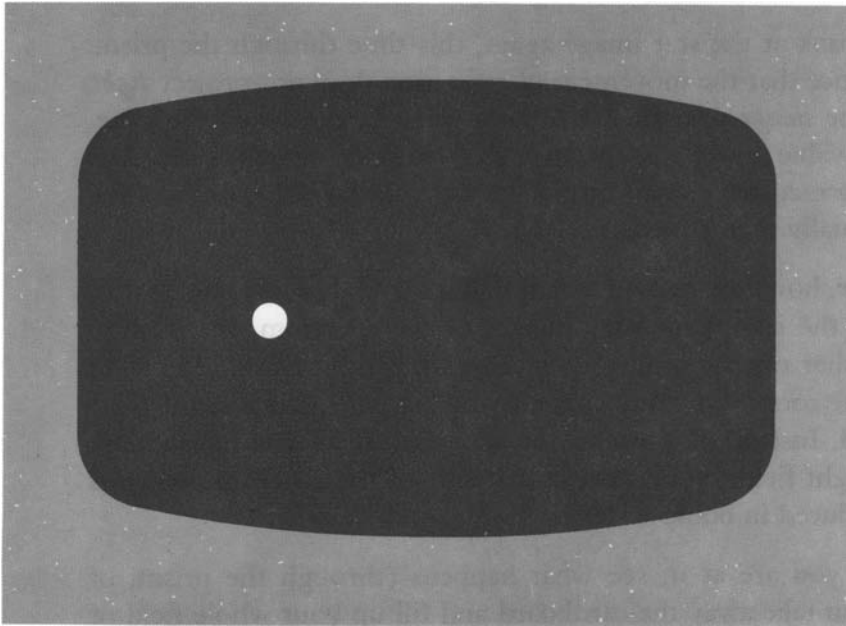


Goethe's prismatic experiments

FRED JORDAN



For anyone seriously interested in color, the experiments proposed by Goethe are indispensable. Therefore, the first objective of this essay and of the included folder, is to induce you to carry out these experiments and live a personal experience of the prismatic process. The second, is to recommend a bibliography of Goethe's comprising and profound studies on color, the so little known and too often misunderstood "*Farbenlehre*".

The experiments which show the *two complementary images of the spectrum*, are the main entrance to not only Goethe's but also to any other color studies. You need no special equipment, just a maximum of tranquility and a minimum of intention. Just try to practice some good phenomenology.

By way of initiation, take a look (whithout a prism) at the above illustration. Is it a star, or rather, the image of a star?

This illustration could well represent Newton's famous experiment, with the small hole in the window shutter. The hole, through which the light entered the dark room, is well remembered. However, few keep in mind the participation of the dark shutter, which after all, *defined* the bright hole. A century after Newton, Goethe demonstrated that the spectrum has to do with the entirety formed by hole and shutter. It has to do, precisely, with the border between two values, Bright and Dark, since it is on this bordering area that the prismatic colors are formed.

Now look at the star image again, this time through the prism. You will notice that the movement of refraction does not project *light*, but rather the *image* of light. It does not project only the bright value, but the dark value as well. *The prism projects the image as an entirety.* And the image formed by a small bright dot on a dark field, produces the spectrum usually reproduced in books.

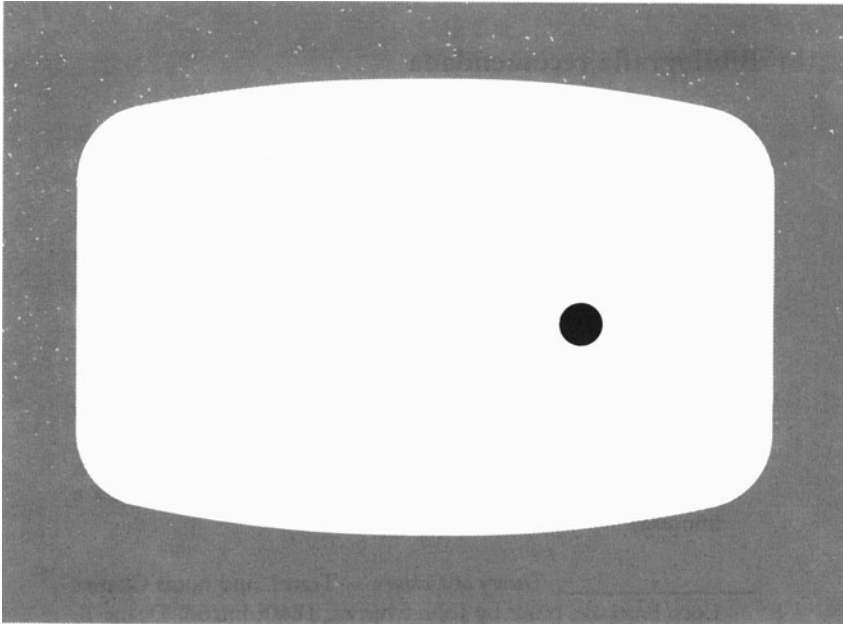
Goethe, however, demonstrated that it shows but *one side*, that is, only one of the complementary images of the spectrum. In order to know the other one, you have to reverse the Bright-Dark! Let light enter into the room. On a transparent window pane, affix a small piece of cardboard. Instead of a bright dot on a dark field, you have a dark dot on a bright field. Now observe that side of the spectrum which is rarely reproduced in books...

While you are at it, see what happens (through the prism, of course) if you take away the cardboard and fill up your whole field of vision with *undifferentiated* "brightness".

For many people it is hard, if not impossible, to accept Dark as an active force and not just as a decrease or absence of Light. Yet they do accept, for instance, Cold, as an active presence, and not as an "absence of Heat"...

"Without light there is no color" is a common statement. I would rather say: "Without *image* there is no color". Light and image are quite different concepts. Light, as an *invisible* energy, exists independently of image. Image, on the other hand, depends on the presence of light *and of matter*. We must keep in mind that, visually, the world exists, not due only to light, but due to the *interaction of light and matter* at any temperatures, densities, transparencies. It is this interaction which forms Bright-Dark: the visual image of our world.

And when Bright-Dark is observed through a semitransparent matter, the prismatic colors are revealed. Goethe calls this matter which



mediates between observer and image (the prism for example) the Turbid medium – "*das trübe Mittel*".

To only read this is of little avail. All of it should be *experienced* frequently, with time, trying to internalize knowledge, perception, sensibility.

