



# Spare parts for the human body

How far will handicapped bodies be reconstructed?

**A** wooden leg, a glass eye or hands made of wax can now be relegated to the museum of prostheses. The medicine of repair no longer has anything to do with these appendages, whose function was merely to reconstruct a damaged or handicapped body outwardly. Now we have to talk of implants, biomaterials, electrodes or cells, capable of restoring the internal function of the faulty limb or organ. Considerable progress has been made in this field. For many patients (accident victims or disabled persons), every hope is now possible.

In the seventies, the team of the surgeon Claude Chouard used a biomaterial\* for the first time to insulate the electrodes placed in the ear of deaf people

and which helped them recover their hearing. By getting rid of the interference between these electrodes, the French professor not only allowed perfect hearing to be restored, but at the same time made a significant advance in the sector of these implants. By using neurones, and consequently the capacities of the brain, the implant allows people to hear again but also to walk

again and recover all sensations.

In the field of orthopaedics, French companies such as Protéor, Implants Industrie or Procerati have achieved technical feats in recent years. Hips, shoulders, knees, ankles, are rebuilt today from ultra-light materials, made of ceramic, titanium alloy or plastic, and are provided with hydraulic systems for the joints. Some leg prosthe-

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In this race for biomaterials that can work miracles in orthopaedics, to replace bone grafts, and also in vascular surgery, with arterial prostheses, researchers and manufacturers are not unconcerned by the potential risks of infection and intolerance. So, supported notably by the Fondation pour la Recherche Médicale (French medical research foundation), development is moving increasingly towards hybrid systems, combining inert materials and living cell matrices. New techniques supervised by the authorities who, in 1994, set up a national committee on such materials for the purpose of gathering information and investigating any incidents related to the implanting of biomaterials.

But high-tech medicine does not stop there, as can be seen from the early stages of remote surgery. To date, worldwide, just one operation of this type has been carried out officially, by the French professor Jacques Marescaux (Research institute on cancers of the digestive system, in Strasbourg), when he was 7,000 km from the surgical unit of the patient he operated on for a gall bladder, through the intermediary of a robot. This experience, if it became widespread, would of course require very high-definition transmission equipment. Founded by the professor in 1992, the Institut de Formation à la Chirurgie à Distance (IRCAD) (remote surgery training institute) has already attracted a great many surgeons from the United States, Japan and Eastern Europe.

\* Non-living material used and designed to interact with biological systems. These include both industrially produced materials (metals, metal alloys, ceramics, plastics...) and materials of natural origin (collagen, cellulose). They are used to make support devices for the body that are capable of replacing the functions of an organ or a tissue in the form of prostheses or

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reconstituted skin or bone.

Using robotics to overcome disability

In his official speech on Bastille Day last year, the French President Jacques Chirac, paid particular attention for the first time to the place of disabled people in society. The Ministers of Culture and of the Family had already worked on this subject with the creation, in March 2002, of the Commission Culture-Handicap (culture-disability committee). Its aim: to provide disabled people with free access to public cultural venues. This accessibility involves the installation of specialised facilities, for example to enable reading in libraries or visits to museums. Robotics firms have been working in this area for several years now.

In collaboration with an association of French physiotherapy institutions and an engineer from the CEA (Commissariat à l'Énergie Atomique) (French atomic energy authority), the French company Afma-robots, has developed the Espace Afmaster. A first of its kind, this robotic station allows, thanks to an articulated arm and a personalised control console, the accomplishment of tasks as varied as turning the pages of a book, telephoning, using a microwave, operating a video recorder or television set.

Robotics on a day-to-day basis is no longer the stuff of science fiction. In the next few years, virtually stand-alone appliances will be able to carry out various tasks on demand. Equipped with cameras and wheels, these machines will accompany the patient or disabled person day and night, standing in for his hands but also his eyes. The only snag is the cost of these new "assistants", which are at present still much more expensive than a flesh-and-blood home help.

by Catherine A'