Letters

Dermooptical Perception: A Cautionary Report

Because of the recent interest in this country and in the U.S.S.R. in studies dealing with visual perception by extraocular means, it is important to call the attention of scientists to the following event which occurred in our laboratory.

Our attention was brought to a subject, an adolescent, who appeared to possess dermooptical perception localized in some unspecified facial area. Prior testing had indicated that the subject read unfamiliar texts despite exclusion of light from the eyes. Since the reading material was held at a normal distance, the phenomenon posed not only the problem of nonretinal photosensitivity but also the problem of image formation in the absence of a lens or pinhole mechanism. This seemed to violate the laws of physics, but we were confronted with the subject's obvious ability to perform. We decided to begin with a complete mapping of the face to determine whether specific sensitive areas other than the eyes could actually be found.

The subject's performance was indeed impressive. Blindfolds were secured with adhesive tape along all edges. The subject read fluently material selected at random. Usually a "warm-up" period of a few minutes was required. The subject usually began by indicating that extreme concentration was required for the task and reported the following introspections: first an orange-red light appeared and finally white light, which was the signal to the subject that the special condition for extraocular reading had been reached.

Although a number of highly skeptical investigators studied the subject's performance, at first no flaws could be found. The bandage seemed foolproof. We could find no other opportunity for cheating and began to believe that we might be dealing with an unusual phenomenon. It finally became apparent, however, that the subject's "concentration of attention" consisted of tensing of muscles in the vicinity of the blindfold until a very tiny, inconspicuous chink appeared at the edge. Placing an opaque disk in front of the chink prevented reading, but not immediately. The subject had excellent memory and usually continued for a sentence or two after blocking of the reading material.

Closing the chink similarly prevented reading until a new opening at the edge of the adhesive occurred. However, closing the opening by applying pressure at the edge of the adhesive was made difficult by the subject's claim that pressure to the face interfered with sensitivity. The most effective blindfold we were able to develop consisted exclusively of two small pieces of adhesive tape which were used to fasten the eyelids shut. This also elicited the complaint of "too much pressure"; the subject seemed not to realize that the complaint of too much pressure at the eyelids was inconsistent with the claims of extraocular, or at least extraorbital, facial sensitivity. The subject was permitted to "adjust" the new occluders and was then able to read. An application of zinc ointment at the edges of these occluders, without exerting pressure, prevented reading—until a new chink was created. The white ointment made it much easier for the experimenters to detect the occurrence of a chink.

While the subject certainly demonstrated a high level of talent in reading at unusual angles through an aperture which often could not have exceeded a millimeter in diameter, it was quite clear that there was no need to invoke any new sensory receptors for vision. During this inquiry it came to our attention that magicians had long been performing similar feats, and it proved helpful to have a professional magician participate in our investigations. Our observation of the subject did not yield any evidence that there was awareness of "peeking." Indeed, use of similar blindfolds on ourselves showed that the vision obtained under these conditions was subjectively quite unusual and easily disassociated from the experience of normal vision.

In conclusion, it is worth emphasizing that, prior to our final thorough investigation, unsystematic testing by several scientists had failed to contradict the subject's extraordinary claims of extraocular reading. While the investigation reported in this letter cannot be considered a direct refutation of other reports of extraocular visual perception which have appeared in the literature, our experience does highlight the exhaustive precautions which must be taken when dealing with such claims.

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Company Budgets for Basic Research

How much should an organization spend on fundamental research? For a business based on technology, with growth dependent on technological improvements, this is indeed a good question. The size of the applied-research budget, while not easy to arrive at, can be determined on the basis of new products or services sought. But one cannot apply this kind of rationale to basic investigations. Those who expect inquiries into the nature of things to produce results of substantial and immediate benefit to the business are very likely to be disappointed. It usually takes much more than is generally imagined to fill this chasm. Many more people today realize what most of those close to fundamental research have appreciated all the while: the glamor is chiefly in the doing.

Good fundamental research, if used properly, can be the best means of keeping current in a field, of providing ready expert consultation (provided there are good internal communications), of establishing an atmosphere in which good "applied" brains are extended and function more effectively, and of stimulating supervisors to do a better job of management. Fundamental research is a tool by which better work can be performed, and an organization should invest in it according to its aims in this respect.

Many organizations exert great efforts to maximize what they can afford for more and better equipment and buildings. To maximize what they can afford for brains usually requires cutting appropriations elsewhere, and often this is not done. On the contrary, it is usually the basic research

that is cut. However, it does not seem unreasonable that funds spent to improve and sharpen an organization's animate tools should be at least as great as those spent for the same purpose on hardware. This may provide a measure of how much should be spent on fundamental research.