By the way, you can always attend *The Chromatic Fantasia in Two Movements*. Just look at the sky: interstellar space is Dark; the Sun is Bright. The atmosphere is the Turbid medium, that is, the Prism. One of the movements appears at night's end, opposite to the rising Sun. The turbid atmosphere between the observer and the dark space is slightly illuminated, acting as *Bright in front of Dark*. The turbidness becomes Violet and then brightens up to Blue.

The complementary movement appears in the afternoon. The turbid atmosphere between the observer and the Sun acts as *Dark in front of Bright* and becomes yellowish. With the setting Sun, the Yellow intensifies to Red.

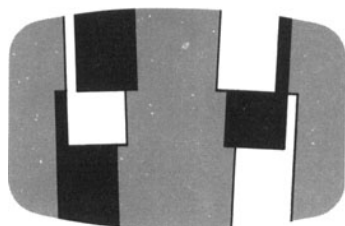
Bright on Dark, Dark on Bright – you will again meet these two generating movements of the prismatic phenomenon in the illustrations of the included folder. They remind me of the final lines from Faust II: "*Alles Vergängliche ist nur ein Gleichnis.*" Phenomenons are parables.

Bibliography: See page 220

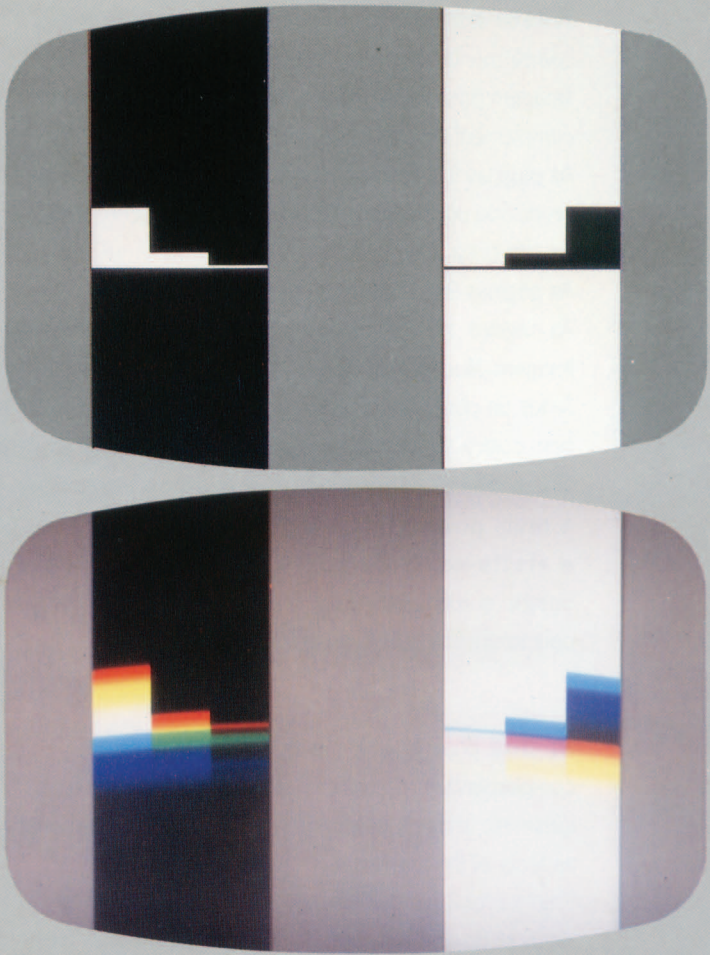
Abstract

The essay intends to stimulate the carrying out of prismatic experiments with very simple resources and, therewith, ease the access to Goethe's fundamental color studies, the "*Farbenlehre*". The included folder contains photographs of a complementary prismatic process produced by *neutral* bright-dark Model-Images. It also contains photographs of prismatic images produced by *colored* Model-Images.

Keywords: complementary color spectrum; prismatic experiments; color studies; Goethe; *Farbenlehre*.



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FRED JORDAN

Os experimentos
prismáticos de Goethe
Goethe's prismatic
experiments

Fotos SAKAE TAJIMA

*Encarte da Revista Estudos Avançados N°19, set.-dez. 1993
Instituto de Estudos Avançados da Universidade de São Paulo*

Neste ensaio fotográfico, cada Imagem-Modelo é complementar. Por isso, a respectiva Imagem-Prisma (imagem prismática) mostra, lado a lado, dois aspectos complementares do Espectro.

As páginas 1 a 8 demonstram um processo prismático produzido por Imagens-Modelo em Claro-Escuro *neutro*, de alto contraste.

As páginas 9 e 10 têm um mínimo de contraste.

As páginas 11 a 16 mostram Imagens-Prisma produzidas por Imagens-Modelo *em cores*.

Antes de observar as páginas 9 a 16, sugiro familiarizar-se bem com a seqüência de 1 a 8 e, no sentido inverso, de 8 a 1.

Mantenha o prisma perto dos olhos. Aproxime-se o mais possível da Imagem-Modelo...

e afaste-se lentamente, para observar a cor surgir e expandir-se. Nas fotos não há expansão, pois foram tiradas em uma distância fixa.

In this photographic essay, each Model-Image is complementary. Therefore, the respective Prism-Image (prismatic image) shows, side by side, two complementary aspects of the spectrum.

Pages 1 to 8 show a prismatic process produced by *neutral* Bright-Dark, high contrast Model-Images. Pages 9 and 10 have a minimal contrast. Pages 11 to 16 show Prism-Images produced by *colored* Model-Images.

I suggest that you get familiar with the sequences 1 to 8, and backwards, 8 to 1, before going on to the other side of the folder.

Keep the prism close to your eyes. Come as near as possible to the Model-Image...

then slowly back away to follow the rise and expansion of color. There is no expansion in the photos, since they were made at a fixed distance.

Importante! As cores prismáticas estão identificadas pelos seguintes nomes:

Important! The prismatic colors are identified by the following names:



Para fazer os experimentos das páginas 1 a 8, bastam três cartões brancos e três cartões pretos (20 x 6 cm); um cartão grande, gris 50%, para o fundo; um prisma de 60° (quanto maior, melhor) de vidro, lucite ou plexiglás. Os cartões representam os valores Claro e Escuro, neutros.

To carry out the experiments on pages 1 through 8, you need three black and three white cardboards (20 x 6 cm); one large 50% grey cardboard for the background; one 60° prism (the larger the better) of glass, plexiglas or lucite. The cardboards represent the neutral Bright and Dark values.

