from 10° to 40° C., sporangial formation taking place at any temperature from 15° to 40° C. Best growth of the fungus appeared to be at 37° C. Chlamydospores developed on the stolons and on the ordinary hyphæ.

A majority of the rotten apples that had been received were green or partially mature fruit and artificial infections were therefore made on both the green partially mature, and ripe fruits. Slight wounding was necessary to start infection. Rotting was slow from 15° to 23° C. but between the temperatures of 32° to 38° C., very rapid decay took place (Fig. 1). The 'well' method of infection gave more uniform results. The rot extended within as rapidly as it increased on the surface and examination of artificially infected and completely decayed fruit showed that the fungus had enveloped the seed with a weft of mycelium just as in a naturally infected fruit. Both the ripe and the green fruit were equally susceptible.

The fungus falls within the 'arrhizus group' of Yamamoto[3] and fits *R. arrhizus* of Zycha.[1] It is hoped to correctly establish its identity after a careful comparison with authentic cultures of some of these fungi. *R. nigricans* Ehrenberg has been known to cause apple rots in countries with temperate climates and parasitic potentialities of the species of 'arrhizus group' which grow better at higher temperatures are well known and their parasitism on apples, other fruits and vegetables has also been established by Harter and Weimer.[4]

So far only one other fungus, *Aspergillus niger* Van Tieghem, has been reported to cause rot in apples by Dey[5] but rot due to a species of *Rhizopus* has not been yet reported.

I am grateful to Dr. B. B. Mundkur for advice and helpful suggestions.

P. R. MEHTA.

Imperial Agricultural Research
Institute, New Delhi,
August 12, 1937.

1 Zycha, H., *Kryptogamenflora der Mark Brandenberg*, 1935, Band, **6**(*a*).

2 Lendner, A., *Les Mucorinees de la Suisse.*

3 Yamamoto, Y., *Jour. Fac. Agric. Hokkaido, Imper. Univ. Sapporo. Japan*, 1930, **1**, 1–101.

4 Harter, L. L., and Weimer, J. L., *Phytopathology*, 1922, **12**, 205–212.

5 Dey, P. K., *Ind. Jour. Agric. Sci.*, 1933, **3**, 663–673.

An Amphibious Parasite from Lac.

IN their reply to the controversy upon the hosts of *Eupelmus tachardiæ*, How. Negi, Glover and Gupta[1] illustrate a "just hatched larva", (Fig. 1 *c*), which hardly shows any hymenopterous characters, much less those specific to *Eupelmus tachardiæ*. With regard to Fig. 1 *d* they confess "details are not fully shown", although the larva is supposed to be full grown. It is very modest of them to say so, for I find not a single character distinguishing it from that of Elasmus or of Microbracon; even the magnification is not indicated. (Fig. 1 *e*) should represent a prepupa and I have not come across the prepupal stage of any chalcid I have studied. On the contrary their figure shows typical pupal characters, so that they are not able to interpret even what they illustrate. In Fig. 1 *e*, the pupa then, and not the prepupa, is partly visible and partly hidden by the

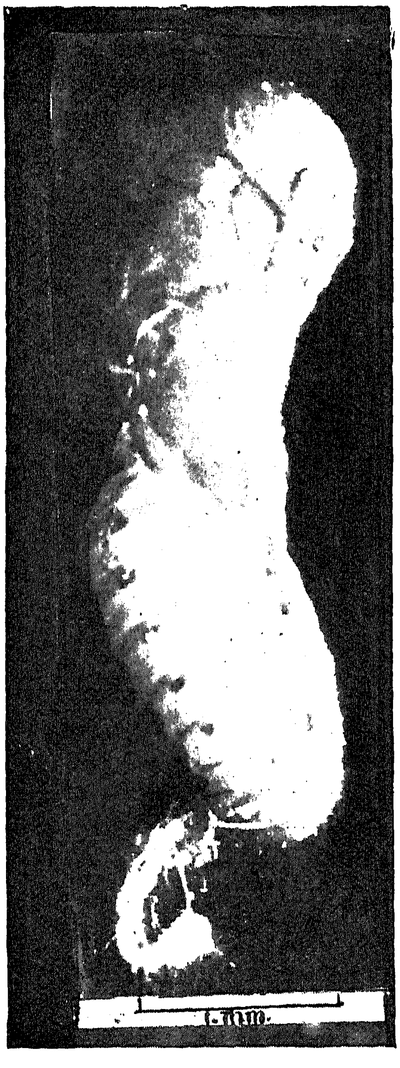

Fig. 1.

