RESEARCH FUNDING

Osaka celebrates new facility

Photonics researchers at Osaka University in Japan are celebrating the news that they have secured seven years of funding, worth a total of ¥4.5 billion (~$50 million), for their Photonics Advanced Research Center (PARC). The grant will help to fund a new five-storey 5,000 m^2 PARC facility that is currently under construction on the University's Suita campus. The facility, due to open in early 2011, will house state-of-the-art equipment for techniques such as laser Raman microscopy, e-beam lithography and sputter deposition, and will support research in fields such as nanophotonics, imaging, sensing and biophotonics.

Satoshi Kawata, the director of PARC, said in a kick-off speech in Osaka on 13 April that an important aspect of the centre is its strong collaboration with local firms such as Mitsubishi Chemicals, Sharp, Nitto Denko, Shimadzu and IDEC, among others. Indeed, the new building will provide space for researchers from these companies through an 'industry on campus' approach, with the aim of benefiting the local economy and Japan's research capabilities.

"The aim of the programme is to promote interdisciplinary research in advanced nanophotonics and plasmonics, and to produce long-term scientific and technological innovation through collaboration between Osaka University and collaborating companies," explained Hiroshi Iwasaki, programme manager at PARC. "PARC's scope ranges from basic research to applied science and industrial technologies, with a special focus on practical applications."

OSAKA UNIVERSITY

PARC's research staff are working on projects such as the development of plasmon-enhanced Raman imaging with nanometre-scale resolution, plasmon-based biochip sensors, luminescent nanoparticle markers for biological imaging and the structural engineering of liquid crystals.

Iwasaki told *Nature Photonics* that the new research building is scheduled to be completed by the end of January 2011, and will feature an intelligent, energy-efficient lighting system based entirely on LEDs.

OLIVER GRAYDON

QUANTUM OPTICS

Spin echo with light

An optical technique that allows the coherence of electron spin inside a quantum dot to be manipulated over microsecond timescales may have important applications in quantum information processing.

Manfred Bayer

Around a decade ago, scientists started trying to implement quantum information technologies, which until then had only been conducted within atomic systems, in semiconductors. Semiconductors are the hardware basis for current communication and computing technologies, and offer the attractive prospects of convenient fabrication, integration, miniaturization and scalability. However, when investigating suitable two-level excitations to be used as quantum bits (qubits), it quickly became clear that for many systems the quantum mechanical coherence is strongly limited by the strong coupling of these excitations to their surroundings. This coupling leads to a loss of quantum information, which quickly destroys any opportunity for quantum information processing.

As a result, much work is now devoted to developing improved quantum hardware and experimental tools that offer precise control of long-lived quantum states. Carrier spins confined in quantum dots are considered to be one of the most promising candidates for carrying quantum information in semiconductors. Particularly appealing are quantum dot systems that can be controlled optically, with recent examples being the demonstration of the optical rotation of electron spins using picosecond laser pulses for single spins[1,2] and spin ensembles[3]. Indeed, any arbitrary orientation of spin may be achieved by combining an optical rotation about the direction of laser excitation with the precession of the spin about an external magnetic field.