struction of the superior colliculus has no effect either on the retention of the habit or on the threshold of brightness discrimination.[5] Destruction of the superior colliculus before learning also has no effect on the formation of the habit.[6,7] Dr. C. W. Brown and the writer produced several cases in which the pretectal and large-celled nuclei were destroyed. In one case both of these nuclei and the superior colliculus were either destroyed or their optic connections severed. This left the geniculo-striate complex as the only functional primary visual structure. All these cases also learned to differentiate brightnesses. Only complete destruction of the striate area produces a loss in the retention of the habit.[8] With further training, however, the habit can be reestablished, but the threshold of brightness discrimination is heightened.[9] Thus, while brightness vision can be carried on by subcortical visual centers they do not function as efficiently as the striate area.

It is seen, then, that even in the rat the cortical visual area is of prime importance, and certainly in higher forms it would not be expected to play a less important rôle. Furthermore, although the rat can learn to respond on the basis of visual cues in the total absence of the striate area, this has also been shown to be the case for the rabbit,[10] the cat,[11] the dog[12,13] and the monkey.[14,15] It is only in man that destruction of the striate area abolishes vision of any kind.[14]

It would seem, therefore, that the principle of encephalization of function which suggests that there is a gradual shift in function from subcortical to cortical centers does not hold for brightness vision in the mammalian series. In the intact organism the striate area plays as important a rôle in the rat as in man, and the visual subcortex is so organized in all mammals except man that in the absence of the striate area it can carry on the function, although it does so with lowered efficiency.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

PREPARATION OF CASTS OF THE BONY LABYRINTH

ALTHOUGH many accounts of various techniques for preparing casts of the osseous[1] and membranous[2] labyrinth appear in the literature, the paucity of such material available for the teaching of gross and comparative anatomy would apparently justify the present description of what is a relatively simple method of preparing such material and one requiring no elaborate equipment. In the course of a routine dissection the size, shape, position and general relations of the internal ear can not be revealed by exposing its several canals. These facts are more easily ascertained from actual models of the labyrinth made available for this purpose or prepared by the student from the material at hand.

The process here described may be divided into two phases; first, the preparation of the temporal bone which serves as a mold and, secondly, the instillation of a molten metal under positive pressure to form the cast.

The petrous portion of the temporal bone is removed from the skull and all the superfluous bone cut away from the labyrinth without actually entering its canals. In so doing the eustachean canal should be sawed through and the incision continued caudally through the middle ear, thus splitting it in a vertical plane. The medial wall of the middle ear with its fenestrae is thus exposed on the lateral aspect of the petrous bone. The bone is next boiled in a weak alkali. $NaHCO_3$ is well suited to this purpose. It should be treated with 95 per cent. alcohol for about 24 hours, more or less depending upon whether or not the bone is fresh. Then it is degreased in xylol, for from 4 to 16 hours, depending on the condition of the bone, and finally placed in hydrogen peroxide until every vestige of the membranous labyrinth is removed. The time required to accomplish this will naturally vary with the original condition of the specimen. If a thoroughly dried petrous bone is taken from an old osteological collection, only a short time will be required. On the other hand, if the bone is from a fresh specimen a week or longer may be necessary to accomplish the desired end.

The second phase or the actual casting could presumably be accomplished by merely pouring the molten metal through the fenestrae into the labyrinth. If

[5] E. E. Ghiselli, *Jour. Comp. Neur.*, 67: 451, 1937.
[6] G. L. Freeman and J. W. Papez, *Jour. Comp. Psychol.*, 11: 185, 1930.
[7] J. D. Layman, *Jour. Genet. Psychol.*, 49: 33, 1936.
[8] K. S. Lashley, *Comp. Psychol. Monog.*, 11: 43, 1935.
[9] K. S. Lashley, *Jour. Genet. Psychol.*, 37: 461, 1930.
[1] Alfred Denker, "Vergleichend-Anatomische Untersuchungen über das Gehörorgan der Säugethiere nach Corrosionpräparaten und Knochenschitten." Verlag Von Vert und Comp. Leipzig. 1899.
[2] Albert A. Gray, "The Labyrinth of Animals," J. and A. Churchill, London. 1907–08.
[10] J. Ten Cate and A. W. H. Van Herk, *Arch. néerland physiol.*, 18: 337, 1934.
[11] J. L. Kennedy, *Psychol. Bul.*, 33: 598, 1936.
[12] D. G. Marquis, *Proc. Asn. Res. Nervous and Mental Disease*, 13: 558, 1934.
[13] E. R. Hilgard and D. G. Marquis, *Jour. Comp. Psychol.*, 22: 157, 1936.
[14] D. G. Marquis, *Arch. Neurol. and Psychiat.*, 33: 807, 1935.
[15] H. Kluever, *Jour. Psychol.*, 2: 49, 1936.

