dent upon the cartilaginous *Annulus tympanicus.* The operation produced uniform results in the series. In the larval stages, no trace of the tubo-tympanum was to be seen on the operated side, and the chondroblastemata of the *Annulus tympanicus* and the distal part of the columella failed to appear. In the stages killed during metamorphosis, the tubo-tympanum, the *Annulus tympanicus* and the distal part of the columella were absent. No other abnormalities were evident on the operated side. The proximal part of the columella made its appearance in the *Fenestra vestibuli* as normally, and elongated anteriorly as far as the *Processus ascendens,* which joined the *Crista parotica* as on the unoperated side.

It appears that 2 cartilages in the middle ear of Rana (the *Annulus tympanicus* and the distal part of the columella), are formed from the endoderm of the first visceral pouch. The author wishes to suggest that possibly in urodeles and pelobatids the tubo-tympanal rudiment possesses the capacity to form cartilage, and that the cartilages described by Litzelmann and Stadtmüller are representatives of the chondroblastema in Rana, from which the *Annulus tympanicus* and the distal part of the columella arise.

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Glycogen Content of Fresh-Water Mussels.

DEA BAILEY CALVIN. (Introduced by Edgar Allen.)

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Determinations of the glycogen content of fresh-water mussels have been made, using a modification of the Pflüger method as described by Cori.[1] Separate determinations were made on the hepato-pancreas and foot muscle. The results are expressed in percentages of the wet and dry weights of the tissues analyzed.

Fourteen different species of fresh-water mussels were used in the work. Altogether, 51 mussels were analyzed. Many of them had been in the laboratory for some time. They were kept in tanks containing sand and a steady, slow stream of tap water was allowed to flow over them. No food was given them. Others were brought in for analysis from various sources.

[1] Cori, C. F., 1926, **70**, 559.

A number of the results are interesting. As might be expected, the mussels kept in the laboratory without food showed a gradual decrease in the glycogen content. This seemed to be more pronounced in the hepato-pancreas than in the foot. In *Fusconaia undata,* for instance, the glycogen content (based on wet weight) of the hepato-pancreas dropped from 7.15% on February 14 to 1.24% on April 14, a loss of 82.7%. At the same time the foot content changed from 2.2% to 0.735%, a loss of only 66.6%. Frequently, in fact, in the starved animals, the percentage glycogen content of the foot was found to be slightly higher than that of the hepato-pancreas, while normally in well fed animals the reverse was true, the hepato-pancreas being 2 or 3 times as rich in glycogen as the foot muscle.

In many instances after long continued fasting the mussel contained too little glycogen to be determined accurately. This seems to coincide very well with the results of experiments carried out in this laboratory on foot muscle activity, in which it has been found that in fasting mussels the degree of activity is very low.[2]

In well nourished mussels the glycogen content of the hepato-pancreas is usually 4 to 10% (average = 5.88) of the wet weight and 12 to 35% (average = 27.6) of the dry weight. In one animal, fresh from the river, 61% of the dry weight of the hepato-pancreas was found to be glycogen. For the foot, the usual range is from 1 to 3% (average = 1.91) of the wet weight and 5 to 15% (average = 9.2) of the dry weight.

The solid matter was found to vary between 18 to 28% (average = 21.9) for the hepato-pancreas and 18 to 33% (average = 21.25) for the foot muscle. It will be observed that these are much smaller variations than those found in the glycogen content of the same group of animals.

[2] Ellis, M. M., and Merrick, Amanda D., unpublished results.