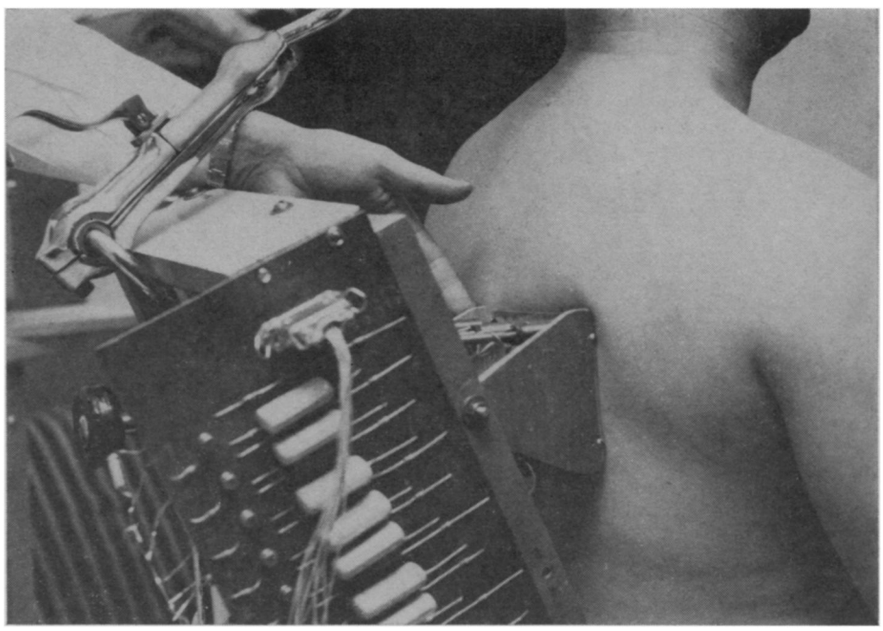
SIMULATED VISION



In use, the experimental device translates images to sensations of the skin.

Electronic Eyes for the Blind

Television pictures, translated into taps on the back, alert the sightless to moving objects.

by Jim Hazelwood

The tightly blindfolded man sat in a battered old dentist's chair and nodded his head while a technician moved a wooden ruler up and down in front of a small TV camera.

"Up!" said the man. Then, "Down . . . down . . . down!"

"Good," said Carter Collins, Ph.D. "That's a 100 percent score."

This scene took place a few days ago in a cluttered back room of the Institute of Medical Sciences of the Presbyterian Medical Center in San Francisco. If Dr. Collins seemed elated, it was because he had just proved that the unusual piece of equipment strapped to the dentist's chair shows promise as a device which will enable the blind to see through the skin.

Dr. Carter Collins

The basic idea is not new, but this approach is. Back in 1964, Russian scientists claimed they had taught several persons "finger sight," said Dr. Richard P. Youtz, a professor of psychology at Barnard College, New York, investigated color-sensitive fingers, but he emphasized that this was not true vision.

Also, in 1966, an experimental reading machine for the blind called a Visotactor was reported to the Veterans Administration in Washington.

A Recogniton Machine, a combinaton Visotactor, memory and magnetic tape that will read letters out loud in a technique called "spelled speech," is being developed in a five-year project at Mauch Laboratories in Dayton, Ohio, with the support of VA.

But PMC team believes that, with their device, it may be possible for the blind to discern persons and movement in a room, easily avoid obstacles in their path and even be able to read ordinary letters printed in large type.

"It won't be sight as we know it," said Dr. Paul Bach-y-Rita, the principle investigator. "But is should be an enormous improvement over anything that has been available for the blind to date."

The device is fairly simple. The TV camera, which would be miniaturized and mounted on a blind person's head, scans the scene in front of him just as though he were looking at it with his own eyes.

The signals, light and shadow, are sent to a specially designed commutator. The commutator, in turn, activates a matrix of little needles which drum against the person's back. The sensitive skin of the back has a

"picture" impressed on it similar to the one seen by the camera.

