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FIGURATIVE 'POLARIZED LIGHT PAINTINGS': STATIC AND KINETIC TYPES

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1.

While teaching general courses in the history and philosophy of physics, wherein the effects of science on society were discussed at length, I began to appreciate various ways in which aspects of physics had affected the visual arts. Later, in order to pursue this idea in greater depth, several students and I decided to make a study of the use of polarized light and to attempt to develop a technique for the construction of polarized light pictures. We were particularly interested in both static and kinetic pictures of figurative subjects. (Several similar techniques for making kinetic pictures have been discussed in *Leonardo* [1, 2, 3].) We believe the technique we have devised will be of interest. The pictures obtainable (we call them 'polarized light paintings') remind one of stained glass windows (Fig. 1, cf. color plate).

It is well known that, when a piece of sheet birefringent (doubly refracting) material is sandwiched between two polarizers (e.g. two pieces of sheet polarizing material, such as that produced by the Polaroid Co., Cambridge, Mass., U.S.A.), striking color effects are produced when ordinary white light is passed through the sandwich [4, 5]. Furthermore, when one of the polarizers is rotated through 360°, a particular color will change to its complement twice during this rotation. Additional color effects can be produced when different thicknesses or several layers of a birefringent material are used (such as ordinary transparent cellulose tape, cellophane or certain other plastics), when the angle of the surface of these materials is varied with respect to the surfaces of the polarizers and when their birefringent property is altered, for example by heat or chemical treatment. The colors produced also generally vary with the type of light source used. Thus, since the wavelength composition of sunlight and of light from fluorescent and incandescent lamps are different, the amounts of light at each wavelength transmitted by the sandwich are different, leading to the production of different colors.

2.

'St. Acquin' (Fig. 1, cf. color plate) by S. Regan was photographed on Kodak Ektachrome film, using fluorescent light for back illumination. The picture itself is transparent. Both Regan and the photographer of the picture, G. W. Burgess, were students in a special independent study course relating to physics and art.

The picture was assembled under fluorescent lamp back illumination. The first step involved the drawing of the black lines in wax crayon on the front (forward facing) surface of the support, an ordinary piece of non-birefringent sheet plastic with dimensions of the final picture. The plastic sheet with the (front surface) drawing was then placed, face down, on a polarizer sheet of the same dimensions. Then bits of birefringent cellulose tape (such as that manufactured by Lepage's Inc., Pittsburgh, Penn., U.S.A.) were stuck on to the back surface of the plastic sheet. Other types of material, both birefringent and nonbirefringent, were cut and stuck in place with this same cellulose (sticky) tape. No glue of any kind was used, the tape itself being sufficiently sticky to attach the various materials firmly to the plastic sheet. In general, cellulose tape, cellophane and miscellaneous plastic sheeting materials were utilized in the construction of the painting.

In order to choose the desired colors, it was necessary to view the picture-making in progress through a second polarizer that was placed over the back side of the plastic sheet, thus forming a sandwich. It was necessary to view each new bit of birefringent material in the sandwich, orient it to produce the desired color, trim it to fit in its assigned place and stick it on (using the cellulose tape). After the picture was finished, it was placed, without the two polarizer sheets, in an open frame for support and then mounted between two pieces of Plexiglas for permanent protection. The two pieces of Plexiglas are held together by small metal clamps, the edges being left unsealed. In order to see the colors, the picture must once more be placed between two polarizers and viewed with back illumination. For this purpose, we have recently finished construction of a viewer that consists basically of a sliding arrangement of three panels, two of which contain the polarizers (rigid, circularly-shaped polarizer material, such as that obtainable from the Edmund Scientific Co., Barrington, N.J., U.S.A.), while the third panel that contains the transparent picture is sandwiched in the middle. The whole sandwich is back illuminated by fluorescent light, and one of the polarizers can be rotated by motor drive in order to give a kinetic-type painting. On the other hand, for a static-type painting, two sheet polarizers could be placed permanently on the front and back surfaces of the picture and the entire sandwich mounted between two sheets of glass or Plexiglas in an open picture frame [3, p. 117], the whole being hung in a window to serve much as stained glass. Whether the painting is of the static or kinetic type, back illumination is necessary in order to see the visual effects easily.

There is a variety of nonbirefringent material that may be used as the support, such as Plexiglas, certain other plastic sheet materials, and ordinary window glass and plate glass. Occasionally we have mounted transparent cellulose tape (birefringent) directly onto a glass support coated with petroleum jelly (nonbirefringent). The jelly not only holds the tape in place but also permits it to be

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moved about and to be removed. We have also used circularly shaped polarizers in order to provide a halo effect.

According to Malina, only he and a few other artists have attempted to use electric light in figurative kinetic pictures [3]. We offer here our technique in the hope of encouraging other artists to explore the use of a medium whose full potentialities have not yet been recognized or investigated. Further, we hope that our work will stimulate scientists and engineers to help artists by revealing potential applications of the results of their work in art.

References

1. C. Martinoya and N. Joël, The 'Chromatic Abstractoscope': An Application of Polarized light, *Leonardo* **1**, 171 (1968).
2. J. A. Burns and J. K. Burns, Kinetic Art: A Mural of Variably Stressed Photoelastic Material with Light Polarizers, *Leonardo* **6**, 325 (1973).
3. F. J. Malina, Electric Light as a Medium in the Visual Fine Arts: A Memoir, *Leonardo* **8**, 109 (1975).
4. M. Grabau, Polarized Light Enters the World of Everyday Life, *J. Appl. Physics*, **4**, 6 (1938).
5. F. W. Sears and M. W. Zemansky, *University Physics* (Reading: Addison–Wesley, 1970) pp. 622–634.

Top left: *Pavel Filonov. 'Animals', oil on paper*, 35.4 × 43 cm, 1925/26. (Fig. 9. cf. page 228.)

Top right: *Scott Regan. 'St. Acquin', polarized light painting, cellophane, cellulose tape, plastic sheet material, Plexiglas, polarizers*, 31 × 25 cm, 1975. (Photo: G. W. Burgess, Mexico, N.Y., U.S.A.) (Fig. 1, cf. page 213.)

Bottom left: *Diana Shaffer. 'Installation No. 3', sculptural environment, wood, gypsum board, oil paint, fluorescent light tubes*, 1975. *View of triangular plaque from room entrance.* (Fig. 3, cf. page 224.)

Bottom right: *Paul Franck. 'Combat', oil on canvas*, 75 × 150 cm, 1942. (Fig. 2, cf. page 219.)