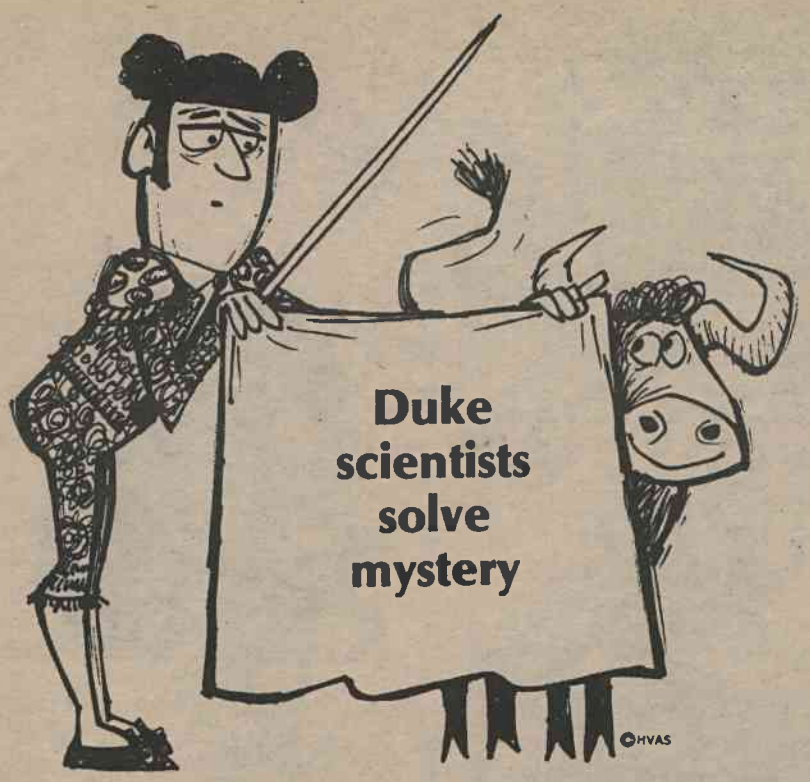

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Bulls see red

By David Williamson

A Duke researcher believes he and his associates have settled once and for all the question of whether a bull can see red.

While it's not the kind of breakthrough that will guarantee a Nobel Prize, there are plenty of scientists and matadors who will be pleased to know that the answer is "yes."

Dr. Myron Wolbarsht, professor of ophthalmology and biomedical engineering, said in an interview that the experiments were conducted on cats, but the findings probably can be duplicated in all mammals, including bulls, because their eyes are so similar in structure.

Until now, he said, primates (man, monkeys, etc.) were the only mammals known to be able to distinguish all the colors of the rainbow.

The investigators discovered that the cat possesses three kinds of color receptor cells in its retina, the sensory membrane lining the inner surface of each eye.

The brain needs all three varieties of these cells, which are called "cones," to recognize the primary colors red, blue and green and blend them into other hues.

"Previously, people have identified only two receptors in the cat so they assumed that the cat and other mammals were blind to either red or green," Wolbarsht said.

The experiments, which were part of a larger series of studies related to laser safety, involved shining a range of colored lights into the eyes of anesthetized cats.

While the different lights were on, tiny electrodes picked up changes in the natural electric responses within the

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Shining light through head may save lives

Using the same principle that allows a child to see light through his hand when he presses a flashlight against it, a Duke researcher has devised a method of determining how well brain cells take up oxygen from blood.

Dr. Frans Jobsis, professor of physiology, said he believes the new technique eventually may help to save lives in hospital intensive care units and have a number of other useful medical applications as well.

It involves sending harmless infrared light through the skull and to the brain and then measuring how much of the light emerges on the opposite side of the head.

Less than bright sunlight

Jobsis, who performed the first human experiments on himself, said there is no pain involved and no radioactivity. Less infrared light is required than a person would receive walking in bright sunshine.

"Science" magazine published an account of his research in its Dec. 23 issue.

In an earlier interview, the scientist explained that when blood squeezes through capillaries in the brain, hemoglobin molecules contained in red cells release oxygen to a respiratory enzyme found in nerve cells.

This enzyme, called cytochrome aa-3, changes color as it becomes rich in oxygen and absorbs more infrared light particles than it does when it is oxygen deficient.

More light, less oxygen

A device known as a photomultiplier transforms infrared light that has passed all the way through the head into an electric current that can be continuously monitored. Jobsis said that increases in the amount of light recorded correspond to decreases in oxygen.

"Just about all deaths can be attributed to a lack of oxygen in the brain," the scientist said. "A person doesn't die because his heart stops, for example, but because the mechanism for transporting oxygen to brain cells has broken down."

Currently, physicians in intensive care units can record the oxygen content of blood, blood pressure and the circulation of blood within the head. Monitoring circulation, however, requires radioactive tracers that are unsafe to use continuously.

