SOCIETA’ ITALIANA CRISTALLI LIQUIDI

ITALIAN LIQUID CRYSTAL SOCIETY

Research Groups
### ANCONA

**PHOTOMAT**

Organic Materials for Optical Information Processing and Storage

| Site and full address: | Dipartimento di Fisica e Ingegneria dei Materiali e del Territorio Università di Ancona
Via Brecce Bianche, 60131 Ancona - Italy |
<table>
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<tbody>
<tr>
<td>Group Leader:</td>
<td>Francesco Simoni</td>
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<tr>
<td>Staff:</td>
<td>Oriano Francescangeli, Liana Lucchetti, Daniele E. Lucchetta, Vesna Stanic, Luigi Gobbi, Renato Marzocchini, Alessandro Manni (Graduate Student), Massimo Di Fabrizio (Graduate Student), Luigino Criante (Undergraduate Student)</td>
</tr>
<tr>
<td>Contact persons:</td>
<td>Francesco Simoni <a href="mailto:simoni@unian.it">simoni@unian.it</a>, Oriano Francescangeli <a href="mailto:france@unian.it">france@unian.it</a></td>
</tr>
</tbody>
</table>
| Present subjects of Research: | - Nonlinear optical properties of liquid crystals and polymers  
- Electro-optics of composite organic materials  
- Structure and morphology of polymeric matrices with nanosized domains of liquid crystals  
- Light-induced structural modifications in liquid crystalline materials  
- Structure of new polymeric and liquid crystalline materials  
- Real time holography for aberrations compensation  
- Recording of permanent binary and holographic images for optical storage applications  
- Optical patterning on composite materials for telecom applications  
- Spatial Light Modulation for optical information processing |
| Laboratories and facilities: | - Lab1 **Sample preparation**: standard apparatus for preparation and control of pre-aligned LC and composite samples  
- Lab2 **Laser Optics 1**: CW laser sources, Argon laser (2W@514nm), Diode pumped Nd laser (2W@532nm), He-Ne laser (35mW@632nm)  
- Lab3 **Laser Optics 2**: Q-switched Nd-Yag laser (200mJ@1063nm, 4ns pulse) with SHG and THG  
- Lab4 **X-Rays 1**: General Area Detector Diffraction System  
- Lab5 **X-Rays 2**: Powder Diffractometer equipped with stage for Reflectometry and Grazing Angle Diffraction  
- Lab6 **SEM**: Scanning Electron Microscope (Department Facility)  
- Lab7 **TEM**: Transmission Electron Microscope (Department Facility) |
<table>
<thead>
<tr>
<th>Selected publications of last three years:</th>
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BOLOGNA 1

<table>
<thead>
<tr>
<th>Site and full address:</th>
<th>Dipartimento di Chimica Fisica e Inorganica Universita' di Bologna, Viale Risorgimento 4, I-40136 Bologna, Italy home page: <a href="http://www.fci.unibo.it/~bebo/z/index.html">http://www.fci.unibo.it/~bebo/z/index.html</a></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(b) Istituto Nazionale di Fisica Nucleare, Sezione di Bologna, Via Irnerio 46, 40126 Bologna, Italy</td>
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<tr>
<td>Group Leader:</td>
<td>Claudio Zannoni</td>
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<tr>
<td>Staff:</td>
<td>Alberto Arcioni(a)</td>
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<td>Roberto Berardi(a)</td>
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<td></td>
<td>Corrado Bacchiocchi(a)</td>
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<td></td>
<td>Cesare Chiccoli (b)</td>
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<td>Silvia Orlandi(a)</td>
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<td></td>
<td>Luca Muccioli(a)</td>
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<td></td>
<td>Paolo Pasini (b)</td>
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<td></td>
<td>Matteo Ricci(a)</td>
</tr>
<tr>
<td>Contact persons:</td>
<td>Claudio Zannoni                                   <a href="mailto:Claudio.Zannoni@cineca.it">Claudio.Zannoni@cineca.it</a></td>
</tr>
<tr>
<td></td>
<td>Paolo Pasini                                          <a href="mailto:Paolo.Pasini@bo.infn.it">Paolo.Pasini@bo.infn.it</a></td>
</tr>
<tr>
<td>Present subjects of Research:</td>
<td>Computer Simulations of Liquid Crystals</td>
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<tr>
<td></td>
<td>o Lattice models are used to investigate bulk systems, model displays, defects. We are now studying nanoconfined systems, in particular the effects on order and memory of silica particles or polymer fibrils dispersed in nematics.</td>
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<tr>
<td></td>
<td>o Molecular resolution models are employed to study various bulk phases and their transitions. In particular we study the effect of changing molecular features (shape, dipole, quadrupole etc.) on liquid crystal properties. We use this to design molecular models for optimized or novel mesophases. Recently we have succeeded, by suitably combining repulsive and attractive interactions, in simulating a thermotropic biaxial nematic and a ferroelectric nematic designed from tapered molecules.</td>
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<tr>
<td></td>
<td>Development of Theories and Data Analysis Methodologies for the study of order and dynamics of liquid crystalline materials, including polymers and membranes with Fluorescence Depolarization, ESR, NMR, Dielectric Relaxation. E.g.</td>
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<td></td>
<td>o Energy Transfer experiments are modeled using computer simulations for rodlike and discotic systems to study the effect of phase organization on Forster transfer.</td>
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<tr>
<td></td>
<td>o ESR is used to study probes in nematic with dispersed aerosils and examine changes in order and dynamics.</td>
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</table>
### Group computational facilities:

- Silicon Graphics (SGI) Origin 200 system (12 processors (PE)): 4 R10000, 180 MHz PE, 512 Mb, 9Gb HD; 4 R10000, 220 MHz PE, 1024 Mb, 9Gb HD; 4 R12000, 270 MHz PE, 2048Mb, 36Gb HD.
- Silicon Graphics Origin 3800 (6 processors of the Cineca installation totalling 128 R14000 500 Mhz, 1Gb memory PE)
- cluster Linux (20 CPU AMD Athlon 1200MHz),
- cluster Linux (9 CPU AMD Athlon 700MHz),

### External computational facilities:

Access to the resources of CINECA Supercomputing Centre (http://www.cineca.it) based in Bologna: SGI Origin 3800 (128 CPU MIPS R14K 500Mhz), IBM SP4 (512 CPU POWER4 1100MHz), cluster Linux (128 CPU Intel Pentium III 1133MHz)

### Instrumental facilities:

- ESR: Bruker ESP300E spectrometer,
- Fluorescence: static (Perkin Elmer) and nanosecond time scale dynamics (Edinburgh Instr.) Single Photon Counting apparatus.

