The 'Chromatic Abstractoscope': An Application of Polarized Light
Author(s): Carlos Martinoya and Nahum Joël
Reviewed work(s):
Source: *Leonardo*, Vol. 1, No. 2 (Apr., 1968), pp. 171-173
Published by: The MIT Press
Stable URL: http://www.jstor.org/stable/1571956
Accessed: 03/09/2012 22:36

Leonardo, Vol. 1, pp. 171–173. Pergamon Press 1968. Printed in Great Britain

NOTES—*NOTES*

THE 'CHROMATIC ABSTRACTOSCOPE': AN APPLICATION OF POLARIZED LIGHT

Carlos Martinoya* and Nahum Joël**

Both of us are physicists at the University of Chile where we developed an interest in devices capable of producing results with physical phenomena comparable to the works of abstract painters. This interest led to a rather exciting experience which we would like to communicate in this note‡

An open air exhibition of the visual arts (Feria de Artes Plasticas) was held in Santiago, in a park along the river Mapocho, in December 1960. This annual exhibition is an important event in Santiago, and, as scientists with an interest in the fine arts, we decided that it would be a good occasion for showing to the public some form of expression that might constitute a bridge between science and art.

We thought that the colours obtained through the interference of polarized light by birefringent crystals would provide a good example. In polarized light the transverse vibrations are restricted to certain special directions; for instance, in plane polarized light they are all in one plane. A polarizing material, such as Polaroid sheet, has the property of transmitting only those transverse light vibrations that are vibrating in a certain plane. A birefringent material splits a wave of light into two waves that propagate through the material with different velocities, thus giving rise to interference effects which when polarized light is used produce colours.

Both of us had on many occasions demonstrated this well-known effect to our students of physics and crystallography; their reaction made us think the general public might also enjoy seeing it.

When discussing the programme and technical details of our 'show', we decided that in addition to demonstrating experiments of crystal growth by means of polarized light, we would also replace the crystals with colourless cellophane sheet (another birefringent material). When pieces of cellophane that have been folded and crushed into various shapes and textures are viewed between two sheets of polarizing material they form patterns rich in colours similar to those made by crystals. These colours undergo striking changes when either one of the polarizing sheets or the cellophane piece is rotated or tilted. Furthermore, the colours also change if a single cellophane sheet, or several layers of sheet, are inserted between the polarizing elements. A great variety of coloured abstract pictures can thus be created.

The next step was to make it possible for these abstract pictures to be seen by projecting them onto a screen, so that many spectators could see them at the same time. This we did simply by enclosing the cellophane pieces in cardboard or plastic holders used for projecting 35 mm slides. Two pieces of polarizing material, a slide projector and a screen was the only equipment required. Our show was beginning to take shape—we got a supply of holders and of cellophane with which the spectators could compose their own pictures.

At this stage of our planning we felt that an automatic device should be built which would continuously vary the composition and the colouring of a projected picture on a screen.

This was achieved with a device consisting of three colorless glass disks of different diameters that were rotated slowly by an electric motor (Figs. 1 and 2). Cellophane patterns were glued to the glass near the periphery of each disk. The three parallel axes of the disks were fixed so as to allow the disks to overlap over an area of about 5×5 cm. This area was then masked by means of a standard 35 mm slide frame. Light from a 500 W projector passed through an element of polarizing material and then through the framed area of the overlapping disks. The image of the composite pattern was focused on a screen by means of the projector lens. The second piece of polarizing material was placed in front of the projector lens, and rotated by the same motor that turned the disks. The angular velocity of each rotating part was arranged so as to make no repetition of the projected pictures during several hours of operation. In Figs. 3a and b and in Fig. 4 are shown two compositions that occurred during the cycle.

*Faculty of Sciences, University of Chile, Santiago, Chile.
**Department of Advancement of Science, Unesco, Place de Fontenoy, Paris 7, France.

‡This paper was written in 1961. Since then the authors have become aware of the work of Munari, Olson, Dantu and Malina who have also used polarized light. See, for instance, the articles by Frank Popper and by Reginald Gadney in *Kinetic Art* (London: Motion Books, 1966). (Received 4 November 1967).

