscape problems.

Two strictly related topics of this report are:
- Ways of using natural colour effects for architectural surfacing materials;
- Visual effect of the surfacing material as a function of hue.

Nowadays an important problem of architecture is monotony due to standardisation. Namely, up-to-date building technologies and industrial products are used overwhelmingly compared to handicraft or site prefabrication.

This technology still cannot produce surfaces equivalent to those of other industrial or crafts products. Besides economy, this fact has also conceptual causes. Building industrialisation has opened up two ways for design, depending on the production features, i.e. those of mechanization and of

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automation, decisive also for trends of surfacing.

Building industry based on mechanisation

is featured by integration, coherence of design and production. Essentials of design are related to industrial production, and the design process ends when the production starts, namely the production apparatus has created essential preconditions of standard designing, adaptation. Three consecutive phases in the building industry based on mechanisation are: design - production - assembly.

Building industry based on automation

is featured by disintegration between design and production. Essential requirements of design are related to industrial production, i.e. directly to technology, and the design and the design process starts together with the production, since the production apparatus created essentially the preconditions of design for variation. Thus, in a building industry based on automation, the order of the three phases changes into: production - design - assembly.

Building automation raises the design freedom to a qualitatively higher industrial level by translating it to computer language, corresponding in fact to the recognized necessity of this era.

As concerns the architecture, industrial revolution brought changes in the relation between the industry of building materials and the building industry itself. Automation of the building process (in particular, for mass construction) has such affected surfacings. On the other hand building parts arranged side by side have to make an aesthetic effect to express architectural ideas. Units for mass production are to be designed with care taking scientific ideas needed to meet changed but stressed aesthetic standards into consideration. Texture and colour varieties of surfacings may contribute to enforce the principle of "low number of units-high-grade variability".

Our experiments have supported the following assumptions:

1. The architect is creating the building in accordance to the requirements of the intended user by means of space and mass shaping. He selects the most convenient material to this work (production, design), the entity of which produces the architectural effect. Viewed at a certain proximity, architectural surfacings are decisive because of certain physiological effects on man.

   Essentials of the building are space, mass, and the structure (material), but in a certain phase of perception surface texture and colour are decisive; this phenomenon becoming prevalent at close view, even in interiors.

2. The visual effect of the surface referred to is related to the texture of the given surfacing material.

   The the surface texture, 'natural' materials give a hint on the internal structure of the material. Tools, machines used in processing leave imprints depending on the resistance or accommodability of the material, characteristics resulting from inherent properties depending, in turn, on molecular or atomic structure. Hence, surface textures, carriers of natural hues, result from the natural features of the material.

   These features are decisive because of the return of the fashion to leave materials unaltered, but even for coloured materials, the texture carrying the colour is of importance. Coloured ceramics, fire-clay, plastern or aluminum have different visual effects.

   Textural effects are those obtained from the natural texture of the material, its processing, natural or coloured hue.

   Light-shadow effects result from pattern, i.e. surface processing. Surface effects are also affected by the order of magnitude relations between the textural pattern and the size of the given surface.

   Texture lends peculiar dynamics to colour, and vice versa, colour may enhance textural effects.

3. The final object of our experiments is to create a standard, an aid to designers and protubers, likely to designate optima for various materials and surface textures as a function of illumination quality (monochromous or mixed light, spotlight or diffused light),
   illumination intensity and
   illumination direction (for an outer surface depending on the daytime).

   Our experiments included the visual verification of the influence of colour to enhance or reduce plasticity values, and texture effects (grain, unevenness etc.)

Conclusion:

Any surfacing can be reduced to a few fundamental texture elements. Preparing models by using these texture elements, using different materials, offers a visual means of testing the character of a given texture on a surface in case of different illumination alternatives.

Illumination was attempted to reproduce daylight; for given materials and incidences, surfacings were observed to show a dynamic or static effect depending on illumination or colouring.

For surfaces of a heterogeneous material composition, colour determination by a single wavelength is insufficient, as the final spectral energy distribution results in great many alien reflections. In these cases the texture has to be redetermined (superposition).

Results have been illustrated graphically, presenting at the same time the given surface texture.

G. Rákóczy

Among the symbols of different early cultures the four-start spiral (meander) appears recurrent and may be considered as a natural graphical basic unit, due to its shape. An ancient Scotch figure on a grave has led through research work to examining the possible combination of the four shades or tints evolving in the core of the spiral and also to analysing the possible versions of filling in the plane.

Regularities observed in the course of examinations have led to interesting results. On the one part the symbols evolving, or combinations of symbols, are similar in surprisingly many cases, or identical with symbols of ancient cultures. On the other part the symbols are directly linked to combinatorics, while their forms, shades and colour variations show kinship with the environment appearing in our actual, highly technical world. They may be considered as abstract representants of the environment. It seems therefore, the symbols are at the same time ancient and modern.

There is no possibility to demonstrate here all relations of the examinations, so we shall just point out a few main phases thereof.

Then examining the core of the mentioned four-start spiral, we fill one quarter each of the cross-shaped quadriform division with a shade or a colour each, then the four shades can be arranged in 6 different ways in total, without repetition. Each arrangement, however, offers a new visual possibility when turned round by one quarter, thus we have 6 x 4 = 24 eventualities in total.

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Changing the sense of rotation of the spiral, clockwise or counter-clockwise, we get 48 variations. These quantifications can be observed in advantaged provinces in the ancient cultures, equally as the evolving symbols proper.

An interesting result is yielded through examining how new spiral cores can be created, starting from one single spiral core through meander connection, and how long this is possible without repetition.

If e.g. we go round each shade on all four sides, starting from the quadriform core (this is the spiral course), we may step out of the spiral whirl through a meander shift and generate a new spiral core. Drawing only those lines which come from the original core, or only connect the new cores, we obtain a system consisting of 9 cores in total. Thereof one is the original and 8 are new. Among the 8 new 4 each are in kinship with one another: 4 are identical, 4 are their whirled ones. Thus the 9 cores are divided to 5 and 4 units.

It is remarkable that we get formally the same result if we investigate how the evolved unit of 9 can be linked to the space outside of them. The connection shows 4 double-line and 4 single-line units and the original core, since it completely encircles the 8 new central points, has no linkage with the "external world".

Taking the quantity of spiral cores behaving as units, we get 9 x 4 = 36 variations. The number 36 is recurrent also otherwise within the system of symbols.

Investigating further possibilities of linkage of the spirals rotating in the same sense, we find that the two types of rotation centres also may be organised into an endless screen. One type of centre point is the isosceles cross mentioned before, the other is that of the character of rotating square. The thus evolving screens can be dextrogyre and laevogyre. Laying the two kinds of spirals (double spiral) one upon the

other, resolving their joint projection in a way that but the coinciding sections of the two kinds of line system should be visible, then a symbol system sets about appearing in its complete opulence. Known and unknown, i.e. ancient and maybe new symbols appear, we perceive labyrinths.

The two kinds of spiral systems can be moved one upon the other (reproduced on film). In this case the symbol system is projected to us in the dynamics of straight motion and of rotation, respectively.

Among the many feasable possibilities we want to point out still one more. Successively disjoining per unit the four-start spiral (starting from within outwards) and preparing the disjoined i.e. empty spaces to form a row (e.g. cutting them out of paper), then a proportionate stepped pyramide can be built up by placing these one upon the other. Stairs are starting from the four lower corners each, and walking up one meets on the summit.

Concluding, instead of a learning, we would just rise the question: it would be worth while to think about, whether an analysis of the exposed logic of spiral patterns could not open new ways for understanding the basic symbols of an individual culture, and their organizing, respectively.

D. Nagy

The philological investigation of colours is not only an interesting contribution to the colour dynamics, but an important - sometimes the unique - way to get reliable information about colour perception and colour preference of people of earlier ages. Namely, the usage of colours (colour terms) in literature - beyond the possible indigence of terminology - is not limited by technical problems which are frequent at the concrete (visual) application of colours in practice, i.e. in fine arts, in architecture, etc. (E.g. Homer liked and used free the colour "purple" (πορφύρεος), which was very rare in practice of antiquity, because this paint was almost impayable, and later prohibitive; see the expressions "royal colour" or "born in the purple".) Other advantage of colour analysis on the basis of literature is, that the texts preserve the original colours wanted by the author, while the archeological findings or earlier objects have often changed their colours. The texts contain sometimes concrete data about colour perception of earlier generations which data cannot be reconstructed on our different evolutional level. (Unfortunately there are a lot of too mechanical conclusions in this field.)

The investigations of this type may help in determining certain general tendencies of colouristics in the human evolution. Our aim is to summarize some results of linguistics and history of literature which may form the base of a sug-

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gested colour-dynamic-philology (philology for colour dynamics):

1. Linguistics. The etymology and evolution of the colour terms - these are important for calibration of earlier terminology with the modern one. The relative universality of the basic terms, and some special characteristics of different nations.
2. History of literature. Statistics of colours in literary works, Solov'ev's "colour number" - these are important for the dynamic reconstruction of colour preference changes (e.g. in age of L. N. Tolstoi and F. M. Dostoevskii). The prominent role of colours in certain periods or in the works of some authors (e.g. in symbolism or by J. W. Goethe, E. I. Witkiewicz, G. Trakl, etc.).