### Selected publications of last three years:

• Arcioni, C. Bacchiocchi, M. D’Elia, R. Tarroni and C. Zannoni - Order and Mobility of the Fluorescent Probe 1,6-Diphenylhexatriene in a Polyester Liquid Crystal Polymer - MOL. CRYST. LIQ. CRYST. 362, 279-288 (2001)

• Bacchiocchi, M. Brunelli and C. Zannoni - Energy transfer and orientational dynamics in isotropic and nematic phases. A computer simulation approach - CHEM.PHYS.LETT. 336, 253-261 (2001)


• Zannoni - Molecular design and computer simulations of novel mesophases - J. Mater. Chem. 11, 2637 - 2646 (2001)


• Arcioni, C. Bacchiocchi, L. Grossi, A. Nicolini and C. Zannoni - ESR studies of order and dynamics in a nematic liquid crystal containing a dispersed hydrophobic aerosil - J.PHYS. CHEM. (2002)
**BOLOGNA 2**

| Site and full address: | Alma Mater Studiorum – Università di Bologna  
Dipartimento di Chimica Organica “A. Mangini”  
Via S. Donato 15, 40127 Bologna (Italy) |
<table>
<thead>
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<tbody>
<tr>
<td>Group Leader:</td>
<td>Giovanni Gottarelli</td>
</tr>
</tbody>
</table>
| Staff:                 | Gian Piero Spada, Professor  
Stefano Masiero, Research Associate  
Silvia Pieraccini, Post-Doc  
Tatiana Giorgi, Graduate Student  
Riccardo Lobruto, Graduate Student  
Stefano Lena, Graduate Student |
| Contact persons:       | Giovanni Gottarelli gottarel@alma.unibo.it  
Gian Piero Spada gpspada@alma.unibo.it |
| Present subjects of Research: | Our group is interested in many subjects concerning the study of molecular and supramolecular chirality. In the field of Liquid Crystals we are interested in:  
a) the study of the induced cholesteric mesophases to obtain information about the chirality of the inducer; in most favourable cases, this type of research allows to obtain information about the absolute configuration and/or the preferred conformation of a chiral dopant dissolved in nematic phases;  
b) the self-recognition and self-assembly of guanine derivatives; these compound self-assemble to give different supramolecular objects whose structure depends on the nature of the compound, the solvent used, the temperature and the presence of salts; these supramolecular objects may form lyomesophase in organic solvents;  
c) the synthesis of chiral bis(azo) derivatives as potential molecular wires and photosensitive liquid crystals. |
| Laboratories and facilities: | Organic Syntesis Lab; Instrumental facilities (including 400 MHz NMR, FT-IR, Circular Dichroism Spectropolarimeter, Optical Microscopy). |
| Selected publications of last three years: |  
• G. Proni, G. P. Spada, P. Lustenberger, R. Welti and F. Diederich - Conformational analysis in solution of C₂-symmetric 1,1'-binaphthyl derivatives by circular dichroism spectroscopy and cholesteric induction in nematic mesophases - J. ORG. CHEM. |
65, 5522 (2000)


**COSENZA 1**

**LIQUID CRYSTALS GROUP**

<table>
<thead>
<tr>
<th>Site and full address:</th>
<th>Dipartimento di Fisica and INFM COSENZA- Università della Calabria, Ponte P. Bucci cubo 33B – 87036 Rende (CS) - Italy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group Leader:</strong></td>
<td>Roberto Bartolino</td>
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<tr>
<td><strong>Staff:</strong></td>
<td>Cesare Umeton (full professor)</td>
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<td></td>
<td>Lev M. Blinov (full professor)</td>
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<td></td>
<td>Andrei Th. Ionescu (full professor)</td>
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<td></td>
<td>Riccardo Barberi (associated professor)</td>
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<td></td>
<td>Gabriella Cipparrone (associated professor)</td>
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<td>Nicola Scaramuzza (associated professor)</td>
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<td>Carlo Versace (associated professor)</td>
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<td></td>
<td>Alfredo Mazzulla (contract researcher)</td>
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<td></td>
<td>Giuseppe Strangi (contract researcher)</td>
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<td></td>
<td>Michele Giocondo, (Researcher - Spin Off)</td>
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<td></td>
<td>Federica Ciuchi, (Researcher - Spin Off)</td>
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<td></td>
<td>Maria Iovane (Post Doc)</td>
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<td>Vincenzo Bruno (PhD student)</td>
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<td></td>
<td>Roberto Caputo (PhD student)</td>
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<td>Giovanni Carbone (Ph.D student)</td>
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<td>Antonio Checco (Ph.D student)</td>
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<td>Antonio De Luca (PhD student)</td>
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<td>Giuseppe Lombardo (Ph.D student)</td>
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<td>Marco Morabito (PhD student)</td>
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<td>Pasquale Pagliusi (PhD student)</td>
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<td>Grazia Russo (PhD student)</td>
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<td>Alessandro Veltri (PhD student)</td>
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<td>Bruno Zappone (Ph.D student)</td>
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<td></td>
<td>Stefano D’Elia (graduate student)</td>
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<td></td>
<td>Manuela Malara (Graduate student)</td>
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<td></td>
<td>Salvatore Marino (graduate student)</td>
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<td></td>
<td>Clementina Provenzano (graduate student)</td>
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<td></td>
<td>Massimo Sposato (Technician - Spin Off)</td>
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<td>Alfredo Pane (Technician - Spin Off)</td>
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<td></td>
<td>Bruno De Nardo (Technician)</td>
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<td></td>
<td>Carmine Prete (Technician)</td>
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<td><strong>Contact persons:</strong></td>
<td>Roberto Bartolino</td>
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<td>Tel. +39-098449-3902/6122</td>
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<td></td>
<td>Fax +39-0984 494401</td>
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<tr>
<td></td>
<td>Email: <a href="mailto:bartolino@fis.unical.it">bartolino@fis.unical.it</a></td>
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<tr>
<td></td>
<td>Cesare Umeton</td>
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<td>Tel. +39-098449-6117/6152</td>
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<td></td>
<td>Email: <a href="mailto:umeton@fis.unical.it">umeton@fis.unical.it</a></td>
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</table>
Present subjects of Research:

