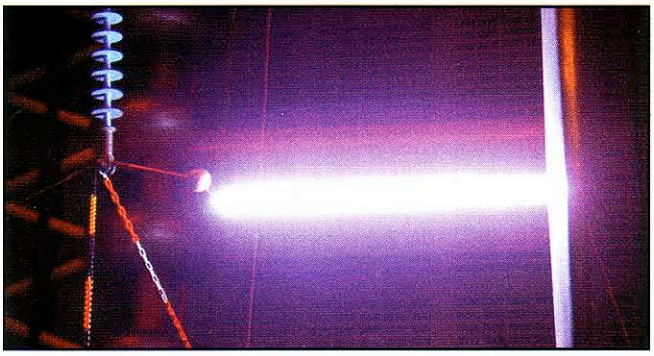
Presstime Bulletin

Femtosecond Laser Investigated for Lightning Control

Since the early 1970s, scientists have considered the potential of lasers to manipulate the path of lightning bolts. Such a capability might enable public utilities, airports and other sensitive sites to save billions of dollars per year by avoiding disrupted services and eliminating damage associated with lightning strikes.

Researchers associated with the joint French/German Teramobile (mobile terawatt) lidar project report in the Dec. 6 issue of *Applied Physics Letters* that their experiments with femtosecond pulses from a chirped pulse amplified Ti:sapphire laser suggest that such ultrashort lasers may be suitable for real-world lightning control.



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In the work, they monitored the probability of high-voltage free discharges over a 1.2-m gap through dry air and a simulated dense cloud under normal conditions and in the presence of self-guided filaments of ionized plasma generated by 170-fs pulses of 800-nm laser radiation with energies of up to 230 mJ. A Marx generator served as the source of high-voltage discharges. They found that the laser-induced filaments triggered and guided discharges even in the dense cloud, albeit with a probability of discharge that was 30 percent lower than they displayed in dry air.

The researchers, from **Université Claude Bernard Lyon 1** in Villeurbanne, France, **Freie Universität Berlin**, **École Nationale Supérieure de Techniques Avancées** in Palaiseau, France, and **Technische Universität Berlin**, note that laser-induced self-guided filaments can propagate several hundred meters through the atmosphere. Coupled with repetition rates that compensate for even low probabilities of discharge, they suggest, femtosecond lasers are promising candidates for lightning control systems. □

A Snip in Time May Save Lives: Laser-Cut Nerves Regenerate

Scientists at **Stanford University** in California, the **University of California, Santa Cruz**, and the **University of Texas at Austin** have demonstrated a femtosecond laser technique with potential in nerve regeneration research.

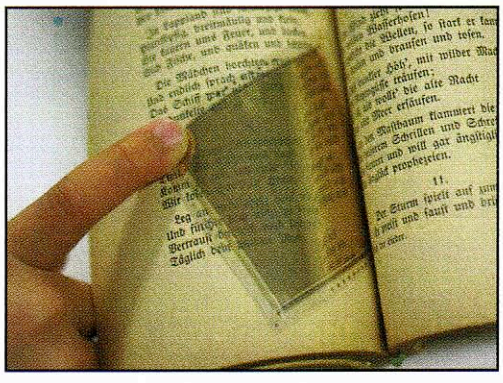
In a study published in the Dec. 16 issue of *Nature*, the researchers snipped motor control nerves in roundworms via laser nanosurgery. They found that some nerves regenerated, enabling the worms to move normally again. They used a tunable **Coherent** Ti:sapphire laser to produce 200-fs, 10-nJ pulses of 780-nm radiation, which they focused to cut 0.3-µm-diameter axons with minimal damage to the surrounding tissue.

The researchers said that the technique could approach a resolution of 80 to 100 nm, enabling its use on subcellular structures such as vesicles, mitochondria and nuclei. Such work could benefit people with nerve damage.

"Our ultimate goal is to discover the rules to prevent damaged axons from decaying or degenerating and to promote them to regrow," said Yishi Jin of the University of California's Howard Hughes Medical Institute. □

Flexible Image Scanner Developed from Organic Transistors and Photodiodes

At the 2004 IEEE International Electron Devices Meeting last month in San Francisco, scientists from the **University of Tokyo** reported the development of a flexible image scanner that integrates organic transistors and photodetectors. Potential applications include the digital archival of fragile rare books, in which such a scanner might be inserted between the pages, enabling a preservationist to digitize a volume without disassembling it.



The device comprises films of pentacene field-effect transistors and organic photodiodes, which are laminated using patterned silver paste. Image capture is performed by distinguishing the difference in reflectivity between black and white regions of the scanned surface under ambient light, so no optics or mechanical components are required in the device.

The experimental scanner, which features 5184 sensor elements, has an effective sensing area of 2 × 2 in. and a resolution of 36 dpi, but the researchers believe that the latter could be improved to 250 dpi with refinements of the fabrication process. □