Pupa of a female *Eupelmus tachardiæ*, How.

larval skin, whereby, not only light, but also, distinct shadow has been cast upon an object of controversy which should have appeared in full limelight. What is exhibited of the pupa is common to many chalcids and the small abdomen is distinctly unlike that of Eupelmus which I have already shown[2] and is again illustrated here. Their Fig. 1 *a*, should have represented the cocoon of Microbracon, which I here illustrate for comparison and not any cocoon; likewise the larva looks neither paralysed nor that of *Microbracon greeni*. I find no specific character which could identify the objects they illustrate.

My previous illustration[2] shows the anal end with a curved ovipositor characteristic of the female Eupelmus. To indicate how true to life this representation has been I offer in, Fig. 1, a photograph showing a similar specimen. The moult skin is also seen which hides nothing of the pupa from view. It was obtained as an ectoparasite on the larva of *Eublemma amabilis*, contrary to the expectations of Negi and Glover. To get such a specimen, with the larval skin still in contact with the pupal body, from within the lac cell or even from within the cocoon of a Microbracon, would not have been possible unless the existence of an Eupelmus pupa within were known and precautions were taken to avoid the otherwise easy separation of the moult skin and the pupa. My previous illustration and Fig. 1 here are both accompanied with a scale which indicates the pupa to be a little less than 2·5 mm. Fig. 2 shows another pupa on its back; Fig. 3 gives the dorsal aspect of another specimen with the attached moult skin at the anal end.

Glover and Negi most innocently evade the point to which I took the greatest objection,[3] *viz.*, "Glover makes the glaring statement of having found *Eupelmus tachardiæ* inimical to lac itself," an objection which has been independently raised by Clausen[4] in America. I find all endoparasites of lac have two life-cycles to one of the host, passing one in the larval and the other in the adult lac insect. In the larval lac insect there is only a single parasite, a fact also apparent from an illustration of Imms and Chatterjee.[6] As previously explained,[5] the female lac insect in the second larval stage is relatively

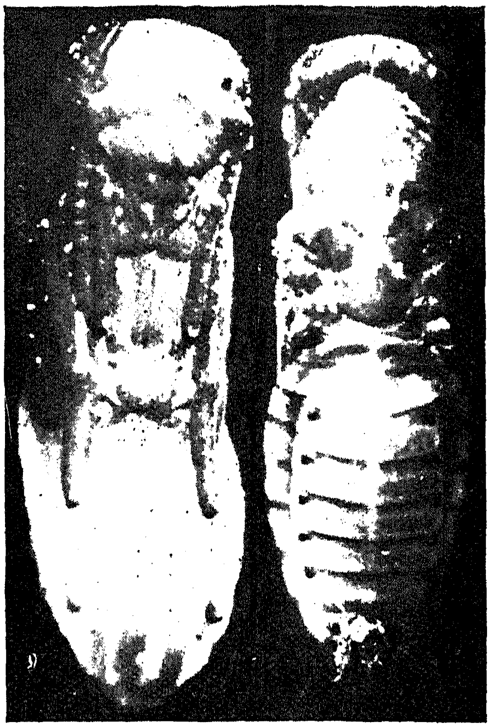

Fig. 2. Fig. 3.

FIG. 2.—Female *Eupelmus tachardiæ* pupa in its ventral aspect.

FIG. 3.—Dorsal view of a female *Eupelmus tachardiæ* pupa.

raised and oval in outline, the corresponding cell of the male lac insect, on the contrary, is flatter and longer. The latter when parasitised and containing the cylindrical body of a chalcid pupa also becomes raised and oval. The parasitised male larval cell is therefore a better specimen to demonstrate than the corresponding female cell which is already oval. Now the species, *Lakshadia communis*, very often gives rise to a generation consisting of only winged males. In such a generation the sex of the larva can be identified with certainty. Fig. 4 shows a second stage larva of a winged male *Lakshadia communis*, containing a single pupa of *Erencyrtus dewitzii* as was found on dissection after the specimen was photographed. To me it appears improbable that the pupa of Eupelmus, which is about 2·5 mm. long, can thus live within the small lac cell and such a consideration excludes the possibility of Eupelmus being an endoparasite of lac.

