LCI ANNUAL REPORT
1990–1991

July 1, 1990–June 30, 1991
J.W. Doane, Director
LIQUID CRYSTAL INSTITUTE
Director’s Report

ALCOM

The major event of the 1990–1991 year was the award of the National Science Foundation Science and Technology Center on Advanced Liquid Crystalline Optical Materials (ALCOM), announced at a news conference on December 4. This grant, with $18 million in funding over the first five years of operation, is not only a major boost to the visibility of Kent in science and technology; it also provides the foundation for materials science and engineering programs. Another major feature of the ALCOM Center is its linkage of Kent’s research programs with complementary programs in Northeastern Ohio at Case Western Reserve University, the University of Akron, and the Edison Polymer Innovation Corporation (EPIC).

Funding for the ALCOM Program began February 1, 1991. In June the Center held its first symposium; 47 representatives from industry attended and contributed to the success of the program. New hirings, the development of brochures, the establishment of policies for industrial participation and education programs, and ordering of major equipment have kept the staff working overtime during the first year of the grant.
Other Funding

In addition to ALCOM activity, the LCI has maintained and even expanded its other grant activity. New awards include grants from DARPA (High-Definition Television), Vari-Lite Corp., Magnascreen, Ajinomoto, and the AFOSR (Moroi, Physics). Numerous other grants and research contracts continue from prior years; these are outlined in the accompanying tables. With this level of activity, the LCI programs continue to grow as indicated in the chart on Program Growth. Liquid Crystal Institute outreach to other departments on campus includes new activity with the Mathematics Department’s association with ALCOM, new faculty from the Chemistry Department, and current efforts to include the College of Education in LCI and ALCOM efforts.

We have been pleased with the interest of graduate students in helping us develop education programs at the K-12 level. During the summer of 1991, the LCI hosted a teacher in a joint effort with the Six District Compact, a local high-school consortium, to improve science education at the K-12 levels. A major proposal is in preparation with the College of Education to extend this program.

Awards

Dr. Antal Jákli was selected by the Office of International Student Affairs to receive the 1991 Provost’s International Scholar Award on the basis of his exceptional scholarly productivity in research on the Physical Properties of Liquid Crystals.

Mr. David S. Fredley, a graduate student in the Chemical Physics Program working under the direction of Dr. John West, received fellowship support from the Tektronix Corporation for the 1990-1991 academic year. The award consisted of a stipend, travel support and supply funds.

Auxiliary Support and New Staff Appointments

The administrative structure of the LCI was revised to add two new positions: Associate Director for Applied Programs and Associate Director for Basic Programs, appointments held by Dr. John West and Dr. Peter Palfy-Muhoray, respectively. Dr. Jack Kelly was appointed Director of the Resource Facility, a research support component funded jointly by our two center programs, the DARPA National Center for Integrated Photonic Technology (NCIPT) and ALCOM. Two support positions were added to the LCI office staff; these appointments are held by Brena Buck and Judith Domonkos. Alexis Dougherty was promoted to the position of Grants Administrator.

J. William Doane, Director,
Liquid Crystal Institute and
NSF ALCOM Center

Compiled by
Elaine M. Landry
Operations Administrator
LCI and ALCOM (8/91)

Ph.D. Degrees Completed 4 (Physics of Liquid Crystals)
Grants and Contracts 24
Expenditures $1,753,000
New Awards 7
Student Support:
  GRA 22
  Undergraduates 15
Publications 41
Presentations 82
Lectures 43

Reviewing a poster presentation at a symposium hosted by the Center on Advanced Liquid Crystalline Optical Materials, are from left, Renate Ondris-Crawford, a graduate research assistant at Kent's Glenn H. Brown Liquid Crystal Institute; Dr. J. William Doane, ALCOM director and Institute Director; Dr. Jack Koenig, ALCOM associate director and professor of macromolecular science at Case Western Reserve University; and Dr. Phil J. Jones, Advanced Displays manager for the Raychem Corp. of Menlo Park, Calif.
FUNDING SOURCES — 1991
LCI Expenditures (Thousands) by Source

July 1990-June 1991
Major Grant Activities

ALCOM Center (NSF)
NCIPT Center (DARPA)
Polymer Liquid Crystal Materials (ONR/DARPA)
High Definition Television (DARPA)

Industrial
- Tektronix
- Magnascreen
- Hughes Research Labs
- Varilight
- Ajinomoto U.S.
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I. FIRST ALCOM SYMPOSIUM

II. OHIO ACADEMY OF SCIENCES CENTENNIAL SYMPOSIUM

III. DOCTORAL DISSERTATIONS ON LIQUID CRYSTALS
<table>
<thead>
<tr>
<th>Name</th>
<th>Appointed</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. William Doane</td>
<td>1979</td>
<td>Director; Professor, Physics</td>
</tr>
<tr>
<td>Glenn H. Brown</td>
<td>1965</td>
<td>Emeritus Director; Emeritus Regents Professor, Chemistry</td>
</tr>
<tr>
<td>Peter Palffy-Muhoray</td>
<td>1987</td>
<td>Associate Director (1990); Senior Research Fellow</td>
</tr>
<tr>
<td>John L. West</td>
<td>1984</td>
<td>Associate Director (1990); Senior Research Fellow Assistant to Director; Operations Administrator (1991)</td>
</tr>
<tr>
<td>Elaine M. Landry</td>
<td>1983</td>
<td>Secretary</td>
</tr>
<tr>
<td>Brenda Buck</td>
<td>1991</td>
<td>Senior Research Fellow</td>
</tr>
<tr>
<td>Liang-Chy Chien</td>
<td>1989</td>
<td>Senior Research Fellow</td>
</tr>
<tr>
<td>Judith Domonkos</td>
<td>1991</td>
<td>Program Aide IV</td>
</tr>
<tr>
<td>Merrill M. Groom</td>
<td>1986</td>
<td>Instrumentation Technician</td>
</tr>
<tr>
<td>Sandra Sabol Keast</td>
<td>1987</td>
<td>Technical Associate</td>
</tr>
<tr>
<td>Jack R. Kelly</td>
<td>1988</td>
<td>Senior Research Fellow; Director of Resource Facility</td>
</tr>
<tr>
<td>Alice A. Mihalas</td>
<td>1968</td>
<td>Word Processing Specialist</td>
</tr>
<tr>
<td>Mary E. Neubert</td>
<td>1972</td>
<td>Senior Research Fellow; Director, Organic Synthesis</td>
</tr>
<tr>
<td>Alfred Sauge</td>
<td>1968</td>
<td>Research Associate; Professor of Physics</td>
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Visitors