All of these measurements are indirect, Jobsis said, and the brain may begin dying before medical personnel are aware of it.

"The crucial difference here is that we can now directly observe the enzyme that takes oxygen so that we are as close as possible to observing the whole purpose of the vascular system," he said.

Lasers that produce exact wavelengths of infrared light are used in the continuing experiments since they require little power. Flexible bundles of glass fibers carry the light from the lasers to the head and then back to the recording equipment.

Infrared light was selected, the scientist explained, because it has a much greater ability than visible light to penetrate biological materials. Infrared lies just beyond what humans can see in the visible spectrum as the color red.

Jobsis said he's been studying optical

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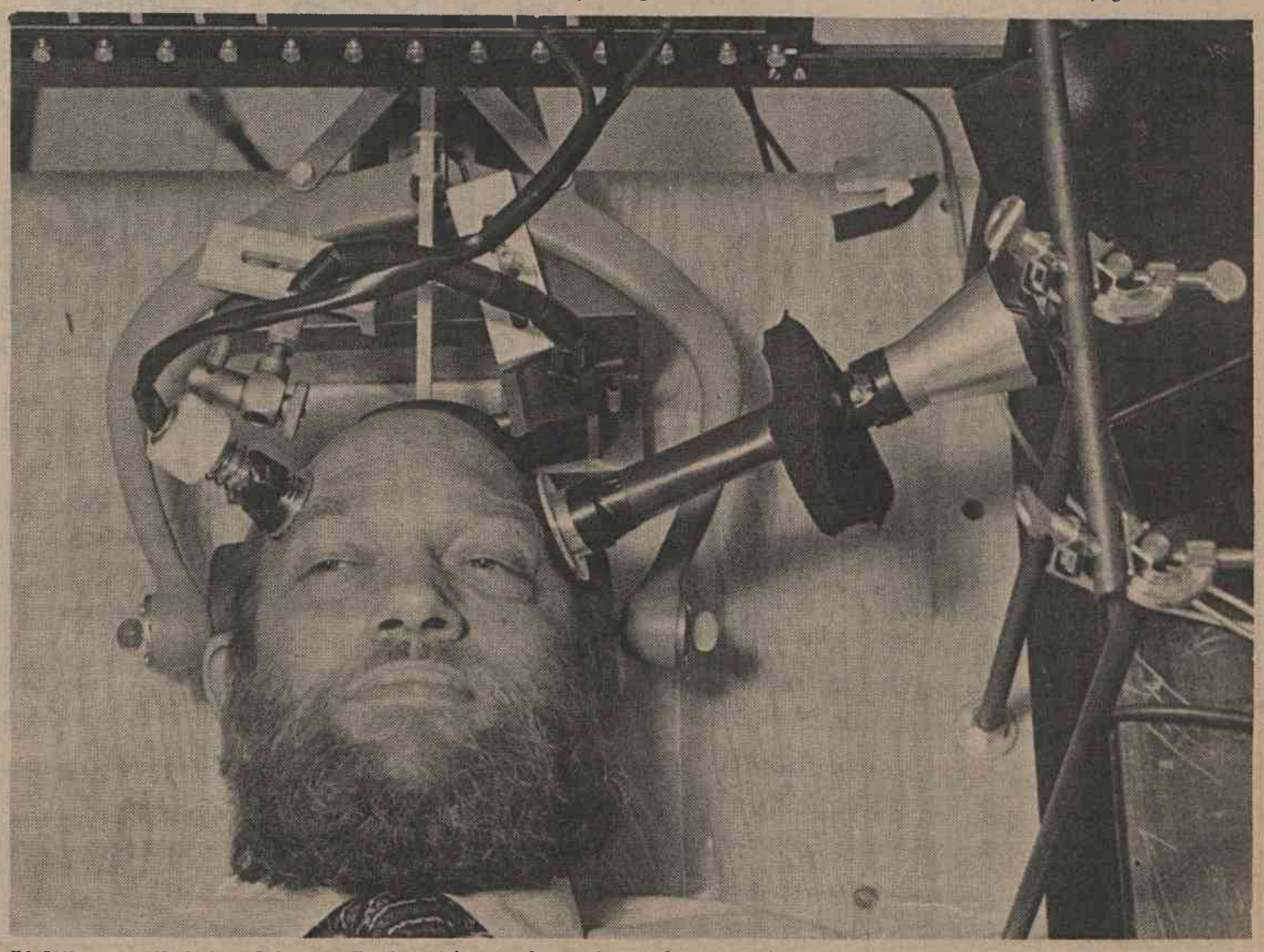

IN ONE SIDE AND OUT THE OTHER—Dr. Frans Jobsis, professor of physiology, models a new device he has created to measure how well brain cells take up oxygen from hemoglobin. The equipment records changes in absorption of infrared light that has passed all the way through the head. *(Photo by Jim Wallace)*