Observations were made upon the exit holes caused by various parasites in lac encrustation in different stages of its development. Fig. 5 gives a picture of

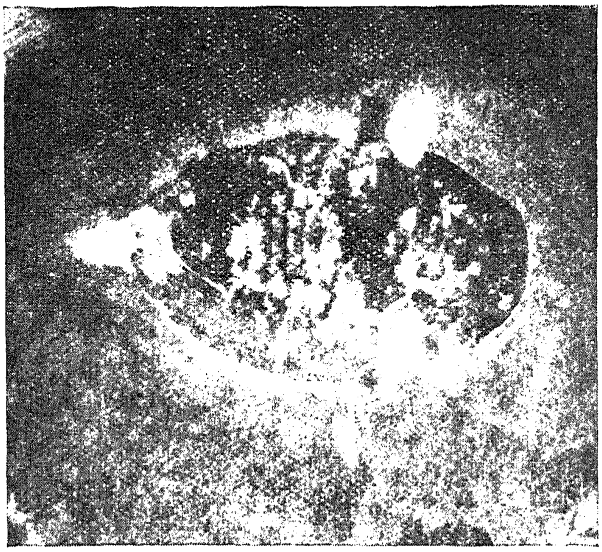

Fig. 4.

Second stage larval cell of a winged male lac insect which contained the pupa of a chalcid.
Background slightly retouched to show the cell outline.

Fig. 5.

Exit holes in the cells of *Lakshadia communis* females in the larval stage attacked by *Erencyrtus dewitzii.*

larval cells of *Lakshadia communis* comprising mostly of female larvæ attacked solely by *Erencyrtus dewitzii*; it will be apparent that practically every cell has been attacked. A scale is given to exactly indicate the size of the apertures which correspond with the size of the heads possessed by the male and female Erencyrtus adults. All endoparasites of lac are more or less alike in size and a study of such exit holes does not give a clue to the identification of the parasites which have emerged through them. But Eupelmus is nearly more than twice the size of any endoparasitic chalcid and the apertures made by it, if any, should appear at least twice as large as those seen in Fig. 5 here. Care should however be taken not to confuse the exit holes made by predacious caterpillars of moths and this can be done by finding a case where the infection is almost **total and pure** as represented by me in Fig. 5. From such indefatigable workers as Negi and colleagues, who keep on reasserting their statements, it is hoped such evidence could be most easily furnished. In Fig. 5 a white line points to a dead female lac cell in the first larval stage. As previously shown[5] such an object measures about 1 mm. so that its presence also indicates the diameter of the exit holes as 0·5 mm. in Fig. 5. The photograph with such fine details speaks for its quality and any critic can convince himself, with the help of a magnifying glass, that the exit holes were not made with the help of a pin.

The adult stage of a lac insect has rarely only one chalcid, in which case the host insect does not die. Usually, or rather invariably, there are at least three of them while in cells, such as are seen in Fig. 6, there are over five individuals; two larvæ are pointed with P. It seems

Fig. 6.

Lakshadia mysorensis, adults containing larvæ of a a chalcid parasite P.

to me improbable to find a lac insect which survived after the attack of a single Eupelmus or to find a dead lac insect with three of its pupæ; I speak of pupæ for they, and not their larvæ, are most easy to identify.

Fig. 7 shows nine cocoons of Bracons with a scale to indicate the magnification. The largest of them all, the cocoon to the right, belongs to *Aphrostrobracon flavipennis*, first[7] observed in India by me and was found attacking *Eublemma amabilis*. The

Fig. 7.

Cocoons of *Microbracon greeni*, eight smaller ones, with exit holes due to the emergence of Bracons and with smaller holes made by an unknown chalcid.

The large cocoon to the right belongs to *Aphrostobracon flavipennis* with an exit hole.

remaining eight cocoons belong to *Microbracon greeni*, also feeding on the same caterpillars. These cocoons show apertures which are not uniform in diameter and I suspected a chalcid to be responsible for the smaller holes. In fact I already announced the existence of an enemy of Microbracon. Originally, I imagined it to be a Dibrachys[8] species which both Prof. Masi and Dr. Gahan kindly identified as *Aplatomorpha calandræ*, How., known to attack grain-feeding beetles like *Calandra granaria.*[9] There are several beetles associated with lac and as such it could be assumed to destroy some of them. But I have made many observations on *Aplatomorpha calandræ* in the lac plantations as well as on lac grown experimentally, where I found it hovering about on young encrustations which, I convinced myself, had had no larvæ of predacious beetles but which nevertheless had those of Eublemma and with its presence that of Microbracon could also be assumed. My observations were not concluded and I published nothing more upon it before. But I have frequently come across it and its absence from the records of Glover and Negi is surprising. It seems to me possible that they have mistaken this insect and Eupelmus for one and the same species. For a number of years they have been naively designating their parasites as, "Black Chalcid No. 2," etc.,[10] and since both Eupelmus and Aplatomorpha are black and large there may have arisen a natural confusion. That they thought it necessary to send even their largest chalcid to others for identification, not for confirmation of their own identification, shows the deep familiarity with the insect they have been studying. What was pertinent to know was, not who identified their adults about which they inform us nothing, but who identified the pupæ one of which they so sophistically illuminate.

