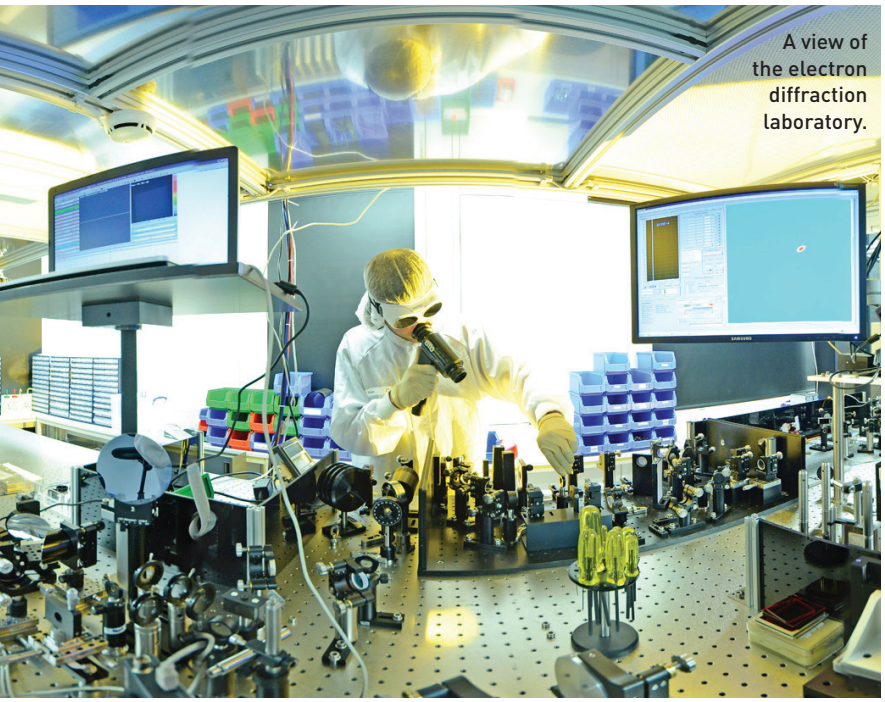


A view of the electron diffraction laboratory.

Thorsten Naeser, MPI

Electron Stopwatch

New technique measures ultrashort bursts of energy.

Teams from the Laboratory for Attosecond Physics (LAP) at Ludwig Maximilian University of Munich and the Max Planck Institute of Quantum Optics, Germany, have created a "stopwatch"—made of electric fields of laser light—that can measure the duration of ultrashort bursts of energetic electrons (Nature Photon. doi:10.1038/nphoton.2013.315). This information is key to a technique that would allow researchers to observe elementary particles in space and time.

Atomic movement happens on an attosecond scale. Electron pulses, which last only a few femtoseconds, can penetrate matter and are capable of capturing action on this timescale. To collect this data, however, researchers need to know the duration of the electron pulses.

To measure the pulses, the researchers directed an electron beam and a laser beam at an aluminum mirror. Whether electrons pick up or lose energy when they meet the laser depends on precisely when they interact with the laser field. An electron detector was used to provide an energy spectrum that the scientists used to calculate the original electron pulse duration. The technique could be instrumental in advancing ultrafast electron diffraction in the pursuit of sub-atomic 4-D imaging. —*Sarah Michaud*

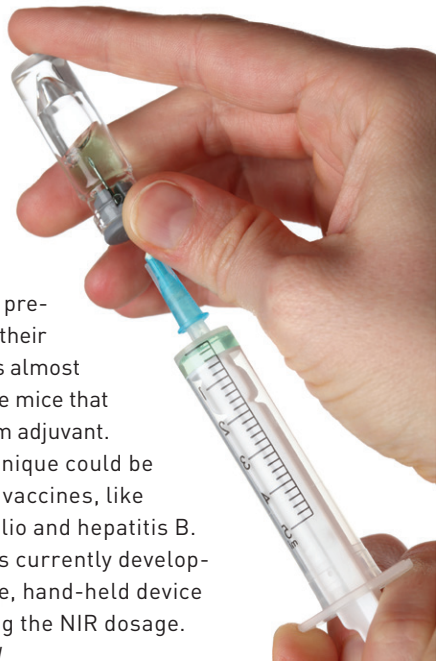
MEDICINE

Laser Boosts **Vaccine Performance**

Researchers from Massachusetts General Hospital (MGH), U.S.A., report that shining a laser on the skin prior to flu vaccination could substantially increase immune response and survival rates (PLoS One **8**, e82899). In addition to increasing efficacy, laser pre-treatment does not produce the adverse effects sometimes caused by adjuvants—additives that boost vaccine performance.

The MGH team chose near-infrared (NIR) laser light because it isn't absorbed by melanin, making it effective across a wide range of skin colors. Using a model vaccine, they found that one minute of NIR exposure prior to vaccination increased antibody generation without damaging the skin. In a comparison study of NIR, visible light and alum adjuvant, NIR produced the greatest antibody response. Four weeks after vaccination, mice were infected with a flu virus. Researchers discovered fewer viruses in the mice who received the NIR pre-vaccination, and their survival rate was almost as good as for the mice that received the alum adjuvant.

The NIR technique could be applied to other vaccines, like tuberculosis, polio and hepatitis B. The MGH team is currently developing an affordable, hand-held device for administering the NIR dosage. —*Sarah Michaud*



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In 1934 **Enrico Fermi** coined the term **"neutrino,"** Italian for **"little neutral one."**