

# PROCEEDINGS OF SPIE

## ***Photonic Crystal Fibers IV***

**Kyriacos Kalli**  
**Waclaw Urbanczyk**  
*Editors*

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## Introduction

It has been nearly twenty years since the conception of photonic crystal fibers, as devised by Philip St. J. Russell in unpublished work dating to 1991. That work was a development of the photonic crystal ideas of Yablonovich and John who published two milestone papers on photonic crystals in 1987. The photonic crystal fiber (PCF) has given the field of fiber optics a newfound resurgence, resulting in revolutionary research and practical breakthroughs that would have proven otherwise impossible with conventional optical fibers; these include octave-spanning light continua, air guidance of light with low loss over several kilometers, and endlessly single-mode fiber operating over several hundred nanometers. The unusual confinement characteristics of PCF have resulted in their use in applications such as fiber-optic communications and sensing, fiber lasers, nonlinear devices, high-power transmission, and highly sensitive gas sensors, amongst others.

The term photonic crystal fiber has been used extensively to cover a class of optical fibers that include the photonic band gap fiber (with light confinement through the band gap effect), hole-assisted or microstructure fiber (guiding light through a conventional high-index core modified by the presence of air holes), and Bragg fiber (photonic band gap fiber formed using multilayer, concentric rings).

This fourth conference in the series on photonic crystal fibers reports some of the latest developments of PCF. The strength of photonic crystal fiber relates to its versatility and flexibility in terms of fiber geometry and material used. The fabrication and design of PCF is reported for nonlinear and active silica and chalcogenide fibres and the latest developments of polymer based PCF, along with the characterization of PCF utilizing spectral interferometry. Developments of fiber-based light sources are supported by advances in super continuum generation through non-linear mixing in index-guiding crystal fibers. New device applications are demonstrated for Bragg and long period gratings in doped and infiltrated fibers. The stability of grating structures is examined as are sensing of external parameters such as temperature and strain. Great strides have been made in the modeling of PCF, and special sessions are devoted to the development of modeling and numerical analysis. The conference has several invited papers and a joint session held with the Optical Sensing and Detection Conference.

We hope the reader will find the conference proceedings as interesting as our recent meeting in Brussels.

**Kyriacos Kalli**  
**Wacław Urbańczyk**

