Notes on visual aids

At the moment there is a large blind population whose contact is limited to ~~sound~~ auditory and direct tactile stimuli. It is to be hoped that medical advances may at some future time restore visual function to a large proportion of these people. ~~Even at best the most that can be expected here will be restoration~~ This restoration will almost certainly be limited to those with defects outside the C.N.S. however.

Some ~~form of~~ a method of, replacing lost visual function ~~increasing spatial sensibility~~ even if it were limited to increasing spatial sensibility should be of benefit to a large number of people. ~~Some~~ Crude attempts have been made in the direction of 'object locators' and the like but their utility has been limited. At least one instance is on record of directly exciting the visual center by a light modulated electrical signal developed from a hand held photoelectric device. This gave only sensibility to light intensity since it was a single channel

~~To date~~ It seems quite valid to consider the grosser aspects of vision in terms of communication theory. Human vision is a staggering feat viewed as an engineering achievement. Its complete functions would tax the ~~best of~~ limits of present day technology to ~~p~~ produce and, such a device capable of simulating visual function would be more than a person could carry and require several hundred watts of power. By elimination of many of the non essentials; very high resolution, color vision, extreme sensitivity and adaptability a device could be produced that would would simulate the function of the eye to the extent of producing a very usable image capable seeing

more than many people suffering common visual defects. The great problem here is coupling this ~~image~~ signal to the brain. Signals from the eye are ~~such~~ provided by a very large number of receptors each of which 'sees' only a small portion of the scene. Variations in light intensity are transmitted as more or fewer maximal responses per unit time. This same or an analogous arrangement could be constructed. Since a nerve may also be excited electrically, if some method of coupling a number of electrical channels to a reasonable number of optic nerve fibres a facsimile of vision would be possible. Such a coupling would be difficult if not impossible and even then a large number of blind individuals ~~c~~ CNS. damage would not be aided.

There are many other sensory pathways to the brain which might be utilized for transmission of information now provided by vision. The ~~extent of utilization of this~~ amount information that can be provided will be entirely dependent upon the brain's ability to interpet messages. ~~This is the~~ Since to my knowledge nothing is known of this, it should be investigated first.

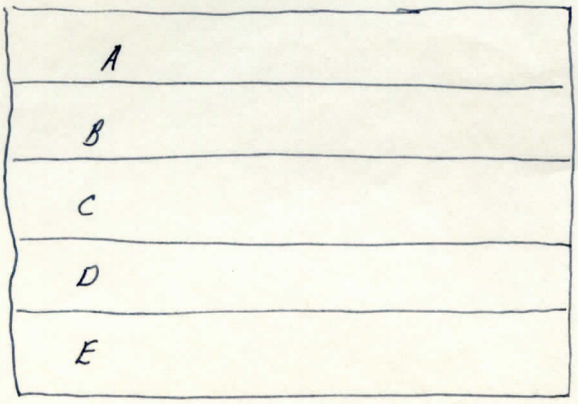
There are ~~a large no~~ many ways of transmitting information. One of the most wasteful methods, in the eyes of man's technology is the use of many parallel or redundant pathways all operating simultaneously. (This is an admission of man's lack of progress in perfection of ~~this~~ communication ~~loops~~ links.) His lack of efficency forces him to economical

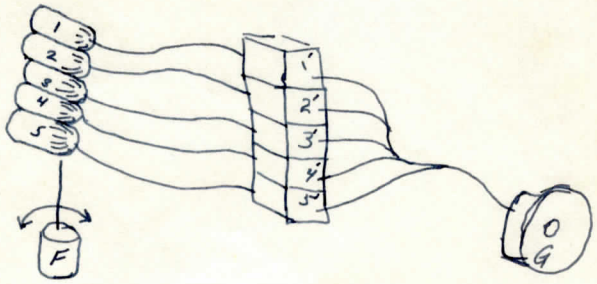
use a single channel and 'time share' or 'scan' the information. A T.V. system is a typical example in which a single receptor scans many elements and transmits them separately only in time. This system depends upon the persistence of vision to reassemble them spatially. Some compromise between what can be provided, the pathways available and possibilities of interpertation must be made.

One example of a possible system would make use of a scanning system which viewed the elements of a scene and presented them to a spatial grid on the skin in terms of with variations of light as variations in some stimuli such as heat. Result of this would result in a braille like image of a scene. Problems here are ability of the brain to correlate the many points into a usable whole and interpet the multitude of signals greatly increased number of signals over that normally present in an area. It seems likely the first could be achieved since a new born baby is faced with and solves the same problem but the second could result in complete failure through paradoxical signals. In any event a long training period would be required.

A technically simpler approach would be conversion of visual imagery to sound. It might be possible to reach a compromise here between a limited number of pathways and a time shared system. Different frequencies or bands of frequencies are transmitted by different fibres of the VIII N. If the brain can remember and rebate events in time the following scheme might prove

feasible.





A-E represents an area scanned by ~~D~~ the photo cells 1-5, A being the area scanned by 1, B by 2, etc. These cells are driven by a scanning device F. ~~S~~ electrical output of the cells control the amplitude of five oscillators, each of different frency frequency. Their electrical outputs are in turn combined and fed to the earpiece G.

Before an elaborate a system as this is done a much simpler one consisting of a single scanned channel should be investigated. The possible combinations of information systems is only approached by the number of possibilities for failure however ~~the~~ an investigation on these lines would give some ~~of~~ clue as to the form of messages the brain is capable of interpeting if only from ~~the~~ negative ~~outputs~~ results.