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U. Willumsen

A home has two very different functions - the practical and the aesthetic. A home must give us the feeling of security and protection, but it must also give us the pleasant feeling of being surrounded by beauty. We require stability in the building's material construction, but our moments of pleasure in our home may be fleeting.

Colours have this fleeting, ever-changing quality which is so fascinating in all emotional experiences. No other effect can so simply yet so fundamentally change our surroundings. Changing light brings about colour changes, and repainting can create a complete change of scene in the matter of hours.

The first ray of sunshine in Spring makes women change to other clothes - to other colours. Even we dreary men allow ourselves the luxury of changing to a more colourful tie.

Our ideas about colours and the feelings we have for them are fortunately as subject to change as life itself. This need for change gives us many moments of pleasure and feasts for the eye. A glance at the changes in fashion in colour for interior decorating can tell us some interesting things about this.

In the world of fashion Paris may dictate: "This year the spring ensemble will be apple green", and perhaps summer dresses will be dove blue, or autumn coats Chinese red. Here the change is in hues, not nuances - from green to blue and then to red. For some reason or other this is not the case

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in our homes. Despite great changes in colour, it is not the hues that are altered. Looking back we may discover unexpected trends in the evolution of colours in interior decorating.

It all started in the Fifties when the new and revolutionary paints, alkyd and latex came on the market. Previously everything was painted beige or white, year in - year out, - at least in the scandinavian markets on which these studies are based.

The first thing that strikes us is that the interest for colour has increased enormously during the past 25 years. Even as late as in 1960, 85% of all indoor paint sold was white or grey. The remaining meagre 15% sales were divided between various shades of colour, and these were practically all pastel. At that time there was also the trend to have one wall in a strong contrasting colour, but this did not have any noticeable effect on the nationwide sales figures. But colour consciousness had started to awaken.

The "Shade to shade" conception first broke through in dress fashions and textiles, but thereafter the whole paint industry followed suit. Colour charts and brochures with colour combinations were influenced by the "Shade to shade" fever. Within the same hue, for example yellow, there had to be 3-4 shades, from very light pastel via mellow, medium shades to deep tot subdued shades. Interest thus moved to a middle area which was not dominated by light, dark or strong colours. These were called mellow medium shades and deep pastel colours in the colour charts of the Sixties.

But by now colour consciousness had awakened with a vengeance. Young people set the trend with bright colours in clothes and sports equipment. They represented the new market potential and soon made their mark on our homes with pop colours and fancy colours. This was about 10-12 years ago.

One strange thing about colour trends is that if the trend goes in too strong effects such as loud (primary) colours

it does not last very long. And that is what happened then. After a few hectic years of strong colours wherever we looked, the colour trend sought other ways. This time it was not difficult to predict. Deep, dark shades were the only ones that had not been in fashion, so what could be expected but that brown, bottle green and wine red became the rage - first and foremost brown, which to some extent is still in fashion.

The cup was full. All the ranges of colour had been used up, so what was there to come? This was when natural materials came into fashion - wood, and jute - in short, brownish beige. We are now back more or less where we started 25 years ago. And such subdued and moderate colours have a tendency to stay on the market for quite a while.

If we take a closer look at what has happened with these colour changes, we will discover that it is the shades (hues?) that have changed from the one period to the next. We have changed our taste from light pastel colours through mellow, medium shades to bright, fancy colours and on to the dark shades, ending up in the vague colours of natural materials. But all the time we have kept to definite hues, i.e. yellowish red. Twenty years ago, more than half the light pastel colours sold were Ivory and Cream. Fifteen years ago Bamboo was the most sold medium shade. When the fancy colours dominated, it was Fancy Yellow that topped the sales, whilst when the dark shades took over, brown became the big hit. Brown is of course a blackish variety of yellow-red. Even the actual colour of the now so popular natural materials is a soft yellow-red (beige).

In fact the sales statistics show that the yellow hues have been sold more than twice as much as all the other hues in all.

In this relation it is really strange to know that every scientific research on colour preferences tells us that blue is the preferred colour, at least when the choice of colour

is not connected to a special aim. This will not be easy to explain.

Of recent years, beige and related colours from natural materials have been dominant. But as a reaction to this somewhat monotonous colour scheme, there is a growing tendency towards clear pastel colours. Not the overpowering loud nuances - we have finished with them - and not the pale, insipid shades we had twenty years ago. Today we have found a happy medium with a clearer and perhaps a more slightly romantic character - a trend which we already have seen in textiles and coverings and will now make its mark on our living rooms, kitchens and bedrooms.

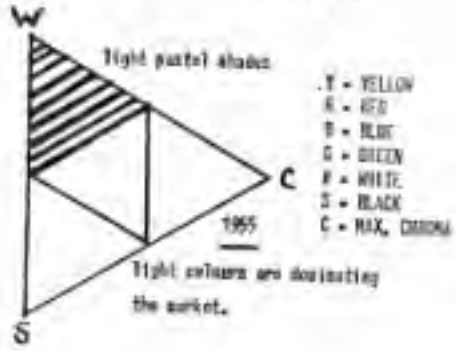
Nobody can force a colour trend which is not already latent in the times. The pattern for the colour changes of today is always to be found in the near past, and for anybody who is open to new impressions, a new colour trend will be welcomed as a mature fruit giving pleasure and well-being.

As already mentioned, this is based on studies of the scandinavian markets throughout the last 25 years.

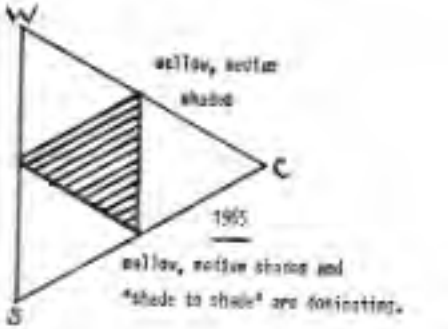
Every colour will belong somewhere between the maximum white, maximum black and maximum chromatic. The last-mentioned may be the yellow area, the red, the blue or the green.

The chromatic grouping can again be divided into main attributes and secondary attributes. A blue colour may, for example, be a little greenish or it may be a little reddish.

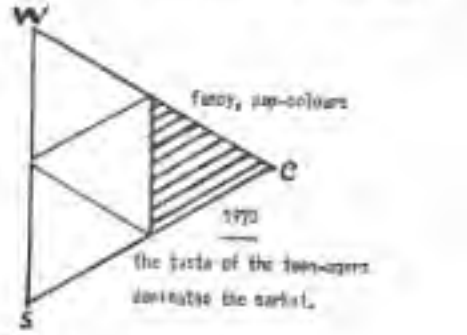
In these eight sectors we have a simple overlying model for hues, - a descriptive colour circle.



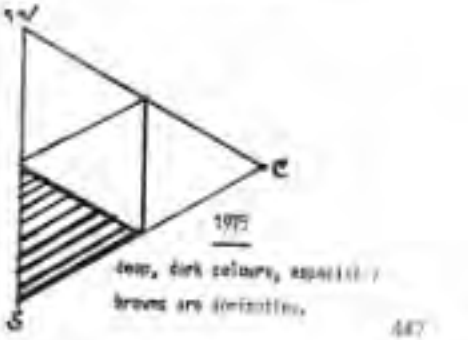
light colours are dominating the market.



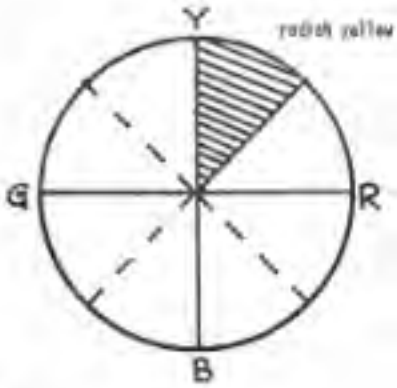
yellow, ochre shades and "shade to shade" are dominating.



the taste of the teen-agers dominates the market.