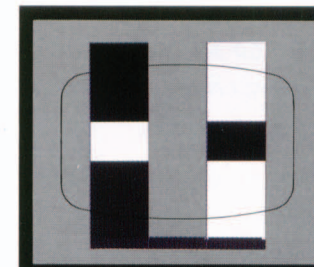
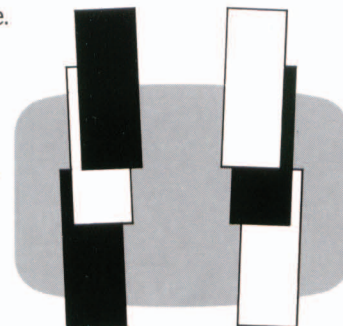


Imagem -Modelo
Model-Image

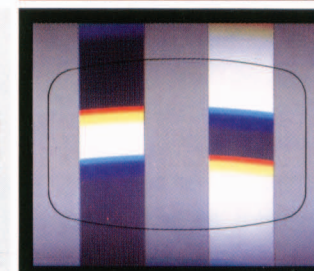


Imagem -Prisma
Prism-Image

As Imagens-Modelo foram fotografadas a 60 cm de distância.

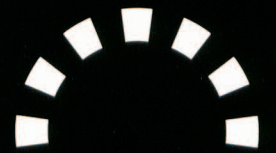
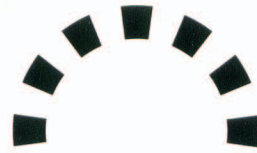
As Imagens-Prisma foram obtidas fotografando-se as Imagens-Modelo através de um prisma de 3,5 x 7,5 cm, afixado diante da lente. Optamos por fotografar através da *face inferior do prisma horizontal*. Assim, a Imagem-Modelo é projetada *para baixo*.

The Model-Images were photographed at a distance of 60 cm.

The Prism-Images were obtained by photographing the Model-Images with a 3,5 x 7,5 cm prism attached to the front of the lens. We chose to photograph through the *lower face of the horizontal prism*, thus projecting the Model-Image *downwards*.

A refração desloca, i.e., *projeta* a Imagem-Modelo (I-M) na direção *perpendicular ao eixo do prisma*. Os limites de Claro-Escuro transformam-se em faixas de cores. Não aparecem cores nos limites que correm paralelos à projeção.

Refraction displaces, i.e., *projects* the Model-Image (M-I) in the direction *perpendicular to the prism axis*. The Bright-Dark borders are transformed into stripes of color. No color appears on the borders running parallel to the projection.

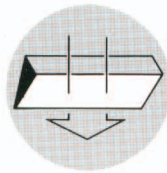


Com o prisma horizontal,

recomendo olhar pela face inferior, projetando assim a I-M *para baixo*.

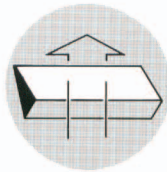
Holding the prism horizontally

I recommend looking through the lower face, thus projecting the M-I *downwards*.



Olhando-se pela face superior, a I-M é projetada para cima.

Looking through the upper face, the M-I is projected upwards.

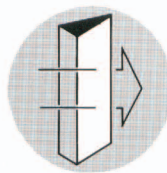


Com o prisma vertical,

olhando-se pela face direita, a I-M é projetada para a direita.

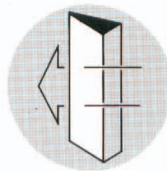
Holding the prism vertically,

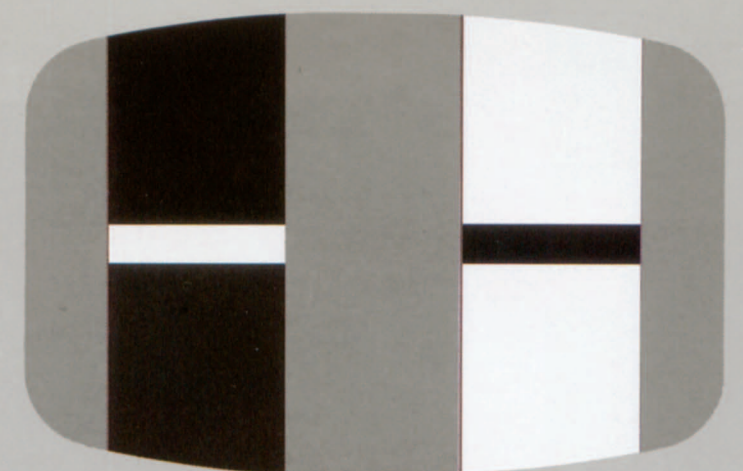
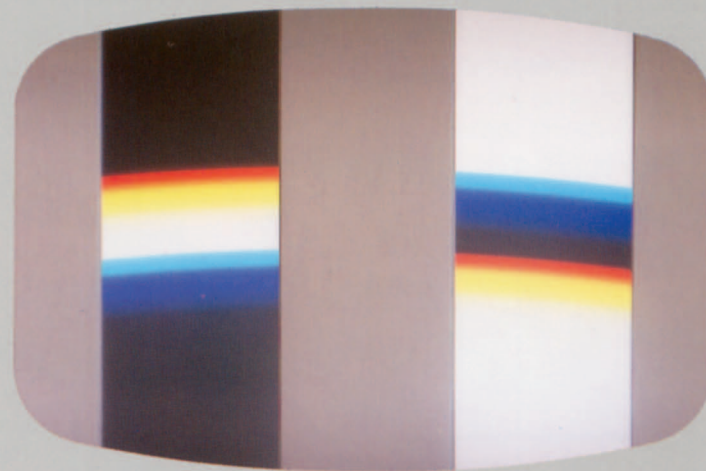
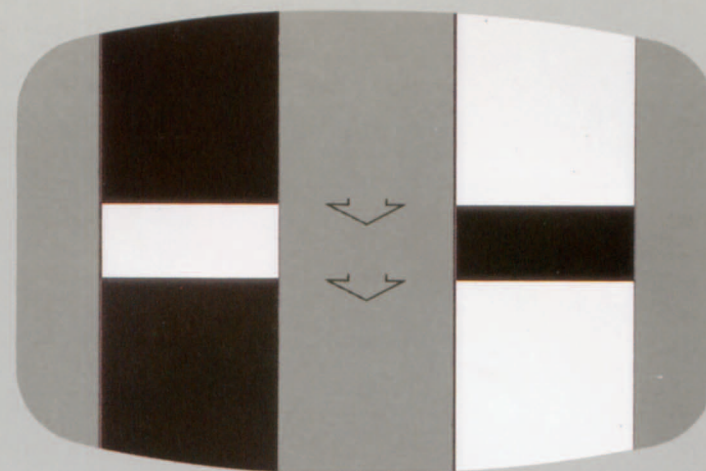
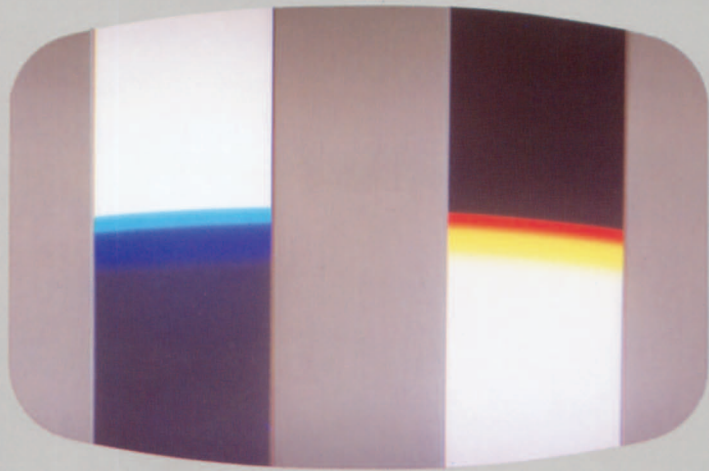
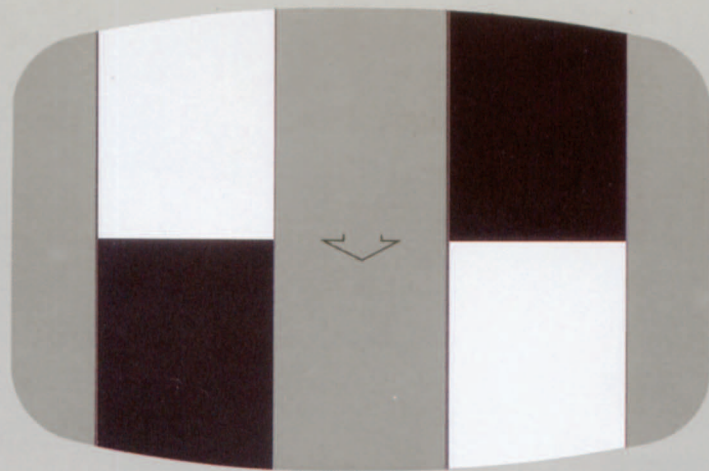
looking through the right face, the M-I is projected to the right.



