LIQUID CRYSTAL INSTITUTE
Annual Report - 1972-73

INTRODUCTION

The staff of the Liquid Crystal Institute has had a fruitful year with our research group making significant contributions toward understanding the properties and structure of the liquid crystalline state of matter. These findings involve both inanimate materials and living matter.

The Institute has been visited by many scientists from the United States and from several foreign countries. These include scientists from Italy, Japan, Hungary and India and governmental personnel from such laboratories as the Office of Naval Research and the Air Force Office of Scientific Research. Representatives from a rather large number of industries visited us; these include Amtek, Hamlin Switches, ITT, Hoffman-LaRoche and Emory.

Industry, academic institutions, hospitals and other organizations have sought advice and counsel on problems dealing with liquid crystals. Some staff members have been called upon to referee manuscripts submitted to scientific journals and to evaluate research proposals submitted to governmental agencies and foundations for financial support.

Faculty members associated with the Institute serve on University, collegial and departmental committees. Some of our staff are involved in organizing seminars (local and international) and in community services such as P.T.A., church activities and
Boy Scouts. We hosted the Fourth International Liquid Crystal Conference in August 1972. This conference was an outstanding success with about 400 scientists from seventeen countries in attendance. The program was excellent and included 181 papers. Professor Brown continues to serve as Chairman of the Planning and Steering Committee for future international conferences, the next of which is to be held in Stockholm, Sweden in 1974.

We have requests from foreign scientists to spend periods of time in our Institute ranging from three months to a year. These are established scholars and not new doctoral students trying to find a postdoctoral appointment. The only thing which keeps these people from joining us is lack of financial resources. We expect a Fulbright Fellow to spend several months with us this academic year.

This report shows the Liquid Crystal Institute to be an asset to Kent State. Our future growth, in what many have labeled as the "hottest" interdisciplinary research activity these days, is limited only by lack of money.

PERSONNEL

The personnel, for purposes of identification, will be divided into two categories in this report. The senior personnel and their titles are as follows:

1. Brown, Glenn H. Regents Professor and Director, Liquid Crystal Institute
2. Andrews, J.T.S. Research Associate
3. Bacon, W.E. Research Associate
4. de Vries, A. Senior Research Fellow
5. Doane, J.W. Associate Professor of Physics
6. Fishe, D.L. Associate Professor of Chemistry
7. Franklin, W.M. Associate Professor of Physics
8. Gelerinter, E.  Associate Professor of Physics
9. Golub, S.  Assistant Professor of Physics
10. Johnson, D.  Assistant Professor of Physics
11. Kobayashi, K.K.  Research Associate
12. Lesser, David  Postdoctoral Fellow
13. Moroi, David  Associate Professor of Physics
14. Neff, V.D.  Associate Professor of Chemistry
15. Neubert, M.  Postdoctoral Fellow
16. Piliavin, M.  Postdoctoral Fellow
17. Saupe, A.  Professor of Physics and Research Associate
18. Sheley, C.  Assistant Professor of Chemistry
19. Uhrich, D.  Associate Professor of Physics
20. Williams, L.  Postdoctoral Fellow

The junior personnel include 10 graduate students pursuing degree work in Chemistry or Physics.

RESEARCH AREAS

Research areas in liquid crystals in which substantial progress has been made during the past year include (1) structure determination by x-ray methods; (2) synthesis of new compounds; (3) optical properties; (4) nuclear magnetic resonance; (5) Mössbauer effects; (6) chromatography; (7) ultrasonic properties; (8) spin resonance; (9) reactions in liquid crystal media; (10) theoretical studies; (11) liquid crystals in living systems; and (12) light scattering. Dr. J.W. Doane has done some inelastic neutron scattering studies at the Jozef Stefan Institute during his sabbatical leave. Dr. Saupe and Dr. Brown, in conjunction with Dr. Holzbach from St. Luke's Hospital in Cleveland, have written a paper describing liquid crystals in human bile fluids. Lack of equipment has curtailed our research activities.

EXTRAMURAL SUPPORT

During this report period, the Institute has held three grants for support of its research program and one for partial support for
a conference. The grants in effect are:

<table>
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<tr>
<th>Granting Agency</th>
<th>Grant Number</th>
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<tr>
<td>Air Force Office of Scientific Research</td>
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<tr>
<td>National Science Foundation</td>
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<td>National Science Foundation</td>
<td>GF30031 (Dr. J.W. Doane)</td>
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<tr>
<td>Navy Research Laboratory</td>
<td>N00173-73-C-0847 (Dr. Alfred Saupe)</td>
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<td>Air Force Office of Scientific Research</td>
<td>AFOSR 72-2251 (Liquid Crystal Conf.)</td>
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A gift of $5,000 was given to the Liquid Crystal Institute by Union Carbide Corporation, Parma Research Center in support of the Institute's research program.

**INTRAMURAL SUPPORT**

The proposal entitled "Integrated Optics" by J.W. Doane, D. Johnson and A. Saupe was selected as the outstanding campus research proposal submitted to the Graduate School. The $25,000 grant is to be used essentially for equipment.

**LECTURES, PUBLICATIONS AND OTHER PROFESSIONAL ACTIVITIES**

The staff gave at least 52 lectures to scientific audiences across the United States and in foreign countries. The lectures were presented at meetings of national scientific societies, international science meetings, departmental seminars in universities and industrial laboratories. Dr. Doane lectured in Italy, France and Yugoslavia. Members of the staff have done some consulting for industrial and governmental laboratories. Staff members have refereed manuscripts for scientific journals and research proposals for federal organizations and foundations.
The publications in scientific journals, in print and accepted for publication, total approximately 40. These papers were published in first-rate journals including the JOURNAL OF CHEMICAL PHYSICS, MOLECULAR CRYSTALS AND LIQUID CRYSTALS, JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, and PHYSICAL REVIEWS.

During the summer of 1972, Dr. J. William Doane completed his sabbatical leave. He did research at the Jozef Stefan Institute in Ljubljana, Yugoslavia and gave a number of seminars there. This fine recognition is a tribute to Dr. Doane's status in the field.

Three major reports to governmental agencies supporting our research were written during this period. Short progress reports were written for other extramural support grants.

Dr. Brown was honored with a continuation of a National Sigma Xi Lectureship. Dr. Brown was commissioned a Kentucky Colonel in February 1973. A number of staff members hold offices in professional societies.

INTERNATIONAL COOPERATION

The Institute has established itself on the international scene in several ways. We are now entering into another phase of cooperation with foreign countries. For example, we have working relationships with the Raman Institute and the Tata Institute of Advanced Studies. Dr. Doane received a continuation of a grant from the National Science Foundation to carry on cooperative research with the staff of Jozef Stefan Institute in Ljubljana, Yugoslavia. In addition to the specific examples cited, we exchange scientific information with research groups in France, West Germany and other European countries, including the Soviet Union. We expect this international relationship to expand.