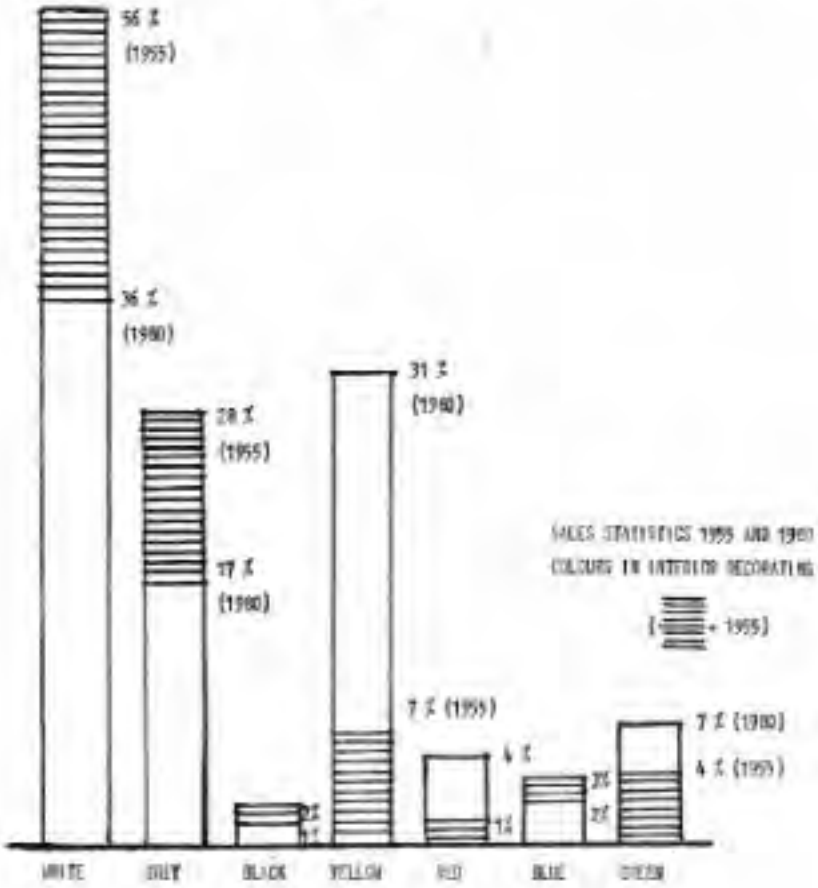
deep, dark colours, especially browns are dominating.



reddish yellow

Y - YELLOW
G - RED
B - BLUE
R - GREEN

we are using twice as much reddish yellow as all the other hues together.



SALES STATISTICS 1955 AND 1980 PURE COLOURS IN INTERIOR DECORATING

[= 1955]

COLOUR DYNAMIC DESIGN AND SEMIOTICS

L. Szép

Any activity and revelation of man is composed of various factors, which all are rooted in his biological build-up. Every human manifestation is calling the world and ourselves to account, it furnishes information about our momentary state. Such revelation may, however, only be considered fruitful, if it does not only satisfy the requirement of the individual to express himself, but if it had an objective meaning, a significance for the community.

Therefore to-day we should concentrate, while humanity stands in front of alternatives in several directions, on regaining these basic energies. This is why we are interested in the intensity of the various artistic manifestations, in those related elements of human nature, which determine his function and his manner of living.

The coherances and regularities of human consciousness and behaviour are under research in several domains of art, and research work proves that any version of intellectual culture was nothing else than a system of symbols and codes. Their significance may first of all be attributed to the fact that they help to recognize, to record and reflect life.

A common feature of arts is the recording and handing down of symbols and codes, while the difference consists in the variety of means characteristic for the individual domain of art used for the purpose.

Semiotics is a science concerned with aesthetic symbols. This relatively recent speciality has investigated the particular

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relations of symbol-meaning in philology. In connection with this certain statements of general validity were made, to be applied in the domain of other disciplines and specialities as well, e.g. in colour theory, environmental planning, and in architecture as well.

The products of architecture are large size commodities, satisfying the basic requirements of the society. In most cases one does not content oneself with the pure fact of realization, but wishes more: tries to expand the notion of utilization and searches after such intellectual and aesthetical aspects, which make the use more complete in both senses, the everyday meaning of the word and in the aesthetical sense.

The result of this endeavour depends in the first instance on the language serving human communication, since the communication system within the individual can only be considered as a language, if it is linked direct to the already evolved communication system, if it joins in the accepted results of earlier ages.

The language, the system of symbols of architecture, like the language of any special domain, is a special one. We may designate the totality of the means of architecture for shaping the environment as a language, which is called to convey communications, hints in respect of the utilization of the environment, as well as aesthetical information.

A primary means of realization of the architectural language and system of symbols are the colours. Colour dynamic design is suitable not only for an aesthetical visualization of the environment, but also for establishing the mark and symbol system of the entire environment.

ENVIRONMENT-SHAPING AND COLOUR-DYNAMICAL PLANNING

Cé. Klausz

In man's activities aimed at shaping his environment colour was used in various historic ages to different degrees and with different intensity, but always as a means of environment-forming. A general characteristic of the 20th-century developments in environment-shaping activities is the aspiration for deliberateness. This tendency is justified and made necessary mainly by the rapid growth of man-made environment, and by the resulting increase of adverse environmental effects.

The efforts to apply colours purposefully produced what we call colour dynamics, its theoretical and practical specialised fields. It is, however, an unfavourable fact that while in the last decades the basis of scientific knowledge through which purposeful colour-planning can be carried on with adequate safety, the number of colour applications not paying regard to the achievements of colour-dynamical research have grown considerably. These include a number of applications which hinder through their unfavourable social effects the progress and spread of purposeful colour-dynamical planning.

If we study the causes producing environments of unfavourable effect, we may conclude by way of analysis that this is determined by the fact that the views relating to the environmental role of colours, to colours as means of environment-formation, are dissimilar, and often contradictory. There are who deny the possibility of employing colour purposefully and apply colours only as a matter of necessity. There are, on the

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other hand, who overvalue the environmental role of colours and apply them unscrupulously to the environments planned by them.

It is therefore necessary besides many other points of view that order and a common attitude should be born in this field.

The basis of a possible common attitude is an environmental attitude which analyses the relationship of man and his environment and summarises the regularities of this relationship. In my lecture at the COLOUR DYNAMICS CONFERENCE '76 I described in detail the colour-dynamical environmental theory as the basis of practical colour planning. Hence I should like to stress here only the fundamental theses.

Man and the elements of his environment are in a determinant interaction. The aim of man's environment-shaping activity is to satisfy his functional needs. The contents of man's all environment-forming activities are determined by his complex functional needs. Man and his environment form together a working system whose functioning can be clarified, in which the regularities of this interaction can be explored.

It is in this way that we arrive at the possibility of a purposeful shaping of our environment, and at the possibility of including purposeful colour-dynamical planning. Within the aforesaid basic theses we must interpret the concept of complex function.

All objects and elements occuring in our environment and produced by man, meet a threefold function: the objects and elements have a function of use, have an informative function and an aesthetical function. These three function components, separated only for the sake of analysis, make up the complex function. By function of use we understand the traditional, generally known functions, e.g. a chair, or a window, or a school, or a town.

By informative function we understand those visual properties of objects and elements which must inform man living in their

environment what the practical function of the objects and elements is which he sees or uses.

Every object or element produced by man has an aesthetical quality. In the case of so-called autonomous artistic objects and creations we speak of artistic aesthetical quality. It follows from all this that all environmental objects and elements have an aesthetical function which they perform or must perform. This threefold, so-called complex functional requirement produces the elements of our environment, or, in other words, every environmental element has this threefold complex function.

The proportion and emphasis of this threefold function is greatly different in the given concrete environmental elements and objects as a matter of course. In the case of certain objects the component functions may become emphatic to the detriment of the other components.

What we have said of the threefold complex function is naturally valid both in the case of individual objects and elements and in the case of environments made up of several elements and objects.

Colour or colours, always appearing on certain materials, environmental elements and objects, may serve for the combined satisfaction of all functions. Moreover, the same colour may serve within a concrete object for satisfying the aesthetical function, but in respect of an entire environment it meets the informative function first of all.

There is no room here for explaining all this in detail, so let us see a concrete example.

Suppose the function of use of a building we see is this: a beer-house, a restaurant. (You see the same building, only over a period of three years during which different owners have painted it in different colours.)

It needs no special explanation for feeling that a red-and-violet colouration is intended as a cheerful momentary

meeting-place of young people, of by-passers; and of the white-and-brown variant we think that it is somewhat more elegant than the other, perhaps more expensive, and indicates a place for a somewhat longer stay. It is the colours that inform us of all this, since the formal shaping of the building has remained the same. As we see, the informative function of colours acts by all means in the case of a building.

When given members, formal elements are handled with different colours and in different proportions, we feel at the same time the qualitative differences between aesthetical gestures and aesthetical functions. And in favour of the red-and-violet variant, I think.

Thus it is clear that the informative and aesthetical function of colours as a means of environment-shaping is clear-cut with both variants.

If we study the effect of a given building in its wider environment, in the streetscape, the various functional components and their satisfying to various degrees can be perceived in this larger system in the same way. A certain change can be seen in this case. The red-and-violet variant, considered in itself better and of more favourable effect, would seem here more emphatic than necessary on the basis of its actual function of use.

In the case of a road-sign or direction-post the function of colours is almost solely informative; but in the case of, say, a bathroom it is rather the aesthetical function that becomes prominent. The case is similar with the various sorts of towels.

As we see and know, colours always appear on objects, on the elements of our environment, they never appear alone, self-contained. (Except perhaps for the autonomous creations of the fine arts which clearly belong to the category of arts.)

It is almost a commonplace to say that numerous wrong colouration plans are born exactly because of the neglection of

this correlation. When the designers of colouration produce a colour composition independent of the complex function of the environment planned by themselves or by others, and in many cases alien to the given environment, they have not paid regard to the aforesaid correlation.

The complex view outlined here can serve for making the colouration-planning of concrete objects, elements, buildings, even of wider environments, clear-cut, interpretable and understandable to creative and receptive men.