Olhando-se pela face esquerda, a I-M é projetada para a esquerda.

Looking through the left face, the M-I is projected to the left.





Processo prismático complementar. Complementary prismatic process

Um limite definindo dois valores: eis o fenômeno prismático reduzido à sua forma *elementar*. Neste limite aparecem cores, aos pares.

“Lendo” de cima para baixo:

quando o Claro antecede o Escuro, aparece o par Azul-Violeta.

Quando o Escuro antecede o Claro, aparece o par Vermelho-Amarelo.

One border defining two values: here the prismatic phenomenon is reduced to its *elementary* form.

Upon the border, colors appear in pairs.

“Reading” downwards: if Bright precedes Dark, the Blue-Violet pair appears. When Dark precedes Bright, you have the Red-Yellow pair.

Dois limites paralelos.

Os pares de cores estão separados por uma área neutra. Um princípio prismático fica evidente: o Amarelo e o Azul sempre voltam-se para o Claro; o Vermelho e o Violeta, sempre para o Escuro. O Amarelo está todo sobre o Claro; o Violeta está todo sobre o Escuro.

Two parallel borders.

The color pairs are separated by a neutral area.

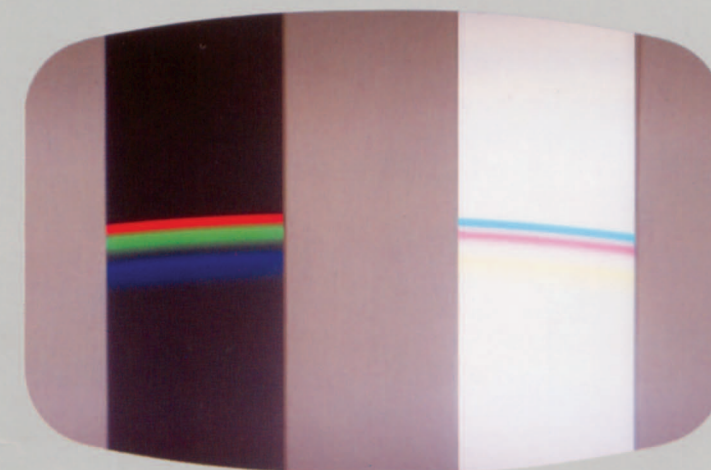
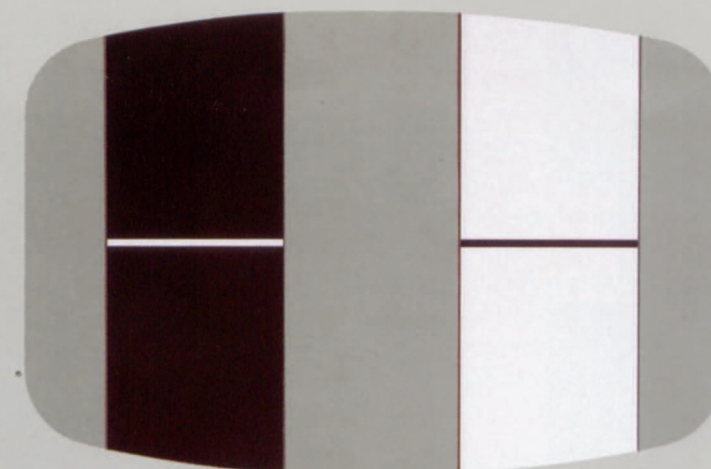
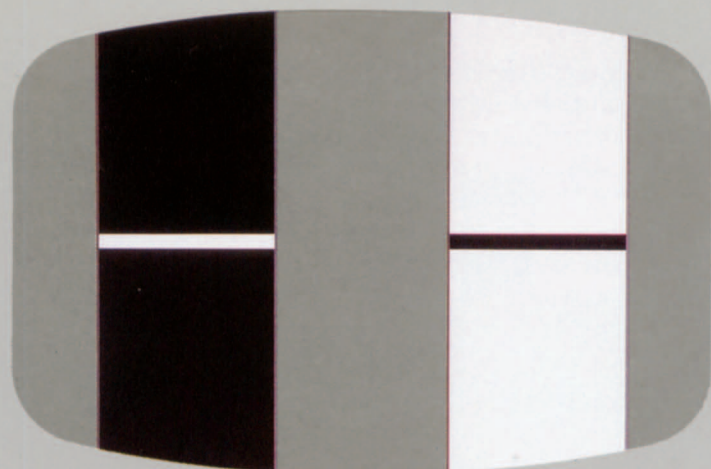
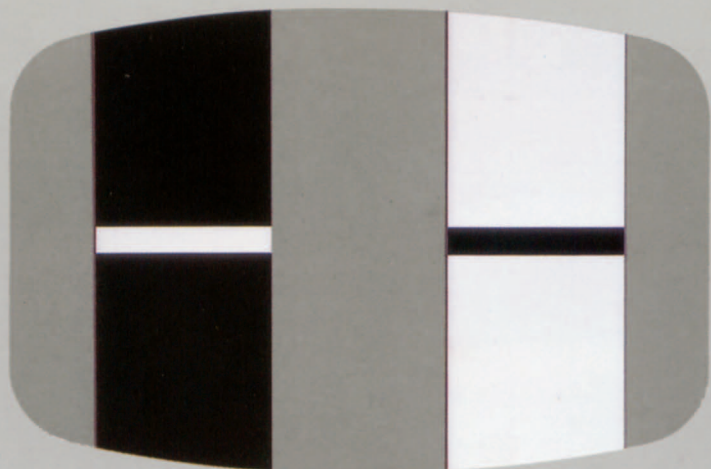
A prismatic principle becomes evident: Yellow as well as Blue always face Bright;