<table>
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<tr>
<th>Name</th>
<th>Dates</th>
<th>Position</th>
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<tbody>
<tr>
<td>Chung-Ho Cho</td>
<td>Aug. 90-Aug. 91</td>
<td>Visiting Scientist (Pai-Chai University, Korea)</td>
</tr>
<tr>
<td>Marija Vilfan</td>
<td>June 1991</td>
<td>Visiting Scientist (University of Ljubljana)</td>
</tr>
<tr>
<td>Slobodan Zumer</td>
<td>May-July 1991</td>
<td>Visiting Scientist (University of Ljubljana)</td>
</tr>
<tr>
<td>RESEARCH STAFF</td>
<td>SUPPORT DEPARTMENT; GRANT*</td>
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<tr>
<td>Full Members</td>
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<tr>
<td>David W. Allender</td>
<td>Physics; DAROA-URI-UPenn, Doane; DARPA-Army, Lee;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NSF DMR88-17647, Doane; ALCOM</td>
<td></td>
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<tr>
<td>Liang-Chy Chien</td>
<td>LCI; DARPA-Army, Lee; DARPA/URI-UPenn; ALCOM</td>
<td></td>
</tr>
<tr>
<td>J. William Doane</td>
<td>LCI; NSF DMR88-17647; NSF DMR88-18561, Neubert; DARPA/URI-UPenn; DARPA-NCIPT; DARPA-HDDT;</td>
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<tr>
<td></td>
<td>Ajinomoto; ALCOM</td>
<td></td>
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<tr>
<td>Daniele Finotello</td>
<td>Physics; ALCOM</td>
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<tr>
<td>Derry L. Fishel</td>
<td>Chemistry</td>
<td></td>
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<tr>
<td>Edward Gelernter</td>
<td>Physics</td>
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<tr>
<td>Roger K. Gilpin</td>
<td>Chemistry; DARPA/URI-UPenn</td>
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<tr>
<td>Jack R. Kelly</td>
<td>LCI; DARPA/URI UPenn; DARPA-NCIPT; DARPA-HDDT; ALCOM</td>
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<tr>
<td>Satyendra Kumar</td>
<td>Physics; Academic Challenge; NSF DMR88-19680; NSF DMR88-18561, Neubert; ALCOM</td>
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<tr>
<td>David L. Johnson</td>
<td>Physics; NSF DMR88-18561, Neubert; DARPA/URI-UPenn;</td>
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<td></td>
<td>ALCOM</td>
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</tr>
<tr>
<td>Michael A. Lee</td>
<td>Physics; DARPA-Army; ALCOM</td>
<td></td>
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<tr>
<td>David S. Moroi</td>
<td>Physics</td>
<td></td>
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<tr>
<td>Vernon D. Neff</td>
<td>Chemistry</td>
<td></td>
</tr>
<tr>
<td>Mary E. Neubert</td>
<td>LCI; NSF DMR88-18561; ALCOM</td>
<td></td>
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<tr>
<td>Peter Palffy-Muhoray</td>
<td>LCI; DARPA-Army, Lee; DARPA-NCIPT; ALCOM</td>
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<tr>
<td>Alfred Sauge</td>
<td>LCI; NSF DMR89-03453; NSF DMR88-18561, Neubert; DARPA/URI-UPenn; ALCOM</td>
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<tr>
<td>Nathan Spielberg</td>
<td>Physics</td>
<td></td>
</tr>
<tr>
<td>David L. Uhrich</td>
<td>Physics</td>
<td></td>
</tr>
<tr>
<td>John L. West</td>
<td>LCI; DARPA/URI-UPenn; DARPA-NCIPT; DARPA-HDDT; Tektronix programs; ALCOM</td>
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<tr>
<td>Philip W. Westerman</td>
<td>NEOUCOM</td>
<td></td>
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</tbody>
</table>

*Grant number indicates that a portion of the investigator's salary was provided by the grant, either as a cost share or direct charge (academic year or summer).
Table 2. LCI Membership

**Associate Members**

<table>
<thead>
<tr>
<th>Name</th>
<th>Support Department; Grant</th>
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<tbody>
<tr>
<td>Roger B. Gregory</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Khosrow Laali</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Chun-che Tsai</td>
<td>Chemistry</td>
</tr>
<tr>
<td>Carlos Vargas-Aburto</td>
<td>School of Technology</td>
</tr>
<tr>
<td>Robert B. Akins</td>
<td>LCI; DARPA-HDDT, West</td>
</tr>
<tr>
<td>Valerie A. Hill</td>
<td>DARPA-HDDT, Doane</td>
</tr>
<tr>
<td>Antal Jakli</td>
<td>LCI; DARPA/URI-UPenn, Saupe</td>
</tr>
<tr>
<td>Le Li</td>
<td>LCI; DARPA/Army, Palffy</td>
</tr>
<tr>
<td>Zili Li</td>
<td>LCI; DARPA-NCIPT, Kelly</td>
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<tr>
<td>Cuilian Lin</td>
<td>LCI; DARPA/URI, Chien</td>
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<tr>
<td>Ibrahim G. Shenouda</td>
<td>LCI; NSF DMR88-18561, Neubert</td>
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<tr>
<td>V. Surendranath</td>
<td>LCI; NSF DMR88-18561, Johnson</td>
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<td>DARPA/URI-UPenn, West</td>
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<tr>
<td>Hemasiri Vithana</td>
<td>Physics; DARPA-URI-UPenn, Johnson</td>
</tr>
<tr>
<td>Deng-ke Yang</td>
<td>LCI; NSFDMR88-17647, Doane</td>
</tr>
<tr>
<td>Han Zou</td>
<td>LCI; Palffy</td>
</tr>
<tr>
<td>Alan R. Baldwin</td>
<td>Physics, Research Engineer</td>
</tr>
<tr>
<td>Sandra SabolKeast</td>
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<td>Michael R. Kuzma</td>
<td>Visiting Scientist</td>
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**Undergraduate Student Support**

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<tr>
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<tr>
<td>Thomas Bahleda</td>
<td>Charlene Keane</td>
</tr>
<tr>
<td>Toria Bethea</td>
<td>Tsia-I Lo</td>
</tr>
<tr>
<td>Carla Cianino</td>
<td>Jamie Paulin</td>
</tr>
<tr>
<td>Patrick Greer</td>
<td>Yvonne Polverine</td>
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<tr>
<td>Mary Higginbotham</td>
<td>Philip Pontikos</td>
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<tr>
<td>Keith Jewell</td>
<td>Brian Quinn</td>
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<tr>
<td>William Jones</td>
<td>George Ventouris</td>
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<td>Stephen Yarish</td>
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<tr>
<td>Student Members</td>
<td>Support Department; Advisor; Grant</td>
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<tr>
<td>---------------------------</td>
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<tr>
<td>Sugath Abegunarathna</td>
<td>Physics; Saupe</td>
</tr>
<tr>
<td>Letemeskel Asfaw</td>
<td>Physics; Johnson</td>
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<tr>
<td>Darwin Boyd</td>
<td>Physics; Uhrich</td>
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<tr>
<td>Evan Boyko</td>
<td>Physics/LCI; Doane; NSF DMR88-17647; ALCOM</td>
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<tr>
<td>Li Chen</td>
<td>Physics; Kumar; NSF DMR88-19680</td>
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<tr>
<td>Gregory Crawford</td>
<td>Physics/LCI; Doane; NSF DMR88-17647</td>
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<tr>
<td>David Fredley</td>
<td>Physics/LCI; West; Tektronix Fellowship</td>
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<tr>
<td>William Fritz</td>
<td>Physics/LCI; Doane; Vari-Lite</td>
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<tr>
<td>Yeuk Fung</td>
<td>Physics/LCI; Doane; ALCOM-ODD</td>
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<tr>
<td>Germano Iannacchioni</td>
<td>Physics/LCI; Finotello; ALCOM-ODD</td>
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<tr>
<td>Jianlin Li</td>
<td>Physics/LCI; Palffy</td>
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<tr>
<td>James Gleeson</td>
<td>Physics/LCI; Palffy; NSERC Fellowship, Canada</td>
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<tr>
<td>Jing Huang</td>
<td>Physics; Johnson</td>
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<tr>
<td>Yimin Ji</td>
<td>Physics/LCI; Kelly; DARPA-NCIPT</td>
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<tr>
<td>Du-Rim Kim</td>
<td>Physics/LCI; Saupe; DARPA/URI-UPenn</td>
</tr>
<tr>
<td>Jae-Yon Kim</td>
<td>Physics/LCI; Palffy; ALCOM-ODD</td>
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<tr>
<td>Jianlin Li</td>
<td>Physics/LCI; Palffy</td>
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<tr>
<td>Hefen Lin</td>
<td>Physics/LCI; Palffy; DARPA/Army</td>
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<tr>
<td>Jiming Liu</td>
<td>Physics/LCI; Saupe; NSF DMR89-03453</td>
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<tr>
<td>Joseph Mang</td>
<td>Physics/LCI; Kumar; Ajinomoto</td>
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<tr>
<td>Devdatt Nagvekar</td>
<td>Chemistry; Fishel</td>
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<tr>
<td>Renate Ondris-Crawford</td>
<td>Physics/LCI; Doane; DARPA/URI-UPenn</td>
</tr>
<tr>
<td>Sung-Sik Pak</td>
<td>Physics/LCI; Saupe; NSF DMR89-03453</td>
</tr>
<tr>
<td>Prem Patel</td>
<td>Physics/LCI; Kumar</td>
</tr>
<tr>
<td>Moin Sarkar</td>
<td>Physics; Spielberg</td>
</tr>
<tr>
<td>Desmond Seekola</td>
<td>Physics/LCI; Kelly; DARPA/URI-UPenn</td>
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<tr>
<td>Sung-Tae Shin</td>
<td>Physics; Kumar; ALCOM</td>
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<tr>
<td>Wen Chen Su</td>
<td>Chemistry; Fishel</td>
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<td>Daphne Taylor</td>
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<td>Wei Wu</td>
<td>Physics/LCI; Kelly; DARPA-NCIPT</td>
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<tr>
<td>Gang Xu</td>
<td>Physics; Johnson; NSF DMR87-03542</td>
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<tr>
<td>Zhengkui Xie</td>
<td>Physics/LCI; Palffy</td>
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<tr>
<td>Linghong Xie</td>
<td>Chemistry; Chien; ALCOM-ODD</td>
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<tr>
<td>Hai-Tian Yang</td>
<td>Physics/LCI; Allender; DARPA/URI-UPenn</td>
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<tr>
<td>Haiji Yuan</td>
<td>Physics/LCI; Palffy; DARPA/Army</td>
</tr>
<tr>
<td>Student</td>
<td>Title</td>
</tr>
<tr>
<td>-----------------------</td>
<td>----------------------------------------------------------------------</td>
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<tr>
<td>Ravi Subramaniam</td>
<td>&quot;Quantum Simulations of the Ground State Electronic Structure of Diatomic Molecules&quot;</td>
</tr>
<tr>
<td>Sundar Subramanyam</td>
<td>&quot;Liquid Crystal Containing the Dibenzo-pyran Nucleus: Synthesis and Mesomorphic Properties of 30(4-n-Alkoxy-benzyliden-famino) Dibenzo[b,d] Pyrans&quot;</td>
</tr>
<tr>
<td>James L. Gleeson</td>
<td>&quot;Instabilities During Directional Solidification of a Transparent Material&quot;</td>
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Table 4
GRANTS AND CONTRACTS