We must remark at the same time that the view outlined here is substantially nothing else than an approach to man and his environment from a systematic point of view. And this applies to the complex planning of environment in the same way as to the environment conception of man living in his environment.

On the basis of the view described here, it is possible to deduce unequivocally the proper, uniform system of all colour applications, a system which can be followed step by step in the course of planning. It is my opinion that if an environment is planned not on the basis of this complex attitude, it may happen that this environment becomes colourful, but muddled at the same time. And this spoils the expected effect of such environment considerably.

Environments becoming muddled, void of intuition emerge in such cases exactly because of the fact that the colours' manner of action follows in every case the regularities of the correlation of man and colour, whether the designer is aware of this or not.

HAUPTTENDENZEN IN ZEITGENÖSSISCHER FARBGESTALTUNG

J. Brošek

Im Fach Farbgestaltung bzw. Farbdynamik gibt es heutzutage sehr viele Aufgaben für Farbgestalter und Farbberater. Das führt zu einer dringenden Anforderung junge Farbgestalter zu schulen, zweckdienliche Methodik der Farbgestaltung zu suchen und erfolgreiche Gestaltungsvorgänge zu entdecken. Dieses Erfordernis hat mich zu einem Vergleichsstudium angeregt um zu erkennen, auf welche Weise verschiedene Farbgestalter ihre schöpferischen Aufgaben verwirklichen. Ich habe in letzten 20 Jahren an zahlreichen Farbtagungen und farbdynamischen Konferenzen teilgenommen, viele Vorträge aus diesem Bereich angehört. Das konnte ich noch mit den schriftlichen Berichten in den Büchern und Zeitschriften über durchgeführten Realisationen der Lebensumwelt vergleichen und mit dem Vermögen der Farben konfrontieren. So bin ich zur Erkenntnis verschiedener schöpferischen Verfahren bzw. Auffassungen im Fach Farbgestaltung gekommen, sie kritisch beurteilt und daraus folgende Schlüsse gezogen.

Ich versuche an die auffallendsten Auffassungen der farblichen Raumgestaltung zu zeigen, deren Begrenzungen oder Mängel zu entdecken und dadurch die theoretisch günstigsten Farbgestaltungvorgänge festzustellen. Ich möchte eine kurze Übersicht von den häufigsten Farbgestaltungskonzeptionen vorlegen:

1. Historisch treue Farbgestaltung

Als historisch treue Auffassung möchte ich solches Verfahren bezeichnen, welches nach Entdeckung von historisch ursprünglicher Farbigkeit der gestaltenden Objekte strebt, um sie

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historisch getreu rekonstruieren zu können. /1/

Wenn es sich um Erhaltung oder Rekonstruktion eines historisch wertvollen Gebäudes oder eines Stadtganzen (einer städtischen Reservation) handelt, das einen musealen Charakter hat, dann kann man diese Auffassung überhaupt nicht in Zweifel ziehen. Auch das Studium der historischen Farbgestaltung kann heutigen Architekten wertvolle Kenntnisse und Anregungen vermitteln.

Wenn man aber in einer lebendigen Stadt ein älteres Gebäude historisch getreu farbgestalten will, ist dieser Vorgang nicht ganz zweifellos. Solches Gebäude soll doch in das Stadtganze organisch eingepasst werden, es soll dem modernen Geschmack folgen und dem Farbgefühl der heutigen Einwohner der Stadt entsprechen. Daraus kann man schliessen, dass in diesem Fall eine historisch treue Farbgestaltung ein wenig eng und einseitig ist. /2/

2. Verengt ästhetische Auffassung

Wenn man mit Farben arbeitet, strebt man natürlich unter den benutzten Farben ästhetisch und bildnerisch gute Beziehungen zu schöpfen, oder wie man kurz aber nicht ganz eindeutig sagt "Farbharmonien" zu konstituieren. /3/

Doch aber, wenn ein Farbgestalter unter den Gebäuden einer Gasse oder eines Stadtplatzes nur Farbharmonien sucht und realisiert ohne zu sorgen, wie die Eigenart und Funktion eines Hauses durch Farben zu betonen oder wie die Rolle und Stellung des Hauses im Stadtganzen auszudrücken (neben vielen anderen Möglichkeiten der Beeinflussung vom Häuserausdruck durch Farben), kann man mit vollem Recht sagen, dass solche Auffassung zu eng und einseitig ist.

3. Psychologische Auffassungen

sind die, welche die psychologischen Wirkungen der Farben bei Gestaltung eines günstigen Lebens- oder Arbeitsmilieus zur Geltung bringen wollen.

Doch aber auch hier gibt es zu eng gefasste Lösungen, wenn man z.B. die Wahl der Farben bloss den Farbpräferenzen unterordnet. Die Präferenzen sollen natürlich beachtet werden, besonders bei den Farbgestaltungen für kleinere und psychologisch einheitliche Einwohnergruppen (wie es z.B. bei Schulkindern eines gewissen Alters oder bei schwangeren Frauen in einer Entbindungsanstalt der Fall ist). /4/

Sonst aber soll man unbedingt auch andere psychologische Merkmale der Farbwirkungen in Betracht nehmen und zur Geltung bringen. Beispielhafte Lösungen in dieser Hinsicht finden wir oft in den Arbeiten von H. Frieling. /5/ Er achtet darauf, dass die Bedürfnisse der Einwohner eines farbgestalteten Raumes breit respektiert und durch Farben ermöglicht werden und sogar damit ein günstiges psychologisches Klima im Raum geschaffen wird, das nicht nur zur guten Laune der Einwohner, sondern auch zur erhöhten Leistung stimulieren kann.

4. Architektonische Auffassung

Die Raumgestaltung gehört zur Problematik der Architektur und deshalb können wir von einer architektonischen Konzeption sprechen, wenn man darum strebt, damit die architektonischen Erfordernisse eines gut gestalteten Raumes erfüllt werden. Es steht ausser allem Zweifel, dass die Farbe architektonische Beziehungen zwischen Stützen und Balken betonen kann, dass sie Proportionen und ganzen ästhetischen Ausdruck des Baues korrigieren oder ergänzen kann und dass sie auch andere nötige Verhältnisse im Raum teilweise sicherstellen kann. Darauf achten viele Farbgestalter, deren fachliche Schulung architektonisch ist.

Man soll aber zur Kenntnis nehmen, dass ein Bau, ein architektonischer Raum überwiegend den Leuten dient und deshalb auch alle möglichen Bedürfnisse des Menschen zufriedenzustellen soll. Daraus ergibt sich, dass eine gute Farbgestaltung nicht nur architektonische Beziehungen der Elemente, sondern auch psychologische Bedürfnisse der Einwohner sicherstellen

soll. Ein überzeugendes Referat in dieser Hinsicht hat im Jahre 1976 in Budapest E. Ruth von Stockholm gehalten, der gezeigt hat, dass man von guter architektonischer Lösung sprechen kann, wenn der Bau alle möglichen menschlichen Bedürfnisse der Einwohner respektiert und gewährleistet. Dazu soll man Möglichkeiten des architektonischen Ordnens und Gliederns aber auch der farbigen Lösung ausnutzen, mit dem Ziel, damit sich die Leute psychologisch gut fühlen, was dann zur Gesundheit, zur Unfallverhütung und zur besseren Arbeitsproduktivität führt. /6/

Manche Farbgestalter sorgen also durch die Farbe die ungünstigen Züge des Raumes zu kompensieren sowie die günstigen Züge zu unterstützen. /7/

Nach dieser kurzen Analyse kann man feststellen, dass eine gute moderne Farbgestaltung [farbige Raumgestaltung] einen komplexen Charakter haben soll, um die architektonischen Qualitäten des gestaltenden Raumes mittels der Farbe betonen, ihm einen ästhetisch wirksamen Ausdruck verleihen und ein funktionell günstiges psychologisches Klima gestalten zu können. - das alles auch durch vielseitige Ausnutzung der ästhetischen, architektonischen, physiologischen und psychologischen Wirkungen der Farben.

Aber auch dann, wenn man seine Komplexität der Farbgestaltung sichert, wird die Gestaltung der Umwelt immer vielseitig sein. Es tragen dazu die typologischen Voraussetzungen des Gestalters, sowie dessen bildnerische [illegible] bei.

Bereits im Anfang unseres Jahrhunderts hat Ostwald [illegible] gezeigt, wie stark das Verhältnis zur Farbe bei den Menschen unterschiedlich ist und den Typ der ästhetischen Qualität der Farbe, [illegible] Empfindlichkeit der Farbe eines [illegible] Vermögen des einzelnen [illegible] zu [illegible] Assoziationen, Synästhesien oder verschiedene [illegible] Funktionen handelt), der einen zu [illegible] empfindet die Farbe etwas objektiv nur als [illegible] Farbenunterschiede ohne irgendeinen [illegible] Inhalt. /8/

Und was die ästhetische, bildnerische Anschauung des Gestalters betrifft, es werden vielleicht immer nebeneinander zwei grundlich unterschiedliche Auffassungen existieren und streiten, und zwar der Unterschied zwischen einem geometrisch konstruktiven und zwischen einem organischen (oder wie man sonst sagt "figurativen") Ausgangspunkt.

