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The production of accessory appendages and other abnormalities in amphibian larvæ through the action of centrifugal force.

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A year ago after centrifuging some eggs of *Rana sylvatica* it was noted that all of the survivors in one lot had accessory tail-like appendages. This seemed to be a sufficiently striking modification to merit some effort to learn just what was responsible for their occurrence. After many trials similar modifications were produced again this season. Eggs were treated in various stages from unsegmented eggs to the gastrula, and the different lots were given three different treatments.

In this note the earlier stages will not be considered. In a stage at which the blastopore had just become evident, or soon afterward became evident, the eggs which were subjected to a centrifugal force equivalent to 1,700 times gravity for two minutes were mostly killed. Accessory tail-like appendages developed in the survivors. 1,350 times gravity killed very few and accessory tail-like appendages developed in all of the survivors. 200 times gravity for ten minutes produced all normals in cases where the blastopore was not yet evident at the time of treatment. Where the blastopore was just evident all produced the accessory appendages. All survivors of similar treatments in the advanced gastrula and later stages were normal and accessory appendages were not produced in earlier stages than the blastula.

The accessory appendages, usually one to each animal although in some instances as many as four have been noted, occurred on different parts of the body. By far the commonest location was the mid-ventral region although they were in all positions from the anal region to the under side of the head. In many cases the position was more or less lateral, or even dorso-lateral, the appendage usually extending ventrally however. The appendages in the positions described were all distinctly tail-like having the characteristic myomeres seen in the normal tail and having a fin-like

keel on one or both margins. In some cases, nearly always in other lots of eggs than those which developed into larvæ having definite tail-like accessory appendages, the accessory structure was distinctly dorsal or cephalic in position. In some of the cases the structure was merely a broad-based, blunt, fleshy protuberance; in others it was wholly epidermal,—a more or less slender, sac-like epidermal projection. In still others the protuberance was longer, 1/8 to 1/10 the length of the larvæ, and extended distinctly forward from the frontal, dorso-frontal, or ventro-frontal region of the head. In some of these cases the myomere structure was evident although no fin-like margins occurred and the structures were approximately round in cross section.

In certain cases in which early gastrula stages of *Ambystoma punctatum* had been centrifuged, a number of the larvæ lacked the anterior region of the head including the eyes and, in fact, most of the head anterior to the gill region. A single lot of eight larvæ contained five possessing this abnormality.

Interpretations of these structures will be suggested in a larger paper.

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Further observations on the toxicity of tin.

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In a preliminary communication[1] from this laboratory, the results of experiments with the double salt of tin tartrate were announced. Experiments performed since with tin tartrate have shown that like the double salts, it caused marked injury to the kidneys. Large amounts of albumin were present in the urine of rabbits when administered subcutaneously and intravenously but larger doses of the normal salt were required to produce this effect.

The amount of tin as the double salt necessary to produce a very marked albuminuria was 20 to 30 per cent less than in the form of tin tartrate. Observations on the action of stannous and

[1] Salant and Smith, *J. Pharm. and Exp. Ther.*, 1914, Vol. 5, p. 517.