[illegible] prior to beginning the treatment with [illegible] of the several corrosive [illegible] was [illegible] specimens which have [illegible] for laboratory aquaria for as long [illegible] of these preparations [illegible]

J. E. Morris

[illegible]

[illegible] NOTES

[illegible] OF [illegible] SOLMATION OF PARA- [illegible] IN PHYSIOLOGICAL [illegible] SOLUTIONS

[illegible] completed at the U. S. Bureau of [illegible] Station at Fairport, Iowa, by us this summer, in which artificial nutrient solutions were prepared in which the glochidia of the freshwater mussel, *Lampsilis ellipsiformis* Conrad (known as the Creeper or Bloody Butter), were carried through their various developmental stages from glochidium to the free living juvenile mussel. The glochidia of this species of freshwater mussel are parasitic on the gills of the sheepshead perch, *Lepisosteus platostomus* Rafinesque, for a period varying from two to several weeks, during which time the glochidia undergo marked internal changes and differentiations and emerge from their cysts at the end of this sojourn on the fish as free-living juvenile mussels. The nutrient fluids were perfected so that this period of parasitic life on the fish could be replaced by a period *in vitro*, during which the growth and differentiations ordinarily made by the glochidium in the cyst could be studied and controlled.

The glochidia used in these first series of experiments were dissected out of their cysts on the gills of artificially infected fish eighteen and ninety-six hours after experiments were begun. The freed glochidia were transferred at once to the solutions in which their development was to be followed. Glochidia removed from the cysts eighteen hours after attachment to the fish gill differed little if at all in appearance from ripe glochidia in the maternal marsupium. Glochidia removed at the end of ninety-six hours showed considerable development of the organ anlagen, although the glochidia were still in a very embryonic stage, as was evidenced by the presence of a large portion of the larval granular cell mass. In the most favorable solution tested the glochidia were carried through the twelfth day in the solution, at which time their development [illegible] that of control glochidia which had not been removed on the fish and were just ready to emerge from the cysts. When this stage was reached it [illegible] *in vitro* the [illegible] [illegible] for [illegible]

[illegible] transformation in [illegible] the [illegible] first [illegible] transforma[illegible] [illegible] glochidia *in vitro* [illegible] [illegible] the fish, but there may be [illegible] involved in this comparison [illegible] the growth and development of the [illegible] not delayed.

[illegible] transformed in these artificial [illegible] were kept in river water for [illegible] formation without the loss of [illegible] the juvenile mussels making [illegible] growth of both shell and soft parts during that time [illegible] in every way to be very vigorous. This [illegible] surprising, as there is known to be a rather [illegible] mortality, on the contrary, among [illegible] during the first few days after leaving the fish following the natural parasitic cycle.

The several [illegible] of glochidia carried in the [illegible] *in vitro* showed that parasitic life on the [illegible] of essential to development and transformation if the proper food substances be supplied in the proper [illegible] environment; that the glochidium receives by its attachment a much-needed protection against certain [illegible] and protozoan enemies; and that the glochidium is a true parasite while on the fish, receiving [illegible] food substances from the host fish. This last [illegible] was repeatedly tested in a variety of experiments and the so-called protective physiological solutions containing only inorganic salts were neither adequate to produce growth and differentiation nor to maintain glochidia already well started on their way to transformation.

The successful solutions contained sodium chlorid, potassium chlorid, calcium chlorid, sodium bicarbonate, dextrose and a mixture of amino-acids, together with small quantities of phosphates and traces of magnesium salts. Detailed data of these experiments as well as experiments on glochidia taken directly from the maternal [illegible] are to be published.

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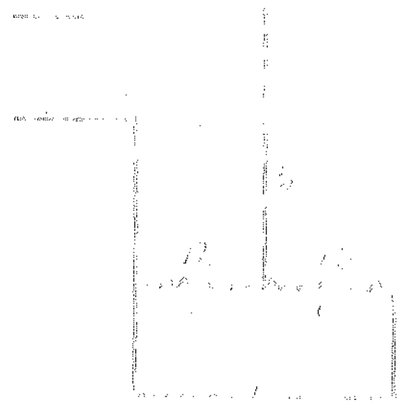
CRITICAL POTENTIAL MEASUREMENTS: A CORRECTION FOR HIGH-EMISSION CURRENTS

In experiments on critical potentials the voltage [illegible] (Fig. 1) applied [illegible] filament and grid is usually measured by [illegible] the potentiometer [illegible].

When the current [illegible] zero, then

[illegible] (1)



However, if the current [illegible] large, then

[illegible] (2)

This equation is derived from [illegible] laws

[illegible] ( )

and Ohm's law

[illegible] (4)

Combining equations (3) and (4) and simplifying, gives equation (2). [illegible] networks have been applied to [illegible] no special assumption has been necessary [illegible] the resistance of the filament-grid space.

Equation (2) has been tested with a [illegible] tube containing helium. The following table shows clearly that the correction [illegible] when I_2 becomes large.

CRITICAL POTENTIAL OF HELIUM AT 0.5 MM [illegible]

I_2 microamperes	Experimental Critical Potential [illegible] uncorrected	corrected
24	[illegible]	[illegible]
760	[illegible]	[illegible]
800	[illegible]	[illegible]
Average		[illegible]

A further correction for initial electron velocity [illegible] contact potential has to be applied to [illegible].

In another test [illegible] has been measured with [illegible] equation (2) [illegible].

[illegible]

[illegible]

[illegible]
[illegible]