Red as well as Violet always face Dark.

All of the Yellow lies upon Bright; all of the Violet lies upon Dark.

Cada par de cores acompanha o movimento do “seu” limite. Além disso, ele se retrai ou expande, dependendo da distância entre prisma e Imagem-Modelo. Exemplo: a maior distância, o par Vermelho-Amarelo expande-se, revelando o Laranja.

Each color pair follows the movement of “its” border. Moreover, it retracts or expands, depending on the distance between prism and Model-Image. For instance, at a greater distance, the Red-Yellow pair expands, revealing Orange.



Aproximando-se os limites, duas cores se sobrepõem, produzindo uma cor-mistura. A seqüência, sempre de cima para baixo, Escuro-Claro-Escuro (*a do foramen exiguum de Newton*) produz Verde. A seqüência Claro-Escuro-Claro produz Magenta. O encontro de um par de pares forma um Espectro contínuo.

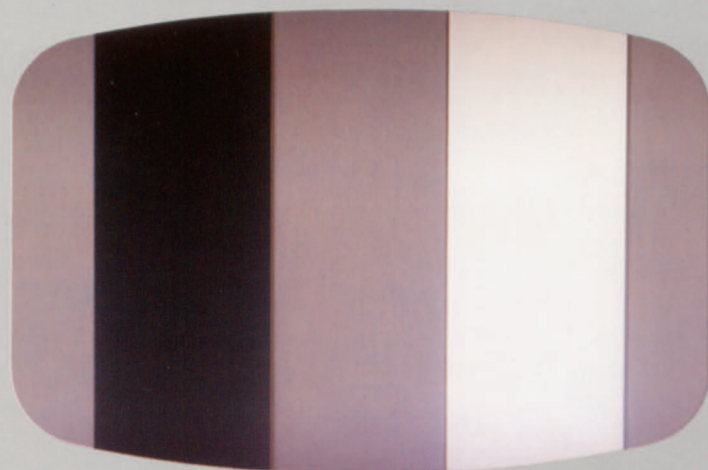
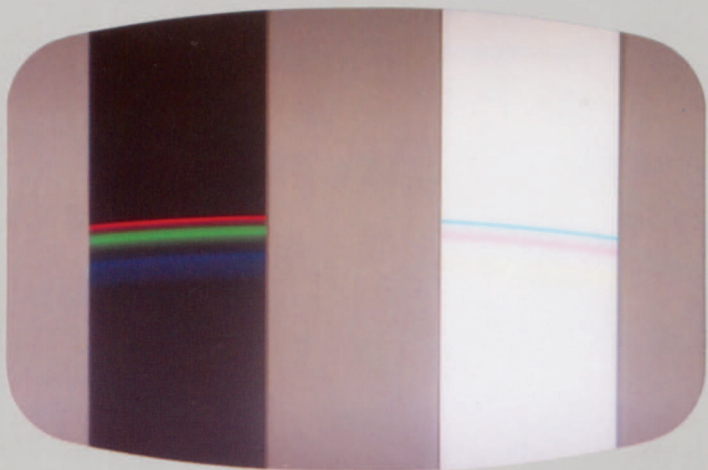
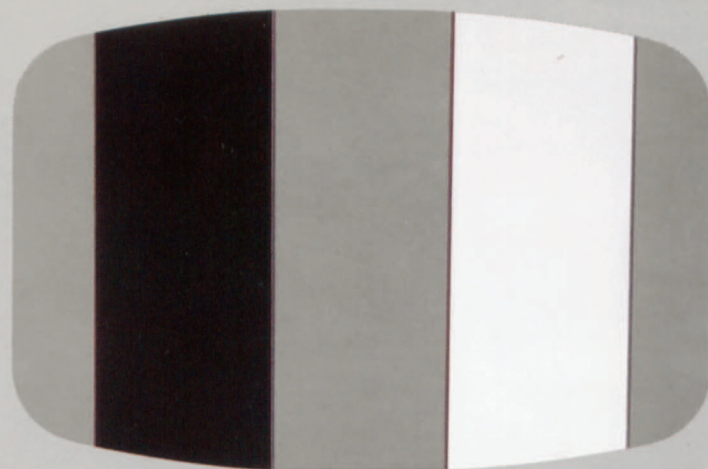
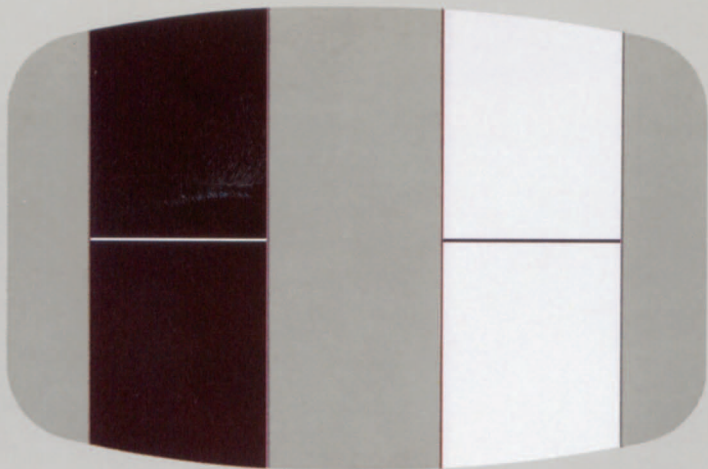
By moving the borders together, two colors superpose, producing a mixture color. The sequence, always downwards, Dark-Bright-Dark (*of Newton's foramen exiguum*) produces Green. The sequence Bright-Dark-Bright produces Magenta. The encounter of a pair of pairs forms a continuous spectrum.