- Switchable holographic gratings in composite materials (PDLC) using alternative recording techniques
- Polarization and intensity holography.
- L.-B. films and thin films for polarimetric applications.
- Nonlinear dynamics and transition to chaos by means experiments in liquid crystals - Techniques for the control of the chaos.
- Diffraction gratings in multicomponent LC
- Spatial solitons in LC
- LC based devices for opto-electronics
- Picosecond optics in LC
- Optics and elasticity of liquid crystals
- Electrohydrodynamics of liquid crystals
- Dynamic light scattering
- Interaction between liquid crystals and mixed conductors.
- Piro- and piezo-electricity in composite materials.
- Flexoelectricity in liquid crystals.
- The study of stable ultrathin film assemblies with specific ordering at the supramolecular level and anisotropic microemulsion. Control of organisation at nanoscale, in fact, can lead to smart materials with unique physical properties. A wide class of low molecular mass and polymer materials will be used, like liquid crystals, side-chain polymers, azo-dye derivatives, hybrid block copolymers. Films and microemulsions of these materials are of fundamental importance in the context of the physics of low-dimensional and self-organising systems. Such highly ordered organic systems are of major interest in areas like information storage, non-linear and integrated optics, display applications. Prepared as thin films these materials may serve
as smart command surfaces and anisotropic coatings for electro-optical devices based on liquid crystals re-alignment and the breakdown of the continuous rotational symmetry of nematic liquid crystals in microemulsion may induce interesting optical, electro-optical and mechanical properties;

The development of bistable nematic devices working with surface bifurcations. We are here in a domain where academic research on modelization combined with basic experiments can lead to very important results to master the mechanisms implied on the proposed new family of surface controlled bistable displays. For all nematic electro-optical devices which use anchoring bifurcation, the "write" and "erase" mechanisms imply a delicate coupling of the surface anchoring bifurcation with shear flow: They are still not well-understood, thus an effort is necessary to model the surface bifurcation dynamics in presence of shear flows. The common previous experimental studies of Orsay and Cosenza on surface bifurcation of nematic anchoring have lead to two main patents on new surface controlled electro-optical devices [1,2]. These patents take full benefits of the fast surface relaxation dynamics. Their characteristic address time is very fast, in the range of 1-10 microseconds.

<table>
<thead>
<tr>
<th>Laboratories and facilities:</th>
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<tr>
<td>Two Argon Ion lasers</td>
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<tr>
<td>laser Nd-Yag Q-switched (II e III harmonics)</td>
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<tr>
<td>Photopolarimeter</td>
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<tr>
<td>Half leaky guided mode set-up.</td>
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<td>Nd:YAG picosecond laser</td>
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<td>Ar+ laser with UV lines</td>
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<td>Light beating spectroscopy (Brookhaven instruments)</td>
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<td>Photopolarimetry (home built four detector polarimeter)</td>
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<td>Spectroscopic Ellipsometry (Wollam M2000F)</td>
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<td>UV-VIS-NIR Spectrophotometer CARY 5E with LABSPHERE</td>
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<td>I and II harmonic spectrometric apparatus</td>
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<td>Laboratory for fundamental researches with polarizing optical microscopes with video acquisition, temperature control and fotometric acquisition; fast electronics for electro-optics; 2 SPM microscopes (AFM contact and non contact, STM, EFM); fast spectrofotometer with optical fibers for real time observations; equipped optical benches; He-Ne laser sources.</td>
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<tr>
<td>Technological laboratory with a large clean room equipped with surface treatments for liquid crystals alignment (Langmuir-Blodgett films, polymer coating, SiO evaporations, spin coating, rubbing machine,...); photolithography on glass plates-, facilities to build very thin cells down to 1.5 micron thickness.</td>
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<tr>
<th>Selected publications of last three years:</th>
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<tbody>
<tr>
<td>• G. Cipparrone, A. Mazzulla and G. Russo - Diffraction grating in PDLC recorded by means of polarization holographic technique - APPL. PHYS.LETT. 78, 1186 (2001)</td>
</tr>
<tr>
<td>• G. Cipparrone, A. Mazzulla P. Pagliusi A.V. Sukhov and</td>
</tr>
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</table>
R.F. Ushakov - Transient photoinduced current in dye-doped polymer and PDLC - J.O.S.A. B 18, 182 (2001)


<table>
<thead>
<tr>
<th>Authors</th>
<th>Title</th>
<th>Journal</th>
</tr>
</thead>
<tbody>
<tr>
<td>L. M. Blinov, R. Barberi, M. V. Kozlovsky, V. V. Lazarev and M. P. De Santo</td>
<td>Optical anisotropy and four possible orientations of a nematic liquid crystal on the same film of a photochromic chiral smectic polymer</td>
<td>J. NONLINEAR OPT. PHYS. &amp; MATERIALS 9, 1-10 (2000)</td>
</tr>
<tr>
<td>M. Iovane, A. L. Alexe-Ionescu, R. Barberi, J. J. Bonvent and M. Giocondo</td>
<td>A tool to control the nematic surface alignment: anchoring competition</td>
<td>MOL. CRYST. LIQ. CRYST. 360, 61 (2001)</td>
</tr>
<tr>
<td>V. V. Lazarev, R. Barberi, M. Iovane, L. Papalino and L. M. Blinov</td>
<td>Dynamics of liquid crystal azimuthal anchoring at a poly(vinylcinnamate) interface measured in situ during polarized UV light irradiation</td>
<td>LIQUID CRSYTALS 28, 273 (2002)</td>
</tr>
</tbody>
</table>
COSENZA 2

