SURGERY

New Limbs for Old

Amputations have lost much of their tragedy as the developments of science provide functional artificial limbs to the victims of war, industry and accident.

By FAYE MARLEY

➤ YOU WILL MEET someone one of these days and not know that he has lost a leg or arm. For science is making it possible for the lame and halt to arise and walk, with functional artificial limbs that look and work like the real thing. Cripples are being reclaimed to useful lives.

You will shake hands and not realize that the hand you shake is not flesh and blood but plastic, so cleverly fashioned that it looks and feels natural.

The old days of peg legs are obsolete. Although hook hands may continue to be used in some industries, cosmetic hands are available. Out of the horrible maimings of war has come a revolution in prosthetics. Thousands each year—more of them injured in industrial accidents than in war—are facing the world with restored confidence because of the revolution that has repaired their injuries.

A little girl had both arms burned off by an electric wire, but artistic artificial hands the color of her own flesh emerge from her sleeves. A U.S. Marine Staff Sergeant, 31 years old when he hit a 12,000-volt power line during a routine training parachute jump, is dancing today, "easier than walking," he says, in spite of the third degree burns that caused his left foot and leg to be amputated.

Funds Available

No one needs to be without artificial limbs in this country today because there are funds available in most cases for their purchase. In the case of children, new hands must be adapted to their growth every year, but the earlier they start using their make-believe hands or legs, the more natural they will feel.

A few miles northwest of Washington, D. C., at the former location of a finishing school for young ladies, is the Forest Glen section of Walter Reed Army Medical Center where there is a laboratory for "biomechanical research," the term now used for developing replacements of body parts lost through some disease or accident.

Under the jurisdiction of the U.S. Army Research and Development Command, this laboratory is a place of inspiration and hope, with mechanical, chemical and manipulation skill joining medical knowledge and experience. Teams of specialists work there, giving techniques and information to all the world and using ideas and methods produced in several scores of other laboratories and hospitals.

Carl Nielson, plastic technologist, and chief of the materials and applications division of the Forest Glen laboratory, where this reporter was shown machines that test prosthetics up to 300,000 times each, said in all of his 18 years' experience at the laboratory, he is fondest of the cosmetic glove that bears his name. "It is something I can see outside," he said.

Helping Hand

Mr. Nielson literally reached out a hand to his amputee friends because his own hand served as a model for the making of the standard Nielson glove. Made of polyvinyl chloride plastic and colored to any of a dozen or more shades of skin, this glove, with its natural-appearing fingernails, is hard to distinguish from a human hand.

So amputees can support the weight of the hand, the shape of the stump left to the arm is fixed in a mold over which three to five multiple layers of nylon stockinette sleeves are slipped.

Then plastic resin material is poured over the stockinette to impregnate it so that it will set in a hard material that can bear the weight without too much fatigue. As far as the socket is concerned, the stump fits. Material used is porous. By adding a solvent to the resin mixture, controlling the reaction time and allowing the solvent to evaporate, minute, almost skin-like pores are left in the structure. Plastic resin is left on the fibers, not in between them, which formerly closed off air.

Internal Body Program

Lt. Col. Peter Margetis, director of the laboratory, explained the most recent research being done on the internal body program. This was one reason for changing the name of the laboratory from "Prosthetics," which carries the connotation of outer artificial organs, including a missing eye and teeth as well as limbs, to "Biomechanical," which connotes substitutes for internal parts too.

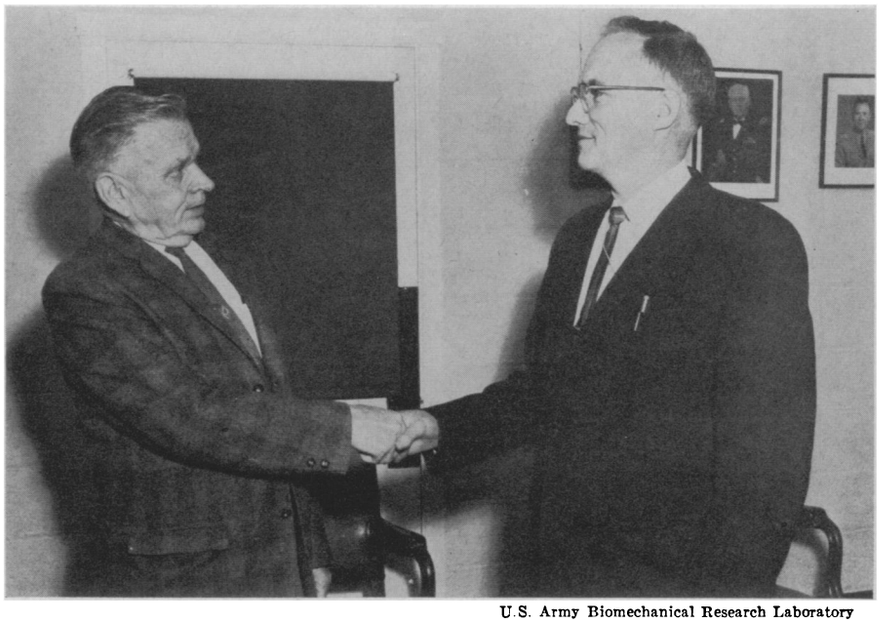
These parts so far are mainly what some of the scientists call "plumbing." There are no hearts or kidneys being made out of the synthetic Dacron, plastics and urethane foam one sees on the laboratory tables.

Donald Ingenito, chemist, reported that artificial arteries and bile ducts have been successful to a certain point with animals. A loosely woven Dacron trachea and iliac arteries that had been made of foam-covered crimped material were shown.

