form of the deltas deposited in the proglacial lakes and the process observed at the Rhone River-Lake Geneva junction, it is probable that the deposition of the deltas in the proglacial lakes was only exceptionally done under the extreme conditions of temperature difference present at the Rhone River-Lake Geneva site. It may be presumed that the surface waters of the proglacial lakes were ordinarily colder and that the stream waters were warmer and chiefly derived from precipitation on land. However when the higher level terraces of these delta deposits were made the streams were in part, at least, fed by ice melting.

On June 15, 1930, the conditions and phenomena noted at the Rhone mouth in Lake Geneva were also observed where the Lutschinen stream from the Lauterbrunnen valley empties into the Lake of Brienz at Interlaken. At this site the lake waters at the delta front were very shallow and the sediment load was so great that the advance of the front of the delta might be said to be quite entirely brought about by top-set beds. That is, there was the same abrupt checking of the current of the stream as with the Rhone but the Lutschinen was visibly transporting coarse gravel to the line of disappearance of the glacial flood.

In contrast with these conditions are those present at the mouth of the Cayuga Inlet stream that enters the south end of Cayuga Lake, New York. There the stream waters are, during spring and early summer, commonly warmer than the lake waters, especially in periods following a prevailing south wind. Consequently it is a conspicuous phenomena that the lake waters during flood flows of the Inlet stream are discolored for a half mile or more out from the mouth of the stream. The lake waters over this section are very shallow, the bottom having a very gentle slope. In this instance the colder lake waters appear to exert a significant effect in buoying up the finer sediment and giving it a wide-spread deposition.

In addition to their bearing on the interpretation of delta forms and deposits generally these observations may have some significance in relation to the conditions under which deposition of varved clays in glacial lakes comes about.

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SUFFOCATION POINT IN THE HORNED LIZARD, PHRYNOSOMA CORNUTUM

THE horned "toad" or horned "frog," as this lizard is commonly called, has won a great deal of publicity in recent years concerning its ability to withstand suffocation and starvation for long periods of time. The following article will serve to supply some definite information on its hardiness and lethal point in respect to suffocation. Two series of a number of different individuals each were used, and the results seem fairly consistent. One series was run in respiratory chambers where the carbon dioxide discharged by the animal was allowed to remain and accumulate, while in the other series, soda lime was used to absorb the carbon dioxide as it was produced.

The animals were placed in stoppered bottles, properly arranged to serve as respiratory chambers. The size of these chambers was between 900 and 1,000 cc in volume. When the animal had been kept in the respiratory chamber for the desired length of time at a known temperature and in a known volume of air, a sample of about 9.5 cc of the air was drawn from the outlet of the chamber directly into a portable Haldane gas analysis apparatus and analyzed for carbon dioxide and oxygen. The weight of the animal was also noted in each case. The samples were taken either immediately after the animal was dead or after it was in great distress, shown by labored gasping and struggling, which indicated that it would very soon die if allowed to remain in the chamber.

According to the results of these experiments, the animals which were actually carried through until death in the chambers where the carbon dioxide was allowed to accumulate consumed the oxygen down to a point where the air in the chamber contained between 4 and 5½ per cent. oxygen. Normal air contains about 20.93 per cent. oxygen. Carbon dioxide was produced in these chambers until it reached percentages ranging from 12 to 15 in different individuals at death, while normal air contains only approximately .03 per cent. The other animals included in the series, which were at their limit and would have died very soon, show an oxygen and carbon dioxide range that is very similar to the range for the ones which were killed.

The second series of experiments, where the carbon dioxide was absorbed, show the animals reaching the lethal point of suffocation only after the oxygen content of the respiratory chamber has gone down to 3.21 per cent. on the average. One or two individuals in the first series were able to survive until the oxygen content went down to about 4 per cent., but this was not the rule. It is seen immediately that the carbon dioxide effect is quite marked here.

The larger animals of course consume more oxygen and can survive a much shorter time than a smaller animal in a chamber of similar size. As would be expected, the temperature affects the rate of respiration quite sharply in this lizard, especially during the summer, and of course enters prominently into the length of the survival time in a limited volume of air. These animals do not struggle or move about to any extent so that the metabolic factor did not influence the survival time to any great degree in these experiments.