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I-87030 Arcavacata (CS) - Italia |
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<tbody>
<tr>
<td>Group Leader:</td>
<td>Mauro Ghedini</td>
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</tbody>
</table>
| Staff:                | Prof. Alessandra Crispini        
Prof. Daniela Pucci    
Dott. Iolinda Aiello    
Dott. Giovanna Barberio 
Dott. Anna Bellusci    
Dott. Davide Dattilo    
Dott. Anna Rita Grisolia 
Dott. Massimo La Deda  |
| Contact persons:      | Prof. Daniela Pucci             
d.pucci@unical.it        |
| Present subjects of  | Coordination chemistry in metal-mediated formation of liquid  
Research:              | crystals Synthesis and thermal, diffractometric and spectroscopic  
                        | characterization of luminescent metallomesogens.  
                        | Studies of supramolecular mesogenic associations. |
| Laboratories and      | NMR Spectrometer                 
facilities:            | X-Ray single crystal and powder diffractometers  
                        | Optical Polarizing Microscope with microfurnace  
                        | IR and UV/VIS Spectrophotometers  
                        | Spectrofluorimeter          
                        | CHNS Elemental Analyzer     
                        | Differential Scanning Calorimeters  
                        | Spinner for spin coating |
| Selected publications | M. Ghedini, D. Pucci, A. Crispini, G. Barberio, Oxidative   
of last three years:   | Addition To Cyclometalated Azobenzene Platinum(II)  
                        | Complexes: A Route To Octahedral Liquid Crystalline  
                        | Materials, ORGANOMetallicS 18, 2116 (1999)  
                        | F. Barigelletti, M. Ghedini, D. Pucci, M. La Deda, A  
                        | Mercurated Azobenzene Complex For Photoswitching Between Trans And Cis Form, CHEM. LETT., 297 (1999)  
                        | A. Crispini, D. Pucci, I. Aiello and M. Ghedini - Synthesis |
And Crystal Structure Of Dinuclear Cyclopalladated 1,2- And 1,3-Bridged Squarato Complexes - INORG. CHIM. ACTA. 304, 219 (2000)


- D. Pucci, O. Francescangeli and M. Ghedini - Heteroligand Palladium Complexes With One Or Two Chiral Centres - MOL. CRYST. LIQ. CRYST., 00 (2002)

- O. Francescangeli, C. Ferrero, D. Pucci and M. Ghedini - Variable Temperature Exafs Investigations In The Liquid Crystalline Phase Of The Cyclopalladated 4-4’-Bis(Hexyloxy)Azobenzene Acetylacetonate Complex - MOL. CRYST. LIQ. CRYST., 00 (2002)
COSENZA 3

| Site and full address: | Dipartimento di Chimica  
|                       | Università della Calabria  
|                       | Via P. Bucci, 87036 Rende |
| Group Leader:         | Attilio Golemme |
| Staff:                | Roberto Termine  
|                       | PhD Student  
|                       | Mara Talarico  
|                       | Research Fellow |
| Contact persons:      | Attilio Golemme  
|                       | a.golemme@unical.it  
|                       | Tel. +39 0984 492016 - Fax +39 0984 492044 |
| Present subjects of Research: | - Photorefractivity in liquid crystals |
| Laboratories and facilities: | - Set-up for Multiwave-mixing |
• R. Termine, B. C. De Simone and A. Golemme - Photorefractive Chiral Smectic A Phases - APPL. PHYS. LETT. 78, 688 (2001)  
• R. Termine and A. Golemme - Polymer-Dispersed Chiral Smectic A with Photorefractive Properties - OPT. LETT. 26, 1001 (2001)  
**COSENZA 4**

| **Site and full address:** | University of Calabria, Department of Chemistry  
Via Pietro Bucci, Cubo 15C, Arcavacata di Rende, 87036 CS |
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<tr>
<td><strong>Group Leader:</strong></td>
<td>Prof. Giuseppe Antonio Ranieri</td>
</tr>
</tbody>
</table>
| **Staff:** | Prof. Mario Terenzi  
Prof. Luigi Coppola  
Dott. Raffaella Gianferri  
Dott. Isabella Nicotera  
Dott. Cesare Oliviero |
| **Contact persons:** | Prof. Giuseppe Antonio Ranieri  
E-mail address: p.ranieri@unical.it  
Phone number: 0984/492021 |
| **Present subjects of Research:** | The research field of the Group is the structural characterization and the study of physical-chemical properties of Liquid Crystal systems. The NMR methods and particularly the PFG-NMR and rheological techniques are used to this purpose. Recently the systems Gemini (16-4-16)/water, STDC/water, Pluronic L64/p-xylene/water, C_{12}E_5/water and CTAB/water were investigated by NMR and rheology techniques. Additionally the study of the mechanical and conductivity properties of the electrolytes gel membranes based on PAN, ethylene carbonate and Lithium perchlorate was performed with the support of the CIPE Project. |
| **Laboratories and facilities:** | NMR 80 MHz, NMR 15 MHz, DSC, Optical microscopy, Conductimeter, Tensiometer, strain controlled Rheometer. |
- L.Coppola, A. Gordano, A. Procòpio and G. Sindona - Phase equilibria and Physical-Chemical Properties of Sugar-Based Surfactants in Aqueous Solutions - *COLLOIDS AND*
SURFACES A, 196 (2/3), 175 (2001)