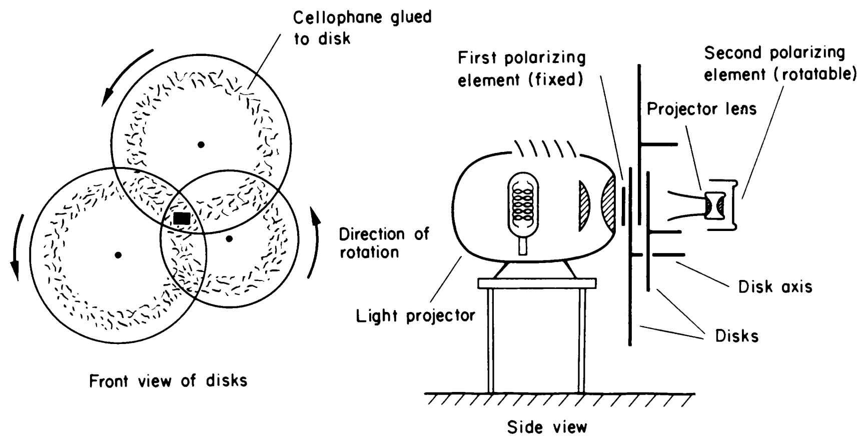

Fig. 1. *Diagram of the 'Chromatic Abstractoscope'.*

We called our machine a 'Chromatic Abstractoscope' and, for the benefit of the general public, we added the subtitle 'the Robot of Abstract Painting'. We were very curious to see the reaction of artists and the general public to our machine-produced abstract pictures.

Our show at the exhibition was presented by means of a threefold projection system. One third of a wide screen was devoted to a continuous performance of the 'Chromatic Abstractoscope'. On the second part, the spectators could project their own creations using the sheets of cellophane in the slide frames we had provided. The third part of the screen was used for demonstrating crystal-growth experiments, which were interrupted at intervals by a series of slides explaining the scientific principles of the interference of polarized light. The mechanism of the 'Chromatic Abstractoscope' was also described. The slides included a graded sequence of simple cellophane patterns for illustrating each aspect of the phenomenon described.

As our show took place in the open air, we began after sunset and continued it for 2 to 3 hours. The spectators showed a greater interest than we had anticipated in both the scientific and the aesthetic aspects of our demonstration. They read and listened attentively to the scientific explanations, asked questions and were especially excited by the crystal-growth experiments that were projected on the screen. They shared our fascination in the optical study of crystals in polarized light. They also learned how to produce these effects without using