Com os limites horizontais cada vez mais próximos, o Amarelo e o Azul desaparecem no Verde, enquanto o Vermelho e o Violeta desaparecem no Magenta. Cada lado do Espectro se transforma em tríade.

As the horizontal borders close in on each other, the Yellow and the Blue disappear into the Green, while the Violet and the Red disappear into the Magenta. Each side of the spectrum turns into a triad.

As cores se separam. Ao longo do processo prismático, os dois lados opostos permanecem complementares. "Lendo" as cores *horizontalmente*, você tem os três pares complementares:
Vermelho e Azul
Verde e Magenta
Violeta e Amarelo

The colors separate. During the whole process, the two opposite sides stay complementary. "Reading" the colors *horizontally*, you find the three complementary pairs:
Red and Blue
Green and Magenta
Violet and Yellow

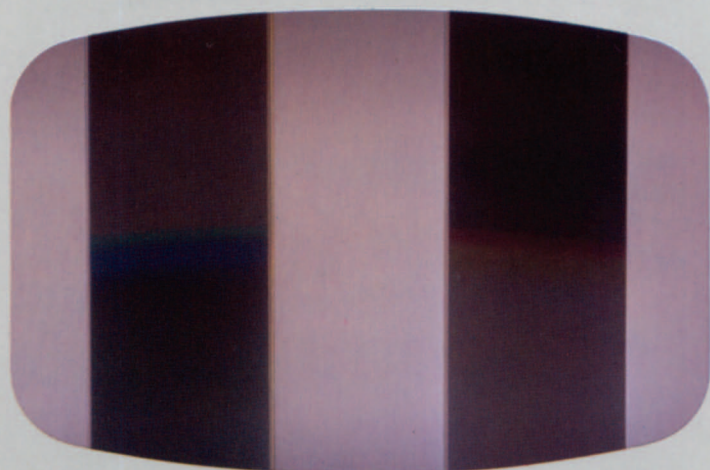
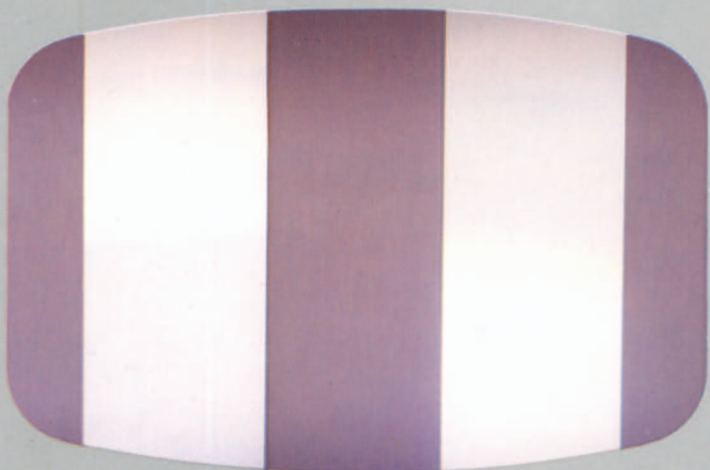
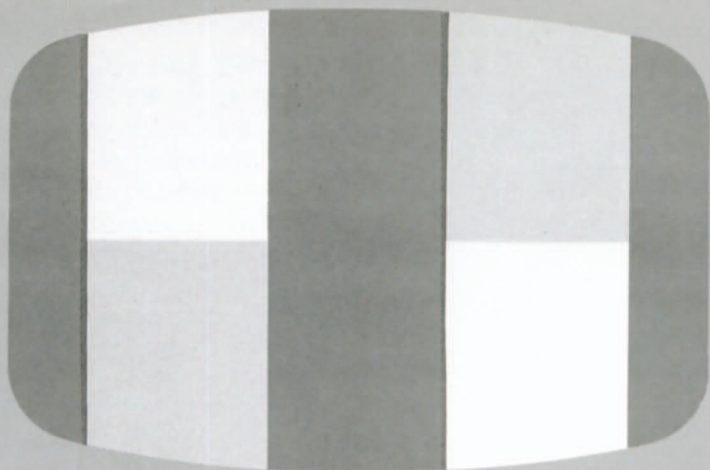


Exemplo: Verde (mistura de duas cores voltadas para o Claro) produz a *pós-imagem* Magenta (mistura de duas cores voltadas para o Escuro) – e vice-versa. Verde e Magenta, *sobrepostos*, produzem Gris neutro. A tríade Vermelho-Verde-Violeta turva-se e submerge no Escuro. A tríade Azul-Magenta-Amarelo empalidece e se dissolve no Claro.

For instance: Green (mixture of two colors facing Bright) produces the *post-image* Magenta (mixture of two colors facing Dark) – and vice versa. Green and Magenta, *superposed*, produce neutral Grey. The Red-Green-Violet triad becomes turbid and merges into Dark. The Blue-Magenta-Yellow fades and dissolves into Bright.

Desaparecendo os limites, desaparecem as cores prismáticas. Nada se opõe ao “Escuro”; nada se opõe ao “Claro”. Se a área *indiferenciada* ocupar todo o seu campo de visão, você não percebe imagem alguma. Ao mesmo tempo, eis um novo começo: basta inverter a seqüência do processo. Imagem e Cor surgem da ruptura da uniformidade.

As borders disappear, so do the prismatic colors. Nothing opposes “Dark”; nothing opposes “Bright”. If the *undifferentiated* area fills your whole field of vision, you will perceive no image at all. At the same time, this is a new beginning: just reverse the sequence of the process. Image and color arise from the rupture of uniformity.