**MILANO**

**Complex Fluids Laboratory c/o L.I.T.A.**

<table>
<thead>
<tr>
<th><strong>Site and full address:</strong></th>
<th>Dipartimento di Chimica e Biochimica Medica, Università di Milano Via Fratelli Cervi 93, 20090 Segrate (Milano)</th>
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</thead>
<tbody>
<tr>
<td><strong>Group Leader:</strong></td>
<td>Tommaso Bellini</td>
</tr>
<tr>
<td><strong>Staff:</strong></td>
<td>Francesco Mantegazza, <a href="mailto:francesco.mantegazza@unimib.it">francesco.mantegazza@unimib.it</a>&lt;br&gt;Marco Buscaglia, <a href="mailto:marco@buscaglia.it">marco@buscaglia.it</a>&lt;br&gt;Marco Caggioni, <a href="mailto:caggio@email.com">caggio@email.com</a></td>
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<tr>
<td><strong>Contact persons:</strong></td>
<td>Tommaso Bellini, <a href="mailto:tommaso.bellini@unimi.it">tommaso.bellini@unimi.it</a>&lt;br&gt;Tel: +39-02-503 30353 - Fax: +39-02-503 30365</td>
</tr>
<tr>
<td><strong>Present subjects of Research:</strong></td>
<td>- Liquid crystal in disordered systems&lt;br&gt;- Optical waveguides with liquid crystalline core</td>
</tr>
<tr>
<td><strong>Laboratories and facilities:</strong></td>
<td>Experimental set up for measurements of time resolved electric birefringence, operating in a wide range of electric field frequency. He-Ne laser source and remote control of the whole set up. Experimental set up for measurements of static and dynamic scattered light. Optical fiber collection of the light diffused at various angles. Remote control of temperature and electric field applied to the sample. Microscopy system with temperature controlled cell. Polarized microscope for transmission measurement. Inverted microscope for reflection measurements. Remote control of ccd acquisition of images, temperature, and applied electric fields.</td>
</tr>
</tbody>
</table>
**NAPOLI**

**Optics of Liquid Crystals**

| Site and full address: | Dipartimento di Scienze Fisiche, Complesso di Monte S. Angelo  
Via Cintia 80126 Napoli |
<table>
<thead>
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<tbody>
<tr>
<td>Group Leader:</td>
<td>prof. Enrico Santamato, prof. Giancarlo Abbate</td>
</tr>
</tbody>
</table>
| Staff:                 | Lorenzo Marrucci  
Domenico Paparo  
Bruno Piccirillo  
Angela Vella  
Gabriella Cerrone  
Carlo Manzo  
Antigone Marino         |
| Contact persons:       | Enrico Santamato  
enrico.santamato@na.infn.it  
Giancarlo Abbate  
giancarlo.abbate@na.infn.it |
| Present subjects of Research: | Angular momentum transfer; anisotropic optical tweezers; photosensitive materials and ultra-high nonlinearity; surface and interface investigation with SHG; microscopic and chemico-physical investigation of dye-host interaction; opto-electronic devices and integrated optical devices using LC; LC in confined systems, waveguides and optical fibres; photonic band-gap crystals and nanostructures with LC. |
| Laboratories and facilities: | Pulsed laser lab (ps laser and OPG); CW lasers lab (nonlinear optics, polarimetry, interferometry); electro-optics and integrated optics lab (at visible and IR C band wavelengths); sample preparation room. |
• B. Piccirillo, C. Toscano, F. Vetrano and E. Santamato - Orbital and spin photon angular momentum transfer in liquid crystals - PHYS. REV. LETT. 86, 2285 (2001)  

20
**PARMA**

| Site and full address: | Dipartimento di Fisica, Università degli Studi di Parma  
Parco Area delle Scienze 7/A, 43100 PARMA |
<table>
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<tbody>
<tr>
<td>Group Leader:</td>
<td>Marco P. Fontana</td>
</tr>
</tbody>
</table>
| Staff:                | T. Berzina  
L. Cristofolini  
P. Camorani (Ph D student)  
S. Sottini (Ph D student)  
L. Mussi (Undergraduate)  
P. Bonaretti (Undergraduate) |
| Contact persons:      | Marco Fontana  
Phone: 0521 905222 (switch) 905240 (office) 905262 (lab)  
Fax 0521 905223 |
| Present subjects of  | Photosensitive liquid crystalline azo-polymer films in bulk  
Research:             | Langmuir Blodgett films and superlattices of azopolymers, also as command surfaces in low molecular weight LC cells.  
                       | Ellipsometric, AFM and SNOM characterization of LB films of photosensitive polymers, and optical writing on the sub-micron scale by SNOM microscopy in pump-probe. |
| Laboratories and     | Complex Molecular Systems and Langmuir Blodgett Films laboratories located at the Physics Department, Parma University, plus regular access to the ESRF synchrotron and ILL nuclear reactor facilities in Grenoble (F) through long standing research collaborations. |
| facilities:           |                                          |
of last three years:   | L. Cristofolini, S. Arisi and M. P. Fontana - Surface anchoring and optically induced molecular motion in thin azobenzene polymeric films. - SYNTH. METALS 124, 151 (2001)  
                       | L. Cristofolini, M.P. Fontana, M. Laus and B. Frick - Photoinduced dynamics in a photosensitive side chain polymeric liquid crystal by quasielastic and inelastic neutron scattering - PHYS. REV. E 64, 061803 (2001)  
                       | P. Camorani, L. Cristofolini, G. Galli and M. P. Fontana - Photoinduced Morphological Changes and Optical Writing in a Liquid Crystalline Polymer on the Micron and Sub-Micron Scale - MOL. CRYST. LIQ. CRYST. 375, 175 (2002)  
## Site and full address:
Department of Mathematics, University of Pavia & INFM
Via Ferrata 1, 27100 Pavia, Italy
http://smmm.unipv.it

## Group Leader:
Epifanio G. Virga

## Staff:
- Dr. Riccardo Rosso
- Dr. Fulvio Bisi

## Contact persons:
- Dr. F. Bisi
  - bisi@dimat.unipv.it

## Present subjects of Research:
- Defect dynamics in liquid crystals
- Defect structure
- Order reconstruction
- Molecular biaxiality
- Stability of lipid membranes
- Anisotropic capillarity in wetting

