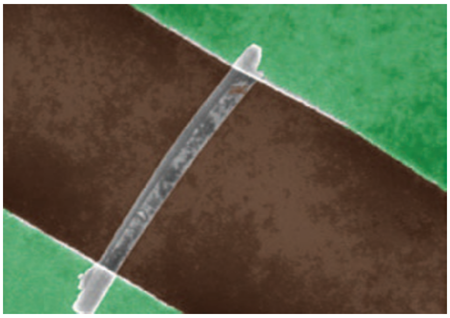
necessary to establish both the microscopic origin of the effect and its universality. *JB*

PHOTODETECTORS

Improved UV-A sensing

Adv. Mater. **24,** 2305–2309 (2012)



Sunlight in the ultraviolet-A (UV-A) range of 320–400 nm is only weakly absorbed by the Earth's atmosphere and is known to contribute to an increased risk of skin cancer. Today's photodetectors for the UV-A range — devices typically based on ZnO and ZnS — generally exhibit slow response speeds, weak photocurrent and poor stability. Xiaosheng Fang and co-workers in China have now developed a UV-A photodetector based on single-crystalline ZnS–ZnO nanobelts that provides tunable spectral selectivity and a wide photoresponse in the UV-A range. The researchers say that the optimized performance of the device is much better than that of pure ZnS or ZnO nanostructures because it combines high sensitivity with a large external quantum efficiency and very fast response speed. The photodetector could prove useful for applications such as high-frequency optical communication, memory and optoelectronic circuitry. *JB*

WAVEGUIDES

Negative radiation pressure

Opt. Express **20,** 8907–8914 (2012)

Light typically exerts a positive radiation pressure (a pushing force) on an object. Jonathan Nemirovsky, Mikael Rechtsman and Mordechai Segev from Technion in Israel have proposed a new technique that could be used to achieve negative radiation pressure in a medium with antiparallel group and phase velocities. Realizing this phenomenon has proved difficult because the media explored so far are either solids, which prohibit particle motion, or structured on a subwavelength level and therefore exhibit large electromagnetic losses. The researchers propose the use of a dielectric slab waveguide structure that has a large (up to tens of wavelengths in length) gap in the middle to allow particles to propagate. The structure consists of a gap sandwiched between two biaxial slabs, followed by uniaxial layers and clad with a Bragg grating. The layers can then be designed so that the light energy (and group velocity) moves in one direction but the phase velocity, inside the central gap layer, moves in the opposite direction. Particles in the gap should experience a force in the direction of the phase velocity, in a direction opposite to the energy flow. *DP*

METROLOGY

Position detection

Opt. Lett. **37,** 1070–1072 (2012)

Speckle-based metrology can be used to provide versatile measurements of strain, displacement and rotation in a sample. However, the speed of such techniques is limited by the required image sensor, whose response time is often orders of magnitude slower than detectors such as fast photodiodes. E. G. van Putten and co-workers have now experimentally demonstrated an alternative fast technique for measuring displacements in complex scattering materials. By spatially controlling the wavefront of the incident light, the researchers were able to concentrate the scattered light to a focus at a designated position. The scattered wavefront acts as a unique optical fingerprint that enables precise position detection of the illuminated material simply by measuring the intensity at the focus. The researchers combined two such fingerprints to provide position detection along one in-plane dimension with a displacement resolution of 2.1 nm. Because this approach does not require an image of the scattered field, it is possible to employ fast detectors to enable the high-speed position detection of scattering materials. The researchers say that employing more than two detectors would provide multiple optical fingerprints, and that the set-up can also be configured to detect other sample movements, such as rotations. *JB*

MOLECULAR LOGIC

DNA control

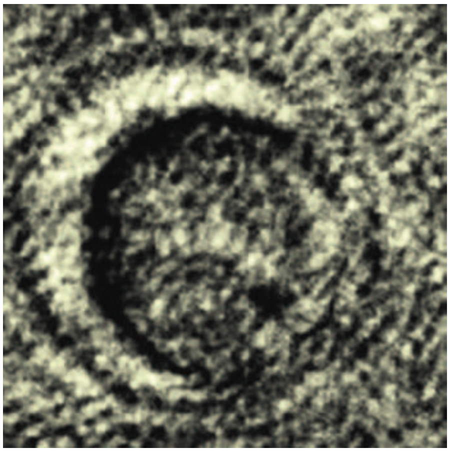
Nano Lett. **12,** 2117–2122 (2012)

Elton Graugnard and co-workers from Boise State University in the USA have developed molecular optical logical gates that operate by using DNA, dyes and fluorescence resonant energy transfer to switch visible fluorescence on and off. The switches are made from serpentine DNA scaffold that is hybridized with three strands containing the dyes FAM (input), TAMRA (intermediate) and Cy5 (output). The three dyes form a linear series of exciton transmission lines along a single DNA double helix, which allows excitation energy to flow from the input dye (peak emission wavelength of 520 nm) through to the intermediate dye (580 nm) and the output dye (670 nm). Strand invasion can be used to modify a DNA control strand and turn fluorescence off by removing a fluorophore, or turn it on by removing a quencher. Strands can also be used to restore the chromophores, thus allowing the switches to be reset and cycled through many operations. The authors say it is possible to create AND and OR logic functionality by cascading switches that are complementary in their operation. Such molecular photonic circuits could be useful for logical information processing in nanoscale devices and networks. *OG*

MICROSCOPY

Detecting malaria

Biomed. Opt. Express **3,** 991–1005 (2012)



Tests for diagnosing malaria should ideally be rapid, low-cost, accurate and portable. Currently, the most popular approach is still the manual examination of a blood sample under a microscope, despite being expensive and time-consuming. An international collaboration of researchers from Israel, Italy, Spain and Germany has now developed an alternative optical approach that promises fast, automated and accurate detection of malaria. The scheme, called secondary speckle sensing microscopy, involves irradiating a blood sample in a microfluidic chip and imaging the unfocused speckle pattern of a single red blood cell. Analysis techniques such as fuzzy logic and principal component analysis can then be used to distinguish between healthy and infected cells, which have different speckle pattern characteristics. The researchers say that one of their future goals is to expand the technique such that it can determine the exact stage of the disease. *OG*

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