mining tools lost their edge as they bored through nature's rocky shell, the frustration of all miners. Stellite could be the ideal tool alloy. It appeared to be destined for the grinding and pounding that the "hard rock" miner desired.

METAL HIP JOINTS

There was another, more useful role waiting for it. After six decades of development of stellite as a tool material, surgeons were looking for an inert alloy that would not cause secondary reactions when it was incorporated in the human body; they wanted a tough alloy that would take enormous strains, would not change when exposed to body fluids, and would be accepted by the bone of the body itself. Stellite appeared to be ideal. Cautiously, first for those patients who were hopelessly crippled, who had joints almost frozen into position, the medical profession designed handcrafted mechanical joints for the human hip. They used stellite and it worked. In England, Mr. Peter Ring, leading in the experimentation, made patients walk again. Inert, tough stellite had jumped from the tool industry to a great advance in human resources.

To understand the impact, (and we use the word literally), of the new development, consider that, if a man weighs 250 pounds and jumps on one foot for a distance of twenty-four inches, a force of 500 foot pounds is transmitted through his hip joint. When one takes this a step further and realizes that the force is acting on a bone coupling with about three and a half square inches of surface, the impact becomes about 140 pounds per square inch. Nature, in its amazing way, can compensate for this. Man finds it difficult to construct material that will not give way under such a blow, especially when it can happen over and over again.

There are limitations to what can be done when the surgeon attempts to compensate for a joint failure. Bone may be weakened and unable to stand up under continual hammering; but even tough tool steel bends when stresses in the order of hundreds of pounds per square inch are applied repeatedly to it. Nature may not be able to grow the new material that is needed to bond the repaired joint in the body. To put it briefly, human beings are far from indestructible even with the best mechanical help. Despite this, the successes have been far more than the failures.

The medical door has been opened just a small way. Eventually, all human joints may have an opportunity for some sort of repair mechanically. From hips to ankles, to shoulders to wrists and to knuckles nature has ball socketted joints in operation, joints that can become crippled and inactive. Science still has not produced the complete answer. But, what man can imagine, man can attempt.

It was fortunate that the medical profession does not rush into production of all types of mechanical substitutes, even with the amazing successes of stellite. A tough-minded committee of surgeons follows every patient with concern. A week, a month, a year is not enough to decide that the answer is perfect. In fact every advance in the field has an improvement around the corner. Here in Canada, the professionals have the facilities of the great orthopaedic wing of Wellesly Hospital in Toronto where alloy implants are constantly under review. International co-ordination on this continent is achieved through the surgical division of Medishield Incorporated of New Jersey who distribute the prostheses to hospitals.

NEW MEDICAL FRONTIERS

Inventitive genius and surgical science have shown that they can go hand in hand. The final chapter of this story is an encouraging report of the real value that can come when private industry, the government and professional exploration are brought together for the good of mankind. In the 1970's at a time when news stories of bureaucratic mishaps are more common than successes, the Deloro Stellite story is a refreshing illustration of co-operation.

Back in the 30's the Ontario Research Foundation, hampered though it was by its cramped laboratories in Queen's Park, had been investigating the process of "sintering", the procedure by which powdered metals are formed into stable blocks through heat and pressure. They too had no concept then that the process would be a boon to the human being.

In the medical field, it had become accepted that the human body would regenerate bone about a stellite implant without rejection. The problem was that, to ensure a solid bond between the living bone and the metal joint, a cement had had to be developed which would fill the space and hold the implant securely. While this was adequate, whenever the bone material could reach the implant to bind to it, the highly polished metal forced it to form a tight socket rather than an integrated weld. Although it was satisfactory, scientists were convinced that perfection could be improved.

The implants being constructed at Deloro Stellite were each individually cast through a combination of the sculptors' "lost wax" technique and a formed ceramic mould for each piece. Each piece was tested no less than three times. In other words, each implant was a handcrafted work of art. Now the engineering staff at Deloro Stellite proposed that the process be carried one step further and that, if stellite were to be powdered, no small feat in itself, a coating of what were in effect minute alloy balls could be sintered to the surface of each implant. This roughened surface would be ideal for the regeneration of bone which would be locked into the surface of the prosthesis. This proposal is likely to change the entire concept of surgical integration of metallic implants.

Deloro Stellite had the technical knowledge for the construction of highly accurately designed implants made of one of man's toughest alloys; the Ontario Research

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