## Laboratories and facilities:

## Selected publications of last three years:
- G.G. Peroli and E.G. Virga - The role of boundary conditions in the annihilation of nematic point defects - PHYS. REV. E 59, 3027 (1999)
- S. Kralj, E.G. Virga and S. Žumer - Biaxial torus around nematic point defects - PHYS. REV. E 60, 1858 (1999)
- J. Bajc, G. Guidone Peroli, E.G. Virga and S. Žumer - Dynamics of nematic point defects in a capillary with tilted boundary conditions - LIQUID CRYST. 29, 213-129 (2002)
- S. Kralj and E.G. Virga - Universal fine structure of nematic hedgehogs - PHYS.A: MATH. GEN. 34, 829 (2001)
- M. Schadt and E.G. Virga - Corrugations on the free surface of
nematic liquid crystal layers - JPN. J. APPL. PHYS. 39, 6637 (2000)

- A.M. Sonnet and E.G. Virga - Dynamics of dissipative ordered fluids - PHYS. REV. E 64, 031705 (2001)
| Site and full address: | Physics Department – University of Pavia  
|                      | via A. Bassi 6 - I - 27100 Pavia, Italy  
|                      | Web page: http://decux1.pv.infn.it/~romano |
| Group Leader:        | Silvano ROMANO |
| Staff:               |                |
| Contact persons:     | Silvano ROMANO  
|                      | romano@pv.infn.it  
|                      | tel +39 - 0382 - 507487  
|                      | fax +39 - 0382 - 507563 |
| Present subjects of  | SR works on computer simulation of simple mesogenic systems,  
| Research:            | producing Liquid Crystalline behaviour, in some cases the models  
|                      | also allow for torsional degrees of freedom and their coupling  
|                      | with orientational correlations. |
| Laboratories and     | Library, some computing power. |
| facilities:          |                |
| Selected publications | G.R. Luckhurst and S. Romano - Computer simulation study of a  
| of last three years: | nematogenic lattice model based on an elastic energy mapping of  
|                      | the pair potential - LIQ. CRYST. 26, 871 (1999)  
|                      | S. Romano and V. A. Zagrebnov - Comments on the paper "Long  
|                      | range order on the classical bilinear-biquadratic exchange  
|                      | hamiltonian", Akinori TANAKA and Toshihiro IDOGAKI, J.  
|                      | 2146 (1999)  
|                      | A.V. Zakharov, S. Romano and A. Maliniak - Statistical-  
|                      | mechanical study of the pair correlations for the dipolar Gay-  
|                      | Berne model - PHYS. REV. E 60, 1142 (1999)  
|                      | R. Hashim and S. Romano - Computer simulation study of a  
|                      | nematogenic lattice model based on the Nehring-Saupe  
|                      | interaction potential - INT. J. MOD. PHYS. B 13, 3879 (1999)  
|                      | S. Romano - Computer simulation study of a nematogenic lattice-  
|                      | gas model - INT. J. MOD. PHYS. B 14, 1195 (2000)  
|                      | V. Popa-Nita and S. Romano - Nematic-Smectic A phase  
|                      | transition in porous media - CHEM. PHYS. 264, 91 (2001)  
|                      | S. Romano - Mean field, two-site cluster, and computer  
|                      | simulation study of a nematogenic lattice-gas model - INT. J.  
|                      | MOD. PHYS. B 15, 259 (2001)  
|                      | S. Romano - Computer simulation study of a nematogenic lattice-  
|                      | gas model based on the Nehring-Saupe interaction potential -  
|                      | MOD. PHYS. LETT. B 15, 137 (2001) |
## PISA 1

| **Site and full address:** | Dipartimento di Fisica, Università di Pisa  
Via Buonarroti 2, Pisa |
<table>
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<tbody>
<tr>
<td><strong>Group Leader:</strong></td>
<td>Sandro Faetti</td>
</tr>
<tr>
<td><strong>Staff:</strong></td>
<td>Prof. Leone Fronzoni , Students</td>
</tr>
<tr>
<td><strong>Contact persons:</strong></td>
<td>Sandro Faetti , <a href="mailto:faetti@df.unipi.it">faetti@df.unipi.it</a></td>
</tr>
<tr>
<td><strong>Present subjects of Research:</strong></td>
<td></td>
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</table>
I - EXPERIMENTAL INVESTIGATION OF INTERFACES.  
Experimental investigations of surface properties of Liquid Crystals with special interest in photosensitive surfaces, surface memory effects, and director gliding. In the last years we have developed optical and dielectric methods to measure the anchoring energy and the dynamic behaviour of the surface director angle.  
II - STUDY OF ELECTROHYDRODYNAMIC INSTABILITIES.  
We investigate the transitions from ordered patterns to turbulence states. These transitions are characterized by anomalous diffusion and Brownian fractional motion. Liquid Crystals is a suitable medium in order to study spatio-temporal chaos. Now, we are interested to quantify this phenomena with the use of theoretical approach based on the idea of Diffusion Entropy and Kolmogorov Complexity. The experiments consist on realizing spatial instabilities in Nematic Liquid Crystals and on collecting images and time series as function of a control parameter as the electric field applied to the samples. The data are analyzed by means suitable algorithm in order to characterize the dynamical transitions.  
III - THEORETICAL INVESTIGATIONS ON SURFACE ELASTICITY. We have investigated the role of the surface elastic constants on the macroscopic behaviour of liquid crystals and we have proposed a new form of the surface free energy that takes into account also for the effects of the curvature of the surfaces. |
| **Laboratories and facilities:** | Laboratory for optical and dielectric measurements. Electromagnet, Polarizing Microscopes with transmitted and reflected light, high sensitivity CCD Camera, optical and electronic devices. |
| **Selected publications of last three years:** | |  
- S. Faetti - The effects of curvature on nematic liquid crystals confined in a cylindrical cavity - PHYS. LETT. A 237, 264 (1998)  
- S. Faetti, L.R. Evangelista and G. Barbero - Elastic-effects of... |
long-range quadrupolar interactions in nematic liquid crystals - PHYS. REV. E 58, 7465 (1998)