Die konstruktive oder geometrische Farbgestaltung ruht darauf, dass man farbig die architektonischen Grundprinzipien von Stütze und Balken, von der Rechtwinkligkeit der Konstruktion betont oder mindestens respektiert und zum Respekt vor den architektonischen Gliedern und Elementen führt.

Daneben existiert eine ganz unterschiedliche Auffassung, die man als organische Lösung bezeichnen kann. Ihre Ziele sind entgegengesetzt. Bei dieser Lösung will man ganz im Gegenteil die schroffe, strenge Rechtwinkligkeit der Tafelbauten brechen oder mittels der Farbgestaltung einen Schein, eine Suggestion von organischen Naturelementen (wie z.B. von Bäumen, Felsen, Wasserwellen, usw.) in die industriell wirkenden Baukomplexe einführen, dem Bau einen mehr menschlichen, naturhaften Charakter aufzwingen. /9/

Zu allen diesen Aufgaben kann die Farbe ohne Zweifel beitragen, denn sie ist - nach den Worten von Josef Albers, dem grossen Lehrer auf dem Gebiet der schöpferischen Farbe - "das relativste Medium in der Kunst", (das sich fortwährend verändert), sie ist "eine nie endende Aufregung". /10/

Unser Auge soll aber zur Farbe geübt und sensibilisiert werden.

Anmerkungen und Hinweise zur Literatur:

1. "Bei der Rekonstruktion der Görlitzer Ratsapotheke ... wurden Proben von Farbresten wissenschaftlich analysiert, so dass die jetzige Farbgebung der ältesten Fassade, die festzustellen war, entspricht." - Gotthard Meingold: Zur Farbgestaltung der Görlitzer Ratsapotheke, Zeitschrift "Farbe und Raum" 13/74, S.13.

2. Karl Krause: Zur Farbgestaltung in Weimar, Farbe und Raum 5/76, Seite 11: "Im Schlossbereich waren genaue Kenntnisse über die ursprünglichen historischen Farben vorhanden; es erfolgte eine konsequente getreue Farbrekonstruktion, die teilweise zu ungewohnten Farbgestaltungen führte und zweifellos mit unseren heutigen Farbempfinden an einigen Stellen zur Auseinandersetzung Anlass gab."

3. Dieter Deutsch: Die Anwendung des Farbsystems Ostwald im Bauwesen. XVI. koloristisches Symposium, Siófok, 1979.

4. Werner Spillmann: Farbgestaltung der Primarschule Ebikon. Konferenz Farbdynamik, Budapest, 1976.

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MAN'S EVALUATION OF COLOUR COMBINATIONS
– a pilot study

A. Hård

Background

Many persons believe that "beauty" is something very individual and that it must be impossible to predict the goodness of a colour combination out of knowledge about the colours. And it is not unusual that those who declare that opinion are people – highly scilled – working with aesthetical questions like artists, designers, architects, decorators etc.

On the other hand the same individuals often give statements about colour-compositions in which they emphasize what *is* good and bad.

In some cases these statements are only a result of their personal emotional feelings, in a specific moment and a specific context. But the professions of these people (tify them – they believe – to generalise their reactions to be the highest truth for man-kind.

However, still it could be true that there is nothing general in emotional evaluations – but these professionals are, or believe, that they are more capable to judge what is good and worst is bad than ordinary people. But still it cannot be predicted!

But there also exist aesthetical rules that are more dogmatic than that and based on very peculiar conclusions out of physical, chemical, physiological or other theories.

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One example of such dogma is the rule of the beautifulness of complementary pairs. And we will continue to call it a dogm as long as it has not been adequately proofed in experiment well documentated.

I believe that there exist at least five different definitions of "complementary colour pairs" and most of them will result in different pairs of colour appearance. Some of the definitions are physical, some physiological, but none purely psychological, may-be with the exception of the conceptual background to Goethe's definition. There are also definitions which are based on a "model-thinking". Colours laying on each end of a diametre in a hue-circle are sometimes said to be complementary – independent of how arbitrary the construction of the circle is!!!

Many authors declaring the beauty of complementaries seem to be aware of the different definitions – but they don't care less – complementaries *are* beautiful together!

A combination theory

Ideas like what I have reported here, plus the hypothesis that if any general rules would exist, it must be based on what people see, have started to interest Lars Sivik and me in our work regarding colour, man and environment supported by the Swedish Building Research Board. The natural colour system, NCS, is purely based on colour-perception without any conclusions from chemical, physical or physiological laws or models of colour-vision. And therefore we assumed that *if* there existed general laws of colour combination it was most probable that they might be derived out of the NCS-model.

We started to develop outlines of a theory of colour combination by using phenomenological analyses. We looked around us, studied what others had said, discussed with artists, designers etc, and tried to analyse what was ment in relation to what we call the "total colour gestalt". This, I have reported already in my other paper, at this conference. But may

I remind you that we base the theory on three factors that we have found being of importance how we perceptually characterize - and understand - a colour gestalt.

FACTORS

1. The colour-interval — which represents the
   a. Distinctness of border — contrast-characterising
   b. Kind of
   c. Size of kind — part of the Gestalt
2. The colour-chord — which has to do
   a. Complexity — with how the colours are bound to each other
   b. Attributes
   c. Type (of representation) — on a characteristical manner
3. The colour-harmonic — which deal with
   a. Area-relations — how colours are
   b. Colour-similarities — balanced
   c. Rhythm

But theories, hypothesis and models might be of interest, but it needs experiments to verify or falsify the theories. And vice versa - to evaluate experiments in this field you need some sort of hypothesis to test, because the number of possible combinations are astronomeous.

Only 1,400 colours give in this theory context 4,000 000 000 000 different 4-colour-combinations. It should take 600 000 years to study all of them only 1 second each.

A pilot study of the language of colour

In a way I would like to compare the information via colour with our spoken and written language. Its possibilities are infinitive and no man can ever dream of taking part of all in his life time. But any creative man might at any moment produce any of them all.

If we say that the NCS is the "word-book" of colours and the NCS Atlas is a colour-dictionary, we now want to learn about colour as a language. And the combination theory might be seen as the colour grammar and syntax.

The infinite number of possibilities is the reason why we need some hypothesis to test. And still it seems too big a task. So we decided to set up an experiment with the main objective, firstly to check if there exists anything that could be called a general agreement between people to certain different combinations of colours. At a colour-seminar we took the chance to a pilot study.

We designed 22 different 4-colour combinations according to a certain pattern (fig.1). The 23 "observers" were asked to determine their evaluation of these, what we called, pictures in four scales:

1. Forceful
2. Cultured
3. Beautiful
4. Complicated

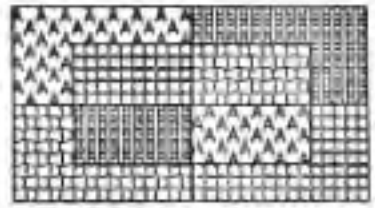


Fig 1

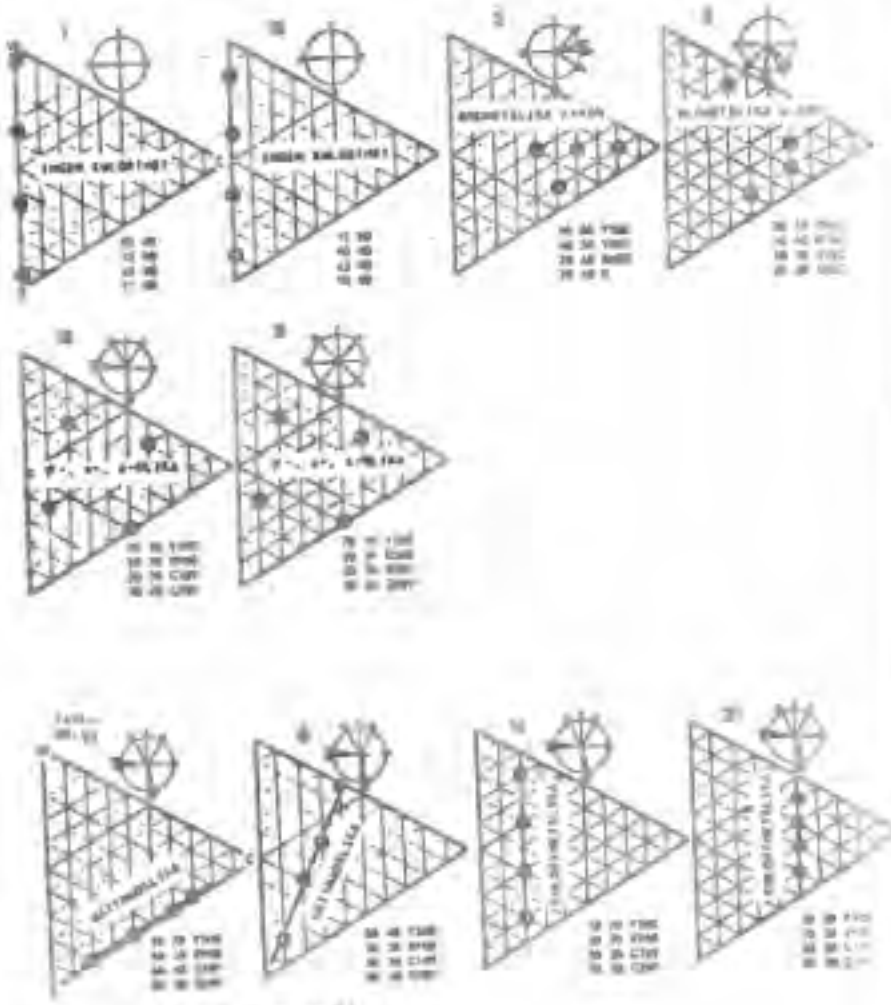
We used a common semantic differential technique (Osgood-scales) of a unipolar type (fig.2).