this is practiced, however, it will be found that in a certain percentage of cases air will be imprisoned in the upper coils of the cochlea and at the apex of the semi-circular canals, thus leading to an imperfect cast. If a positive pressure is applied to the molten metal in the labyrinth the air is forced out through the pores in the bone and the canals completely filled with the metal, giving a true cast of the interior.

A piece of rigid tubing[3] 2½ or 3 inches in length is placed with one end over the fenestra rotunda and fenestra ovalis and a piece of ½-inch adhesive applied to the outer surface of the tube to hold it to the bone and to cover the openings resulting from the inequalities between their respective surfaces. Plaster of paris is next applied to the outer surface of the adhesive, bone and tube to seal their union. A piece of adhesive is placed over the internal auditory meatus and the entire petrous bone is covered with a thick layer of the plaster, leaving only the upper end of the tube projecting from the mass. After hardening, the mass is placed in a sand bath with only the upper inch of the tube above the sand, which is heated to 110°–120° C. Molten Wood's metal is now poured into the tube, almost filling it. A rubber cork previously bored to fit this tube is fitted over its upper end and pressure is applied by manually compressing an atomizer bulb the tube of which is adapted to the upper opening in the rubber cork. While the pressure is being applied the whole mass is removed from the sand bath and immersed in cold water. The plaster is immediately removed and the petrous bone with its attached tube is placed in 15 per cent. HCl until decalcification is complete. The organic matter can then be washed from the cast. The sprue interconnecting the labyrinth and tube is carefully cut across. If desired, the Wood's metal cast may be plated or invested in plaster and recast in any of the harder metals, giving a much more durable preparation.

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DIOXAN AS A FIXATIVE OF YOLK

DIOXAN has been known from the first publication of Graupner and Weissberger[1] as a very economical and convenient dehydrating agent. McWhorter and Weier[2] recommended its use as an admixture to the fixing fluids, Graupner and Weissberger[3] gave the description of a fixative consisting chiefly of dioxan. Nobody, however, as far as I know has remarked the advantages which result from the fixing of embryonal tissue solely by means of it.

The pieces of tissue to be fixed in dioxan are simply thrown into a container of that liquid, at the bottom of which lies a layer of calcium chloride. Such an arrangement has been devised for the dehydrating technique by Graupner and Weissberger.[1] After lying for a certain time in dioxan, the duration depending on the size of the piece of tissue, the material is transformed to a mixture of dioxan (5 parts), soft paraffin (5 parts) and xylol (1 part), heated to 37° C.[2] The tissue is then placed in hard paraffin, in which it becomes embedded.

The principal advantage of this method consists in the fact that any hardening of embedded embryonal tissue is thereby completely avoided. Consequently the cutting of the paraffin blocks is considerably facilitated. As is well known it is rather difficult to cut the eggs of frogs, as also the young frog embryos.

The pieces of the ripe ovary of *Rana esculenta,* having been fixed in dioxan as described above, cut as easily as blocks of pure paraffin; the same applies to the young frog embryos. It must be emphasized that all the histological stains hitherto tried (hematoxylin, eosin, Van Gieson's solution, etc.) have successfully colored tissues fixed in dioxan. In conclusion it is to be noted that the use of dioxan for fixing can facilitate many embryological sections.

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[3] Ordinary glass tubing or iron pipe one centimeter in outside diameter is recommended.

[1] H. Graupner and A. Weissberger, *Zool. Anz.*, 96: 204–207, 1931.

[2] F. P. McWhorter and E. Weier, *Stain Techn.*, 11: 107–117, 1936.

[3] H. Graupner and A. Weissberger, *Zool. Anz.*, 102: 39–44, 1933.

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