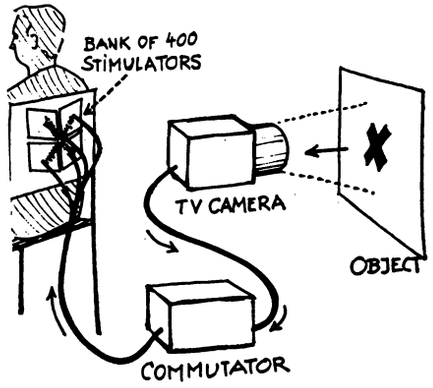
The picture moves if the persons or objects being scanned move, and the person wearing the device can detect specific shapes such as squares, triangles or, it is hoped, a large printed letter.

Drs. Bach-y-Rita and Collins conceived the idea independently and toyed with it for years before they finally met and began comparing notes at PMC three years ago.

They made three applications for grants and were turned down each time. "The idea just seemed too far out to the people we approached," said Dr. Collins.

The two men began working nights and weekends. They scrounged an old dentist's chair, an old-fashioned TV camera with electrostatic plates which was better for their purposes than a modern one and a fisheye camera lens.

Then they enlisted the services of



Sight through the skin of the back.

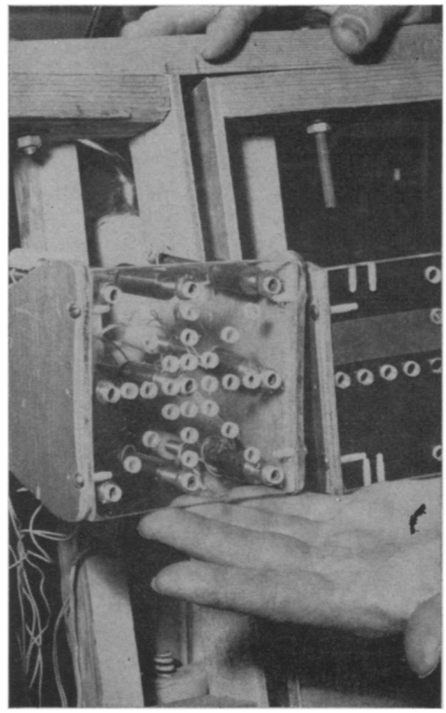
Aileen Morris, Ph.D., a psychophysicist whose field is visual acuity. Dr. Morris was needed to help work out the problems of translating the signals received by the skin into useful patterns.

There was still one major problem to overcome. The wiring and electrical work was tricky, and the trio lacked an expert technician.

Since there was no money, they persuaded the hospital to hire Gordon Holmlund, ostensibly to work in another part of the laboratory. Holmlund soon found himself working almost exclusively on the "seeing" device, a diversion which he has never regretted.

The financial problems have been alleviated. The team recently obtained a $70,000 two-year grant from the Vocational Rehabilitation Agency of the Department of Health, Education and Welfare. Dr. Bach-y-Rita said this should be enough to produce a good working model.

The business end of the device is the matrix, or tactile array, as the researchers call it, which vibrates against a person's back to reproduce in sensation on the skin the picture seen by the TV camera. The prototype, which was built mainly to see if the system would work, contains only nine vibrators.



Needle holder shaped to fit back.

Even with this small number, blind persons tested were able to follow movement and describe basic shapes pinned on the wall. But the team realizes that a much more sophisticated matrix will be necessary before more detailed pictures can be translated. They have a 400-vibrator matrix in a 10-inch square on order. Eventually the matrix may contain thousands of vibrating needles.

The little needles, or plungers, are metal, tipped with plastic to prevent pain. Each is housed in a tiny solenoid which vibrates it in tune with the TV picture.

In the working model, the plungers will be contained in a shirt-like device which blind persons will wear next to their skin.

The device in its present form is far too bulky to be portable, but Dr. Bach-y-Rita thinks he can trim it down to a 30-pound package with the present grant; future models should be even lighter.

The team won't know how successful their equipment will be in providing essential visual information to the blind until they have the more elaborate matrices. But judging by results from the prototype, they are encouraged to think that at last they have comes up with a device to replace, at least partially, the lost eyes of the blind.