What is your imagination of this colour-picture?
Is it BEAUTIFUL?

not at all 0 1 2 3 4 5 6 in the highest degree

Fig 2

The choice of colours was mainly steered by some ideas around what we have called the HARMONIC factor. Would certain similarities in NCS colour attributes affect the evaluations, seen in the figure 9 we see them all. The selection was far from totally covering, and will be done in another way for a planned main study.



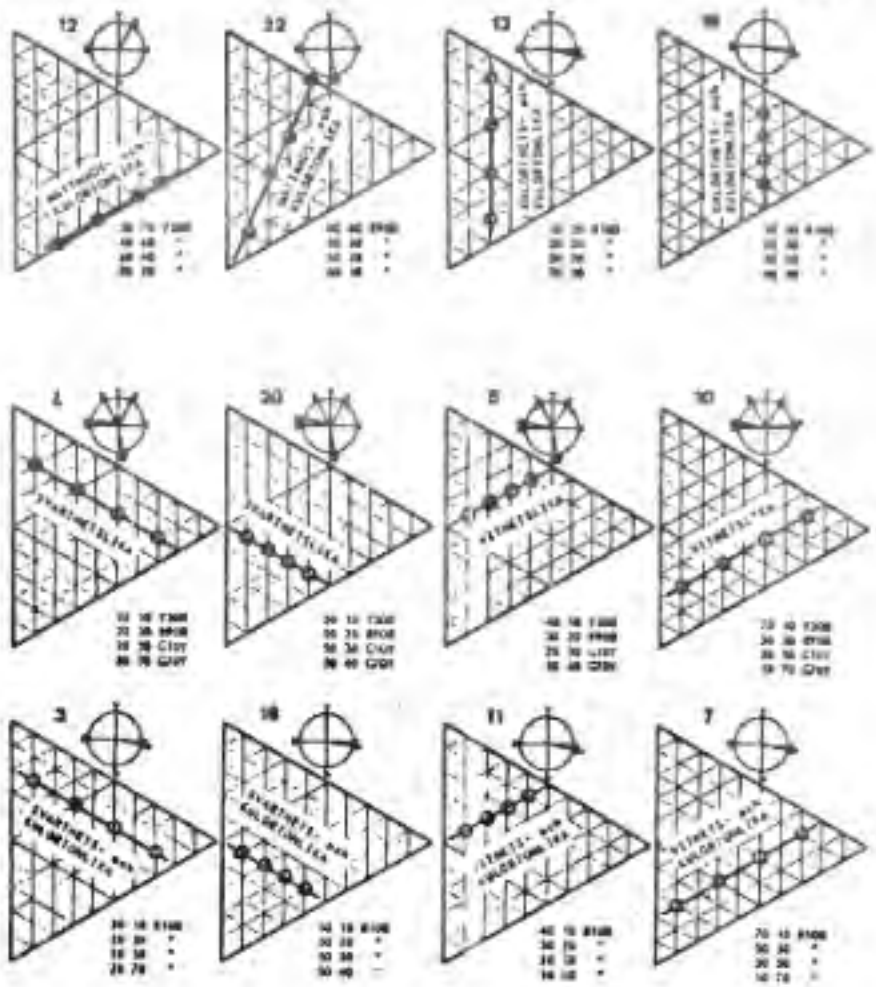


Fig 3

The first conclusion we drew from our experiment was that there are significant differences in mean-values for the 22 pictures seen in the table. The smallest difference, significant on 95% level, would be 0.8 in the Beautiful-scale, and the difference range is 3.22!!

The same is true for the other scales. Our conclusion from the results is that there exist a meaningful scientific possibility to study this kind of colour-esthetical question. In other words - it is researchable.

We have also carried out the same study with laymen (naive observers) and with a group of art and design students in England. The correlation between these groups are shown in the following table.

	r_{SN}	r_{SE}	r_{NE}
Forceful	0.87	0.68	0.82
Cultured	0.85	0.61	0.82
Beautiful	0.81	0.71	0.83
Complicated	0.74	0.50	0.61

S = Swedish specialists
N = naive observers
E = English art and design students

The correlation analysis indicates that there is an astonishingly high degree of similarity between the three groups - but of course there are also what could be called socio-cultural differences worth while to study.

However, at this stage we find the results as an encouraging verification to the hypothesis of some general rules for evaluation of colour composition.

Analyses of results

The analyses that can be carried out in other respects have slightly less general value. It must no doubt be limited to the stimulus material used; the test-design; the choice of colours etc.

However, some of the results show trends that are so extremely significant that they are worth mentioning.

First of all we have correlated the four (arbitrary) scales to each other:

	CULT.	BEAUT.	COMPL.
Forceful	0	0.10	0.24
Cultured		0.95	-0.77
Beautiful			-0.66

The high correlation between Beautiful and Cultural was - may be - expected, but not so the high negative correlation for Beautiful and Complicated.

We have analyzed the various pictures according to their various degree of similarities in the elementary colour attributes of NCS. Here we have some of the most interesting indications of predictable trends (fig.4.).

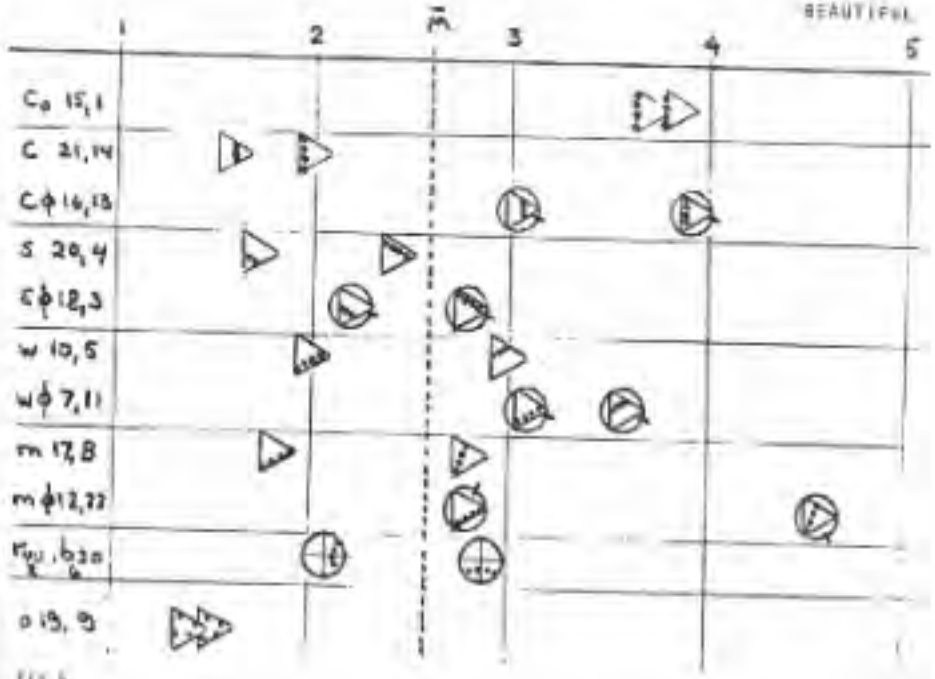


Fig 4

A The two pictures in which the 4 colours show no formal similarity (19, 9) are less Beautiful than all other combinations in which different similarities are shown, (they are also more complicated).

B In all cases where one attribute similarity also is combined with constancy in hue, the latter is determined to be more Beautiful (they are also less complicated) (▷→●).

C 1 Less chromatic (14 and 13) than high chromatic (21 and 16) are more Beautiful (including the achromatic pictures (15, 1).

2 Less blackish (4 and 3) are more Beautiful than more blackish (20, 18).

3 More whiteish (5, 11) than less whiteish (10, 7) are more Beautiful.

4 Less saturated (8, 22) are more Beautiful (including the achromics (15, 1) than more saturated 17, 12).

A comparison with the groups of naive observers and the English art -design-students show exactly the same trends (the only exception are the two achromatic pictures ich are low-evaluated by the Englishmen).

The totally agreement in trends is a measure of very high significance in results.

We have also analysed some other factors in our combinatory-model in spite of the fact that the stimulus-material was not designed for that purpose. Two results can be reported for the moment.

1 First we correlated determined Forcefulness with an operational definition of contrast as average distinctness of border. The correlation was r = 0.81 (fig.5).

2 We also correlated an operational definition of formal colour complexity (number of main and secondary attributes according to NCS) with average in the scale of complicated and found r = 0.87 (fig.6).

