Federal Ministry
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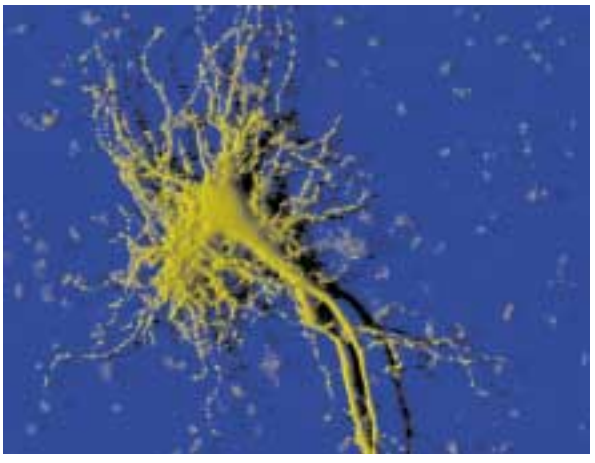
Germany – Israel

Cooperation in Science, Technology and Education

RESEARCH



Nerve cell taken from the hippocampus region of an epileptic patient's brain. This cell was injected with fluorescent dye and then photographed with a confocal laser microscope.

Truffle pigs, drug dogs and also mice have an extremely good sense of smell. They can distinguish between mixtures of several scents even if the difference consists in very fine nuances. Bert Sakmann and Hartwig Spors, researchers at the Max Planck Institute for Medical Research in Heidelberg, have been cooperating with Amiram Grinvald from the Weizmann Institute in Rehovot in studying the **sense of smell in mice**. They were able to show that this ability is due to a complex networking of nerve cells in the brain which are responsible for the sense of smell. Unlike other areas of the brain, these networks integrate new nerve cells throughout life. There is good reason to assume that human nerve cells are connected in a similar way, for example, to enable people to smell and see, or to replace the functions of damaged brain areas. With their work on mice, the researchers therefore hope to be able to also point out **new ways in the treatment of human brain disease**: if it were, for example, possible to systematically foster the reconnection of surviving nerve cells and the insertion of new ones in stroke patients, the adverse effects of stroke such as sight defects and paralysis could be alleviated.

The industry-led cooperation between the Natural Science and Medical Institute (NMI) in Reutlingen and the Neural and Vascular Reconstruction Labs Inc. Ness-Ziona (NVR) is a project in the medical and pharmaceutical area which offers good prospects for the application of findings. The aim is to use specific cells in the easily accessible olfactory epithelia (OE) in rats and humans for **better treatment of paraplegia**. For this purpose, new composite implants are being developed. At the same time, efforts are being made to install a test system using nerve cells to improve the development of pharmaceuticals. At the NVS, neuronal OE stem cells, which can be easily prepared, are engineered for use as implants in patients who suffer from spinal injury, where they are to promote regeneration. This process is to be further improved by special cell adhesion molecules which are being synthesized. The NMI uses the same cell types in neuronal test systems of the kind required by the pharmaceuticals industry. Genetic modification is to help prolong cell life.

Reading other people's minds and predicting their actions has always been a fascinating idea, above all for authors of science fiction novels. Current progress in brain research shows that this need not remain mere fiction. At first sight, the possibility of controlling cerebral functions might seem frightening, but a closer look reveals that it might turn out to be a blessing for mankind as the knowledge could be used for alleviating numerous forms of disability. The **development of neural prostheses** is therefore among the currently most fascinating areas of research. Such prostheses can read brain activity and use this information to control paraplegic limbs or prostheses. Recent studies have revealed our insufficient capability to filter out the relevant information from the observed brain activity. Brain activity provides only incomplete and unclear information about the test person's intentions. In addition, the situation is constantly changing due to technical problems such as instable recording or as a result of the brain's natural ability to adapt to personal experience.

The METACOMP project, which is financed from the DIP program, is a joint endeavor of researchers with different knowledge in the field of neuroscience. Its objective is to develop a system for the effective reconstruction of the movements which a person wishes to make. The project is coordinated by Professor Eilon Vaadia in Israel and Professor Ad Aertsen in Germany. It is expected that the findings will contribute substantially to achieving a long-term goal, namely the application of these methods for improving the motor functions of amputees and of people suffering from spinal injury, Parkinson's or other motor dysfunction.