Key

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<tbody>
<tr>
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<td>b. Grant/Contract Number</td>
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<td>c. Period</td>
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<td>d. Initial/Renewal/Other</td>
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<tr>
<td>e. Amount</td>
</tr>
<tr>
<td>f. Principal Investigator(s)/Project Director</td>
</tr>
<tr>
<td>g. Faculty Associates</td>
</tr>
<tr>
<td>h. Research Associates</td>
</tr>
<tr>
<td>i. Dissertation Student(s) Involved in Research</td>
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1. Optical Power Limiting Liquid Crystal Composites
a. US Army Communications Electronic Command
b. BAA-DAAB0707–88–C-F421
c. August 1988–August 1992
d. Continuation
e. $350,000 per year
f. M.A. Lee, P. Palffy-Muhoray
g. D.W. Allender, L.-C. Chien
h. Le Li
i. H. Yuan

2. Microdroplet Technology Research
a. Tektronix
b. October 87–October 88
d. No-cost continuation
e. $15,000
f. J.W. Doane, J.L. West
i. Y. Fung
### 3. The Science and Application of Polymer Liquid Crystals and Related Materials
   a. DARPA URI/Navy-University of Pennsylvania
   b. N00014–86K-0766
   d. Continuation (Years 4 and 5; 3 month extension)
   e. $350,000
   f. J.W. Doane, PD; A. Saupe, D.L. Johnson, R. Gilpin
   g. J.L. West, D.W. Allender, J.R. Kelly, L.-C. Chien
   h. J.W. McCargar, G. Magyar, A. Jakli, C. Lin, H. Vithana, V. Surendranath; M. Jaroniec, R. Sridharan, L. Wu

### 4. High-Definition Displays
   a. DARPA (subcontract through University of Pennsylvania)
   b. N00014–90–J-1559
   d. New
   e. $227,000
   f. J.W. Doane, J.L. West, J.R. Kelly
   g. R. Akins, V. Hill
   i. Y. Ji, W. Wu

### 5. Condensed-Matter
   a. Ohio Board of Regents, Academic Challenge (S. Kumar, D. Finotello)
   c. 1989–1991 biennium
   d. Continuation
   e. $720,000

### 6. Display Prototyping Unit
   a. GAR Foundation, Akron
   e. $500,000 (Equipment funds)
   f. J.W. Doane, J.R. Kelly

### 7. Thermal and Optical Studies of Liquid Crystal Phases and Phase Transitions
   a. National Science Foundation, Division of Materials Research
   b. NSF DMR87–03524
   c. May 1989–May 1990
   d. No-cost extension
   e. $100,600
   f. D.L. Johnson
   i. G. Xu
Table 4. Grants and Contracts

8. Physical Properties of Amphiphilic Nematics
   a. National Science Foundation, Division of Materials Research
   b. NSF DMR89–03453
   d. Renewal (2 years)
   e. $146,500
   f. A. Saupe
   h. W. Wedler
   i. J. Liu, S. Pak

9. Basic Studies of Polymer Dispersed Liquid Crystals
   a. National Science Foundation, Division of Materials Research
   b. NSF DMR88–17647
   d. Continuation (Years 2 and 3 of 3)
   e. $86,240; $88,000
   f. J.W. Doane
   g. D.W. Allender
   h. D.K. Yang
   i. G.P. Crawford

10. Liquid Crystal Synthesis
   a. National Science Foundation, Division of Materials Research
   b. NSF DMR88–18561
   d. Continuation (Years 2 and 3 of 3)
   e. $88,200; $90,000
   h. V. Surendranath, I.G. Shenouda

11. X-ray and Neutron Scattering Study of Structure and Fluctuation Phenomena in Side-Chain Liquid Crystals
   a. National Science Foundation, Division of Materials Research
   b. NSF DMR89–19680
   d. Initial
   e. $96,100
   f. S. Kumar
   i. Li Chen
Table 4. Grants and Contracts

12. Statistics and Dynamics of Ripple Phases in Liquid Crystal Films
   a. U.S.-Israel Binational Science Foundation
   c. $18,000
   d. R. Hornreich (Weizmann Institute); D.W. Allender, D.L. Johnson

13. Polymer Liquid Crystal Synthesis Program
   a. Ohio Board of Regents, Research Challenge
   b. 1989–1991 Biennium
   c. $100,000
   d. J.W. Doane, J.L. West

14. Magnascreen Research
   a. Magnascreen Corp.
   b. 1991
   c. $69,675
   d. J.L. West
   e. J. Franci

15. National Center for Integrated Photonic Technology (NCIPT)
   a. DARPA (Consortium of USC, UCLA, KSU, MIT and Columbia)
   b. MDA972–90–C-0037, Subcontract 542381
   c. March 1990–March 1993
   d. $1,217,200
   e. J.W. Doane, J.L. West, J.R. Kelly, P. Palffy-Muhoray
   f. L.-C. Chien
   g. P.M. Dunn, C. Citano

16. Center for Advanced Liquid Crystalline Optical Materials (ALCOM)
   Consortium of KSU, Case Western Reserve University, and The University of Akron
   a. National Science Foundation, Science and Technology Centers
   b. NSF DMR89–20147
   d. Initial (5 years)
   e. $1,000,000 (54% KSU; 33% CWRU; 12% UA)
   f. J.W. Doane, Director; D.W. Allender, D. Finotello, D.L. Johnson, S. Kumar, M.A. Lee,
      Physics; L.-C. Chien, J.R. Kelly, M.E. Neubert, P. Palffy-Muhoray, A. Sause,
      J.L. West, LCI; P. Farrell, E.C. Gartland, Jr., A. Ruttan, R.S. Varga, P. Wang,
      Math/CS. J.L. Koenig, Associate Director, J. Blackwell, W. Gordon, A. Jamieson,
      J.B. Lando, J.A. Mann, R.G. Petschek, C. Rosenblatt, D. Schuele, P.L. Taylor,
      S.Q. Wang, CWRU. S. Cheng, F.W. Harris, T. Kyu, UA
   g. S.W. McCargar
   h. S. Shin
Table 4. Grants and Contracts

17. ALCOM Support
a. Ohio Department of Development
c. Initial (Year 1 of 3)
d. $500,000 (54% KSU; 33% CWRU; 12% UA)
e. G. Magyar
f. G. Iannacchione, J.Y. Kim, L. Xie

18. ACOM Support
a. Edison Polymer Innovation Corporation
c. Initial (Year 1 of 5) (54% KSU; 33% CWRU; 12% UA)
d. $300,000
f. J.W. Doane

