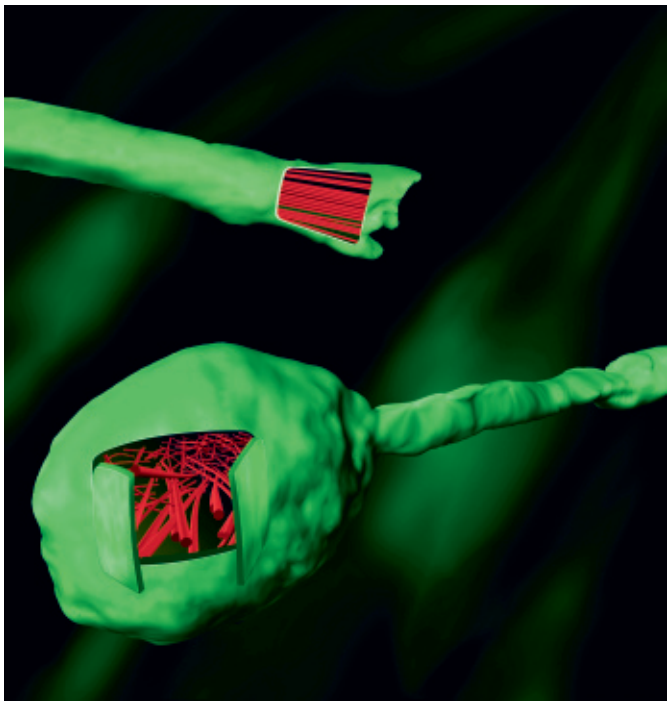
Neuronal Growth Brake Released

Cancer drug displays unexpected effect



A damaged axon with the microtubules arranged in an orderly manner continues to grow (top) –unlike one with its cytoskeleton in disarray (bottom).

Photo: MPI for Neurobiology – Bradke et al.

AROUND 130,000 PEOPLE throughout the world suffer spinal cord injuries every year, often as a result of sports or motorcycle accidents. Around half of those affected by such injuries can no longer move their legs, and many are paralyzed from the cervical vertebrae down. Special proteins hinder the renewed growth of the severed nerve cell fibers, the axons. After the injury, a bulge forms at the tip of the axon, known as a retraction bulb. Once a retraction bulb has formed, the growth of the nerve fiber is halted for an indefinite period.

Together with his research team, Frank Bradke discovered that the microtubules – strands of the cytoskeleton that are formed by proteins – in these retraction bulbs are no longer present in an orderly parallel arrangement, but rather in a state of complete disarray. The group tried to stabilize them by administering Taxol. The microtubule-stabilizing effect of this substance is already used for treating cancer, where it blocks the division capacity of cancer cells. Frank Bradke showed that it also displays astonishing effects in damaged nerve cells: "The axons started to grow again in cell cultures."

This sustains the hope that a treatment option for paraplegia may emerge in the distant future. "But this will take another 15 to 20 years," says the biochemist. For the time being, the Max Planck Institute of Neurobiology has had its discovery patented. "So far, only basic research has been done, which will need to be clinically tested later."

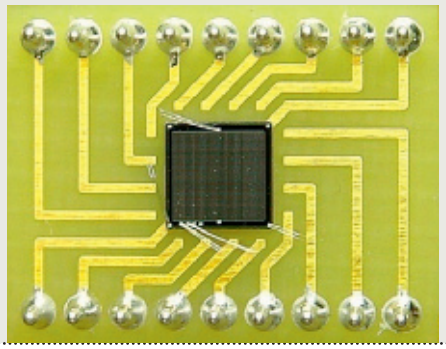
BA | MI 0202-3439-EL

A Close Look at Tumors

Highly sensitive detectors hold promise for application in medicine and environmental technology

IT MAY SOON BE POSSIBLE to identify malignant tumors faster and more reliably – thanks to detector technology developed by researchers at the Max Planck Institute of Physics and the Moscow State Engineering Physics Institute. With the help of the researchers' silicon photomultipliers, the standard test methods of magnetic resonance and positron emission tomography could be combined in a single device – one of the potential applications that PerkinElmer envisages for the detectors. PerkinElmer, a leading global manufacturer of analytical technology in the fields of medicine and environmental safety, has been granted a license for the detector technology.

The detectors could solve a dilemma in medical diagnostics. Magnetic resonance tomography (MRT) provides crystal-clear images of organs, bones and connective tissue, but provides no information about metabolic activity. Therefore, an MRT is of little help in searching for tumors that betray their presence through their high glycometabolism. This is precisely what positron emission tomography (PET) shows, but it withholds the precise location of the active cells. Computer tomography can do both, but it exposes the patient to additional X-radiation.



A savvy chip: Silicon photomultipliers could help detect tumors in the body better – without the disadvantages and side-effects of other procedures.

