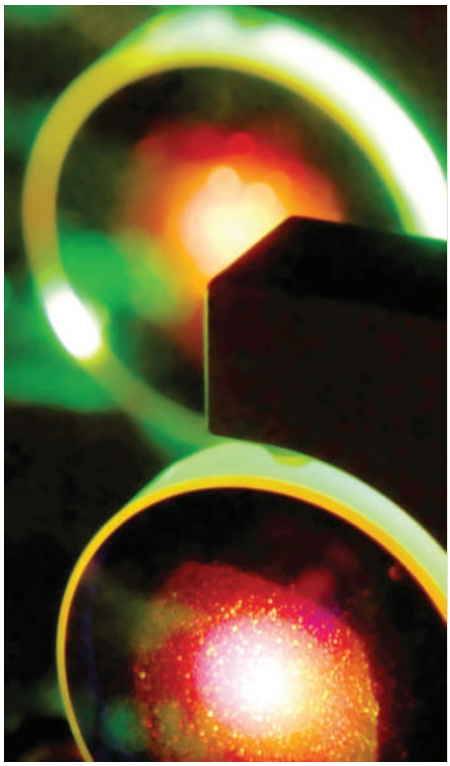

COVER IMAGE
Ultrafast laser applications require tailor-made optics, such as these mirrors produced by German start-up company UltraFast Innovations.

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Ultrafast photonics

Putting together this issue of *Technology Focus* has been a challenge because 'ultrafast photonics' means different things to different people. For some, it refers to ultrafast communications networks, and it seems that 2010 will be an exciting year for 100 Gbit s^{-1} communications (see page 144). By using phase shift keying and coherent detection, several companies have managed to squeeze 100 Gbit s^{-1} capacity onto a single wavelength that can then be piped along existing fibre infrastructure.

To others, ultrafast photonics means high-speed imaging, and in this area the development of the intensified high-speed camera has enabled the capture of ultrafast and low-light events without any motion blur (see page 152).

But to many *Technology Focus* readers, ultrafast photonics refers to ultrafast lasers generating pulses of light in the femtosecond and even attosecond regime. Here too there are exciting developments, with femtosecond lasers allowing the creation of table-top coherent X-ray sources (see page 149) along with many other applications. Although the market for femtosecond lasers is already 20 years old, the application of these ultrafast sources is growing all the time. Many people, including Andreas Stingl, CEO of Femtolasers, believe the best is yet to come (see page 158). Through the remarkable properties of its ultrashort pulses, the femtosecond laser can often perform tasks that no other laser technology or tool is capable of.

The temporal and spectral shaping of ultrashort optical pulses helps optimize their use in specific applications. For example, shaped broadband pulses can be used to control chemical reactions, and pulse shapers have become key components for enhancing resolution and improving detection in nonlinear multiphoton imaging (see page 154). Among the future potential applications of pulse-shaping devices is the manipulation of optical pulse trains with high repetition rates. This field of research has attracted interest for high-speed optical fibre communications and ultrafast optical signal processing.

This link back to ultrafast communication and detection shows how closely all the areas of ultrafast photonics are connected. So, because ultrafast photonics means different things to different people, we hope everyone will find something of interest in this issue of *Technology Focus*.

CONTENTS