

Eyeing a Solution

By JOANNE SILBERNER

People with macular scotomas suffer blurry vision because a crucial part of their retinas doesn't work. One possible therapy being looked at: teaching them to use another part of their eyes.

The retina's macula is a pinhead-sized area responsible for detailed, sharp vision — it is where the eyeball focuses images. It is also, for reasons not yet known, prone to degenerate with time. With that degeneration comes a clouding, called a scotoma, in the central part of the visual field, so that whatever a person is trying to look at becomes a complete blur.

Objects on the periphery are seen normally, until the person tries to look directly at them. "No matter where you look, the thing you want to look at is gone," as one eye researcher describes it.

According to the National Eye Institute

in Bethesda, Md., in 1982 about 116,000 people in the United States were legally blind as a result of this condition, called aging-related maculopathy (also known as senile macular degeneration, though it has nothing to do with senility). The condition is the leading cause of severe visual loss among people 65 years old and over.

But the degeneration is localized, and nearby areas of the retinal tissue are still capable of clear vision. At the recent science writers' seminar sponsored by Research to Prevent Blindness, Inc., George Timberlake described a process he is working on to get the eye to use a different area. The idea is to train the person to use a nondiseased part of the retina, thwarting the system that puts the image smack onto the problem spot.



Tom Monogoi/Eye Research Institute

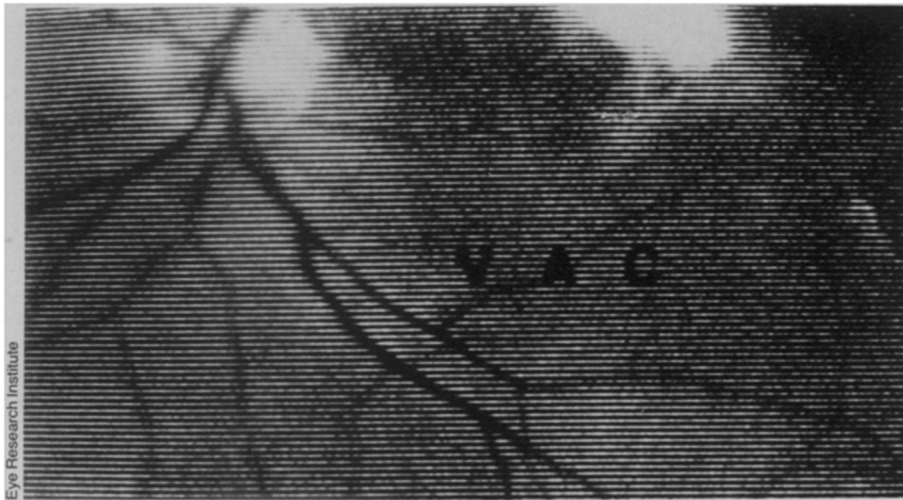
Timberlake's procedure relies on a sophisticated apparatus called the scanning laser ophthalmoscope (SLO), developed by Robert S. Webb at the Eye Research Institute in Boston, where Timberlake also works. The SLO projects an image onto the retina with a weak laser. It uses the retina the way an electron gun in a television set uses the picture tube — the retina becomes a screen for the laser.

Light is reflected off the retina and is caught by a photomultiplier, which turns it into electrical signals for display on a TV monitor. "A patient looking into the SLO sees a square patch of light about as bright as a white sheet of paper in full sunlight," Timberlake explains. "The examiner viewing the TV monitor sees where the patterns are located on the patient's retina. It's as though you could hop inside the person's eye and see where they are putting the images."

Dots, patterns and letters are used. "Any graphic pattern that the computer can produce, such as a video game, can also be produced on the patient's retina," Timberlake notes.

People with aging-related maculopathy naturally come to use a spot of retina next to the affected area, Timberlake has found, and the location of that spot in relation to the degenerated area varies from person to person. "There's some reason to believe that because of the disease process, vision might be worse on one side of the scotoma," Timberlake says. And there's no guarantee that the new spot isn't in the worst area. What he is trying to do with the SLO is map out the exact area of damage in the retina of the better eye, and then find

A macular scotoma blurs the central part of the visual field, so that a person so afflicted would see the scene above right as it appears to the lower right.



The whitish area in the upper right-hand portion of this picture of a retina is a macular scar. The scar and surrounding tissue can't transmit visual information to the brain. The letters are projected directly onto the retina to determine how far the damaged tissue extends.

the spot of highest acuity in the surrounding tissue.

The damaged area can be mapped, though less accurately, with other methods. What is unique to the SLO is that it can be used to move an image and find the best alternative. "The advantage is that it allows us to see where on the retina the word [or other pattern] is placed. It makes the analysis a whole lot easier," says Timberlake.