19. ALCOM Administrative Support
a. Edison Polymer Innovation Corporation
c. Initial (Year 1 of 5) (54% KSU; 33% CWRU; 12% UA)
e. $60,000
f. J.W. Doane
h. Dr. E.C. Carnes

20. ALCOM Equipment Support
a. Ohio Board of Regents
c. Initial (Year 1 of 2) (54% KSU; 33% CWRU; 12% UA)
e. $1,500,000
f. J.W. Doane

21. Tektronix Fellowship
a. Tektronix Corp.
c. $16,992
f. J.L. West
i. D.S. Fredley

22. Feasibility Study for Ferroelectric Smectic C Liquid Crystals and Polymer Dispersions
a. Ajinomoto Corp.
c. 1991
e. $50,000
f. S. Kumar, J.W. Doane
i. J. Mang
23. Liquid Crystal Research
   a. Vari-Lite
   c. 1991
   e. $60,000
   f. J.W. Doane
   i. W. Fritz

   a. AFOSR and National Science Foundation
   b. AFOSR-91-0202
   d. Initial
   e. $103,319
   f. D.S. Moroi
   i. N. Amarasinghe
Table 5
PROPOSALS FOR EXTRAMURAL SUPPORT

Key

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<thead>
<tr>
<th>Title</th>
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<tbody>
<tr>
<td>a. Agency</td>
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<td>b. Period</td>
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<td>c. Initial/Renewal/Other</td>
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<td>d. Amount</td>
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<tr>
<td>e. Principal Investigator(s)/Project Director</td>
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<tr>
<td>f. Faculty Associates</td>
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<tr>
<td>g. Research Associates</td>
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<tr>
<td>h. Dissertation Student(s) Involved in Research</td>
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<tr>
<td>i. Status</td>
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1. **Melting in 2–1/2 Dimensions: A System of Magnetic Dipoles**
   a. US-Israel Binational Science Foundation and Israeli Academy of Sciences
   c. Renewal
   d. $25,000
   e. R.M. Hornreich and D.W. Allender
   i. Pending

2. **High Performance Liquid Crystal Epoxy Polymers**
   a. DARPA/ONR Chemistry Division, Polymer Chemistry Program
   b. 3 years
   c. Initial
   d. $326,315
   e. L.-C. Chien
   i. Not awarded

3. **Liquid Crystalline Epoxy Polymers and Networks for PDLC Applications**
   a. Army Research Office, Materials Science Division, Smart Materials Program
   b. 3 years
   c. Initial
   d. $344,376
   e. L.-C. Chien
   i. Not awarded
Table 5. Proposals for Extramural Support

4. PDLC Materials Development for the Active Matrix Flat Panel Display
   a. DARPA High Definition Display Technology Program
   b. 1991
   d. $227,000
   e. J.W. Doane, J.L. West and J.R. Kelly
   i. Awarded

5. PDLC’s for High Definition Display Technologies
   a. DARPA High Definition Display Technology Program
   b. 2 years
   c. Initial
   d. $1,147,000
   e. J.W. Doane, J.L. West and J.R. Kelly
   i. Awarded $1,147,000 for 3 years (Sept. 1991–Aug. 1994)

6. Basic Studies of PDLC’s
   a. National Science Foundation, Division of Materials Research
   b. 3 years (1992–1994)
   c. Renewal
   d. $300,000
   e. J.W. Doane
   f. D.W. Allender
   h. R. Ondris-Crawford
   i. Pending

7. Electric Field Response of Polymer-Dispersed Liquid Crystals
   a. National Science Foundation
   b. 3 years (1992–1994)
   c. Renewal
   d. $199,350
   e. J.R. Kelly
   i. Pending

8. Liquid Crystal Synthesis
   a. National Science Foundation, Division of Materials Research
   b. 3 years (1992–1994)
   c. Renewal
   d. $486,370
   e. M.E. Neubert and L.-C. Chien
   i. Pending
9. Feasibility Study for Ferroelectric Smectic C* Liquid Crystals in Polymer Dispersions
   a. Ajinomoto Corp.
   b. 1991
   d. $50,000
   e. S. Kumar and J.W. Doane
   h. J. Mang
   i. Awarded

    a. AFOSR and NSF
    d. $286,820
    e. D.S. Moroi
    h. N. Amarasinghe
    i. Awarded $103,319

11. XPS Studies of Liquid Crystal Alignment Layers
    a. Army Research Office
    d. $648,933
    e. J. Fulghum and J.L. West
    i. Not awarded

12. XPS Analysis of Liquid Crystal Alignment Layers
    a. Keck Foundation
    d. $400,000
    e. J. Fulghum and J.L. West
    i. Pending

13. X-ray Diffraction Study of Structure and Phase Transitions in Liquid Crystals
    a. National Science Foundation, Division of Materials Research
    c. Renewal
    d. $300,000
    e. S. Kumar
    i. Pending
Table 5. Proposals for Extramural Support

14. Midwestern Universities Collaborative Access (MUCAT) Team Beam Line
   a. Argonne National Laboratory, Advanced Photon Source
   b. 1991–1996
   c. Initial
   d. $5.7 million
   e. D. Lynch, Iowa State University, PD; S. Kumar, KSU P.I.
   i. Pending

15. Comprehensive Theoretical Model of High-Definition Liquid Crystal Display Optical Performance
   a. DARPA-HDDT Program
   d. $229,695
   e. M.A. Lee and K. Quader
   i. Awarded
Table 6
RESEARCH SUPPORT AWARDS

Key

<table>
<thead>
<tr>
<th>Title</th>
<th>a. Agency</th>
<th>b. Recipient</th>
<th>c. Period</th>
<th>d. Type of Award</th>
</tr>
</thead>
</table>

1. Heat Capacity and Dielectric Constant Measurements in Confined Liquid Crystals
a. KSU Research Office
b. D. Finotello
c. Summer 1991
d. Summer Research Award

2. Calorimeter
a. KSU Research Office
b. D. Finotello
c. March 1991
d. Equipment support $5,000; partial)

3. SANS Studies of Polymer Liquid Crystals
a. National Institute of Standards and Technology
b. S. Kumar; J. Mang, P. Patel
c. March 1991
d. Beam time awarded

4. SANS Beam Time
a. Los Alamos National Laboratory
b. S. Kumar; J. Mang, P. Patel
c. April 1991–April 1992
d. Beam time awarded

Visiting Research Scholar
a. Argonne National Laboratory
b. D.L. Fishel
c. Summer 1991 residence; 91–91 AY
d. Mass-spec analysis
Table 7
PUBLICATIONS BY LCI MEMBERS

David W. Allender


L.C. Chien


J. William Doane


Table 7. Publications by LCI Members


**Daniele Finotello**


**Derry L. Fishel**


**Edward Gelerinter**


**Roger K. Gilpin**


**Jack Kelly**


**Satyendra Kumar**


**Michael A. Lee**

Table 7. Publications by LCI Members

Mary E. Neubert


Peter Palfy-Muhoray


Table 7. Publications by LCI Members

Alfred Saupe


Chun-che Tsai


John L. West


Patents Issued


Table 8
PRESENTATIONS BY LCI MEMBERS

Underscore indicates presenter.

David W. Allender


L.-C. Chien


J.William Doane


"Formation of Haze-free Polymer Dispersed Liquid Crystals (PDLC)," 13th ILCC, J.L. West, D.S. Fredley and J.W. Doane.
Table 8. Presentations by LCI Members


“Introduction to PDLC’s” and “Advanced PDLC Materials and Devices,” APS Tutorial on “Science and Applications of Polymer Dispersed Liquid Crystals (PDLC),” APS 1991 March Meeting, Cincinnati.


Daniele Finotello


Derry L. Fishel

Table 8. Presentations by LCI Members


Roger L. Gilpin


David L. Johnson


Jack R. Kelly


Table 8. Presentations by LCI Members

“Shielding Effects due to Interfacial Charge Buildup in a PDLC Film,” APS March Meeting, D. Seekola and J.R. Kelly.

Satyendra Kumar


Michael A. Lee


Mary E. Neubert


Peter Palffy-Muhoray

Table 8. Presentations by LCI Members


“Mean Field Theory of Spatially Inhomogeneous Nematic Liquid Crystals,” 13th ILCC, P. Palffy-Muhoray and A. Saupe.


