made before the end of the second month and by the third month return of vision is clearly demonstrated.

A selection of 35 eyes was made for the tests of visual function and in every case proof of return of vision was obtained between the second and third month after operation. The technique has been reported in the literature cited. One case will give an idea of the results after grafting the eye 3 times (reimplant, reimplant, transplant, respectively). The first return of vision was on the eighty-seventh day; the second return of vision was on the seventy-ninth day; the third return of vision was on the sixty-first day. How many times this perfect eye could have been grafted so successfully is problematical.

Repeated grafts showed that the eye went through the same changes each time as in the first operation. There was only one striking change and that was a gradual permanent reduction of the ganglion cell layer, about 40% reduction. We hope to use this method in testing how far the reduction of ganglion cells can be obtained and still prove the presence of visual function.

7447 P

Production and Metamorphosis of Chimeras in Anurans and Urodeles.

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The perfect union of the anterior and posterior halves of the embryos of 2 species of anurans[1] and the metamorphosis[2] of such a combination into a perfect adult was shown to be possible by Harrison 30 years ago. Up to the present day the opportunities which this operation makes possible have never been realized. The intention of the present report is to demonstrate that such combinations can be produced in large enough numbers to enable the experimental embryologist and geneticist to carry out a variety of new studies.

The frog embryos employed were *Rana palustris* and *Rana sylvatica*. Those of the salamander used were *Amblystoma tigrinum* and *Amblystoma punctatum*. The stages at which the operation was done were in the early tail-bud period of development.

1 Harrison, R. G., *Arch. f. mikr. Anat. u. Ent.*, 1904, **63**, 35.

2 Harrison, R. G., *Anat. Rec.*, 1908, **2**, 385.

The species conbinations in their respective classes are, at the tail-bud stages, about the same in size. Similar stages in development were selected and placed in slightly diluted Ringer's solution in an operating dish, the floor of which was covered by a thick film of white beeswax. The embryo was oriented under the microscope, dorsal side up, between fine forceps so that iridectomy scissors could, with one stroke, cut the embryo transversely at the level of the seventh to eighth somites. It is quite possible to cut at other levels as well in making successful combinations.

The anterior half of one species and the posterior half of the other were then placed in a depression in the wax which was about the size of an intact embryo. The cut surfaces of the reciprocal halves were brought together in the concavity of the wax as soon after the operation as possible.

When the incision is made with one stroke the lateral ectodermal surfaces come together and temporarily seal in the mid line. This prevents the immediate escape of the heavily laden yolk cells. The ectodermal edges then slowly separate and by the time the reciprocal halves are properly oriented the cut surfaces are closely opposing one another.

By means of the flat broken end of a fine glass rod finger-like spurs of wax can be produced to form a tight cage over the 2 halves of the embryos in the depression. This is done by pushing the end of the glass rod in the surface of the soft wax from the periphery of the depression toward the position occupied by the embryonic halves. Each finger-like spur of wax increases to the desired length as it is shoved nearer the desired spot. Furthermore the projections of wax curl in such a manner that they form flat bands which incase the 2 embryonic halves. The spurs of wax are flexible enough so that each can be adjusted to the proper position as desired.

With but little experience the operator can orient 6 wax bands, 2 on either side and 1 at the anterior and posterior ends, respectively. These are sufficient to unite the embryonic halves, permitting healing within 2 hours.

The halves of the embryos were oriented with the dorsal surfaces uppermost so that one could be certain that the cut ends of the neural canals were perfectly apposed for proper healing. Some yolk laden cells ooze from the cut surfaces. This is more marked in the urodeles than in the anurans. Very often the ventral surfaces are not entirely healed when the chimera is lifted from the wax depression. Therefore, great care must be exercised at this point, for a large

ventral wound may cause the early death of the embryo or later on lead to the formation of a permanent fistula.

In one series of 16 anuran combinations, 12 reached late larval life and of these 8 metamorphosed into frogs. Each showed by the skin coloration the regions of the 2 species in combination. In another series of 15 combinations 7 are now in late larval life and one has metamorphosed. Four of these consist of 2 perfect reciprocal pairs.

In one series of 9 pairs of urodele combinations 3 have metamorphosed and one is approaching metamorphosis. In another series of 9 pairs, 3 are in mid-larval life. All of these are perfect specimens. Several were imperfectly united and lived to mid and late larval life when they were discarded.

The head, thorax and forelimbs of the anterior half of the combination attained the normal size and appearance of the species it represented. It, however, exerted a marked influence over the posterior half of the combination. The normally smaller anterior half inhibited the growth of the normally larger posterior half. The normally larger anterior half reversed the conditions by increasing the size of the normally smaller posterior half. In other words, the anterior half was always species dominant in its effect. This was very striking in the late larval and early adult life.

7448 P

Glucose Metabolism of the Trypanosoma Equiperdum in Vitro.

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It has previously been found that trypanosomes can live either aerobically or anaerobically. The oxygen consumption has been measured and in some instances also compared with the glucose utilization.[1, 2, 3, 4] In the present paper a report is given of measurements of the glucose and oxygen consumed and the products formed aerobically and anaerobically.

1 Yorke, W., and Nauss, R. W., *Ann. Trop. Med.*, 1912, **5**, 199.

2 Fenyvessy, B. v., and Reiner, L., *Z. Hyg.*, 1924, **102**, 109; *Biochem. Z.*, 1928, **202**, 75.

3 Issekutz, B. v., *Arch. Path. u. Pharmakol.*, 1933, **173**, 479.

4 Brand, T. H. v., *Z. vergleich. Physiol.*, 1933, **19**, 587.