and numerically. The nanojets had a waist of 205 nm and a divergence angle of 3.3° — more than ten times smaller than the Gaussian focus spot. These nanojets could be useful for on-chip applications in biosensing and single-molecule detection. *NH*

OPTOMECHANICS

Electrical coupling

Phys. Rev. Lett. **107,** 273601 (2011)

Jake Taylor and colleagues from the USA and Denmark have proposed a laser-induced cooling technique based on strong coupling between a nanomechanical membrane and a high-*Q* electrical circuit — a technique that could be used for the optical readout of electrical signals. The device consists of a Fabry–Pérot cavity with a nanomechanical membrane at the resonator waist. This membrane is part of a capacitor whose capacitance depends on the displacement of the membrane. The idea is to use a voltage bias and an inductive component to give the circuit a resonant frequency close to that of the mechanical resonance. The resulting coupling between photons and the membrane phonons may become large enough to cause detectable mode-splitting in this system of electromechanical excitations. The researchers hope that the theoretical parameters are experimentally feasible and that the idea may yield field measurements beyond the conventional quantum limit. *DP*

SENSING

Plasmonic interferometry

Nano Lett. **12,** 602–609 (2011)

Nanoscale plasmonic interferometers comprising two grooves either side of a central slit in a thin silver film can function as tiny biochemical sensors that suit dense integration on a chip, according to Jing Feng and colleagues from Brown University in the USA. Light illuminating the structure strikes the grooves and excites surface plasmon polaritons, which interfere with light passing through the central slit. The two slit-groove paths act as tiny arms of a miniature interferometer. Light transmission through the slit depends on the illumination wavelength, the refractive index of the medium and the slit-groove distances, and thus can be used to detect small changes in refractive index due to changes in chemical concentration or composition. The researchers performed tests with a proof-of-concept sensor chip containing thousands of such plasmonic interferometers per square millimetre. Results indicate that the sensor can not only resolve refractive index changes as small as ~3×10^{-7}, but also detect glucose in water with a concentration of 0.1–140 mg ml^{-1} in sample volumes as small as 20 fl. The researchers anticipate that such sensors could serve as useful high-throughput devices for a wide variety of biomedical sensing tasks. *OG*

SEMICONDUCTORS

Contact-printing devices

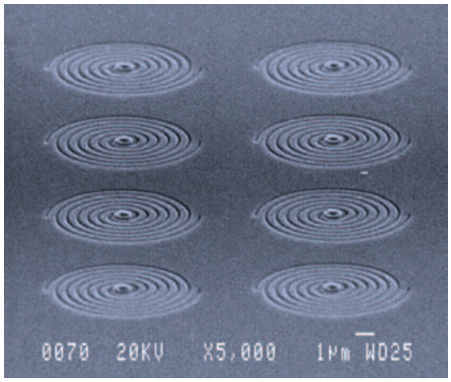
Nanotechnology **23,** 045201 (2012)

Spatial tuning of a semiconductor's bandgap is desirable for the realization of tunable wavelength optoelectronic devices. Toshitake Takahashi and colleagues in the USA have now used a recently reported contact-printing method to transfer parallel CdS_xSe_{1-x} nanowire arrays with spatially graded bandgaps to a substrate. The technique involves directional sliding, which preserves the initial compositional grading. The resulting arrangement of spatially graded nanowires can then be used as an array of photodetectors. Spectral photocurrents showed that the bandgaps of the grown nanowires span a large portion of the visible range. Photoluminescence measurements revealed peaks across the wavelength range of 525–650 nm. The researchers emphasize that further work must be done on growth optimization to cover a wider spectrum. The time constant for the photocurrent response was around 130 ms. The study demonstrates the ability to assemble organized collections of semiconductor nanowires in a one-step process, which could be extended to a variety of materials for optical and chemical sensors. *DP*

PLASMONIC ANTENNAS

Filtering circular polarization

Opt. Express **20,** 1308–1319 (2012)



Complete Stokes vector imaging is a challenge because of the difficulty in fabricating micropolarizing structures that are sensitive to circular polarization. However, recent work by Kate Bachman and colleagues from Colorado in the USA suggests that this won't be a problem any longer. The researchers demonstrated that a spiral plasmonic antenna with a high circular polarization selectivity allows the transmission of one circular polarization state while blocking the opposite circular state. They formed the antenna by first nesting Archimedean spiral gratings in a silicon-dioxide-coated gold film. They then formed a cavity by cutting out the gold region in the centre of the spiral grating to the same depth as the grating grooves, and covering the aperture in a gold cap. Incident light couples to surface plasmons travelling towards the central aperture. The spectral bandwidth, efficiency and extinction ratio of the device, which operates in the visible and near-infrared regimes, can be tuned by changing the antenna's geometric parameters. The researchers also fabricated an array of spiral antennas to form a circular dichroic metamaterial, which can be used as a circular dichroic thin-film filter compatible with very-large-scale integration. *RW*

DATA STORAGE

DNA bio-approach

Appl. Phys. Lett. **99,** 253301 (2011)

Yu-Chueh Hung and co-workers in Taiwan and Germany have demonstrated a write-once, read-many-times organic memory device composed of a 90-nm-thick DNA biopolymer nanocomposite layer loaded with a silver precursor and sandwiched between two electrodes. Irradiating the device with 365 nm ultraviolet light at an intensity of 3.5 mW cm^{-2} caused silver nanoparticles to form through a thermally driven process of light-induced growth. The device exhibited good charge retention properties and became highly conductive above a threshold voltage of 2.6 V. The researchers also found that the device exhibited no significant change in conductivity in either its 'on' or 'off' states during the testing period of 10^5 s. This facile technique, which takes advantage both of DNA's affinity for silver ions and the ease with which DNA films can be formed through spin-coating, can be used to manipulate the properties of DNA nanocomposite thin films, and therefore holds great promise for optical storage and plasmonic applications. *JB*

Written by James Baxter, Oliver Graydon, Noriaki Horiuchi, David Pile and Rachel Won.