“Tunneling Resistivity, Scale Invariance and the Petersburg Paradox,” XX Winter Meeting on Statisical Physics, Cuernava, Mexico, Jan. 1991 (invited).


Table 8. Presentations by LCI Members


Alfred Saupe

"Linear Electromechanical Effects in an S\textsubscript{C}* Liquid Crystal," 13th International Liquid Crystal Conference, Vancouver, B.C., July 1990 (13th ILCC), A. Jakli and A. Saupe.


"Experimental Investigations of the Nematic Liquid Crystal Phases of the Micellar System Tetradecyltrimethylammonium bromide/decanol/H\textsubscript{2}O," 13th ILCC, S.Y. Xu, P. Photinos and A. Saupe.


Nathan Spielberg

"Further X-ray Studies of Mesophase Structure of Hexakis(alkylsulfono)benzene and Tribenzocyclononene Homologues," 13th International Liquid Crystal Conference, Vancouver,
Table 8. Presentations by LCI Members


John L. West

Table 9
ACADEMIC AND OTHER PRESENTATIONS

David W. Allender


L.-C. Chien


“Liquid Crystalline Epoxies for PDLC Applications,” ALCOM PLCD Symposium, L.-C. Chien.

J.W. Doane

“Polymer Dispersions in High Definition Spatial Light Modulators,” NCIPT Workshop, MIT, Nov. 5, 1990.


Daniele Finotello

Table 9. Academic and Other Presentations

Jack R. Kelly

“Shielding Effects due to Interfacial Charge Buildup in a PDLC Film,” ALCOM PLCD Symposium, D. Seekola and J. Kelly.

Michael A. Lee

“Nonlinear Optics of Liquid Crystals,” Liquid Crystal Symposium at the Centennial Meeting of the Ohio Academy of Science, Ohio State University, Columbus, April 26, 1991, M.A. Lee and P. Palfy-Muhoray.

Mary E. Neubert

“Glenn H. Brown,” Organizer and Moderator for Liquid Crystal Symposium, Centennial Meeting of the Ohio Academy of Sciences, Ohio State University, Columbus, April 26, 1991.

Peter Palfy-Muhoray

“Nonlinear Optics of Liquid Crystals” and “Inhomogeneous Liquid Crystal Systems,” University of Ljubljana, Yugoslavia, Oct. 8 and 9, 1990.
“Tunnelling Resistivity, Scale Invariance and the Petersburg Paradox,” Department of Physics, University of Akron, March 5, 1991.
“Fingers, Dendrites and Filaments: Pattern Formation in Liquid Crystals,” Liquid Crystal Symposium at the Centennial Meeting of the Ohio Academy of Science, Ohio State University, Columbus, April 26, 1991.
“Nonlinear Optics of Liquid Crystals,” Liquid Crystal Symposium at the Centennial Meeting of the Ohio Academy of Science, Ohio State University, Columbus, April 26, 1991, M.A. Lee and P. Palffy-Muhoray.

Alfred Saupe

“Nematic States and Phase Transitions in Surfactant Solutions, Karl Marx University, Leipzig, Germany, May 29, 1990 (not reported last year).
“Micellar Liquid Crystalline Phases, Properties and Textures.” Martin Luther University, Halle, Germany, May 31, 1990 (not reported last year).
“Viscous and Elastic Properties of Micellar Liquid Crystal Phase Transitions,” Siegen University, Germany, June 11, 1990 (not reported last year).

John L. West

“Polymer Dispersed Liquid Crystals: New Developments,” Seminar on Liquid Crystals, Centennial Meeting of Ohio Academy of Science, Ohio State University, Columbus, April 26, 1991.
“Characterization of Liquid Crystal Epoxies,” ALCOM PLCD Symposium, D.S. Fredley and J.L. West.
“Infrared PDLC’s,” ALCOM PLCD Symposium, J.W. McCargar and J.L. West.
Table 9. Academic and Other Presentations


