In the first place, there is no question that the chimpanzee subjects were well motivated. Sufficient hunger to produce whimpering, and shock severe enough to bring vocal protests, did not alter the fact of failure to "see." The similar slowness of learning of the human patients therefore cannot be accounted for merely by a defect of motivation. The emotional disturbances would seem to have been the result of slow learning, just as Senden concluded, rather than its cause; that is to say, the patient lost some of his enthusiasm when he found how difficult it was to make effective use of the new and at first interesting sensations.

Secondly, the verbal assistance given the human patients make it clear that the difficulty is not simply a failure to attend to visual sensations. With attention successfully directed to a newly-introduced stimulation, as attested to by the patient's partial success in describing it, learning to identify remained a tediously slow process, with the notable exception of color naming. Since color names were learned easily, it cannot be said that "visual attention" was absent.

The prompt visual learning so characteristic of the normal adult primate is thus not an innate capacity, independent of visual experience, but requires a long apprenticeship in the use of the eyes. At lower phylogenetic levels the period of apprenticeship is much shorter. The chick makes effective use of vision immediately upon hatching and shows further improvement of efficiency with the practice afforded by a dozen pecks (*1*). Rats reared in darkness, when first exposed to light, show no clear utilization of vision but learn to jump in response to visual cues within 15 minutes and after an hour or two may be indistinguishable from the normally reared animal (*2*). The chimpanzees of the present study received 50 hours of exposure before the first visually mediated learning was evident; and man, to judge by some of Senden's cases, may require an even longer exposure.

The comparative data conform to the generally recognized principle that organisms whose potential adaptations to the environment are most complex, *i.e.* those that show the greatest intelligence at maturity, also require the longest period of development. This has generally been regarded as a period of maturation. The clinical and experimental data discussed here, however, show that this long period is also essential for the organization of perceptual processes through learning.

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IN THE LABORATORY

Intestinal Perfusion in the Treatment of Uremia

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Interest in the removal of nonprotein nitrogenous constituents of the blood by "artificial" means in cases of renal failure has been stimulated greatly by the recent work of Kolff (*1*), Fine and his associates (*3*), Murray (*2*), and others. It has been suggested (*1*) that perfusion of a loop of bowel, isolated surgically, might prove superior in some respects to other methods presently used. It occurred to one of us (J. W. R.) that a specially designed intestinal tube with three lumina might make it possible to perfuse the intestine *in situ*, thus rendering surgical intervention unnecessary. Furthermore, aseptic technique would not be required.

By using a thin, triple-bore rubber tube, with a small balloon on the tip, it has been possible experimentally to perfuse any desired length of intestine without resorting to surgery of the bowel. However, in the dog it is necessary to manipulate the tube into position through an abdominal incision. This would be unnecessary in the human. Warmed perfusion fluid of physiological type has been introduced above the inflated balloon and withdrawn through another lumen of the same tube several feet higher up.

In experiments to date the blood nonprotein nitrogen of nephrectomized dogs has been reduced consistently and materially. For example, a lowering of the azotemia from 198 to 126, 198 to 112, and 231 to 145 mg./100 ml. of blood was observed in successive trials using 12–18 l. of perfusion fluid over a period of about 6 hours. The rinsing fluid after perfusion contained 4.3–5.4 grams of nonprotein nitrogen.

A more detailed experimental study of the method is now in progress and investigation of its clinical application is being undertaken.

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