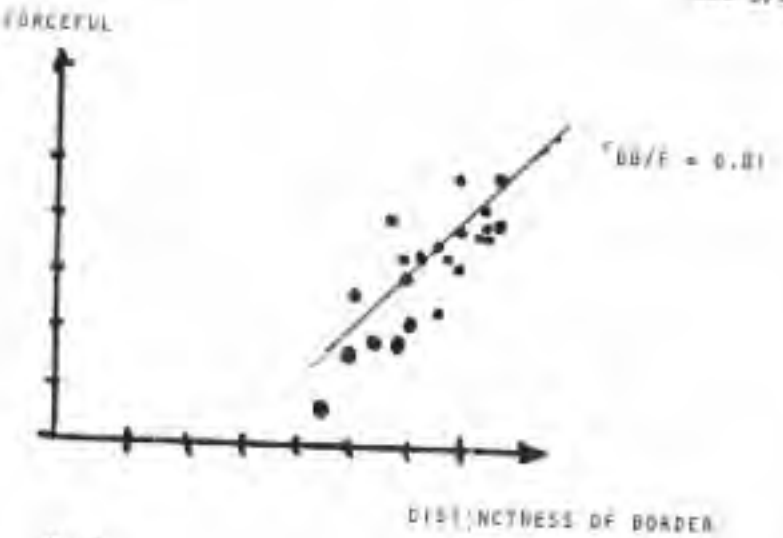


Fig 5

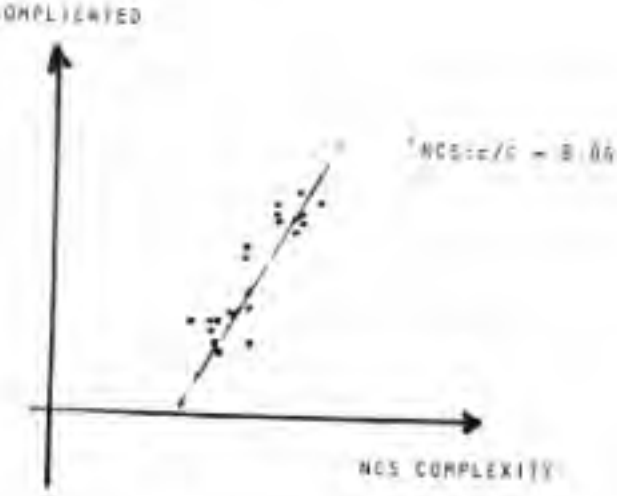


Fig 6

Conclusions

This pilot study first of all shows the scientific possibility to study this kind of colour-esthetical questions and thus they are researchable.

It also indicates that people react to colour combinations in very much the same way - at least if they belong to the same socio-cultural context. But the study also indicates the very complicated structure of colour combinations that can be evaluated, making it extremely difficult to draw conclusions out of a limited number of experiments.

However, today we are convinced that these kind of questions are researchable, the problem is to formulate the questions we want the answer to.

Therefore we are now planning new and more extensive studies, both regarding the connotative scales and the selection of colour-combinations.

COLOUR: THE SOURCE OF OUR KNOWLEDGE

E. Béres

Phenomena reach our consciousness via the sense organs. We get the overwhelming majority of information via our eyes in the process of vision. Book printing, photography and recently television distinguished between the two basic forms of image production, i.e. the monochrome or black and white, and the coloured one. It is well-known that moving objects catch our attention just as do bright colours, especially if these are observed in an appropriate surrounding. In the present paper we will deal with this second group of phenomena, with the importance of colours.

We would like to show on a simple example how important colours can be in our perception. A person who has a necessary knowledge can determine in spring-time from a large distance whether a field of crops contains wheat, rye or barley. He can even determine how old the green corn is and can estimate whether the weather was good or bad and what the quality of the soil is. All this information is carried by a relatively narrow region of the green colours. If we take into consideration that even the same field shows different colours depending on the hour of the day and the illumination (clear sky, direct sunshine, overcast, etc.) and whether the scene is viewed after a dew, or rain-fall or withering, then we can realize which tremendous amount of information is carried by colour and on the other hand that colour vision is much more than the physical measurement of colours. During vision our neural system automatically corrects for illumination, the influence of the environment, etc.

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This automatic correction backs up upon previous knowledge and experience. Thus it works correctly only if the external circumstances - principally the illumination - stay within the previously known region, but our knowledge fails to make the necessary corrections if illumination deviates strongly from normal illumination, i.e. if we use instead of daylight artificial lighting. Everybody has nowadays such an experience and this alone is enough to call our attention how complicated our visual mechanism is. It is not enough space here to go into detail with above subject, but it seems to be worth-while to enumerate its most important factors, especially because these deviate highly from optics learned in elementary physics.

The colour of a ray of optical radiation depends not only on its wavelength or composition of wavelength but also on its intensity.

The observed colour itself does not define unanimously the spectral distribution of the ray that produces it because the same colour - except the colour of the spectrum - can be produced by an infinite variety of spectra.

The colour perception produced by a given spectral distribution depends also on the surrounding of the investigated optical ray. Thus e.g. if a screen is illuminated evenly with an appropriate intensity of white light, the screen will be perceived as white. But, if after this, one half of the screen will be illuminated by the same spectral distribution but with a stronger light intensity, than only this highly illuminated area of the screen will be perceived as white and the other half, where actually the illumination remained unchanged, will be perceived as gray.

The same light ray can produce in different observers different colour perception. In persons with so-called normal colour vision this difference is small but it can be determined. An unambiguous relationship between the light ray and the colour could be defined only by introducing the standard observer.

The International CIE Colorimetric System is based on the measurement of the physical constituents of light. The users of colour like more those systems which get nearer to the perceived colours. Among these the SZINOID Colour System has the peculiarity that it shows an exact mathematical relationship to the CIE Colorimetric System, but on the other side it is perceptually equidistant.

The only possibility to describe colours is by the use of a colour order system as painted colour chips change in time. On the other side colour order systems and the laws of colour mixture help to paint defined colours, help to get these colours visualized. Thus e.g. a painter has only a few dozen of paints, from the immense variety of real colours and for all other hues, he would like to prepare, he has to mix his paints. And although it is true that the knowledge of colours and the laws of vision are not needed to be able to enjoy a coloured surrounding and that also the colour mixture laws can be learned without knowing the deeper relationships of colorimetry (at least for an illumination corresponding to that of day-light), but the understanding of colour mixture can be highly simplified by knowing these relationships.

Under artificial illumination the colour order which we have built on our perceptions gained with natural illumination will be distorted (perhaps totally thrown up). These distortions can be explained only if the necessary theoretical knowledge is in our possession. Thus e.g. it is quite obvious that the colour schemes of some of the metro stations here in Budapest had been prepared by not taking into consideration the illumination that has been installed there. By purchasing coloured goods many difficulties are produced by the fact that the illumination in the shops differs from that at home (e.g. fluorescence tubes in the shops and incandescent light at home). Of course, for practice not explanation is needed but a good solution. This means that at a place where the illumination is given, the coloured scheme has to be prepared

in such a form that it conforms to that illumination and that colour scheme has to be coloured under the illumination where it will be used.

FARBENGESTALTUNG VON INTERIEURS VON WOHNUNGEN, SCHULEN UND GESUNDHEITLICHEN EINRICHTUNGEN VOM HYGIENISCHEN STANDPUNKT

A. Krtilová, V. Štícha

Ansprüche auf eine hohe Kultur von Wohnungs- und Arbeits-Interieurs steigen im Zusammenhang mit der Entwicklung von kulturellen und ästhetischen Erkenntnissen der Bevölkerung unaufhörlich an. Die Übertragung des gesellschaftlichen Lebens in das Privatleben führt zur Anforderung auf höheren Komfort des Wohnens, auf maximale Bequemlichkeit und Behaglichkeit. Das ästhetische Hauptmittel dazu ist die Vollkommenheit von Proportionen, nüchterne und kultivierte Farbigkeit der gesamten Einrichtung des Interieurs. Eine weitere Anregung zur Renaissance der Entwicklung in der Tapetenproduktion stellte der riesige Anstieg des Aufbaues mit Anwendung von Bauplatten in der ČSSR an Ende der sechziger und am Anfang der siebziger Jahre. Der beträchtliche Arbeitsaufwand der abschliessenden Baseverfahren, die erwähnte Anforderung der Benützer auf Erhöhung der ästhetischen, hygienischen und der Oberflächeneigenschaften der Interieurwände, die Ökonomie des Ersatzes von zwei Operationen (Auftragung von Putz, Anstrich und Malen) und nicht zuletzt auch die 2 bis 3-mal Lebensdauer im Vergleich mit Malen führten zur Einführung dieser Technologie. Bauplatten aus neuen Technologien bieten auch eine glattere Oberfläche und der Kalkstuck hält sich auf solchen Oberflächen schon nicht mehr so gut. Der Verbrauch von Papiertapeten in der ČSSR mit 6 m pro Person erreicht jedoch trotzdem die Werte in anderen Ländern mit hoher Tapetentechnik nicht (z.B. in der DDR 25 m für einen Einwohner, in den Westländern bis 30 m pro Person).

