emergence is almost nil. It is suggested that the relatively low emergence occurring during 1–10 cm. pressure-deficiency is due to low oxygen concentration in the water around the cysts when the sand is saturated and the pore spaces are filled with water. An increase in emergence occurs after 10 cm. pressure-deficiency, when air appears in the pore spaces, resulting in increased oxygenation of the water film. Emergence rises to a maximum at 70 cm. pressure-deficiency, after which there is a decline. Two possible explanations of this decline are suggested. Egg hatch may be inhibited by the extraction of water from the cysts, and larval emergence may be impeded by the surface forces of the water film.

The effects of oxygen concentration, temperature, saturation deficiency, size of soil particles and different soil types on larval emergence are also being investigated.

I am indebted to the Sugar Beet Research and Education Committee for providing facilities for carrying out this investigation.

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Hardness of Arthropod Mouthparts

It is well known that many insects are able to bore through packing materials, including metal foils, used for wrapping foodstuffs and other commodities. During an attempt to develop a physical barrier that would be resistant to penetration by insects, the hardness of the mouthparts of a number of insect pests was determined.

Richards[1] considers the question of the hardness of arthropod cuticle, but it appears that no determinations have been made. In view of this, representatives of several insect orders and of other classes of arthropods were included in these tests.

Fresh materials were used in each case and the mouthparts, generally the mandibles, were removed and cemented to needles. Scratch tests were carried out on the minerals in Moh's scale of mineral hardness (see Lange[2]) which would appear to be the appropriate standard.

Determinations were made on species of the following genera:

Insecta
- Coleoptera: *Tenebrioides, Rhizopertha, Stegobium*
- Lepidoptera: *Pteroloscura*
- Isoptera: *Mastotermes*
- Orthoptera: *Calolampra*

Crustacea
- Decapoda: *Cherax*

Myriapoda
- Chilopoda: *Scolopendra*

Arachnida
- Scorpionidea: *Cercophonius*
- Araneida: *Isopeda*

In each case the hardness was found to be approximately 3, the specimen of calcite being scratched with difficulty. Minerals softer than 3 were readily marked. In view of the function of mouthparts, this may represent the highest value to which arthropod cuticle can be hardened.

It is of interest to consider the role taken by calcification of the cuticle which occurs notably in the Crustacea. Many authors have examined the calcium salts involved, and it appears that calcium carbonate in the form of calcite is the usual deposit. Whatever properties calcification may modify, it is clear from the present results that it will neither harden nor soften the cuticle.

From the above evidence there would appear to be no physical difficulty in insects boring through foils made from such common metals as lead, tin, copper, zinc and silver, providing that these have not been work-hardened.

I am indebted to Mr. A. Musgrave, of the Australian Museum, for identification of the Arachnida.

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[1] Richards, A. G., "The Integument of Arthropods" (Univ. Minnesota Press, 1951).

[2] Lange, N. A., "Handbook of Chemistry" (Sandusky, Ohio, 1941).

Effect of Refrigeration of the Pupæ of *Microbracon brevicornis* Wesm. on the Pigmentation of the Adult

DURING the course of mass breeding of *Microbracon brevicornis* in the parasite laboratory of the Entomology Division of this Institute for the purpose of exporting them to the United States of America for the control of pink boll worm in the cotton belt of that country, it was necessary to maintain a stock of pupæ of the parasite in cold storage at a temperature of 10 ± 3° C. It was observed that the adults emerging from the chilled pupæ which had been in cold storage from 10 to 75 days showed dark pigmentation ranging from dark grey to jet black, as against the distinctly brown individuals obtained from unchilled pupæ.

The possible effect of humidity on the production of melanic forms was eliminated by subjecting the pupæ to low (10 ± 3° C.) and high (25° C.) temperatures at different humidities. Irrespective of the humidity, the parasites that underwent metamorphosis under low temperature always showed darker pigmentation. Similarly, the effect of light on the pigmentation of the adults also showed that while dark forms emerged from chilled pupæ, whether kept in darkness or in light, all adults that were obtained from pupæ at higher temperatures under both conditions were brown individuals. It was thus concluded that low temperature alone was responsible for the abnormal pigmentation of adults obtained from the chilled pupæ.

Kaestner[1] observed that when females of *Habrobracon* are exposed to extremes of heat or cold, the parasites became dark and the effect was transmitted apparently through the plasma to the next generation. However, in the present case it has been observed that the dark forms when bred at a temperature of 25° C. and 70 per cent humidity gave rise to normal brown individuals. Evidently in this case the progeny has failed to inherit the acquired character of their parents, and we are therefore unable to confirm Kaestner's observations. Genies, Schlottke and also Kuhn[2] have shown that, in the case of *Microbracon habetor*, at low temperatures the black pigments become dominant, whereas at higher temperatures the pigmentation is more reduced until finally entirely yellowish forms are produced. In the present case, even when the parasites were bred at 35° and 40° C., they did not exhibit any loss of pigment-