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<thead>
<tr>
<th>Date</th>
<th>Speaker</th>
<th>Title</th>
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<tbody>
<tr>
<td>August 8</td>
<td>Dr. Robert Blinc</td>
<td>&quot;Microscopic Model for Ferroelectric Liquid Crystals&quot;</td>
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<tr>
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<td>Jozef Stefan Institute</td>
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<td>University of Ljubljana, Yugoslavia</td>
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<tr>
<td>August 20</td>
<td>Dr. C. L. Khetrapal</td>
<td>&quot;Recent Aspects of NMR of Liquid Crystals&quot;</td>
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<td>Bangalore, India</td>
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<td>September 12</td>
<td>Mr. Leo Holmberg, Manager</td>
<td>&quot;PC Internet Networking and Unix Workstations&quot;</td>
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<td>September 26</td>
<td>Dr. Jeffrey Richards</td>
<td>&quot;Optical Processing Pattern Recognition&quot;</td>
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<tr>
<td>October 3</td>
<td>Professor Paul Wang</td>
<td>&quot;Advances in Integrating Symbolic, Numeric and Graphics Computing&quot;</td>
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<tr>
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<td>Dept. of Mathematical Sciences</td>
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<tr>
<td>October 10</td>
<td>Dr. Eugene P. Janulis</td>
<td>&quot;Fluorinated Liquid Crystals&quot;</td>
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<td>St. Paul, Minnesota</td>
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<td>October 17</td>
<td>Professor Stephen Z. D. Cheng</td>
<td>&quot;Thermotropic and Lyotropic Liquid Crystal Polymers&quot;</td>
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<td>Institute of Polymer Science</td>
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<tr>
<td>October 24</td>
<td>Professor Jack L. Koenig</td>
<td>&quot;Solid State NMR of Polymer Liquid Crystals&quot;</td>
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<td>Dept. of Macromolecular Science</td>
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<tr>
<td>October 31</td>
<td>Professor Don Sullivan</td>
<td>&quot;Theory of Wetting and Orientational Transitions at Free Surfaces of Liquid Crystals&quot;</td>
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<td>November 2</td>
<td>Professor William H. Steier</td>
<td>&quot;NLO of Organic Materials&quot;</td>
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<td>November 7</td>
<td>Professor Jerome B. Lando</td>
<td>Dept. of Macromolecular Science</td>
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<td>November 8</td>
<td>Dr. Timothy D. Shaffer</td>
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<td>November 9</td>
<td>Professor Gina Hoatson</td>
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<td>November 14</td>
<td>Professor Thein Kyu</td>
<td>Dept. of Polymer Engineering</td>
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<td>November 28</td>
<td>Professor Art Epstein</td>
<td>Department of Physics</td>
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<td>Ohio State University</td>
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<td>November 29</td>
<td>Dr. Philip D. Hampton</td>
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<td>December 4</td>
<td>Professor K. D. Singer</td>
<td>Department of Physics</td>
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<td>December 5</td>
<td>Professor D. K. Cohoon</td>
<td>Dept. of Mathematical Sciences</td>
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<td>West Chester University of PA</td>
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<td>December 6</td>
<td>Dr. Yan Sun</td>
<td>University of Pennsylvania</td>
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<td>December 17</td>
<td>Dr. Long Y. Chiang</td>
<td>Exxon Research and Engineering</td>
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<td>Annandale, New Jersey</td>
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<td>January 30</td>
<td>Dr. Harvey Scher</td>
<td>BP Research</td>
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<td>February 6</td>
<td>Professor Alexander Jamieson</td>
<td>&quot;Viscoelastic Properties of Side-Chain LCPs in Nematic Solvent&quot;</td>
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<td>February 13</td>
<td>Professor Frank W. Harris</td>
<td>&quot;Synthesis and Properties of Organic Soluble Rigid-Rod Polymers&quot;</td>
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<td>February 15</td>
<td>Dr. Jane LeGrange</td>
<td>&quot;Pattern Formation and Wetting Observations of a Langmuir Monolayer&quot;</td>
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<td>March 1</td>
<td>Dr. X. Y. Wang,</td>
<td>&quot;The Brochard Wall in Liquid Crystals&quot;</td>
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<td>March 4</td>
<td>Dr. Ulrich Finkenzeller</td>
<td>Liquid Crystals: Phases, Faces and the Black Forest</td>
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<td>March 6</td>
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<td>&quot;Arbitrary Fourier-Transform Liquid Crystal Light Modulator&quot;</td>
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<td>March 7</td>
<td>Dr. Mitchell Luskin</td>
<td>&quot;Defects and Instabilities in Liquid Crystals&quot;</td>
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<td>March 13</td>
<td>Professor Charles Rosenblatt</td>
<td>&quot;Magnets and Molecules: Liquid Crystal and Other Systems in High</td>
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<td>April 3</td>
<td>Dr. G. Paul Montgomery, Jr.</td>
<td>&quot;PDLC Films for Solar Control&quot;</td>
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<td>April 10</td>
<td>Dr. Adrian Kitai</td>
<td>&quot;Developments in Hot Electron Luminescent Devices&quot;</td>
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<tr>
<td>April 17</td>
<td>Professor Kenneth Singer</td>
<td>Department of Physics</td>
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<tr>
<td>April 24</td>
<td>Dr. Mahinda Gangoda</td>
<td>Department of Chemistry</td>
</tr>
<tr>
<td>May 1</td>
<td>Professor David Andereck</td>
<td>Department of Physics</td>
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<tr>
<td>May 13</td>
<td>Dr. Akihiro Mochizuki</td>
<td>Organic Materials Lab</td>
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<tr>
<td>May 15</td>
<td>Dr. Shunsuke Kobayashi</td>
<td>Tokyo University of Agriculture and Technology</td>
</tr>
<tr>
<td>Date</td>
<td>Visitor</td>
<td>Address</td>
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<td>1990</td>
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<tr>
<td>July 14</td>
<td>Michael Savaguan</td>
<td>W.H. Brady Co., Milwaukee, WI</td>
</tr>
<tr>
<td>July 18-19</td>
<td>Rusty Brutsche</td>
<td>Vari-Lite, Inc., Dallas, TX</td>
</tr>
<tr>
<td>July 19</td>
<td>Thomas P. Dowling</td>
<td>Morgan &amp; Finnegan, New York, NY</td>
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<tr>
<td>July 20</td>
<td>Quinten Kroes</td>
<td>University of Twente, The Netherlands</td>
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<tr>
<td>July 23</td>
<td>Senri Miyaska</td>
<td>SONY Research Center</td>
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<tr>
<td></td>
<td>Seiichi Arakawa</td>
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<tr>
<td>August 3</td>
<td>Jon Deex</td>
<td>Zero Corp.</td>
</tr>
<tr>
<td>August 3</td>
<td>Frank Allan</td>
<td>EM Industries, Hawthorne NY</td>
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<tr>
<td>August 9</td>
<td>Yung Fu Chang</td>
<td>Telxon Corp.</td>
</tr>
<tr>
<td>August 9</td>
<td>Pat O'Hara</td>
<td>W. C. Buntz Co.</td>
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<tr>
<td>August 14</td>
<td>Michael Savaguan</td>
<td>W. H. Brady Co., Milwaukee, WI</td>
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<tr>
<td>August 17</td>
<td>Dr. Kazutami</td>
<td>Ajinomoto Co., Teaneck, NJ</td>
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<tr>
<td>September 13</td>
<td>Sakamoto</td>
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<td>February 24</td>
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<tr>
<td>April 5</td>
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<tr>
<td>August 25</td>
<td>Dr. David Casasent</td>
<td>Carnegie Mellon U., Pittsburgh PA</td>
</tr>
<tr>
<td></td>
<td>Dr. Neil H. Carnob</td>
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<tr>
<td>September 10</td>
<td>Dr. V. Pierimattie</td>
<td>Aristech Chemical Corp.</td>
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<tr>
<td>September 13</td>
<td>R. A. Dunbar</td>
<td>Walter Kidde, Swampscott, MA</td>
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<td>R. E. Glaser</td>
<td>Walter Kidde, Wilson, NC</td>
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36
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<tr>
<td>September 25</td>
<td>Dr. Jeffrey Richards</td>
<td>Packard Electric, Warren OH</td>
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<td>September 26</td>
<td>Dr. Howard Mettee, Dr. Duan F. Rost, Dr. J. D. Bakos, Jr.</td>
<td>Youngstown State U., Youngstown OH</td>
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<tr>
<td>October 9</td>
<td>Sudi Kulkami</td>
<td>Tektronix</td>
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<td>John Carter</td>
<td>Goodyear</td>
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<td>October 12</td>
<td>Mr. Tohru Kashiwagi</td>
<td>Sumutomo Electronics</td>
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<td>October 12</td>
<td>Mr. William Marks</td>
<td>Hercules Aerospace</td>
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<td>October 24</td>
<td>Dr. Philip Gleckman</td>
<td>Microoptics Corp</td>
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<td>October 25</td>
<td>Dr. Dave Margerum, Dr. Anna Lackner</td>
<td>Hughes Research, Malibu CA</td>
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<tr>
<td>December 13, 1991</td>
<td>Dr. J. C. Lee</td>
<td>SAMSUNG, Sed, Korea</td>
</tr>
<tr>
<td>January 7</td>
<td>Dr. H. Hakemi</td>
<td>SNIA BPA, Italy</td>
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<tr>
<td>January 28</td>
<td>Dr. J. Murakami, Dr. T. Miyazaki</td>
<td>Socio Tsuso, Osaka, Japan</td>
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<td>January 30</td>
<td>Dr. Harvey Scher</td>
<td>BP Research, Cleveland OH</td>
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<tr>
<td>January 31</td>
<td>Dr. David Zelmon</td>
<td>Materials Lab, WPAFB</td>
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<tr>
<td>February 15</td>
<td>Dr. V. Pierimatti, Dr. Ray Hoffman</td>
<td>Aristech Chemical Corp</td>
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<tr>
<td>April 3</td>
<td>Dr. Kris Baranwal</td>
<td>Uniroyal Goodrich, Akron OH</td>
</tr>
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<td>February 18</td>
<td>Mr. Rodney Blose</td>
<td>Magnascreen</td>
</tr>
<tr>
<td>March 25</td>
<td>Dr. G Michael Turner</td>
<td>LeCroy</td>
</tr>
<tr>
<td>Date</td>
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<td>Company/Institution</td>
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<td>February 22</td>
<td>Dr. Neil Mazurek</td>
<td>Modular Display Systems</td>
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<td>March 4</td>
<td>Dr. Ulrich Finkenzeller</td>
<td>E MERCK, Darmstadt, Germany</td>
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<td>Dr. David Coates</td>
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<td>March 5</td>
<td>Mr. Fred Nobile</td>
<td>Peregrine Optical Systems</td>
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<td>March 5</td>
<td>Dr. Tom Rukavina</td>
<td>PPG Industries, Inc., Glass R&amp;D Center</td>
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<td>Dr. Ross Dowbenko</td>
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<td>March 15</td>
<td>Stephanie L. Kwalek</td>
<td>Wilmington DE</td>
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<td>Dr. Ralph Jerutka</td>
<td>W. H. Brady Co</td>
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<td>Stanley Strause</td>
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<td>Ralph P. Fergis</td>
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<td>Ray D. Hoffman</td>
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<td>John G. Geoffrey</td>
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<td>April 3</td>
<td>John C. Peers, Jr. T. A. Pegan</td>
<td>Materials Research Corp, Orangeburg NY</td>
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<td>April 3</td>
<td>Gerry Brown</td>
<td>State University of NY, Stony Brook NY</td>
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<td>Jim Gray</td>
<td>Warner Cable, North Dublin OH</td>
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<td>April 26</td>
<td>Hahn Torn</td>
<td>Royal Institute of Technology, Sweden</td>
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<td>May 13</td>
<td>Dr. Akihiro Mochizuki</td>
<td>Fugitsu Labs, Atsugi, Japan</td>
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<tr>
<td>Date</td>
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<td>Organization/Institution</td>
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<td>May 14</td>
<td>Japanese Display Scientists (14) led by Dr. S. Kobayashi</td>
<td>Fugitsu Kiden Ltd</td>
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<tr>
<td></td>
<td>Dr. Yoshikazu Yabe</td>
<td>Mitsubishi Petrochemical Co</td>
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<td>Dr. Kumio Kihara</td>
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<td></td>
<td>Dr. Shoji Yamaguchi</td>
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<td>May 14</td>
<td>Dr. S. K. De</td>
<td>ITT, Kharajpur, India</td>
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<td></td>
<td>Dr. A.N. Gent</td>
<td>University of Akron, Akron OH</td>
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<tr>
<td></td>
<td>Dr. Thein Kyu</td>
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<tr>
<td>May 21</td>
<td>Ms. Sharon Davis</td>
<td>Crystalloid</td>
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<td>May 29</td>
<td>James Stroh</td>
<td>LXD, Inc, Oakwood OH</td>
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<td>May 31</td>
<td>Dr. Dave Laughlin</td>
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<td>June 3</td>
<td>Dr. W. J. Marks</td>
<td>BFGoodrich Aerospace Display, Hatfield</td>
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<td>Dr. B. C. Derai</td>
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<td>Dr. K. Sakamoto</td>
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<td>Dr. Hundii P. Kamath</td>
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<td>Dr. David Coates</td>
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<td>Dr. Paul Drzaic</td>
<td>Taliq Corp</td>
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<td>Dr. B. Bahadur</td>
<td>Litton Data Images</td>
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<td>Dr. H. Takatsu</td>
<td>Dainippon Ink &amp; Chemical</td>
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<tr>
<td>June 14</td>
<td>Dr. David Margerum</td>
<td>Dr. Anna M. Lackner</td>
<td>Hughes Research, Malibu CA</td>
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<td>Dr. Werner Becker</td>
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<td>E MERCK, Darmstadt, Germany</td>
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<td>June 14</td>
<td>Dr. Kenji Hayashi</td>
<td>Dr. Tetsuo Oka</td>
<td>Toray Industries, Inc, Japan</td>
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<td>Dr. H. Morimoto</td>
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<td>Toray Co</td>
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<td>June 18</td>
<td>Dr. Yukiha Uemura</td>
<td>Dr. Seimei Yasui</td>
<td>Sumitomo Chemical Co</td>
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<td>Dr. Koichi Fujisama</td>
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<td>Dr. Rene Dedroit</td>
<td>Dr. J. F. Thomas</td>
<td>Glaverbel, Belgium</td>
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<td>Dr. Sharon Elliott</td>
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<td>June 24</td>
<td>Dr. P. H. J. Beatty</td>
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<td>Cambridge, United Kingdom</td>
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Table 12
EDUCATION AND PUBLIC SERVICE