One problem with the trachea had been that it would collapse when it actually took the place of a dog's windpipe. But by including a rigid acrylic, plastic coil within the substitute trachea, this collapse can be eliminated.

Burn coverings, adhesive made of plastic for surgical use, and even heart valves are being developed at Forest Glen.

No work is being done for thalidomide-deformed babies here, as this is mostly being done in Europe where the demand is great. However, letters are received at the labora-



U.S. Army Biomechanical Research Laboratory

HELPING HAND—Carl Nielson (left) of the U.S. Army Biomechanical Research Laboratory, Forest Glen, Md., is shaking a model of his own hand worn by Leo Gowen, an amputee.

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tory with pictures of "congenital amputees" and requests for advice on prosthetics.

One father objected to this technically correct term when asked if his son was a "congenital amputee" and answered, "No, he was born like this!"

Dr. Fred Leonard, scientific director of the laboratory, recently returned from India where wooden legs are still widely used, but where scientists are asking for advice on more modern prosthetics.

Work is being done on mechanisms to guide hands, feet and legs above as well as below the elbow or knee. Hydraulic and electric means of operating prosthetic devices have proved successful in cases where the patient cannot manipulate his prostheses through his own musclepower.

Electric Elbow

For example, an electric elbow was designed so the amputee's deep breathing under the strap across his chest would trip the switch and activate the electrically operated elbow lock.

The Veterans Administration has developed a "revolutionary" type of artificial leg that is being issued to eligible veterans who had amputations above the knee. It has hydraulic knee mechanism and contains the same kind of fluid composition as that in planes taken to the Arctic. The ankle and knee motions are coordinated to make walking easier.

As far back as 1948, at the National Academy of Sciences, Washington, D. C., was demonstrated among the then new artificial limbs and materials a suction socket that makes a leg feel like a part of the amputee's own body. The prosthetics program, badly needed following World War II, was sponsored by the Army, Navy, Air Force and Veterans Administration. The materials were developed by Government, industrial and university laboratories and continue to be developed with the aid of this biomechanical laboratory.

• Science News Letter, 85:42 Jan. 18, 1964

BIOTECHNOLOGY

Cars Steered by Flicks Of Muscles Foreseen

➤ BY SKILLFULLY FLICKING back and chest muscles, an armless person could drive a car and an astronaut could control his craft despite tremendous forces pressing on him.

Such a possibility is foreseen by Amos Freedy, engineering student from Israel, at the University of California at Los Angeles, who is working in a team trying to see if amputees can learn a new way of controlling artificial limbs with greater skill and less effort. Electronic aids for paralyzed persons also are forecast.

The study involves following a weaving dot on an oscilloscope using only the play of a chest and a back muscle for tracking.

"You might get an idea of the complexity of the operation if you took an armless man trying to use two levers, one for side motion, the other for up-and-down movement, to hit a bobbing duck in a shooting gallery," Dr. John Lyman, head of the UCLA biotechnology laboratory, explained.

Two transducers made from silicone rubber impregnated with carbon powder are glued to a chest muscle and a back muscle. One muscle controls horizontal movement, the other vertical motion. By coordinating the frequency and force of the muscles' pressure on the transducers, a person can track the dot on the oscilloscope.

"By the same method and power an amputee could use his artificial limb to grasp something with his fingers and rotate his wrist simultaneously," Dr. Lyman, professor of engineering and psychology, said.

The research is supported by the U.S. Office of Vocational Rehabilitation and the Veterans Administration.

• Science News Letter, 85:43 Jan. 18, 1964

MEDICINE

New Plastic Promises Better Facial Repairs

➤ EASIER and better-looking repairs of facial deformities are promised by a new plastic material which can be injected under the skin and molded to the desired shape before it hardens.

Tests of the material, called "room temperature vulcanizing (RTV) Silastic" were described to the American College of Surgeons in San Francisco in a paper by Drs. Thomas M. Biggs, Bromley S. Freeman and Arthur C. Beall Jr. of the department of surgery, Baylor University College of Medicine, Houston.

Silastic, a trade name for dimethylpolysiloxane, a type of synthetic rubber, has been used for many years in plastic surgery, but only in its solid form.

In liquid form, he said, it can be injected under the skin with a hypodermic needle. It hardens in about ten minutes, during which the surgeon can mold it to the desired shape.

Dr. Biggs said the material is readily accepted by the tissues, which simply form a light fibrous sac around it. It will not "drift," he said, as some waxes used several years ago have done.

Dr. Biggs said he has tried the material so far only in dogs, and in a very few clinical trials on human patients. He said it has been used in clinical trials on humans by Dr. Herbert Conway in New York and Dr. Ralph Glocksman in Grand Rapids, Mich.

• Science News Letter, 85:43 Jan. 18, 1964

Do You Know?

In the U.S. each year about 6,000 to 7,000 *children* under 15 die as a result of accidents that take place in the home.

Unidentified seasonal factors influence the transmission rate of flu *viruses*.

Many species of *fungi* may be potential sources of edible protein.

Nylon is now produced in 120 plants in 38 countries.

Help in predicting growth patterns of *lung cancer* may now be obtained from digital computers.

• Science News Letter, 85:43 Jan. 18, 1964

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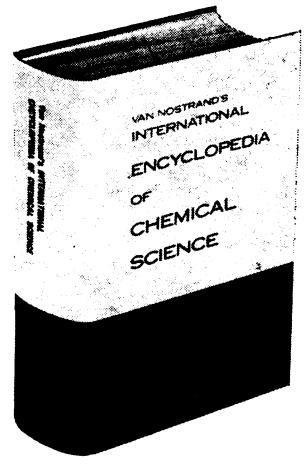

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