LIQUID CRYSTAL INSTITUTE
KENT STATE UNIVERSITY

ANNUAL REPORT FOR THE PERIOD
SEPTEMBER 1, 1969 - AUGUST 31, 1970

GLENN H. BROWN, DIRECTOR
INTRODUCTION

It is impossible in the limited space available to do justice to the work done by the faculty and staff who are conducting research in the field of liquid crystals. The Institute and some of its personnel have gained both national and international recognition. During this year our research group has made significant contributions toward a better understanding of the properties and structure of the liquid crystalline state.

Personnel in the Institute have been called upon by industry, academic institutions, hospitals and many other sources for advice and counsel on problems dealing with liquid crystals. Many high school students want advice on science projects. We have been visited by persons interested in liquid crystals from across the United States and from foreign countries.

Some faculty and staff members have been called upon to referee manuscripts submitted to scientific journals and to evaluate research proposals which have been submitted to governmental agencies for financial support. Our personnel have lectured across the United States and in several European countries.

This report may leave the impression that our personnel do nothing but science. Faculty members serve on university, collegial and departmental committees. One finds some of our staff involved in organizing seminars (local and international), and in community services such as PTA, church activities, and Boy Scouts.

The Institute has gained recognition internationally for its accomplishments in research. During the third conference in Berlin, the director was approached by at least five scholars who wanted to join us for periods of three months to a year.

Our report indicates that we have made progress this year. It shows that the Liquid Crystal Institute is an asset to Kent State and points out our need to move ahead. We have only begun to open up a field that challenges researchers of several disciplines.
PERSONNEL

The personnel, for purposes of identification, will be divided into two categories in this report. The first group will be characterized as senior personnel and the second as junior personnel. 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. Arora, S. L. Research Associate
4. Bacon, W. E. Research Associate
5. de Vries, Adriaan Research Associate
6. Doane, J. W. Associate Professor of Physics
7. Fergason, J. L. Associate Director (Sept. 1969 - June 30, 1970) Research Associate (July 1, 1970 to date)
8. Fishel, D. L. Associate Professor of Chemistry
9. Franklin, W. M. Associate Professor of Physics
10. Mishra, R. K. Visiting Professor of Biophysics and Research Associate
11. Neff, V. D. Associate Professor of Chemistry
12. Nehring, J. Research Associate
13. Patel, P. R. Postdoctoral Fellow
14. Saupe, A. Professor of Physics and Research Associate
15. Taylor, T. R. Postdoctoral Fellow
16. Uhrich, D. Assistant Professor of Physics

Dr. Sherman Golub and Dr. Edward Gelerinter of the Physics Department carried on research on liquid crystals during the summer of 1970. Dr. Golub worked on ultrasonics and Dr. Gelerinter on electron spin resonance.

The junior personnel include 12 graduate students pursuing degree work in Chemistry or Physics. One person was employed as an electronics technician and assistant to the director.
RESEARCH AREAS

The research areas in the Liquid Crystal Institute are diverse, and as our equipment and facilities improve and our research staff grows, our diversity will be expanded. Research areas 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 of liquid crystals; (4) nuclear magnetic resonance; (5) Mössbauer effect; (6) chromatography; (7) ultrasonic properties; (8) spin resonance; (9) reactions in liquid crystal media; (10) theoretical studies; and (11) liquid crystals in living systems. New studies were initiated in Raman and infrared spectroscopy and in optical techniques using lasers.

EXTRAMURAL SUPPORT

During the period of this report, the Institute has held seven contracts for support of its research program. The largest of these is now supported by the Air Force Office of Scientific Research. We have been fortunate in obtaining this support in a period when support from government agencies is 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>
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LECTURES, PUBLICATIONS AND OTHER PROFESSIONAL ARTICLES

The faculty and staff gave at least 60 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 a number of universities and industrial laboratories. Eleven scientists from the Institute attended the Third International Liquid Crystal Conference in Berlin and presented 12 papers. If one adds these twelve papers to the sixty already cited, the Institute personnel gave at least 72 lectures during this report period. Dr. Saupe gave lectures in Australia and Switzerland, Dr. Arora gave two lectures in India and Dr. Brown gave four lectures in the Soviet Union. Dr. Brown was a guest of the Academy of Science U.S.S.R. for two weeks during the month of June 1970. The number of lectures recorded does not include lectures to on-campus groups of scientists and those lectures given to general audiences and high school classes. On the lighter side, lectures were presented to service clubs.

Publications in scientific journals, printed and accepted for publication, total 52. Of this number 45 dealt with the subject of liquid crystals. These papers were published in first-rate journals including Journal of Chemical Physics, Molecular Crystals and Liquid Crystals, Applied Optics, Journal of Organometallic Chemistry and Journal of the American Chemical Society. Some members of the faculty and staff were called upon to referee manuscripts for scientific journals. Research proposals submitted to governmental agencies are often refereed by members of the group. Dr. Brown is an editor of the journal, Molecular Crystals and Liquid Crystals. Dr. Brown edited a two-volume collection of papers presented at the Second International Liquid Crystal Conference.

Four major reports to supporting agencies were written during this period.

EQUIPMENT

The Institute, along with the Departments of Chemistry and Physics, added some valuable equipment during this year with monies from contracts
and from university resources. Items of major equipment in service or on purchase this reporting period include: a laser system, light scattering equipment, X-y recorder, power supply, boxcar detector, interferometer, multichannel analyzer, and microdensitometer. Minor equipment and accessories for major equipment were also obtained.