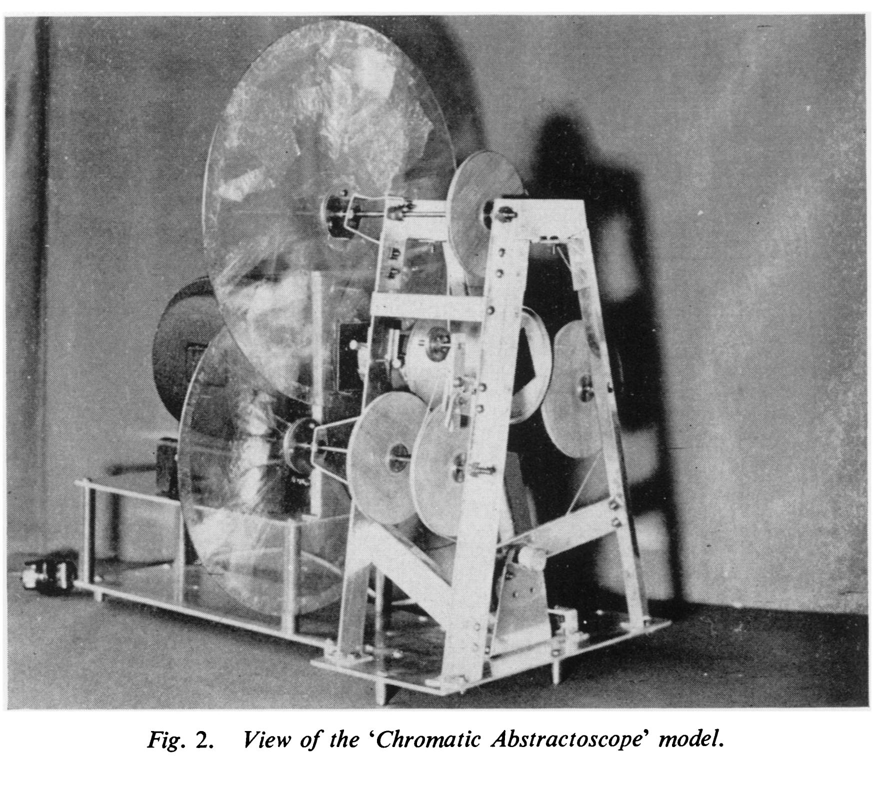

Fig. 2. *View of the 'Chromatic Abstractoscope' model.*

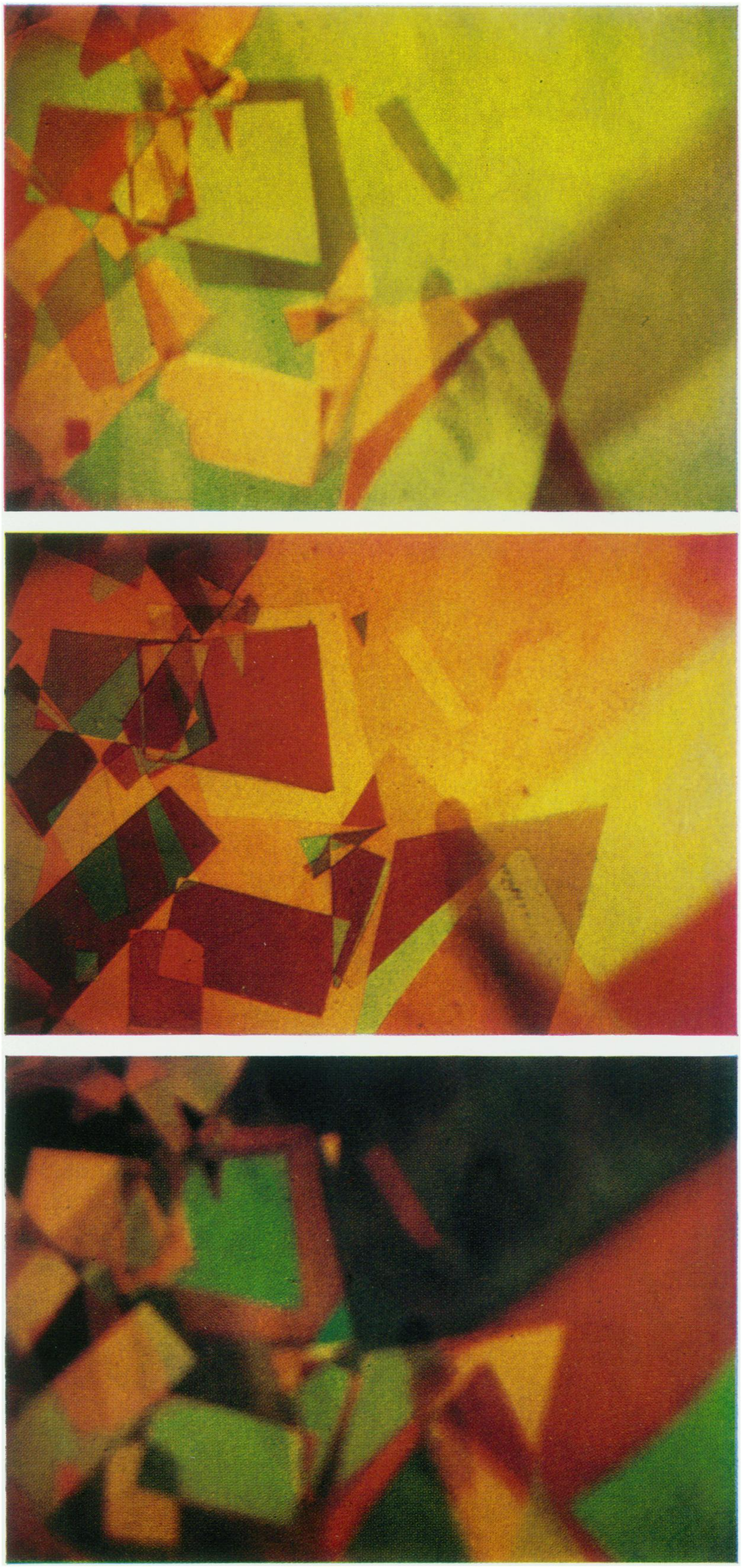

Fig 4. A composition in different colours produced by the 'Chromatic Abstractoscope' when only the second polarizing sheet is rotating.