So far, he and his colleagues have used the machine to map scotomas in 15 people, and in two they have determined the area of best vision. The researchers were able to explain to these people that they wanted them to use an area of their eyes a little over (or under, or to the right or left of) the area where they usually focused. Imprecise as this verbal instruction technique was, their visual acuity and reading ability improved.

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EM study challenged

Most American citizens, including legislators, don't know the difference between a watt and a volt. Considering this general lack of knowledge, a study as unscientific as that of Ruey S. Lin's group ("Brain tumors linked to EM radiation," SN: 11/10/84, p. 292) can only enhance prejudices. It is true that electromagnetic radiation is linked to cancer, as in the well-known example of X-rays; but the study misuses statistics in a way that could stir up unwarranted controversy.

No scientist would disagree with the possibility that low-frequency radiation could perhaps cause cancer if the energy absorption rate in the body were high enough. However, using the stated occupations on the death certificates of the individuals as the means of determining EM radiation exposure is simply ridiculous. One cannot quantify exposure levels (if any) by this method. In fact, one cannot even demonstrate that any single individual in the study ever received an EM radiation dose.

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Lin replies: It is surprising to find that some science-literate readers still misunderstand the essence of an epidemiologic study. Epidemiology as a branch of medicine follows the same scientific disciplines of observation and inference in studying risk factors of the disease in question by means of comparing the distribution of disease and exposure among different groups of human beings. The case-control

method applied in our study is a well-established epidemiologic method to explore risk factors. The demonstration of an association between smoking and lung cancer is a classic example of the application of epidemiologic methods. The recent finding of a linkage between toxic-shock syndrome and tampon use is another. Although the lack of information on dose and duration of EM exposure on death certificates limits the power of inference in our study, the similar findings of a higher risk of brain tumors among electrical workers in the State of Washington's vital statistics as well as in other multiple occupational studies enhance our suggestion of an association between EM radiation and brain tumors.

Currently, the findings from experimental studies that demonstrate calcium ion efflux in chicken and cat brain tissues after exposure to weak EM radiation (Adey and Blackman) as well as an increasing proliferation rate in tumor cell cultures exposed to EM fields (Winters) also support our hypothesis.

Besides the well-known thermal effect, the nonthermal bioeffects of EM radiation have been asserted in numerous published papers. Indeed, the repeated lowering of ANSI standards for radiofrequency and microwave exposure reflects the apprehension of experts in the American National Standards Institute on the possibly profound nonthermal effects of EM radiation.

Pollution solutions

In "Bugging a toxic groundwater hazard" (SN: 11/24/84, p. 329), an EPA microbiologist offers a methane-loving bacteria that can enzymatically break down the groundwater contaminant TCE

"We were surprised," says Timberlake, "but they did manage to do it."

Some people happen on the better area on their own. Timberlake describes one report in the medical literature of a bilingual man with a macular scotoma who retained his ability to read Hebrew but not English. Evidently the damage in his macula was such that it blocked out what was just to the right, but not what was to the left. "The people who have this problem often get lost in the line they're trying to read. If you're reading Hebrew you're reading from right to left, so words to the left wouldn't be obscured by the scotoma [in this case]," he explains.

The technique needs a lot more work to nail it down, he notes, and more sophisticated training procedures would help. The SLO, which will be marketed soon for general diagnostic purposes, will retail in the tens of thousands of dollars. "But though it's going to be a bit esoteric for awhile," says Eleanor E. Faye of the Lighthouse for the Blind in New York City, "it's a very important development and something we'd really like to have."

And the need is there. As a disease of the elderly, notes Timberlake, aging-related maculopathy is too often passed off. "There's a notion that they're old, they're retired, they don't need to see. It's exactly the opposite. They can't read food labels, recipes, medications. It's not just their favorite novels." □

into degradable alcohols.

While this is all fine and good, he and many other well-intentioned scientists have missed the main point. The solution to pollution is not more scientific technology but the removal of the originating cause. We see this problem of approach appearing in all disciplines: Each "expert" will see the problem from a limited vantage point based upon their specialized educational framework. While they may perform the function for which they have been trained, the training may add nothing to the simpler solutions that could be reached using common sense.

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Controlling craving

With interest I read of using clonidine to suppress cravings associated with drug and cigarette withdrawal ("Craving may be at the root of several drug addictions," SN: 11/17/84, p. 310). Clonidine has also been used to control Tourette's syndrome, in which intense cravings precede, and relief follows, the severe motor tics. The neurochemistry involved may be more than coincidental, and it may be more profitable to consider Tourette's as a condition of addiction to substances released during the motor tics rather than as a lack of inhibitory controls requiring major tranquilizers (e.g. haloperidol) for therapy. Endorphins may be involved, and the use of opiate antagonists could provide a new avenue of research in Tourette's syndrome.

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