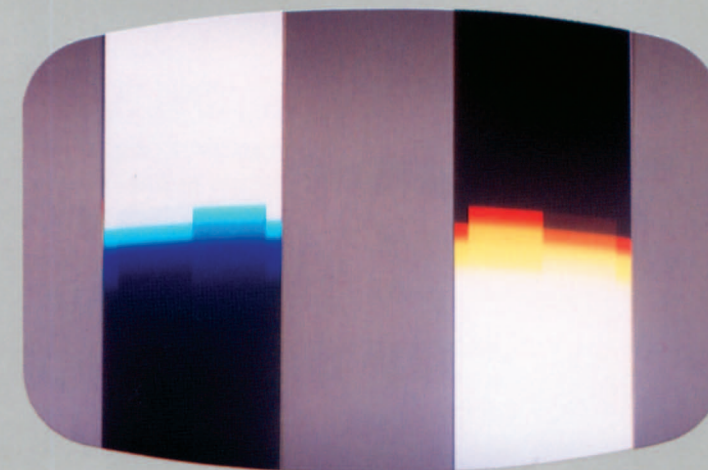
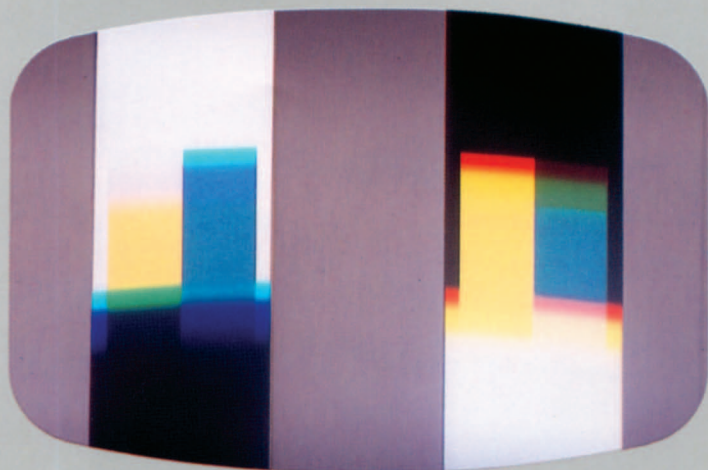
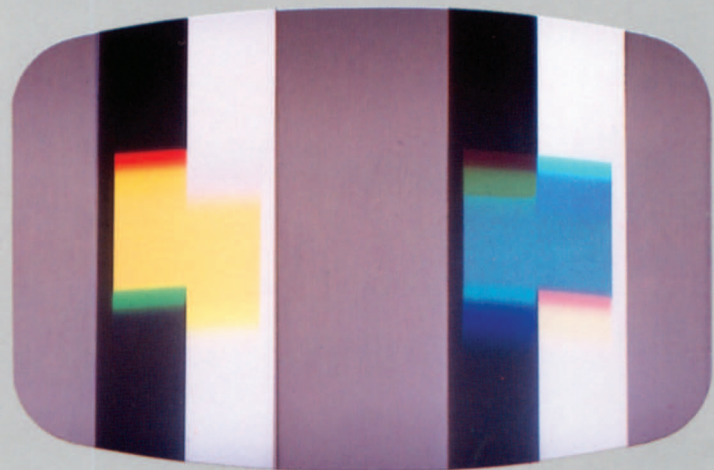
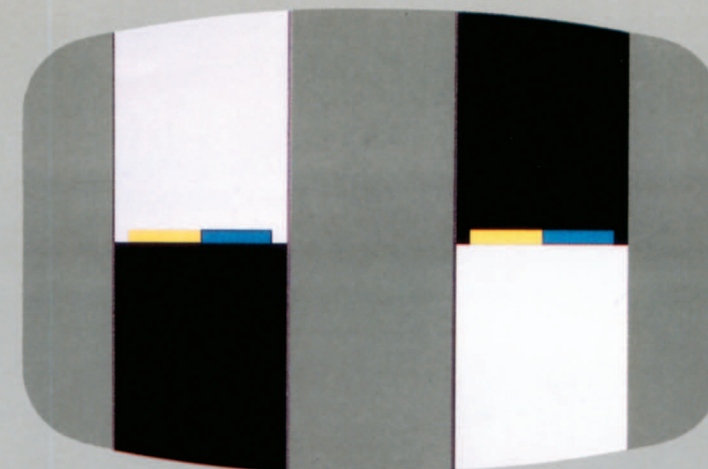
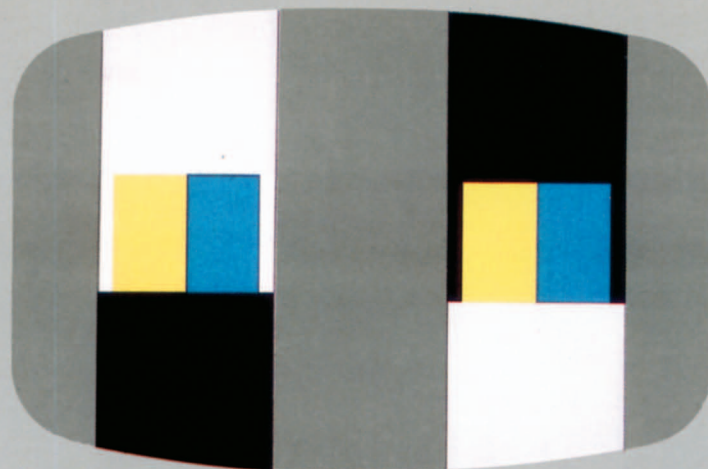
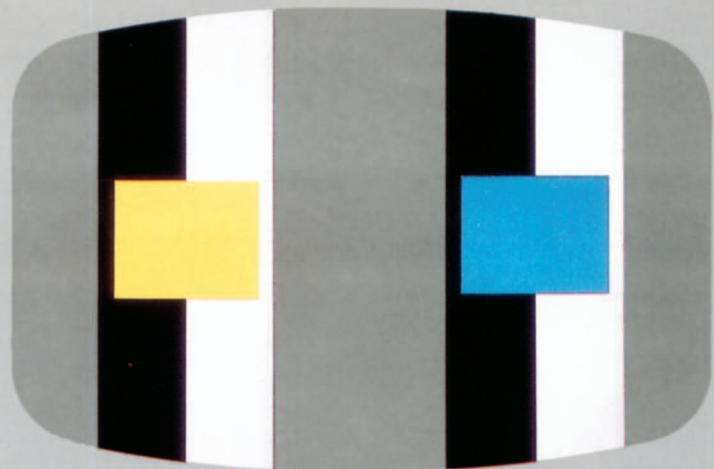
Contraste mínimo. Minimal contrast

Imagens-Modelo neutras, feitas com cartões de dois valores “claros” diferentes e dois valores “escuros” diferentes. O contraste é mínimo, porém já produz o que Goethe chama de *“Urphänomen”*, protofenômeno, pois dele surge toda a complexidade prismática.