At temperatures of 23° to 26° C., specimens of the average weight of those used above will survive in a liter bottle for ten days or more before the point of suffocation is reached. At 35° C. the point of suffocation is reached in two or three days in bottles of similar size. When the temperature is down to about 10° C. with the animals in hibernation, it has been found that those of the average size, as considered above, will live for about two months in a liter chamber of air.

These experiments, which are only a part of more extensive ones, give a rather definite idea of the lethal point for suffocation in oxygen percentages and carbon dioxide percentages for this animal, as well as reviewing the factors influencing the survival time. This is a preliminary report.

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GRADUAL OBLITERATION OF THE PORTAL VEIN AS A SUBSTITUTE FOR ECK-FISTULA[1]

THE diversion of the portal blood directly into the vena cava was accomplished by N. V. Eck[2] in 1877 by means of the fistula which bears his name. This procedure has been exceedingly useful in the study of many problems concerned with the physiology of the liver and organs whose venous blood drains into the portal system. Its application has been somewhat limited by the technical difficulties of the operation, particularly for those not trained in blood vessel surgery. During the past three years the author and associates, J. C. Ellis and W. B. Mathews, have made use of a more simple method for accomplishing the same purpose. It consists essentially in producing so gradual an obstruction to the portal vein that the collateral anastomoses in the esophagus and rectum develop sufficiently to prevent gangrene of the intestines. This may be accomplished by means of a two-stage operation in the dog, cat, goat, rabbit and rat. At the first operation, the portal vein is carefully isolated and two strong linen threads introduced around it above the entrance of the pancreatic-duodenal branch. One of these threads is then tied sufficiently to produce a constriction of the portal vein to about one half of its normal diameter. A slight congestion of the intestines may occur which rapidly disappears. The ends of the second thread are then fastened to the abdominal wall so they may be readily found at the second operation. The second operation may be done two to three weeks later, at which time the portal vein is completely occluded. Gangrene of the intestines does not occur. The operation is very simple and there is practically no mortality. A demonstration was made of this method at the meeting of the American Physiological Society in Chicago in April, 1930. It is altogether probable that many others have used this or a similar method before. I have been prompted to publish this note because of the many requests received during the past year for details of the method. We have used it successfully on the various laboratory animals listed above.

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[1] From the Department of Surgery of the University of Chicago.

[2] N. V. Eck, *Militar-medicinisches Journal*, 1877, cxxx, Jahrgang 55. Travaux de la Soc. des Naturalists de St. Petersburg, 1879, x. 55.

DEVIL'S SHOE-STRING AS AN INSECTICIDE[1]

THE investigator's attention was attracted to the possibilities of devil's shoe-string, *Cracca virginiana* Linn., as an insecticide three years ago through studies of derris, and particularly through the physiological action of derris on fish. The roots of both plants are powerful fish-poisons and, from all accounts, affect fish in a similar way. No references in literature have been found where this species has ever been used for insecticidal purposes; however, studies have been made by several investigators of foreign species of this genus. The most important studies were made by F. Tattersfield, C. T. Gimingham and H. M. Morris.[2]

Roots were dug from several localities at various times of the year and were dried by different methods. They were then finely ground in an herb mill. Careful and repeated experiments with aqueous suspensions were made under laboratory conditions on the cotton or melon aphis, *Aphis gossypii*. Marked variations in toxicity were found, due to the season, soil, method of drying and probably various other factors. The most toxic samples were obtained from sandy soil, dug in the hottest part of the year and dried in the sun. Drying in the shade, boiling in water and heating the roots caused a loss in toxicity. Comparative data with nicotine sulphate (40 per cent.), and aqueous suspensions of derris and a commercial brand of pyrethrum showed that the best samples of devil's shoe-string were slightly more toxic than pyrethrum, but were less toxic than derris; however, they compared more favorably with derris than derris with nicotine sulphate (40 per cent.).

[1] Contribution No. 24, Department of Entomology, Texas A. and M. College, College Station, Texas.

[2] "Studies on Contact Insecticides," Parts 1 and 2, Vol. 12, and Part 4, Vol. 13, Annals of Applied Biology.