Once an airport, the venue of the June CLEO/Europe–IQEC in Munich continues to attract visitors from across the globe.

a concept often referred to as the DLCZ protocol after the authors of the original proposal in 2001 (ref. 3). Julien Laurat and his colleagues at Caltech have demonstrated that it is possible to distribute entanglement between such quantum nodes separated by three metres (ref. 4). In their work, each node consists of two ensembles of cold caesium atoms and each pair is prepared into an entangled state. These stored quantum states are mapped onto polarization-entangled photons. And it is the measurements of these photons that prove the distribution of the entanglement from one node to the other.

With quantum technology advancing so quickly, who knows how close practical elements of quantum computers will be when CLEO/Europe–IQEC returns in 2009. A key area to keep an eye on is the development of the quantum repeater. Distribution of qubits is vital for many quantum protocols, but attenuation in optical fibres imposes a severe limit on the distance achievable. Quantum repeaters temporarily store the qubit and can map the state onto new photons. The research presented in Munich represents important steps towards this goal but there is still much work to do.

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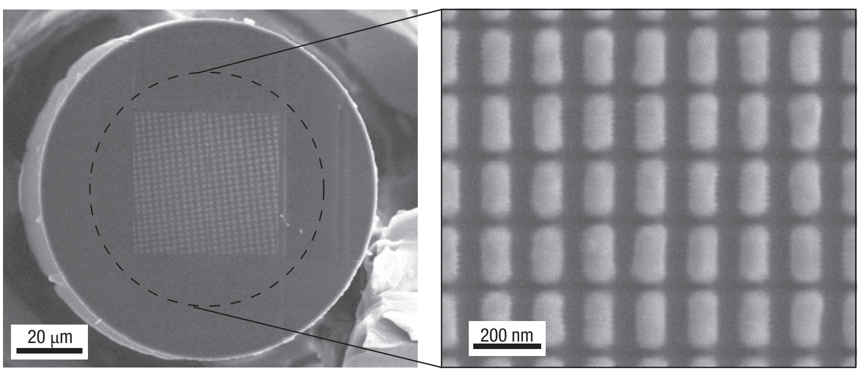
SURFACE PLASMONS

Optical antennas for sensing



By fabricating an array of tiny metallic nanostructures onto the end facet of an optical fibre, researchers in the USA have devised a new type of a sensor called a plasmonic optical-antenna fibre probe. Elizabeth Smythe and co-workers from Harvard University say the probe could potentially perform *in situ* chemical and biological detection and surface-enhanced Raman spectroscopy, SERS (*Opt. Express* **15,** 7439–7447; 2007).

The idea is that one end of the probe is connected to both a spectrometer and a light source and the other end is inserted into a fluid or biological specimen. Changes in the spectrum of the light reflected from the end of the fibre in the specimen, and picked up by the probe, are then monitored. The probe is influenced by the interaction between the nanoparticles and their surroundings. In particular shifts in the nanoparticles' plasmon resonance are induced by changes in the refractive index of the surrounding media.

In their initial studies, the team fabricated an array of gold nanorods onto the end of a multimode silica fibre. A 3-nm-thick layer of titanium and a 35-nm-thick layer of gold were evaporated onto the fibre and then etched by an ion beam to create the array. The array was carefully positioned to cover the core of the fibre to maximize the interaction between the light in the fibre and the nanorods.

To optimize the performance of such a probe, the team has explored the effects of changing the dimensions and spacing of the nanorods. The results reveal that the resonance of the nanorods is highly tunable and is most sensitive to changes in rod length, enabling different designs of probe to be customized for particular measurements or samples.

The researchers also say that if a smaller interaction area and more efficient use of the incident light were required, such a nanorod array could also be fabricated onto the facet of a single-mode fibre.

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