PISA 2

| Site and full address: | Dipartimento di Fisica  
Via Buonarroti 2, 56126 PISA |
<table>
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<tbody>
<tr>
<td>Group Leader:</td>
<td>Marco Giordano</td>
</tr>
</tbody>
</table>
| Staff:                | Laura Andreozzi  
Massimo Faetti  
Diego Palazzuoli |
| Contact persons:      | Laura Andreozzi  laura.andreozzi@df.unipi.it |
| Present subjects of Research: | - Relaxation processes, physical ageing and optical nanowriting in liquid crystal polymers |
| Laboratories and facilities: | - ESR spectrometers  
- DSC  
- Physical ageing  
- Viscosimetry  
- Microwaves lab. |
| Selected publications of last three years: |  
- Laura Andreozzi, Massimo Faetti, Marco Giordano, Diego Palazzuoli and G. Galli - An ESR study on the dynamics heterogeneity in a nematic polymer induced by thermal annealing in the isotropic melt - MACROMOLECULES 34, 7325. (2001)  
- Laura Andreozzi, Massimo Faetti, Marco Giordano, Massimo Hvala, G. Galli and M. Laus - Enthalpy relaxation at the glass transition in a Side chain LCP for opticl data storage - MOL. CRYST. LIQ. CRYST. 372, 229 (2001)  
- Laura Andreozzi, Massimo Faetti, Marco Giordano, Diego Palazzuoli and G. Galli - An ESR study on the dynamics heterogeneity in a nematic polymer induced by thermal annealing in the isotropic melt - MACROMOLECULES 34, 7325. (2001)  
- Laura Andreozzi, M. Bagnoli, Massimo Faetti, Marco Giordano and Diego Palazzuoli - Decoupling from structural relaxation of short and long time dynamics of a paramagnetic tracer dissolved in a liquid crystalline polymer - PHIL.MAG. B 82, 383, (2002) |
### Site and full address:
Dipartimento di Chimica e Chimica Industriale
Università degli Studi di Pisa,
Via Risorgimento, 35 - 56126 Pisa

### Group Leader:
Prof. Carlo Alberto Veracini

### Staff:
- D. Catalano (Researcher)
- M. Geppi (Researcher)
- M. Cifelli (PhD Student)
- L. Chiezzi (PhD Student)
- V. Domenici (PhD Student)

### Contact persons:
C.A. Veracini
verax@dcci.unipi.it
Tel: 050-918266 - Fax: 050-918260

### Present subjects of Research:
- NMR of Liquid Crystals, Liquid Crystals Polymers, Solid State
- NMR of Polymers, Drugs and Biological Compounds

### Laboratories and facilities:
- Three NMR spectrometers: Stelar100, Varian VXR 300, Varian
  Infinity Plus 400 for Solid State NMR

### Selected publications of last three years:
- C. Forte, M. Geppi, A. Triolo, C.A. Veracini and G. Visalli - A \(^1\)H, \(^{13}\)C solid state NMR investigation of the structure and molecular dynamics of hydrogenated oligocyclopentadiene - J. PHYS. CHEM. B 104, 510 (2000)
- M. Geppi, A.M. Kenwright and B.J. Say - Methods for correlating T\(_{1p}\) and FID components in wideline \(^1\)H NMR studies of motionally heterogeneous polymer systems - SOLID STATE NMR 15, 195 (2000)
- D. Catalano, M. Cavazza, L. Chiezzi, M. Geppi and C.A. Veracini - \(^3\)H-NMR spectroscopy of Liquid Crystals: structure and orientational order of a chiral smectogen in its A, C* and J* phases - LIQ. CRYST. 27, 621 (2000)
- D. Catalano, M. Cifelli, K. Fodor-Csorba, E. Gacs-Baitz, M. Geppi, A. Jakli and C.A. Veracini - Microscopic organization and tilt angle in Smectic A and Smectic C phases: Characterization and orientational order by \(^3\)H-NMR and Electric Polarization

• L. Calucci and M. Geppi - The CAGE software: a tool for a critical approach of diffusional models to $^2$H spin-lattice relaxation in liquid crystals - J. CHEM. INF. COMP. SCI. 41, 1006 (2001)


• M. Geppi, S. Pizzanelli and C.A. Veracini - Phenyl ring dynamics in a liquid crystal polymer through $^2$H NMR spectroscopy - CHEM. PHYS. LETT. 343, 513 (2001)

• D. Catalano, M. Cifelli, V. Domenici, K. Fodor-Csorba, R. Richardson and C.A. Veracini - $^2$H NMR and SAXS of a ferroelectric liquid crystal: unwinding of the ferroelectric chiral helix by high magnetic fields - CHEM. PHYS. LETT. 346, 259 (2001)

• C. Forte, M. Cifelli, M. Geppi and C.A. Veracini - Dynamics of a liquid crystal in its smectic A phase from angle dependent deuterium spin relaxation measurements - MOL. CRYST. LIQ. CRYST. 372, 81 (2001)


• L. Chiezzi, V. Domenici, M. Geppi, C.A. Veracini, and R.Y. Dong - Internal and overall molecular dynamics in a chiral smectogen through $^2$H NMR relaxation - CHEM. PHYS. LETT. 358, 257 (2002)

### Site and full address:
Dipartimento di Chimica e Chimica Industriale
Università di Pisa
Via Risorgimento 35
56126 Pisa, Italy

### Group Leader:
Prof. Emo Chiellini, Prof. Giancarlo Galli

### Staff:
Dr. Salvatore D'Antone

### Contact persons:
- Prof. Emo Chiellini
  - [E-mail]
  - (tel +30-050-918299, fax +39-050-28438)
- Prof. Giancarlo Galli
  - [E-mail]
  - (tel +30-050-918272, fax +39-050-28438)

### Present subjects of Research:
- Liquid crystalline polymers: synthesis, characterization, and application:
  - Chiral liquid crystalline polymers for electro-optics and photonics
  - Photoresponsive liquid crystalline polymers.
  - Self-assembling polymers and block copolymers
  - Polymers from banana monomers
  - Polymers for alignment layers if liquid crystals

