LIQUID CRYSTAL INSTITUTE
KENT STATE UNIVERSITY

ANNUAL REPORT FOR THE PERIOD
SEPTEMBER 1, 1968 - AUGUST 31, 1969

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 liquid crystalline state. The main emphasis in our research program is a study of the chemistry and physics of liquid crystals.

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 as far away as Australia.

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 three foreign 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.

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. Postdoctoral Fellow
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. Ferguson, J. L. Associate Director
8. Fishel, D. L. Associate Professor of Chemistry
9. Franklin, W. M. Associate Professor of Physics
10. Mishra, R. K. Visiting Professor of Biophysics
11. Neff, V. D. Associate Professor of Chemistry
12. Nehring, J. Research Associate
13. Patel, P. R. Postdoctoral Fellow
14. Saupe, A. Visiting Professor of Physics
15. Taylor, T. R. Postdoctoral Fellow
16. Uhrich, D. Assistant Professor of Physics

Dr. Mishra joined our staff on September 1, 1969 and Dr. Nehring will join us on October 1, 1969. Dr. Sherman Golub and Dr. Edward Gelerinter of the Physics Department carried on research on liquid crystals during the summer of 1969. 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 is 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; and (10) theoretical studies. New studies were initiated in Raman and infrared spectroscopy and in optical techniques using lasers. All of the research pursued this year has advanced the fundamental knowledge about the liquid crystalline state.

EXTRAMURAL SUPPORT

During the period of this report, the Institute has held nine contracts for support of its research program. The largest of these is the THEMIS grant. 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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Details on extramural support may be obtained by reading the annual report for fiscal 1969 prepared by the Office of the Graduate School and Research.
LECTURES, PUBLICATIONS AND OTHER PROFESSIONAL ARTICLES

The faculty and staff gave at least 65 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. Lectures were given by Dr. A. Sauer in Germany and Australia, and Dr. G. H. Brown gave five lectures in India. James Fergason and Glenn Brown gave a short course at UCLA. This number 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 36. Of this number 21 deal 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, and Journal of Organometallic Chemistry. Some members of the faculty and staff are 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.

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: an X-ray unit, nuclear magnetic resonance equipment, broad-line and high resolution (with the Chemistry Department), an electromagnet, Mössbauer equipment, and a laser system. Minor equipment and accessories for major equipment were also obtained.
SPACE

The research program of the Institute is housed in the Lincoln Building, one room in Williams Hall and two laboratories in the Physics Building. Even though the story is repeated over and over again it should be recorded that the Institute is already crowded and this problem will become progressively worse. In the past, we have pointed out our need for additional and more adequate space and hope that some way will be found to help us.