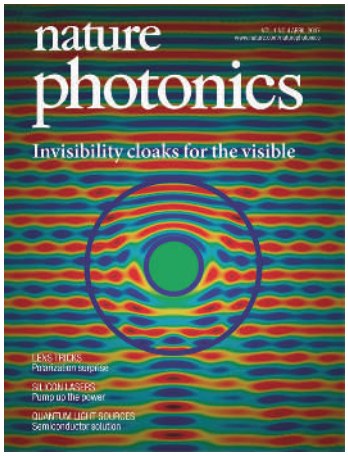


Cover story

Vol.1 No.4 April 2007

Although the dream of constructing an invisibility cloak has until recently been confined to the realms of science fiction, children's books and those labelled crackpots, serious university research is now getting in on the act. The advent of metamaterials — nanostructured materials with electromagnetic properties that can be artificially engineered — is shedding a whole new light on the topic. In this issue, Vladimir Shalaev and his colleagues describe a recipe for creating a cylindrical metamaterial cloak that operates with visible light and present theoretical simulations of its expected performance. They show that in theory any object placed inside a specially designed metamaterial cylinder will in effect become invisible when illuminated with polarized red light. The challenge is now to construct and experimentally demonstrate such a cloak. **[Letter p224; News & Views p207]**

PHOTONS ON DEMAND

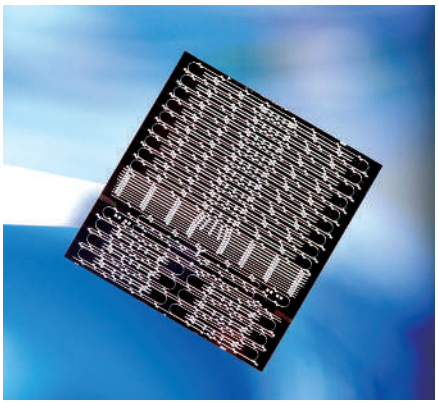
For quantum computing and information processing to take off and become a practical reality, reliable, cost-effective and mass-producible sources of single photons and entangled pairs of photons are a must. Although various schemes for generating such photons have now been demonstrated, those based on semiconductors are arguably most suited to commercialization and mass manufacture. In this issue, Andrew Shields describes the progress that has been made in fabricating quantum-dot-based sources that can generate single photons on demand. The review describes the potential applications for these sources, the unique and interesting optical properties of quantum dots and ways to incorporate them into microcavities. It finishes with a discussion of photon indistinguishability and prospects for single-photon LEDs and the generation of entangled pairs. **[Review p215]**

DVD SUCCESSOR

Much of the current excitement in the world of data storage is oriented towards high-definition-DVD and Blu-ray drives, which can store tens of gigabytes of data on a single disk, but forms of portable storage with even higher capacities will probably be needed in the future. One promising option is holographic storage, which promises to store hundreds of gigabytes and potentially even terabytes as a series of holograms within a single photopolymer disk. In this issue, Duncan Graham-Rowe explains how the technology works and gives a round-up of the progress being made in commercializing it by firms around the world. With initial products boasting capacities of 300 gigabytes due out later this year and the amount of digital data involved in imaging, entertainment and archiving on the rise, perhaps the time has finally come for holographic storage. **[Out of the lab p197]**

SILICON SUCCESS

The initial demonstrations of silicon Raman lasers at the end of 2004 and the start of 2005 were heralded as a great triumph of optoelectronics and a sign that the worlds of electronics and photonics were converging, but they were limited in their performance. Now, Haisheng Rong and his colleagues report a modified design of a silicon laser that offers dramatic improvements in lasing threshold, slope efficiency, bias voltage and output power over previous reports. The authors claim that these improvements now open the door to the practical use for such lasers, in applications ranging from communications to spectroscopy and sensing. Rong talks to *Nature Photonics* about the research and potential applications of silicon lasers in our back-page author interview. In addition, this issue also features a commentary and an editorial on the topic of silicon photonics that cover other recent results as well as the motivation, challenges and future outlook for the field. **[Article p232; Interview p240; Commentary p193; Editorial p187]**



INTEL

Silicon photonics — making great strides.

p232

WHO INVENTED THE LED?

Although the invention and first demonstration of the semiconductor laser is well documented by a series of key journal papers, the origins of the LED are far less clear. The work of US scientists in the early 1960s is often cited, however, delving into historical archives shows that important pioneering work was actually carried out much, much earlier. In this issue, Nikolay Zheludev charts the history of the invention of the LED and explains that much is owed to two figures that have been largely forgotten by the history books and the photonics community. The two figures central to the story are Marconi's Henry J. Round and an ill-fated but brilliant Russian scientist called Oleg Vladimirovich Losev. It turns out that Losev not only published several papers on the topic in the 1920s, but also patented an LED-based light relay. **[Commentary p189]**

POLARIZATION SURPRISE

The polarization of an electromagnetic wave is an important parameter and in the case of light governs how it interacts with materials, especially biomolecules. Although unpolarized light can be converted into polarized light by passing it through a polarizer, it now appears that a simple lens can perform a similar task. Klas Lindfors *et al.* have now experimentally shown, for the first time, that if an unpolarized beam of light is focused by a high-numerical-aperture lens, the tightly focused light contains well-defined rings of polarized light. In contrast, when incident polarized light is focused, rings of unpolarized light appear. **[Letter p228, News & Views p208]**