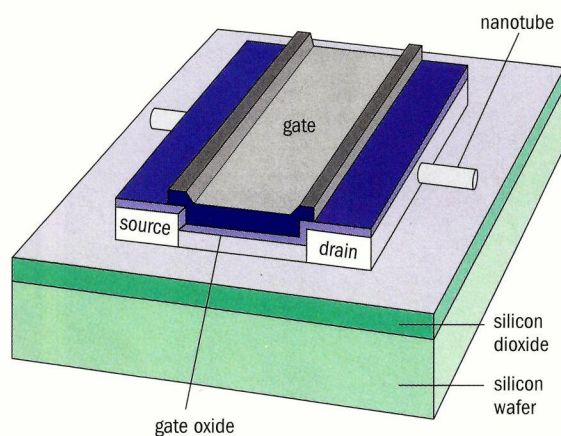


Edited by Archana Sharma

Nanotube transistors pave the way for future nanocomputer design

Nanotube transistors are valuable for future nanocomputer design. They exploit the fact that carbon nanotubes are ready-made wires that can conduct, semiconduct or insulate. In the latest development from IBM, nanotube transistor architecture has been reconfigured such that nanotubes acting as the conducting channel between the transistor source and drain are not exposed to air (top-gate configuration), and so that neighbouring transistors can be addressed individually.

By experimenting with different device structures, researchers have been able to achieve the highest



IBM's carbon nanotube field effect transistor.

transconductance (a measure of the current-carrying capability) of any carbon nanotube transistor to date. High transconductance means that transistors can run faster, leading to more powerful integrated circuits. Furthermore, the researchers discovered that the carbon nanotube transistors produced more than twice the transconductance per unit width of top-performing silicon transistor prototypes.

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Further reading

S J Wind et al. 2002 *Appl. Phys. Lett.* **80** 3817.

Speed of light passes updated test with flying colours

Researchers in Germany have devised a state-of-the-art version of the classic 19th-century Michelson-Morley experiment, which first established that the speed of light is the same in every direction.

Certain versions of string theory suggest that special relativity may not hold exactly, and that violations might reveal themselves in high-precision measurements. But in this new version of the Michelson-Morley experiment, special relativity passes the high-precision test with flying colours – the speed of light does not depend on its direction of propagation to within 1.7 parts in 10^{15} , an accuracy about three times better than previously measured. In their experiment, the German team used two optical cavities each consisting of

two mirrors held at a constant distance. The time taken for a light beam to make a round trip between the mirrors gives a direct measure of the speed of light perpendicular to the mirror surfaces. The cavities were oriented in different directions, and by rotating the set-up the team measured light speed in several directions. Potential sources of error due to variations in cavity length caused by temperature effects and material aging were avoided by using cavities made from an ultra-pure sapphire crystal, which is virtually impervious to aging, and operating it at liquid helium temperature. With the experiment still under way, the researchers hope to obtain another threefold improvement after collecting sufficient data.

New laser improves medical imaging

Scientists from Italy and the UK have produced a low-power, compact solid-state terahertz laser that is set to advance medical imaging. Based on layers of the same semiconductors used in conventional visible and infrared lasers – gallium arsenide (GaAs) and aluminium gallium arsenide (AlGaAs) – the prototype gives better soft tissue resolution than ultrasound.

Semiconductor lasers produce light when electrons move between energy levels in the semiconductor. Usually, these levels are separated by the appropriate amount to produce visible or infrared light. The new laser produces terahertz radiation by using both GaAs and AlGaAs to produce closer energy levels.

Further reading

R Köhler et al. 2002 *Nature* **417** 156–159.

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