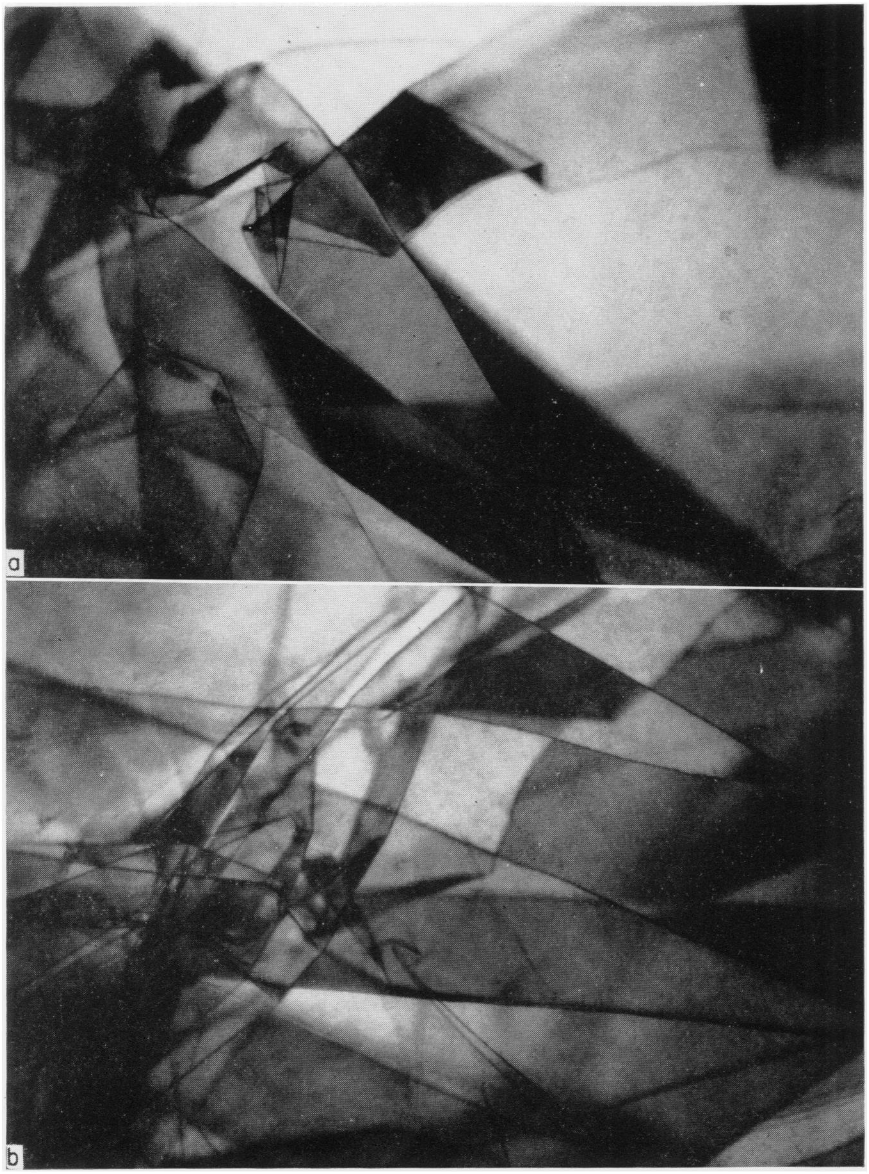

Fig. 3. *a and b. Two pictures projected by the 'Chromatic Abstractoscope.'*

man-made polarizing material, for example, with the partially polarized light of the blue sky and with light reflected by glass or a surface of water.

The spectators responded avidly to the challenge and composed a great number of cellophane shapes in the slide frames. This became a very popular form of spectator participation in creative activity. We found that children produced the most daring compositions. Everyone was amazed that it was so easy to compose such unfamiliar abstract pictures with such unexpected colour combinations.

We noticed that now and then a spectator began to develop a style of his own. Some tried to guess what colours an arrangement of cellophane would have on the screen. Nearly all were puzzled by the fact that such a great range of colours could be obtained without the use of coloured material (filters), and that the colours all disappeared when one of the pieces of polarizing material was removed.

Some artists felt that we were only demonstrating another undesirable intrusion of science into art. Most of them, however, were impressed and saw in the 'Chromatic Abstractoscope' a powerful source of artistic inspiration.