LIQUID CRYSTAL INSTITUTE
KENT STATE UNIVERSITY

ANNUAL REPORT FOR THE PERIOD
September 1, 1971 - June 30, 1972

GLENN H. BROWN, DIRECTOR
INTRODUCTION

The staff of the Liquid Crystal Institute has had a fruitful year even though we have not accomplished all we would like to have done. The Institute and a number of its personnel hold both national and international recognition. During this year our research group has made significant contributions toward understanding the properties and structure of the liquid crystalline state of matter. These findings involve both inanimate materials and living matter.

Industry, academic institutions, hospitals and other organizations have approached Institute personnel for advice and counsel on problems dealing with liquid crystals. Many high school students, in preparing science projects, have sought advice from Institute personnel. Some faculty and staff members have been called upon to referee manuscripts submitted to scientific journals and to evaluate research proposals submitted to governmental agencies for financial support. Our personnel have lectured across the United States and in several foreign countries.

The Institute has been visited by persons from across the United States and from several foreign countries. These include Professor Laisk from Sydney, Australia, and Dr. Borel from Grenoble, France.

Besides scientific research, 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 are preparing to host the Fourth International Liquid Crystal Conference in August of this year.

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 on our part and to some degree theirs.

Our report shows the Liquid Crystal Institute to be an asset to Kent State. We have only begun to understand this fascinating state of matter which challenges researchers of several disciplines. Our future growth is limited only by our lack of money to engage personnel, space and equipment to pursue research in what many have labeled as the "hottest" interdisciplinary research activity these days.

**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, John T.S. Research Associate
3. Bacon, W. E. Research Associate
4. de Vries, Adriaan Senior Research Fellow
5. Doane, J. W. Associate Professor of Physics
6. Fishel, 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 (Summer 1971)
11. Khetrapal, C. L. Research Associate
12. Lesser, David Postdoctoral Fellow (4/1/72 - 6/30/72)
13. Moroi, David Associate Professor of Physics (Summer 1972)
14. Neff, V. D. Associate Professor of Chemistry
15. Saupe, A. Professor of Physics and Research Associate
16. Sheley, Curtis Assistant Professor or Chemistry
17. Smith, Duane Postdoctoral Fellow
18. Uhrich, D. Associate Professor of Physics

The junior personnel include 11 graduate students pursuing degree work in Chemistry or Physics. One person was employed as a junior chemist.
RESEARCH AREAS

The research areas in the Liquid Crystal Institute are diverse. 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 effect; (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 scattering studies at the Jozef Stefan Institute during his sabbatical leave. Dr. Saupe and Dr. Brown in conjunction with researchers from St. Lukes Hospital in Cleveland discovered liquid crystals in human bile.

EXTRAMURAL SUPPORT

During this report period, the Institute has held three contracts or grants for support of its research program. The largest of these grants are supported by the Air Force Office of Scientific Research and a new one by the National Science Foundation. We have been fortunate in obtaining this support in a period when resources from government agencies are on the "down swing."

The contracts and grants in effect in the Institute during this reporting period are:

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<th>Granting Agency</th>
<th>Grant Number</th>
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<tr>
<td>Air Force Office Scientific Research</td>
<td>F44620-67-C-0103 (no-cost extension, terminated November 30, 1971)</td>
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<tr>
<td>Air Force Office of Scientific Research</td>
<td>F44620-69-C-0021</td>
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<tr>
<td>National Science Foundation</td>
<td>GH34164X (effective June 1, 1972)</td>
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<tr>
<td>National Science Foundation</td>
<td>GF30031 (Dr. J. W. Doane)</td>
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LECTURES, PUBLICATIONS AND OTHER PROFESSIONAL ACTIVITIES

The staff gave at least 51 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. Alfred Saupe gave lectures in France and chaired sessions at an International Conference on Nuclear Magnetic Resonance in Israel. Dr. Doane lectured on liquid Crystals in Italy, France and Yugoslavia. The number of lectures recorded does not include lectures to on-campus groups at Kent State and those given to general audiences and high school classes. Lectures were given to service clubs in northeastern Ohio. The staff attended a number of professional meetings in the United States. Members of the staff have done some consulting for industries and government laboratories. Staff members have refereed manuscripts for scientific journals and research proposals for federal and industrial organizations.

The publications in scientific journals, in print and accepted for publication, total approximately 45. 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, PHYSICAL REVIEW LETTERS, AND PHYSICAL REVIEWS. Seven members of the staff attended professional meetings overseas and ten meetings in the United States. Staff members hold offices in professional societies.

During this academic year and summer term, Dr. J. William Doane has been on a sabbatical leave. He has been doing research at the Jozef Stefan Institute in Ljubljana, Yugoslavia, and has given a number of seminars in the Jozef Stefan Institute. Had Dr. Doane not started research in liquid crystals in the mid 1960's he would not have gained this fine recognition.
Dr. Brown is an editor of the journal MOLECULAR CRYSTALS AND LIQUID CRYSTALS. During this year a book entitled "Photochromism" was edited by Dr. Brown, and he also wrote a chapter in the book.

Four 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 received an honorary Doctor of Science degree from Bowling Green State University and was given the Distinguished Service Award by the Akron Section of the American Chemical Society.

INTERNATIONAL COOPERATION

The Institute has established itself on the international scene in several ways. We have already cited the recognition of a number of its staff. We are now entering into another phase of cooperation with foreign countries. We have working relationships with two Indian Institutes; one of these is the All-India Institute of Medical Sciences and the other one is the Tata Institute of Advanced Studies. Dr. Doane received 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, especially if we can receive the necessary financial resources to pursue this activity.

EQUIPMENT

Our opportunities to expand our equipment holdings have been greatly curtailed during this past year because of lack of financial resources. We
have added a few accessory items to the major equipment which we purchased in previous years.