Photo: MPI for Physics – Masahiro Teshima

Resharpening an Old Weapon

Multi-drug-resistant tuberculosis pathogens are gaining ground

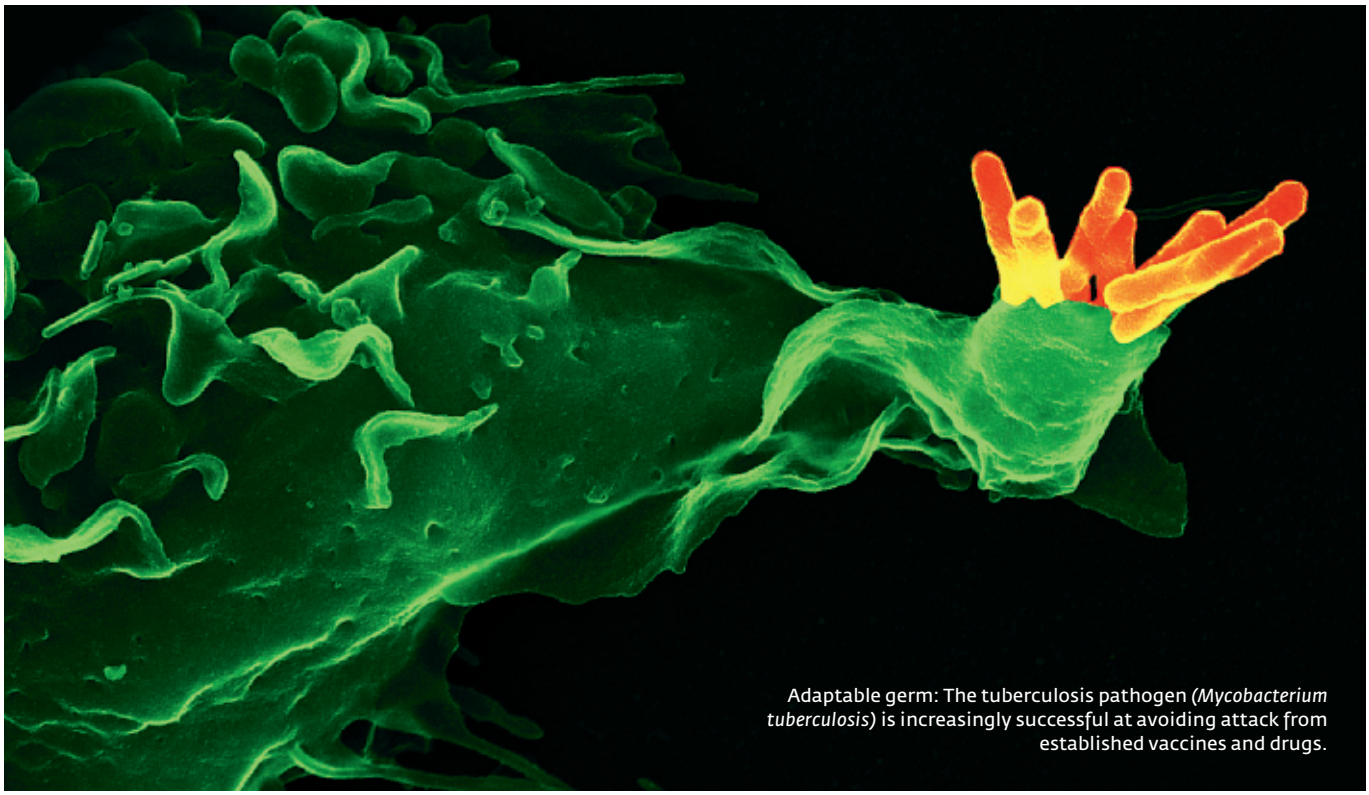


Photo: MPI for Infection Biology – Brinkmann, Schaible

Adaptable germ: The tuberculosis pathogen *(Mycobacterium tuberculosis)* is increasingly successful at avoiding attack from established vaccines and drugs.

The standard detectors used in PET are not suitable for combination with MRT, as the latter's strong magnetic field impedes the measurement. This is why the first combined devices use avalanche photo diodes (APD). These are significantly less sensitive in their reaction, are slower, and require more electricity than the silicon photomultiplier that the Max Planck scientists working with Masahiro Teshima and Razmik Mirzoyan usually use to detect cosmic gamma radiation.

Silicon photomultipliers may find application not only in integrated PET and MRT scanning, but also in any situation where it is important to register the minutest amounts of light.

PH | MI 0206-3573-GBC

NINE MILLION PEOPLE worldwide contract tuberculosis every year, and two million die from the disease. This makes tuberculosis the world's most dangerous infectious disease after AIDS. And treatment is becoming increasingly difficult, as many tuberculosis strains are now resistant to various drugs. The need for a new vaccine is thus more urgent than ever.

Since September 2008, a new vaccine called VPM1002 has been undergoing tests for safety on volunteer subjects in a first clinical Phase 1 study. It is based on the BCG (Bacille Calmette-Guérin) vaccine that has been in use since 1921. This is a live vaccine strain that can prevent life-threatening miliary tuberculosis in babies, but it is largely ineffective against the world's most common form of the disease, pulmonary tuberculosis in adults.

"We wanted to resharpen the BCG weapon, which has become rather blunt," explains Stefan H. E. Kaufmann. "To this end, we altered the genetic make-up of the vaccine in such a way that it can no longer hide from the immune system; instead, it provides the optimum stimulation for it." The altered vaccine proved extremely effective and safe in the preclinical tests on animals. "This protective effect must now be proven for humans before the vaccine can be approved," says Bernd Eisele, CEO of the company Vakzine Projekt Management GmbH (VPM), which has licensed the new vaccine from the Max Planck Institute for Infection Biology.

According to Eisele, the study's progress to date has been extremely promising. Kaufmann, however, urges patience: "Even if the new vaccine proves to be well tolerated, it must still undergo further trials to assess its efficacy. This will take at least another eight years."

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