Glover and Negi suggest trying to breed Eupelmus under laboratory conditions and I have already come across the phenomenon of induced parasiticism. Field experiments are certainly preferable and these have given me definite information which was supported by the findings of Gernet[11] in 1863. He found Eublemma, the host, with Eupelmus, the parasite. Gernet also found the male Eupelmus which indicates in his specimen of lac there must have been many Eupelmus insects for the ratio between the sexes in this insect is very much in favour of the female. The absence of Gernet finding any Braconid indicates the probability of Microbracon not serving as a host of Eupelmus. Gernet also found endoparasites of lac and illustrated a pupa of *Tachardiæphagus*, of which there could only be the species *tachardiæ* (How.). An internal parasite of lac was first figured as early as 1790 by Roxburg and ever since the findings of Green, Stebbing and Imms and Chatterjee have never brought out any instance where Eupelmus was an endoparasite. These offer circumstantial evidence in support of my view to which Clausen's objection must also be counted. To skip over it all and maintain nevertheless that they discovered a prodigy among chalcids which has five different hosts and acts as an ecto- and endo-parasite is to assume the existence of an amphibious creature the like of which is so far unknown to entomologists.

S. Mahdihassan.

Berlin,
June 28, 1937.

1 *Curr. Sci.*, 1935, **4**, 37.
2 *Curr. Sci.*, 1935, **3**, 562.

[3] *Ibid.*, 1934, **3**, 260.
[4] *Ann. Ent. Soc. Amer.*, 1927, **20**, 470.
[5] *J. Ind. Inst. Sc.*, 1926, **9A**, Pt. 1.
[6] *Ind. Forest Mem.*, 1915, **3**, Pt. 1, Fig. 34.
[7] *J. Sc. Assoc. Vizianagram*, 1925, **2**, 79.
[8] *Ibid.*, 1925, **2**, 88.
[9] *Report of the Grain Pest (War) Committee*, No. 9 pub. by the Royal Society, 1921.
[10] *Rep. Ind. Lac Res. Inst., Ranchi*, 1930, p. 49; 1928, p. 26.
[11] *Bull. Soc. imp. des nat. de Moscou*, 1863, 154–74.

Sulphur Iodide.

THE existence of sulphur iodide has been a matter of controversy. Investigations carried out in this laboratory show that sulphur iodide is formed in carbon tetrachloride solution when a dilute solution of sulphur chloride is treated with solid potassium iodide. Sulphur iodide in dilute solutions in carbon tetrachloride has a yellow colour. The iodide decomposes at ordinary temperatures with considerable rapidity giving sulphur and iodine. At low temperatures however, the solutions are comparatively stable. Sulphur iodide gives a characteristic absorption band in the visible region of the spectrum. The reaction of sulphur iodide (in carbon tetracholride solutions) with aqueous sodium hydroxide is analogous to that of sulphur chloride (in the same solvent) with alkali.

The work will be published shortly.

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August 24, 1937.

Astronomical Society for India.

AN association called the Astronomical Society of India was formed on the 26th July 1910, at Calcutta, but its activities seem to have ceased after September 1915, perhaps on account of the outbreak of the War. During the short period of its existence the Society had done much good work and had published 5 volumes of the monthly Journal containing excellent and instructive articles. The advance made in astronomy and astro-physics since 1915 is tremendous. The revival of the Astronomical Society of India will be of great help to the astronomers in our country both professional and amateur. The Society can be run on the lines of the British Astronomical Association. There are Societies in India for almost all the other branches of Physical Sciences.

The following programme can be adopted by the Society:—

(1) The circulation of current astronomical information.

(2) The encouragement of a popular interest in astronomy.

(3) The arrangement of members in different sections under experienced Directors to study the Sun, Moon and Planets, Comets and Meteors, Variable Stars, etc.

(4) The publication of a Journal once in two months.

(5) The formation of a library and of collections of astronomical instruments and lantern slides for loan to members.

C. K. ANANTHASUBRAHMANYAM.

Kodaikanal Observatory,
July 10, 1937.