Workshop

**Strongly disordered optical systems: from the white paint to cold atoms**

September 26–30, 2016
Institut d’Etudes Scientifiques de Cargèse, France

Organizers:
Sergey Skipetrov, Robin Kaiser and William Guerin

Recent years have seen a growing interest in physics of highly disordered optical systems in which light scattering is so strong that substantial deviations from the classical transport theory can be observed. Examples of such systems are suspensions of small dielectric particles, semiconductor or dielectric powders, disordered photonic crystals, or clouds of cold atoms. The latter are particularly interesting since an almost exact description of the interaction of light with the atoms is possible. Nanoscale systems such as quantum dots, for example, also emerged in recent years. Under certain conditions, these systems behave as artificial atoms and enrich the family of physical systems where multiple scattering of light can take place. Despite their diversity, the disordered systems mentioned above allow for observation of a number of common phenomena: the backscattering cone, Anderson localization, mesoscopic fluctuations in transport properties, etc. However, other phenomena are known only in a particular context: for example, we speak of “necklace states” for waves in dielectric disordered systems and of sub- or super-radiant states for cold atoms. The complete understanding of the correspondences between similar phenomena in different systems is therefore not yet acquired.

The purpose of this workshop is to bring together researchers working in the broad domain of optics of disordered media to discuss the various aspects of this problem, the similarities and the differences between similar phenomena in different systems, and the unique opportunities offered by atomic systems which can be considered as model systems controllable at will.
**Time table**

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<td>Session presider: Skipetrov</td>
<td>Session presider: Popoff</td>
<td>Session presider: Guerin</td>
<td>Session presider: Pierrat</td>
<td>Session presider: Vynck</td>
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<td></td>
<td><strong>Welcome</strong></td>
<td>Fink</td>
<td>Van Tiggelen</td>
<td>Scheffold</td>
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<td>16:30</td>
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<td>19:00</td>
<td><strong>Barbecue</strong></td>
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*Posters can be put on starting from Monday and are supposed to be displayed during the entire workshop.*
## Talks