Quanto mais contrastados os valores, mais intensas as cores. Compare com a pág. 1.

Neutral Model-Images, made of cardboard of two different “bright” values and two different “dark” values. The contrast is rather subtle, but already produces what Goethe calls *“Urphänomen”*, protophenomenon, since all prismatic complexity arises from it.

The stronger the contrast, the stronger the colors. Compare with page 1.



Série Amarelo-Azul. Yellow-Blue series

Imagens-Modelo em cores, feitas de papel colorido colado sobre cartão branco e cartão preto. São três Imagens-Modelo em Amarelo-Azul, e três em Vermelho-Violeta. Cada cor da Imagem-Modelo atua como se fosse um Gris neutro, claro ou escuro em relação ao valor adjacente, e produz as mesmas cores prismáticas que um Gris.

O princípio é um só. Veja * página 15.

Exemplo: Branco precedendo Amarelo equivale a Claro precedendo

Escuro, produzindo, portanto, o par Azul-Violeta. Preto precedendo Violeta equivale a Escuro precedendo Claro, produzindo, portanto, o par Vermelho-Amarelo.

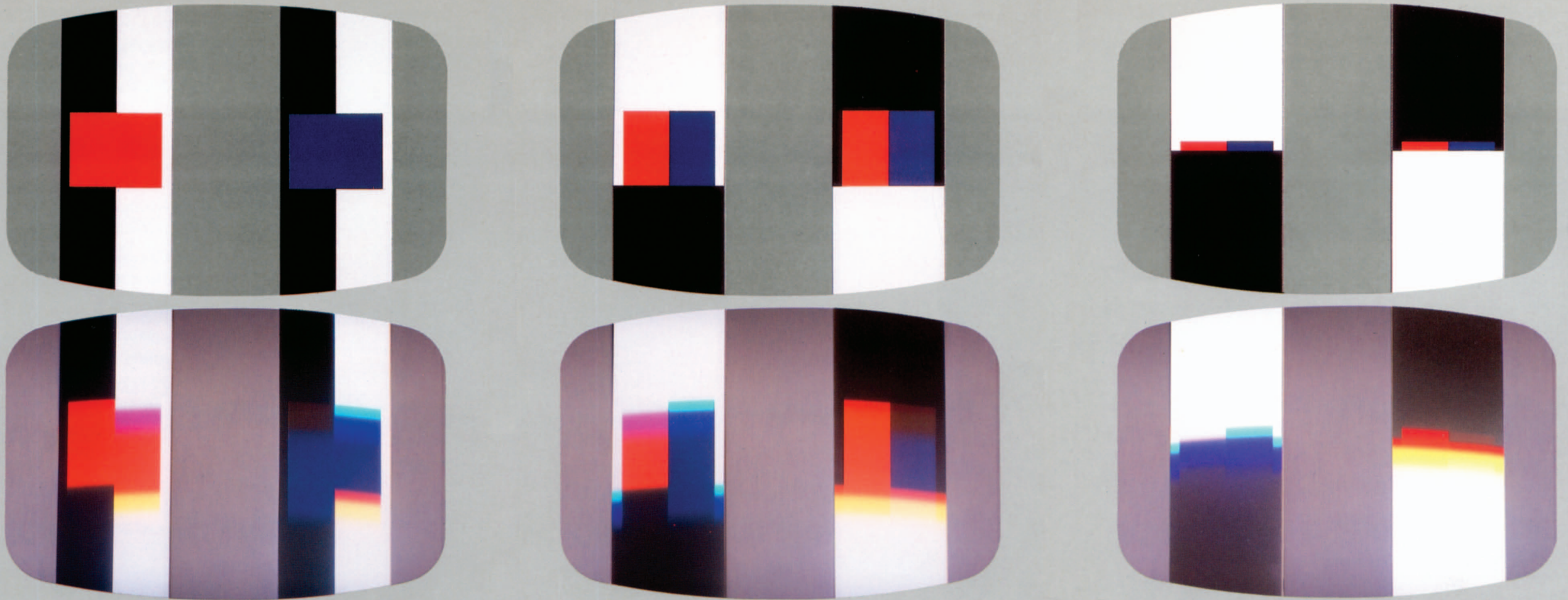
Naturalmente o contraste Branco-Azul produz cores prismáticas mais fortes do que o contraste Branco-Amarelo.

Compare esses contrastes com aqueles das faixas laterais de controle, em Branco-Preto.

Cores prismáticas são transparentes. Quando se sobrepõem à cor da Imagem-Modelo, podem enfraquecer, intensificar ou misturar-se. Se a cor prismática e a cor da Imagem-Modelo forem complementares, *neutralizam-se mutuamente*.

Colored Model-Images, made of colored paper glued on white and black cardboard.

There are three Model-Images in Yellow-Blue, and three in Red-Violet.

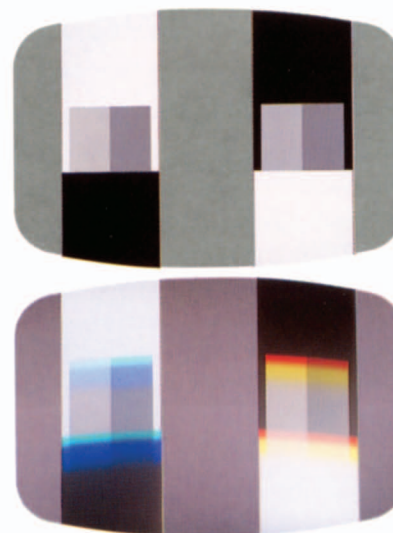


Série Vermelho-Violeta. Red- Violet series

Each Model-Image color behaves like a neutral Grey, bright or dark in relation to its adjoining value, and produces the same prismatic colors as would a Grey. The principle is one and the same. See * page 15.

For example: White preceding Yellow is equivalent to Bright preceding Dark, thus producing the Blue-Violet pair. Black preceding Violet is equivalent to Dark preceding Bright, thus producing the Red-Yellow pair.

Of course, the White-Blue contrast produces stronger prismatic colors



*

15

than the White-Yellow contrast.

Compare these contrasts with those of the lateral black and white control strips.

Prismatic colors are transparent. As they superpose on the Model-Image color, they may fade, intensify or mix.

If the prismatic color and the Model-Image color are complementary, they neutralize each other.

14

16