Liquid crystals
A new dimension in painting

Often in science, a researcher's laboratory work spills over into his private life. NRC's David Makow is a case in point. The chemicals that he works with at his lab bench during the day, liquid crystals, represent the materials of his after hours avocation – painting. By marrying a knowledge of liquid crystal physics to his artistic flair, Makow has produced canvasses unique in the visual arts.

Visitors who attended "Science in Art in Science", an artistic exhibition held in Ottawa last fall as part of Canada's first Science and Engineering Week, were shown some unusual paintings. Shimmering with brilliant, shifting colors, they seemed to change as one moved around them or, in some cases, just by looking at them for a few minutes; on one painting an image of the moon vanished slowly when a heat lamp was shone on it, only to return when the lamp was turned off.

For many of the visitors, this was their first peek at a promising new technique in the visual arts. Called liquid crystals, they were first used as an art form by Dr. David Makow, a research scientist at the National Research Council's Division of Physics in Ottawa.

Discovered in 1889 by an Austrian botanist, these strange organic compounds were known to share some of the properties of both ordinary liquids and crystalline solids, but interest in them lagged for many years as they were considered merely a scientific curiosity, with little or no practical application. In the past ten years, however, scientists have found them most suitable for many new technological applications, particularly as watch and calculator displays and sensitive temperature indicators. Recently, they were also shown by Dr. Makow to offer attractive possibilities as a medium for artistic expression.

A serious painter and sculptor for the past 20 years and a research scientist at the National Research Council of Canada for twenty-eight years, David Makow's work in the Optics Section involves studies in several areas of the science of color, particularly those concerned with colored materials.

Dr. Makow was assigned the study of the optical properties of liquid crystals some two years ago, but he had earlier developed an interest in these materials in his spare time as a painter and sculptor.

Dr. David Makow, a research scientist with NRC's Optics Section, has pioneered the use of liquid crystals for artistic purposes. Some of his works, demonstrating the unusual optical properties of liquid crystals, were displayed as part of Science in Art in Science, an exhibition organized in Ottawa, in October, 1978, during Canada's first Science and Engineering Week.*(Photo: Bruce Kane, NRC)*

Le Dr David Makow, chercheur à la section d'optique du CNRC, a été le premier artiste à se servir des cristaux liquides pour la réalisation d'oeuvres d'art. Quelques-unes de celles-ci, illustrant les propriétés optiques inhabituelles des cristaux liquides, ont été présentées lors d'une exposition intitulée «La Science dans les arts, les arts dans la Science», tenue à Ottawa en octobre dernier dans le cadre de la première Semaine des sciences et du génie organisée au Canada.*(Ph. Bruce Kane, CNRC)*

Liquid crystals –
A profitable potential market for Canadian companies?

With increasing leisure time at their disposal, Canadians are taking a more active interest in painting as a hobby, and as liquid crystal paints become better known to the general public, a potentially lucrative market could open up for Canadian companies specializing in art supplies. At present, liquid crystal paints are very expensive (typically selling at hundreds of dollars a litre) and have to be imported from the United States as there is no Canadian source. Already, a substantial number of artists have expressed an interest in these paints, and the prospects for a viable commercial venture in art supplies are improving.

"For scientists and engineers," says Makow, "liquid crystals are a fascinating field of investigation and the source of many useful applications. Being a state of matter intermediate between liquids and crystalline solids, these compounds (most are organic or carbon-containing) exhibit the molecular mobility of liquids but at the same time a degree of order characteristic of crystals.

"Of the more than one million organic compounds known, at least 20,000 have a liquid crystalline phase: that means that as you heat the solid and melt it, it does not change immediately into a disordered liquid; instead, while the molecules are free to move, they retain a certain collective order, either pointing in a certain direction, or grouped in well-defined layers depending on the type of liquid crystal involved. If you continue heating the liquid, the crystalline properties are lost and it becomes an ordinary liquid.

"The forces that keep liquid crystal molecules in a certain orientation are very weak and easily affected by factors like temperature, electrical or magnetic fields, or ultrasonic waves. This makes them eminently suitable for use as sensors and has led to growing numbers of applications ranging from monitors in the study of air circulation around aircraft models in wind tunnels, to 'fever headbands' that you can