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Water

Abelson's editorial "Water for North America" (8 Jan., p. 113) is exciting. It represents very big thinking. But it leads to a number of critical questions. The figure Abelson gives for present use of water in the United States—1.25×10^9 cubic meters (350×10^9 gallons) daily—works out to about 6.65 m^3 per capita. What uses of water are included in this figure? C. C. Bradley ["Human water needs and water use in America," *Science* **138**, 489 (1962)] estimates total per capita daily use as 57 m^3. This includes the enormous amount of water lost through transpiration by food and fiber plants and the loss by evaporation of water supplied to but not used by the plants. When the very great need for water to produce a pound of paper is considered, for example—years of transpiration stream passing through the pulpwood tree plus all the water used in manufacturing the paper and transporting it to the consumer—Bradley's estimate seems more realistic.

Abelson rightly points out that too much is expected of desalination and that the transport of desalted water inland in great quantities would be very expensive. Another problem would be that of disposing of the accumulated mountains of salt. And huge nuclear reactors require huge supplies of cooling water and means of disposing of this water after it is heated. The use of sea water in such plants could well mean thermal pollution of the continental-shelf marine habitat, the most productive part of the ocean. That irritating ecological question "At the expense of what?" rears its head whenever man plans any alteration of environment. Perhaps another $100 billion is needed to correct our ecological sins of the past—to clean up our filthy waters.

The author says, "Use of the potential supplies would solve most of the continent's water problems for as long as 100 years." A hundred years is a very short period in human evolution. What will happen after that? Certainly the greatest of all problems in the future of man is one of human engineering. How can man control his reproduction, and do so without a disastrously differential birth rate which would reduce the quantity and wreck the quality of the species? Are we ready to accept the task of steering human evolution? The words of Julian Huxley, "I hold strongly that without some knowledge of evolution one cannot hope to arrive at a true picture of human destiny, or even approach the problem correctly," are prophetic indeed.

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The proposal concerning "Water for North America" in Abelson's editorial is typical of the sort of approach we in Canada have been familiar with throughout our history. Our resources are to be disposed of to your advantage. [The editorial described a plan, now under study by a Senate subcommittee, whereby "through a series of dams, lifts, tunnels, and canals, water from Canada and the northwestern United States would be conducted to the Great Lakes and to the southwestern United States and Mexico."]

May we suggest instead that it would be more logical for the people to move to where the water is? This would help to relieve some of the problems associated with overcrowding in your country, such as water and air pollution, traffic jams, and that cooped-up feeling. We would be glad to welcome you to our invigorating climate; please bring industries with you. And thanks again for the wooden nutmegs.

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. . . The proposal to intercept a substantial portion of the flow of the Columbia River and divert it eastward and southward should be a cause of great concern for every citizen of the Northwest. Evidently the people of that region are to stand idly by while a sizable measure of one of the area's most important resources flows away so that the desert may bloom in some distant place. Fresh water is a natural resource in the same sense that crude oil and iron ore are natural resources. Do California and Texas give away crude oil? Does Minnesota give away iron ore? Why should the Northwest be expected to supply southern California or any other place with free water? If the California boom is limited by the availability of fresh water, then I say let it be so limited.

Any further tampering with the Columbia would surely destroy the salmon fishery along the West Coast, which is already in difficulty, despite the construction of new hatcheries, ladders, and so on.

If the Northwest supplies free water for much of the remainder of the West, what will it receive in return?

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Beware the Tax Collector

Wolfle's editorial "Challenge to tax exemption" (9 Oct. 1964, p. 175) indicates to me that the existence of many journals and scientific societies will be threatened if the Internal Revenue Service is permitted to continue its present line of attack. To further demonstrate that the IRS is dedicated to undermining these organizations in every possible manner, I would like to cite an example to show that the attack has been launched at another level.

One of our scientists here was called before the local IRS agent and informed that he could not list journals as a tax deduction. The reasons given for this action were that employers do not require employees to subscribe to journals—otherwise they would reimburse them for the expenditure—and that, since the employer provides a library with all the necessary journals, the individual buys personal copies only for his own convenience.

The scientist attempted to appeal on the grounds that he used the journals while preparing technical publications on his own time. The IRS officer asked how much remuneration he received from these publications. Upon being told that there was none, he declared that they must fall in the category of a hobby. The scientist paid the tax, hoping for fairer treatment on a later appeal. At this time, the original decision still stands.

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