Applied Physics & OSA

Optics Seminar

Glass Cages for Catching Light

Professor Phillip Russell

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Abstract: In its most common form, photonic crystal fibre (PCF) consists of a hair-thin thread of glass with a 'cage' of tiny hollow channels running along its length. This periodic lattice makes it possible to guide light in new ways, for example, to cage it inside an empty core. In such a hollow-core PCF one is able for the first time to eliminate the diffraction of light over km distances in empty space. By filling the core with gases, nonlinear gas-laser interactions can be enhanced by seven orders of magnitude in the best low-loss PCFs. Hollow-core PCF can also be used, for example, to laser-guide small particles, molecules or atoms along a curved path. In PCFs with micron-sized solid-glass cores, the chromatic dispersion can be radically altered, which has led to a revolution in the brightness of broad-band white-light sources. The most recent example of such "supercontinuum" sources is nearly six orders of magnitude brighter than an incandescent lamp, yielding up to 10 mW/nm spectral intensity at visible and near IR wavelengths. The lattice of hollow channels also gives rise to phononic band gaps and families of multi-GHz guided acoustic modes, which themselves interact strongly with light, creating unusual forward and backward Brillouin spectra. By filling the hollow channels with metals such as silver or gold, one can explore plasmon resonances in arrays of parallel nanowires. Through its unique and varied characteristics, PCF is creating many new opportunities in diverse areas of fundamental and applied research.

Philip Russell is a Director of the newly founded Max-Planck Institute for the Science of Light and Professor of Physics at the University of Erlangen-Nuremberg, Germany. He obtained his D.Phil. (1979) degree at the University of Oxford and has subsequently held positions in France, Germany, the USA and the UK. He specializes in the behaviour of light in periodically structured materials and waveguides, and was the founder of BlazePhotonics Ltd (2001 to 2004) whose aim was the exploitation of photonic crystal fibre. He is a Fellow of the Royal Society and the Optical Society of America and has won several international awards for his research.

Anyone interested in meeting with the speaker should contact ***Avi Zadok***, avizadok@caltech.edu

Thursday, April 16th
4:00pm-5:00pm.
Watson 104

Refreshments will be available in the Watson Lobby at 3:45pm