### Laboratories and facilities:
- Chemistry laboratory fully equipped for organic synthesis and characterization of monomers and polymers
- Characterization laboratory of liquid crystalline properties, including equipment for testing some of and their materials properties: optical microscopy, calorimetry and thermal analysis, dynamic-mechanical analyzer, thermo-mechanical analyzer, extruder

### Selected publications of last three years:
- C.Cesarino, L.Komitov, G.Galli, and E.Chiellini - Sign reversal of the dielectric anisotropy in the chiral nematic phase of a copolysiloxane - *MOL. CRYST. LIQ. CRYST.* 372, 217 (2001)
**ROMA**

<table>
<thead>
<tr>
<th><strong>Site and full address:</strong></th>
<th>Department of Electronic Engineering, University of Rome “La Sapienza”, National Institute for the Physics of Matter (INFM) Via Eudossiana, 18 – 00184 Rome – Italy.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group Leader:</strong></td>
<td>Paolo Maltese</td>
</tr>
<tr>
<td><strong>Staff:</strong></td>
<td>Antonio d’Alessandro, Associate Professor Romeo Beccherelli, CNR (Research National Council) Researcher Rita Asquini, Post-Doc</td>
</tr>
<tr>
<td><strong>Contact persons:</strong></td>
<td>Antonio d’Alessandro antonio <a href="mailto:dalessandro@uniroma1.it">dalessandro@uniroma1.it</a> Tel. +390644585459, fax +39064742647</td>
</tr>
</tbody>
</table>
| **Present subjects of Research:** | - Ferroelectric liquid crystals and polymer dispersed liquid crystal devices for display applications and for photonic switching: fabrication and characterisation  
- Conductive polymers for sensor applications  
- Optical waveguides: fabrication and characterisation |
| **Laboratories and facilities:** | Optoelectronic laboratory for electro-optic characterization of LC devices in free space and waveguiding configurations (laser sources, polarized microscopes, optical bench, arbitrary waveform generator)  
Fabrication laboratory: photolithography, thin film deposition, reactive ion etching |
| **Selected publications of last three years:** | • F. Campoli, R. Beccherelli, A. d’Alessandro, V. Ferrara and P. Maltese - Passive matrix SSFLC display with analogue grey levels using PTFE alignment films – DISPLAYS 20, No.4, 191 (1999)  
• R. Asquini and A. d’Alessandro - Realisation and characterisation of a ferroelectric liquid crystal bistable optical switch - Accettato per la pubblicazione sulla rivista MOLECULAR CRYSTALS LIQUID CRYSTALS 372, 353 (2001)  
• R. Asquini and A. d’Alessandro - BPM analysis on an integrated optical switch using polymeric optical waveguides and SSFLC at 1.55 um - MOLECULAR CRYSTALS LIQUID CRYSTALS 375, 243 (2002) |
<table>
<thead>
<tr>
<th><strong>Site and full address:</strong></th>
<th>Dipartimento di Fisica, Politecnico di Torino c. Duca degli Abruzzi 24, 10125 Torino (Italy)</th>
</tr>
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<tbody>
<tr>
<td><strong>Group Leader:</strong></td>
<td>Claudio Oldano</td>
</tr>
<tr>
<td><strong>Staff:</strong></td>
<td>Giovanni Barbero, Marta Becchi, Claudio Oldano, Silvia Ponti, Amelia Sparavigna, Alfredo Strigazzi, Piera Taverna, Laura Trossi</td>
</tr>
<tr>
<td><strong>Contact persons:</strong></td>
<td>Giovanni Barbero, Alfredo Strigazzi</td>
</tr>
<tr>
<td><strong>Present subjects of Research:</strong></td>
<td>Optics of crystals; optics of chiral and complex media; effective medium theory; elastic theory of nematic liquid crystals, surface effects in liquid crystals; influence of the ions on the surface anchoring energy; image processing in microscopy, bidimensional instability in ferroelectric liquid crystals, chiral superstructures in media with nonchiral molecules, banana_like oxadiazolic smectics.</td>
</tr>
<tr>
<td><strong>Laboratories and facilities:</strong></td>
<td>Laboratorio cristalli liquidi (Microscopia ottica, spettroscopia dielettrica, Calorimetria differenziale, Rumore termico), Dipartimento di Fisica, Politecnico di Torino; Orientationally Ordered Media Laboratory (OOM-Lab) as a Consortium IOFRAN, NIOPK, CRF, POLITO.</td>
</tr>
</tbody>
</table>
| **Selected publications of last three years:** | • S. Ponti, C. Oldano and M. Becchi, P. Valabrega and L. Trossi - Optical properties of short pitch cholesteric liquid crystals - LIQUID CRYSTALS 28, 591 (2001)  
• S. Ponti, C. Oldano and M. Becchi - Bloch wave approach to the optics of crystals - PHYS. REV. E 64, 021704 (2001)  
• M. Becchi, S. Ponti, A. Strigazzi, V. Chigrinov and S.I. Torgova - |

- Sparavigna - Texture transitions as order transitions in nematic liquid crystals - RECENT. RES. DEVEL. APPLIED PHYS. 4, 91-111 (2001)
- L.R. Evangelista and G. Barbero - Adsorption phenomenon and external field effect on an isotropic liquid containing ions - PHYS. REV. E 64, 021101 (2001)
- G. Barbero and D. Olivero - Ions and nematic surface energy: Beyond the exponential approximation for the electric field of ionic origin - PHYS. REV. E 65, 031701 (2002)
- L.A. Karamysheva, I.F. Agafonova, S.I. Torgova, B.A. Umanskii and A. Strigazzi - Liquid Crystalline Pyridine-Containing 1,2,4-Oxadiazoles - MOL. CRYST. LIQ. CRYST. 364, 547 (2001)
- S.I. Torgova, L.A. Karamysheva, T.A. Geivandova and A. Strigazzi - Banana-Shaped 1,2,4-Oxadiazole Analouges of 1,3,4-Oxadiazoles - MOL. CRYST. LIQ. CRYST. 365, 99 (2001)