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<td>Cooperative effects and photon localization in atomic gases</td>
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<td>Alexandre Aubry (Paris)</td>
<td>Spatio-temporal imaging of light transport in strongly scattering media</td>
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<td>Geoffroy Aubry (Konstanz)</td>
<td>Light transport in photonic glasses</td>
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<td>Jérôme Beugnon (Paris)</td>
<td>Light transport by a dense ultra-cold atomic 2D Bose gas</td>
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<td>Yaron Bromberg (Jerusalem)</td>
<td>Multimode fibers with random mode mixing: physics and applications</td>
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<tr>
<td>Antoine Browaeys (Palaiseau)</td>
<td>Light scattering by dense cold atomic clouds</td>
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<td>Rémi Carminati (Paris)</td>
<td>Classical and quantum fluctuations of light emitted by two sources in a disordered medium</td>
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<tr>
<td>Andrey Chabanov (San Antonio)</td>
<td>Electrodynamics of metallic thin films in complex media</td>
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<td>Nicolas Cheriereanu (Lille)</td>
<td>Experimental observation of the coherent forward scattering: quantum interferences in the strong localization regime</td>
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<td>Laura Cubos (Paris)</td>
<td>Using dynamic coherent backscattering to study the Anderson mobility gap</td>
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<td>Gabriel Cwilich (New York)</td>
<td>Speckle contrast microscopy</td>
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<td>Nuno de Sousa (Madrid)</td>
<td>Light emission statistics as a local probe for structural phase switching</td>
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<td>Dominique Delande (Paris)</td>
<td>Anderson localization of ultracold atoms: Where is the mobility edge?</td>
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<td>Aristide Dogariu (Orlando)</td>
<td>Anomalous diffusion and fluctuations in white paints</td>
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<td>Mathias Fink (Paris)</td>
<td>Reflection matrix approach for imaging through scattering media</td>
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<td>Luis Froufe (Fribourg)</td>
<td>Disordering disorder: transport and photonic density of states</td>
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<td>Arthur Goetschy (Paris)</td>
<td>Long-range mesoscopic correlations in complex media: what are they good for?</td>
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<td>William Guerin (Nice)</td>
<td>Superradiance and subradiance in a large and dilute cold-atom sample</td>
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<td>Chia Wei Hsu (Yale)</td>
<td>Correlation-enhanced control of transmission through disordered media</td>
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<td>Ernesto Jimenez Villar (Recife)</td>
<td>Localization of light in a colloidal suspension</td>
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<td>Guillaume Labeyrie (Nice)</td>
<td>Self-organization in cold atoms</td>
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<td>Ad Lagendijk (Amsterdam)</td>
<td>Breaking down of diffusion</td>
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<td>Marco Leonetti (Rome)</td>
<td>Secure information transport by transverse localization of light</td>
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<td>Georg Maret (Konstanz)</td>
<td>Towards functional diffusing-wave spectroscopy imaging</td>
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<td>Giacomo Mazzamuto (Florence)</td>
<td>Diffusive light transport in semitransparent media</td>
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<td>Christian Miniatura (Singapore)</td>
<td>Momentum signatures of the 3D Anderson metal-insulator transition</td>
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<td>Fabrice Mortessagne (Nice)</td>
<td>Microwave realization of topologically protected states</td>
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<td>Giuliano Orso (Paris)</td>
<td>2D Anderson transition for cold atoms with synthetic spin-orbit coupling</td>
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<td>John Page (Winnipeg)</td>
<td>Signatures of 3D Anderson localization of classical waves: examples from acoustics</td>
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<td>Antonio Picozzi (Dijon)</td>
<td>Introduction to optical wave turbulence</td>
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<td>Lorenzo Pattelli (Florence)</td>
<td>Spatio-temporal visualization of light transport in complex photonic structures</td>
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<td>Romain Pierrat (Paris)</td>
<td>Coherent transmission of light through a cold atomic gas: flash, superflash, hyperflash</td>
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<td>Felipe Pinheiro (Rio de Janeiro)</td>
<td>Probing natural optical activity of disordered media</td>
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<td>Nicola Piovella (Milan)</td>
<td>Nonlinear effects in cooperative light scattering by cold atoms</td>
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<td>Arno Rauschenbeutel (Vienne)</td>
<td>Chiral nanophotonics and quantum optics</td>
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http://mesoimage.grenoble.cnrs.fr
Francesco Riboli (Trento)  Tailoring correlations of the local density of states in disordered photonic materials
Helmut Ritsch (Innsbruck)  A self-ordered atom – photon crystal in 3D via collective coherent backscattering
Janne Ruostekoski (Southampton)  Light-induced correlations in cold and thermal atomic gases
Juan Jose Saenz (San Sebastian)  Casimir-like interactions between particles under fluctuating light fields
Frank Scheffold (Fribourg)  Bandgaps and localization in hyperuniform and strongly correlated disordered dielectrics in 2D and 3D
Fabrizio Sgrignuoli (Florence)  2D necklace states and correlations
Igor Sokolov (St. Petersburg)  Influence of resonator Fabry-Perot on collective effects in multi-atomic ensembles
Bart van Tiggelen (Grenoble)  Mesoscopic physics with localized waves
Kevin Vynck (Bordeaux)  Properties and applications of complex plasmonic nanostructures

Jose Escalante (Grenoble)  Anderson localization in classical vector waves: electromagnetic longitudinal waves and level spacing statistics
Jose Escalante (Grenoble)  Role of longitudinal field in Anderson localization of light
Nikos Fayard (Paris)  Mutual information between reflected and transmitted speckle patterns
Mathilde Fouche (Nice)  Towards the characterization of coherence properties of cold-atom random laser
Nathan Fuchs (Fribourg)  Biotemplating white beetle scales for isotropic high index photonic materials
Antton Goicoechea (Winnipeg)  Investigating Anderson localization of classical waves in 3D anisotropic media
Ernesto Jimenez Villar (Recife)  Random lasing at localization transition in a colloidal suspension (TiO2@Silica)
Ernesto Jimenez Villar (Recife)  Anderson localization of light in a colloidal suspension (TiO2@Silica)
Emmanuel Lassalle (Marseille)  Multimodal analysis of the frequency shift of quantum emitters near plasmonic nano-spheres
Christian Miniatura (Singapore)  Momentum signatures of the 3D Anderson metal-insulator transition
Felipe Pinheiro (Rio de Janeiro)  Probing scattering resonances of Vogel’s spirals with the Green’s matrix spectral method
Sebastien Popoff (Paris)  Optical reciprocity in multimode fibers: Coherent backscattering and remote key establishment
Clotilde Prophète (Paris)  Multiple scattering of terahertz radiation by Mie scatterers
Lukas Schertel (Konstanz)  Mie-scattering in randomly assembled monospheres
Lukas Siedentop (Konstanz)  Isotropic band gaps in hyperuniform structures
Tyler Sutherland (Purdue)  Cooperative photon scattering in cold atomic gases and arrays
Francesco Utel (Florence)  Diffusion and localization of light in 2D fractal media
Kevin Vynck (Bordeaux)  Theory for the diffusion of light polarization in disordered media with short-range structural correlations