

Plenary Talk PV IV Tue 9:45 E415
New Lightwave Science with Photonic Crystal Fibres —
•PHILIP RUSSELL — MPI Science of Light, Erlangen, Germany

Photonic crystal fibres (PCFs), thin strands of glass with an array of hollow channels running along their length, offer light guidance in both hollow and solid glass cores. They permit unprecedented control over dispersion, birefringence and nonlinearity, and over the last three decades have ushered in a new era of linear and nonlinear fibre optics. Gas-filled hollow-core PCF provides low-loss diffraction-free transmission of light in a single transverse mode, and through pressure-adjustable dispersion provides a simple means of compressing

pulses to single-cycle durations, as well reducing the threshold power for nonlinear effects by orders of magnitude. Operating on opposite sides of the gas-pressure-tuneable zero dispersion point permits a novel form of holography based on Raman coherence, which has been used for highly efficient state-preserving frequency up-conversion of single photons by 125 THz in hydrogen (doi.org/10.1126/science.abn1434). Chiral PCF, formed by spinning the preform during fibre drawing, provides circular and vortex birefringence, as well as permitting localization of light in core-less (i.e., defect-free) 2D lattices of chiral coupled cores (doi.org/10.1002/lpor.202200570). After a brief introduction, a number of recent developments will be covered in the talk.