The idea for a new kind of optical glass fibre—photonic crystal fibre (PCF)—first emerged in 1991 [Science 299, 358–362 (2003)]. The aim was to realise a fibre with a two-dimensional periodic array of microscopic features (typically hollow channels) running along its entire length.

More than a quarter of a century later, PCF has led to a whole series of new developments, some of which are already moving into real-world applications. This is largely because it is able to „corral“ light within a central hollow or solid core, permitting light and matter waves to be tightly confined over long distances while precisely controlling the dispersion. Solid-core PCFs have been used to transform invisible infrared laser pulses into white light 10 million times brighter than an arc lamp, and are now used in commercial supercontinuum sources. Twisted solid-core PCF acts like an „optical impeller“, creating optical vortices that carry orbital angular momentum. Hollow core PCF filled with gases underpins a range of unique and extremely bright sources of tunable deep and vacuum ultraviolet light, driven by ultrashort pulses of infrared light. Microparticles can be optically trapped and propelled over 100 m distances in hollow core PCF, and used as reconfigurable point sensors. Hollow core PCFs are also ideal for flexible delivery of high power laser light in laser manufacturing and, when filled with solvents containing minute quantities of reagents, as convenient microreactors for optical studies of chemical processes.