in use at a number of observatories. He claims that the results show, first, that the Carnegie Institution standards are in every way satisfactory, and second, that "the absolute precision obtainable with carefully designed magnetometers and (dip) inductors, provided instruments are carefully used and comparisons are made with reliable standards at least every two or three years, is of the order 0.2 in declination and inclination and of the order 0.00015H (i.e. 37 in England) in horizontal intensity." If this be true, the gain in accuracy to be hoped for from coil instruments is not great. If, however, as stated on p. 468, a complete observation of H with the coil instrument occupies only 2 minutes, its use at an observatory would represent a great economy of time, always

provided little time is spent on keeping the apparatus up to the mark.

However this may be, what is really more wanted is a coil instrument for measuring V (vertical force). Base line values of V curves are at present dependent on dip circles or inductors. Even if the accuracy claimed by Mr. Fleming for dip inductors be conceded, it must be remembered that an error of 0.2 in the dip at a place where the value of H is only 0.03 (the approximate value at the base station of the Australasian Antarctic Expedition 1912-13) leads to an error of about 90% in V. Thus a coil instrument which could give V directly, to within $\pm 5\%$ even, would be an immense improvement on a dip inductor for use in high latitudes.

New Social Coleoptera.¹

By Dr. A. D. IMMS.

IF we regard as truly social only those insects in which the parent, or parents, live with their offspring, protecting and feeding them, there have been known hitherto but three groups of beetles which come into this category, namely, the Platypodidae, Scolytidae, and Passalidae. Prof. W. M. Wheeler has recently added to the list two genera of Silvanid beetles belonging to the family Cucujidae, discovered by him in British Guiana. The beetles in question are *Coccidotrophus socialis* and *Eunaisibius wheeleri* both of Schwartz and Barber. The bulk of his observations concern the first-mentioned insect, the other species being apparently rare. The beetles enter the hollow petioles of a Leguminous tree *Tachigalia* and either bore their way in, or gain admittance through perforations previously made by other insects. They enter either as a single pair, or one beetle enters and is very soon joined by an individual of the opposite sex. Upon taking possession of their future habitation the beetles remove any loose pith, or the remains of previous tenants, by pushing this debris into the pointed ends of the cavity by means of their flattened heads. This behaviour brings the insects into contact with the outermost layer of pith adhering to the walls of the cavity, and certain strips of nutritive parenchyma. The latter tissue forms the food of the beetles, and is also shared by young Coccidae of the species *Pseudococcus bromeliae*, which soon begin to enter the petiole-cavity. By means of the feeding action of the beetles, the strips become converted into grooves, the coccids stationing themselves in a row in each groove. The beetles carefully avoid soiling their food material and store their frass in the areas between the grooves. They lay their eggs along the frass ridges, and the larvæ which hatch out feed upon the same nutritive parenchyma as their parents. When mature, they

construct brown cocoons within which pupation occurs. The beetles emerging from the latter remain in the petiole with the original pair; they mate and produce eggs and larvæ in turn, thus leading to the climax stage of the colony, which may eventually consist of several dozens of beetles of both sexes, and many larvæ and pupæ in all stages of development. The Coccidae also increase in number, so that the cavity of the petiole sometimes becomes crowded with inmates. In the meantime, the old and exhausted beetles die off, and their bodies are consigned to the refuse accumulations already mentioned. When this crowded condition is reached, beetles begin to leave the colony either singly or in pairs and, seeking other petioles, thus found new colonies.

Both the larvæ and imagines of the *Coccidotrophus* solicit honey dew from the coccids by "stroking" the latter by means of the antennæ. The relations of the beetle to the coccids, moreover, are physiologically similar to those of symphile beetles to host ants that supply them with regurgitated liquids. *Coccidotrophus*, like the symphiles, has specially modified antennæ and labium, such modifications occurring in both the larvæ and adults. This type of relationship with Coccidae has not been noted hitherto in any Coleoptera and, apart from ants, very few insects are known to have developed the ability to solicit honey dew from among the Homoptera.

It appears that the Silvanids have a more primitive social life than any of the three families of beetles previously alluded to, but there is no definite preparation of larval food by the parents. Their colonies represent a stage in social development intermediate between the families mentioned and the merely gregarious species of Cucujidae. For further details, and many interesting observations on the numerous and heterogeneous "biocenose" of other insects associated with the plant *Tachigalia*, the reader is referred to Prof. Wheeler's original paper.

¹ W. M. Wheeler, "A Study of some Social Beetles in British Guiana and of their Relations to the Ant-Plant *Tachigalia*," *Zoologica*, New York, vol. iii, Nos. 3-11, Dec. 24, 1921.

Spectroscopic Studies of Stellar Velocities.¹

By Dr. WILLIAM J. S. LOCKYER.

IN order to determine the distribution and motion of stars in space it is necessary to know four important facts about each star. The first is its position, known as its Right Ascension and Declination; the second is its proper motion, i.e. the move-

ment at right angles to the line of sight; the third is the radial velocity or movement towards or away from the earth; and lastly, the parallax or distance of the star from the earth.

During the last few years the accumulation of a large amount of such data, extending over many years, has led astronomers to the important problem of investigating the systematic motions of the stars

¹ "The Radial Velocities of 594 Stars," Publications of the Dominion Astrophysical Observatory, Victoria, B.C. (vol. 2, No. 1), by J. S. Plaskett, W. E. Harper, R. K. Young, H. H. Plaskett (Ottawa, 1921).