Presentations


“Liquid Crystal TV and HDTV,” Society of Manufacturing Engineers, Kent State University, Nov. 15, 1990, J.L. West.


“Liquid Crystals,” Ford Middle School, Brook Park, OH, April 24, 1991, J.L. West and J.L. Koenig, CWRU.

The LCI responded to numerous requests from elementary, junior high, and high school students for information on liquid crystals for science projects. Dr. Derry Fishel serves as advisor to Chris Engstrom, a Bolivar High School chemistry student, who has used liquid crystal synthesis as the subject of various science fair projects.
Table 12. Education and Public Service

Educational Activities and Tours of LCI

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<tr>
<th>Date</th>
<th>School</th>
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<td>Week of July 16</td>
<td>KSU Creative Connections Half-day Classes, Monday-Friday</td>
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<td>Oct. 29, 1990</td>
<td>Coventry High School</td>
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<td>1991</td>
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<tr>
<td>April 2</td>
<td>East Elementary School</td>
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<tr>
<td>April 9</td>
<td>Rockside Elementary School</td>
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<td>April 10</td>
<td>Central Elementary</td>
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<tr>
<td>April 15</td>
<td>Scholarship in Escrow Group (7th and 8th graders)</td>
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<tr>
<td>April 18</td>
<td>Woodbury Elementary School</td>
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<td>April 19</td>
<td>Warrensville Heights High School</td>
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<td>April 24</td>
<td>Berea City Schools, 7th grade</td>
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<td>May 2</td>
<td>Suffield Elementary School</td>
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<td>May 15</td>
<td>Brimfield Elementary School</td>
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<tr>
<td>May 21</td>
<td>Scholarship in Escrow Group (7th and 8th graders)</td>
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<td>May 22</td>
<td>Dag Hammarskjold Elem. School</td>
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<td>June 20</td>
<td>Hudson Middle School</td>
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</table>

Dr. John L. West, Coordinator  
*Tour Guides*  
Gregory P. Crawford  
David S. Fredley  
Renate Ondris-Crawford
APPENDICES

I. FIRST ALCOM SYMPOSIUM

II. OHIO ACADEMY OF SCIENCES CENTENNIAL SYMPOSIUM

III. DOCTORAL DISSERTATIONS ON LIQUID CRYSTALS
The first ALCOM Symposium was held June 12–14, 1991 at the Sheraton Suites in Cuyahoga Falls. A total of 47 outside participants representing 34 companies attended the conference. Two representatives from Wright Patterson Air Force Base and Robert Reznik from NSF attended. Three visiting scientists participated in the symposium; Peter Crooker from the University of Hawaii, Robert Blinc and Sloboda Žumer from the University of Ljubljana. Lists of the outside participants, companies and invited speakers are included with this report.

A total of 24 papers were presented at the symposium. Of these papers, 9 were presented by ALCOM PI’s, 12 by industrial participants and 3 by the visiting scientists. Thirteen posters were presented by ALCOM undergraduate and graduate students and postdoctoral fellows. An overview of ALCOM and the Industrial Partnership Program was included in the symposium. Lists of the presented papers and posters are included with this report. A journal was made of the papers presented by ALCOM PI’s and all the posters. A copy of the journal is also included with this report.

During the symposium the ALCOM Advisory Board met and approved the Industrial Partnership Program and the ALCOM brochure.

We are sending a questionnaire to all outside participants and ALCOM PI’s to evaluate the symposium. We are also preparing suggested guidelines for organizing future symposia based on our experience from organizing the first symposium.
**POSTER PRESENTATIONS**

**Shielding Effects Due To Interfacial Charge Buildup in a PDLC Film**
D. Sekola, J. Kelly, Kent State University

**Wavelength Dependence of Scattering in PDLC Films: Droplet Size Effects**
W. Wu, J. Kelly, Kent State University

**The Application of FT-IR Microspectroscopy to Nematic Droplets in Polymer Dispersed Liquid Crystals**
C. McFarland, S. Wang, J. Koenig, Case Western Reserve University

**Motional Analysis of Polymer Dispersed Liquid Crystals**
K. Buchert, S. Wang, J. Koenig, Case Western Reserve University

**Anchoring Energies and $K_{24}$ in Polymer Dispersions**
G. Crawford, J. Doane, Kent State University

**Microscope Textures of Droplets**
R. Ondr{e}s-Crawford, E. Boyko, J. Doane, Kent State University,
S. Zumer, University of Ljubljana, J. Erdmann, Hughes Research Laboratory

**Thermoplastic Dispersions**
Y. Fung, D. Yang, J. Doane, Kent State University

**Optical Second Harmonic Generation by Polymer Dispersed Liquid Crystal Films**
L. Li, H. Yuan, P. Palffy-Muhoray, Kent State University

**Optical Field Induced Switching of Polymer Dispersed Liquid Crystal Films**
H. Yuan, L. Li, P. Palffy-Muhoray, Kent State University

**Infrared PDLCs**
J. McCarron, J. West, Kent State University

**Effect of Binder T$_g$ on PDLC Electro-optics**
K. Jewell, J. West, J. Kelly, Kent State University

**Effect of Thickness on PDLC Electro-optics**
R. Alke, J. West, Kent State University

**Phase Decomposition in Polymer Dispersed Liquid Crystals: Polymethyl Methacrylate/E7**
M. Mustafa, T. Kyu, University of Akron

**Confinement Effects on 5CB and 8CB: A Heat Capacity Study**
G. Iannacchione, G. Crawford, J. Doane, D. Finotello, Kent State University

**Orientation of Smectic-A And Ferroelectric Smectic-C* Layers in Cylindrical Pores**
J. Mang, S. Kumar, Kent State University