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Die Erfahrungen der Benützer weisen darauf hin, dass die Muster- und Farbenharmonisierung mit der Einrichtung der Wohnungen in der Gegenwart meistens unzureichend ist, und zwar sowohl infolge der Fehler der Bauorganisationen bei Auswahl von Tapeten, als auch infolge des Mangels an geeigneten Tapeten auf dem Markt bezüglich der Qualität, Musterauswahl, Farbe und Preise. Dieser Mangel erhöht sich noch durch erhöhten Einkauf von Tapeten seitens der neuen Mietern, die die schon austapezierten Wohnungen bis zu 75 % im Laufe eines Jahres umtapezieren wollen, obwohl die durchschnittliche Lebensdauer von Tapeten 5 bis 7 Jahre beträgt.

Eine grosse Menge Tapeten wird auch bei der Rekonstruktion und Erhaltung von bestehenden Bauten verbraucht.

Die Hauptforderung der Benützer besteht in Ausstattung der Wohnungen in dem primären Aufbau mit neutralen weissen Tapeten.

Auf dem Gebiete des anders orientierten Ausbaues fanden gute Anwendung auch weitere Tapetensorten bezüglich der Qualität, der Lebensdauer und des bildenden Gesichtspunktes. Es besteht eine offenbare Neigung zu edleren Materialen (z.B.Te...)) mit feiner Farbigkeit. Neben den Papiertapeten kamen zum Vorschein auch Tapeten aus Kunststoffen mit abwaschbarer Oberfläche, vorgeleimte und selbstklebende Tapeten.

Das Gefallen an Farbigkeit in unseren Handelsräumen und die weitere vorausgesetzte Entwicklung dieses Gefallens zeigen auf folgende Tendenz:

gelb	befindet sich im Rückzug
braun	weitere Verbreitung
beige	weitere Verbreitung
orange	ohne Veränderung
grün	ohne Veränderung
grau	ohne Veränderung
blau	weitere Verbreitung
rosa	ohne Veränderung

Auf dem ersten Plan des Interesses stehen die ersten drei Farbenmutationen und gerade bei diesen kommt es in der letzten Zeit zur markanten Verschiebung in deren weiterer Geltendmachung.

Wegen des grossen Arbeitsaufwandes und des ungenügenden Sortiments werden einstweilen in dem Massenausbau die Decken und von hygienischem Standpunkt auch eine der Aussenwände (die Fensterwand) nicht tapeziert, um die Diffusion von Wasserdämpfen zu ermöglichen.

Bei Tapeten als einem der Erzeugnisse für Bauwesen muss die Eignung durch Überprüfung in der Staatsprüfungsstelle nachgewiesen werden. Dies geht aus dem Gesetz über Territorialplanung sowie aus der Bauordnung hervor. Durch Methodiken sind Parameter bestimmt, welchen Tapeten entsprechen müssen, unter anderem auch vom Standpunkt der Lichttechnik. In dieser Beziehung werden bewertet:

- Farbenbeständigkeit beim Licht,
- die gesamte Farbenabweichung,
- Undurchsichtigkeit von Tapeten,
- die Glanzstufe,
- Lichtreflexionskoeffizient,

wo man mit Hilfe von Standarden auf dem Leukometer (Zeiss, Jena) das Verhältnis des von der Oberfläche des Prüfungskörpers reflektierten Lichtstromes zu dem auf die Oberfläche fallenden Lichtstromes bestimmt. Ferner bewertet man in künstlerischen Kommissionen das Muster der Tapeten.

In dem anfänglichen Stadium der Tapetenerzeugung verwendete man bei uns für die Bedürfnisse des primären Aufbaues Tapeten mit verhältnismässig markantem Muster. Reflexionskoeffizient dieser Tapeten bewegte sich zwischen 0,55 und 0,6.

Gegenwärtig weisen die für diese Zwecke gelieferten Tapeten den Reflexionskoeffizient von annähernd 0,6 auf, die Universaltapeten mit marmorierten Muster zur Anwendung an Wänden a s auch an der Decke von heller Farbe bis 0,75. Spezielle ve...se

geprägte Deckentapete meist einen Reflexionskoeffizient dem Muster der Prägung nach von 0,77 bis 0,8 auf. In der DDR werden Tapeten in drei grossen Papierfabriken hergestellt, in jeder durchschnittlich 100 Muster in etwa 4 Farbenmutationen. Abgeändert werden in diesen Betrieben durchschnittlich 50 Muster im Jahre.

Schon vor einigen Jahren hat auf Ersuchen des Hygienedienstes unser Nationalreferenzlaboratorium für Licht und Beleuchtung eine Kontrollmessung der Beleuchtung in den Interieuren der neutapezierten Wohnungen des primären Ausbaues durchgeführt. Wir haben stichweise einige Wohnungseinheiten mit Orientierung an verschiedene Weltrichtungen, in verschiedenen Geschossen, in geschatteten und ungeschatteten von anstehenden Bauten Wohnungen gewählt.

Bei Messung der Tageslichtbeleuchtung hat sich bei Tapeten an Wänden mit niedrigem Reflexionseffizient (dunkle Tapeten oder Tapeten mit grossen dunklen Mustern, Reflexionskoeffizient 0,4 - 0,6) eine Herabsetzung der Tageslichtbeleuchtung bemerkbar gemacht, und zwar im Vergleich mit den mit hellen Farben gemalten Wohnungen (0,7 - 0,8 - Kontrollgruppe), bis um 0,3 % (bei 5000 lx der Aussenbeleuchtung). Eine ähnliche Rolle wies Anwendung von hellgrünen oder grauen Tapeten an Decken im Vergleich mit der weissen Farbe auf.

Der Koeffizient der Tageslichtbeleuchtung wies einen scharfen Abfall in der Richtung von dem Fenster zur gegenüberliegenden Wand, sodass er infolge der niedrigen Reflexionsfähigkeit die Normwerte nicht erreichte. Ursprünglich wurden in dem primären Ausbau Tapeten ohne einer fachmännischen lichttechnischen Empfehlung verwendet, mit verschiedener, meistens niedriger Reflexionsfähigkeit und mit grossen markanten Mustern. Dies war verursacht durch schlechte Qualität - unebene Oberfläche der Bauplatten, die die Bautechniker mit Hilfe von dunklen gegliederten Tapetenmuster "auszubessern" versuchten. Auch für Decken benutzte man genusterte Tapeten, deren Reflexfähigkeit etwa 0,9 betrug.

Heutzutage für den primären Ausbau hergestellte Tapeten werden der Qualität der Unterlage nach, mit Berücksichtigung der Farbe und der Herstellungsmaschinen mit minimalen Reflexionskoeffizienten zur Anwendung an Wänden 0,5, an der Decke 0,8 geliefert. Diese sogenannten Bautapeten werden von der Prüfstelle am Rand mit einer Bezeichnung der Anwendungsgeschicklichkeit bezeichnet werden.

In der Praxis werden Tapeten ausserhalb des primären Wohnungsausbaues von der Bevölkerung zur Selbsthilfeausstattung von Wohnungen verwendet, ausserhalb des Wohnungsausbaues werden sie in Mutterschulen, Schulen, Krippen und gesundheitlichen Einrichtungen verwendet. In diesen Institutionen muss man besonders bei der Wahl auf Qualität des Druckes, die Anstandslosigkeit der Farben vom toxikologischen Gesichtspunkt beim Abreiben der Tapeten (z.B. in Mutterschulen) achten.

In gesundheitlichen Einrichtungen werden Tapeten mit spezieller Berücksichtigung der Abwaschbarkeit (eventuell wenigstens der Abwischbarkeit) verwendet. Vom mikrobiologisch-hygienischen Standpunkt werden Tapeten durch Abwischen und durch Analyse der bakteriellen Flora meistens mit guten Ergebnissen bewertet. Vom Gesichtspunkt der Psychologie gesehen führen tapezierte Interieure eine angenehme und fröhliche Stimmung herbei.

In Mutterschulen, in Fällen, die wir beeinflussen konnten, betonten wir die Farbengestaltung der Räume und Harmonisierung mit Textilien. In Schulen muss man beachten bei Wahl der Tapeten solche mit hohem Reflexionskoeffizienten und besonders muss man farbig die Wand mit der Schultafel vom Standpunkt des geeigneten Helligkeitskontrastes lösen.

Zusammenfassung:

Es scheint, dass das Bauwesen aus ökonomischen Gründen und im Bestreben, den Arbeitsaufwand der Schlussbearbeitung von Oberflächen herabzusetzen, von Anwendung von Tapeten nicht zurücktreten wird und so wenigstens im Rahmen der hygienischen Überwachung besteht unsere Aufgabe darin, die richtige Wahl von

Tapeten sowohl für den Wohnungs- als auch für den gesellschaftlichen Aufbau vom Gesichtspunkt der Tageslicht- und künstlicher Beleuchtung, sowie der psychologischen Einwirkung auf die Bevölkerung zu verfolgen.

LA COULEUR DANS L'ARCHITECTURE CONTEMPORAINE AU BRÉSIL - ORIGINES ET ACTUALITÉ

S. Prieto

No paper was received before publication went to press!

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