**The Effect of a Polymer Network on the Rotational Viscosity of Nematic Liquid Crystal**
A. Jakli, D. Kim, A. Saufe, Kent State University

**Comparison of Magnetic and Electric Field Induced Switching in Polymer Dispersed Liquid Crystal Films**
Z. Li, J.R. Kelly, P. Palffy-Muhoray, Kent State University and C. Rosenblatt, Case Western Reserve University

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**ALCOM SYMPOSIUM**

**Dispersions of Liquid Crystals and Polymers**
June 12–14, 1991
Sheraton Suites, Cuyahoga Falls, OH

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**Wednesday, June 12**

8:00 Registration, coffee and pastries
8:30 Welcome and ALCOM Update
J. Doane

Session I Chair: J. West

9:00 Emulsion-based Nematic Dispersions: The “Other” PDLC
P. Dragal, T. Czakor Corporation

9:25 Droplet Size Effects and Lighting Techniques in Direct-view PDLC Displays
A. Lackner, J. Erdmann, E. Sherman, J. Maroger, Hughes Research Laboratory

9:50 Modelling the Electro-Optic Response of PDLC Films
J. Kelly, P. Palffy-Muhoray, ALCOM

10:15 Coffee

Session II Chair: T. Kyu

10:35 A Calorimetric Determination of Fundamental Properties of Polymer-Dispersed Liquid Crystals
G. Smith, G. Ventouris, J. West, General Motors Research Lab.

11:00 Spectroscopic Characterization of PDLCs
J. Koenig, ALCOM

11:25 2D NMR in PDLC/FE LC PDLC
R. Blinc, J. Czakor Institute

11:50 Phase Separation Dynamics in Polymer Dispersed Liquid Crystals: Epoxies and E7
J. Kim, C. Cho, P. Palffy-Muhoray, M. Mustafa, T. Kyu, ALCOM

12:15 Lunch
**Liquid Crystals: A Tribute to Dr. Glenn H. Brown**

Arranged by: Dr. Mary E. Neubert
Chemist
Liquid Crystal Institute
Kent State University
Kent OH 44242
216/672-7999

Hosted by: Dr. James L. Marshall

We will honor Glenn H. Brown by presenting recent advances in liquid crystal research.

Friday, April 26, 1991
The Ohio State University
Room 142 Agricultural Engineering
590 Woody Hayes Drive

Mary E. Neubert, Presiding

1:15 PM
Professor Glenn H. Brown and the Liquid Crystal Institute

1:30 PM
Polymers-dispersed Liquid Crystal Films for Solar Energy Control
G. Paul Montgomery, Jr.
General Motors Research Laboratories

2:00 PM
Fingers, Dendrites and Filaments: Pattern Formation in Liquid Crystals
Peter Palfy-Muhoray
Kent State University

2:30 PM
The Cholesteric Blue Phases: The Importance of Fluctuations
Paul H. Keyes
Wayne State University

3:00 PM
Gel/Sol and Liquid-Crystalline Transitions in Solutions of Rigid-Rod Polymides
Frank W. Harris, S. K. Lee, S. L. Hsu, and S. Z. D. Cheng,
University of Akron

3:30 PM
Polymer-dispersed Liquid Crystals: New Developments
John L. West
Kent State University

4:00 PM
Nonlinear Optics of Liquid Crystals
Michael A. Lee
Kent State University

**Narcotic Receptors in Animals and Humans**

Arranged by: Dr. Juliana H. J. Brooks
Assistant Professor
OSU-Dept. of Anesthesiology
410 West 10th Ave, N-429 Doan
Columbus OH 43210
614/293-8487

Hosted by: Dr. James S. King

Our goal is to discuss and explore current and ongoing research on narcotic receptors, and the implications for practical applications.

Friday, April 26, 1991
The Ohio State University
Room 518 Arthur G. James Cancer Hospital
300 West Tenth Avenue

Juliana H. J. Brooks, Presiding

1:30 PM
Effects of Temperature and DTT on Human Peripheral Nerve Opioid Receptors
Juliana H. J. Brooks, Bhagwendas Gupta, G. Tejwani, and A. K. Rattan, The Ohio State University

1:45 PM
Decrease in the Hippocampal Kappa Opioid Receptors in Malignant Hyperpyrexia Pig
A. K. Rattan, M. Kolattukudy, J. S. McDonald and G. A. Tejwani, The Ohio State University

2:15 PM
Kappa-opioid Agonists and Phosphoinositide Turnover in Rat Brain
Sumudra Periyasamy, Wayne Hoss, and William S. Messer, Jr., The University of Toledo

2:45 PM
Effects of PMSF on Human Peripheral Nerve Opioid Receptors
J. H. J. Brooks, B. Gupta, G. Tejwani, and A. K. Rattan, The Ohio State University

3:00 PM
Opioid Peptides Endogenous in Human Peripheral Nerves
J. H. J. Brooks, B. Gupta, G. Tejwani, and A. K. Rattan, The Ohio State University
Appendix III

DOCTORAL DISSERTATIONS ON LIQUID CRYSTALS

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<td>1972</td>
<td>LESSER, DAVID Crystal Structure Analysis by X-ray of 2,2'-Dibromo-4,4'-bis-(p-methoxybenzyldencamino) Biphcynl.</td>
<td>Brown Chemistry</td>
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<td>1972</td>
<td>LEE, Y. S. An Ultrasonic Shear Wave Study of the Mechanical Properties of a Nematic Liquid Crystal</td>
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<td>12/72</td>
<td>WILSON, JACK Mössbauer Effect in a Smectic Liquid Crystal</td>
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*Executive Officer, AAPT, University of Maryland

*Employment, where known as of July
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<td>VISINTAINER JAMES Spin-Lattice Relaxation in the Nematic Liquid Crystalline Phase</td>
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<td>WISE, RAYMOND A Nuclear Magnetic Resonance Study of Smectic C Liquid Crystals</td>
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<td>PHOTINOS, PANAGIOTIS J., Mean Field Study of the Formation of Uniaxial Smectic Liquid Crystals with Polarized Layers. *Assistant Professor, Department of Physics, Southern Oregon State College, Ashland, OR 97520</td>
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<td>MORITZ, ELAN, A Class of Nonlinear Electrohydrodynamic Effects in a Nematic Liquid Crystal. *Research Scientist, U.S. Naval Coastal Systems, Panama City, Florida</td>
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<td>LOCKHART, THOMAS E. Indices of Refraction at Smectic A-Smectic C Phase Transitions.</td>
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<td>KTORIDES, PETROS Mössbauer Study of the Smectic Liquid Crystalline Glass Phase Using Sn-bearing Molecules.</td>
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<td>SHETTY, ANIL N. Molecular and Segmental Orientational Order in Thermotropic Liquid Crystals: An NMR Study.</td>
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*Assistant Professor, Stark Campus, Kent State University

*Assistant Professor, University of Wisconsin, Eau Claire

*Teaching, Cyprus

*Associate Professor, Lawrence Institute of Technology, Detroit

*Visiting Scientist, Liquid Crystal Institute, 1989-90

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*Applications Scientist, Siemens Medical Systems, Pittsburgh, PA
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*Research Scientist, S. C. Johnson, Racine, Wisconsin
*President, Optical Display Systems, Troy, Michigan
*Research Scientist, U. S. Naval Coastal Systems, Panama City, Florida
*Staff Scientist, RCA, Inc., Lancaster, Pennsylvania
*Research Scientist, Eglin Air Force Base, Fort Walton Beach, Florida
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*Research Scientist, U.S. Naval Coastal Systems, Panama City, Florida
*Postdoctoral Fellow, University of Texas, Austin
*Vice President for Development, Polytronix Inc., Richardson, Tex.
*Assistant Professor, Physics, Jeonbug National University, Korea
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<td>SUBRAMANYAM, SUNDAR: Liquid Crystal Containing the Dibenzopyran Nucleus: Synthesis and Mesomorphic Properties of 30(4-n-Alkoxybenzyliden-famino) Dibenzo[b,d] Pyrans</td>
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<td>*Research Scientist, NASA Lewis Research Center, Cleveland</td>
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<td>5/91</td>
<td>GLEESON, JAMES L.: Instabilities During Directional Solidification of a Transparent Material</td>
<td>Palffy-Muhoray</td>
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