accordingly we find three of the largest objectives in the world, — the 27-inch at Vienna, by Grubb; the 23-inch at Princeton, and the great Russian 30-inch, both by Alvan Clark & Sons, with their lenses separated by a considerable interval.

Assuming a large lens to be made of satisfactorily good disks, and having its curves and interval so adjusted as to give the best attainable results, there is another detail of construction which demands increased attention with every augmentation of size; i.e., the state of the surfaces of the lenses. Formerly it was too readily assumed, that, provided the curves were right, a few scratches more or less did not matter. There is a well-known story of an optician, who, on being blamed for turning out a badly scratched lens, replied that an object-glass was to be looked through, and not at. The optician was nevertheless in the wrong; for if delicate objects are under examination, no matter whether they are small companions of large stars, or minute satellites of bright planets, there can be no doubt that the finish of the objective plays a considerable part in their visibility. Nor is it merely necessary that the surfaces should be correctly formed and well polished: it is also requisite that they should be kept scrupulously clean, and, above all, free from grease, the slightest trace of which, when spread over a lens, must throw out irregular diffraction spectra, materially affecting the visibility of any small point of light in the neighborhood of a brilliant object. In this respect no practical astronomer should neglect to assure himself that an object-glass is really doing full justice to the maker.

Dr. Copeland's remarks on the mountings of large equatorials are especially pertinent. In America, he says, the mounting is just or barely sufficient to permit of a satisfactory use of the grand optical powers of their larger instruments; and no refined detail of auxiliary apparatus is attempted. On the continent we find the convenience of the astronomer studied in the most painstaking manner, and perhaps in no instruments in the world is this so carefully kept in view as in the finer German instruments. This is doubtless due in no small measure to the intimate relations which exist between the chief continental instrument-makers and practical astronomers; so that just that kind of apparatus is provided which experience has shown to be requisite. On the other hand, in the stability and rigidity of their mountings, the larger English and Irish instruments stand preeminent, while they year by year show a greater variety of really available subsidiary apparatus. Indeed, there can be little room for doubt that the elder Grubb, by his elegant arrangements for relieving the friction of both axes of the equatorial mounting, practically removed all limits to its size and strength; while in the little-known 25-inch refractor at Gateshead, by Cooke & Sons, we have a telescope which only requires to be efficiently used in a good atmosphere to show its great merits in all respects.

Finally, Dr. Copeland thinks, that whether we take large European or American instruments, the prospect is most encouraging, both to the astronomer and the instrument-maker. Nowhere can signs be detected that the utmost practical limit has been reached. A 27-inch glass can be managed with probably greater facility now than a 10-inch fifty years ago, and with something closely approaching to the full gain in power, due to increased size. The question of size now, as it did then, reduces itself to the production of suitable disks of glass and to cost. Here it is that silvered-glass reflectors offer facilities of which several distinguished investigators have not been slow to avail themselves.

ENTOMOGRAPHY OF HIRMONEURA.

Dr. Friedrich Brauer has, during the past season, been able to add considerably to our knowledge of the life-history of the Hirmoneura obscura, and the results of his observations have been published (*Sitzungsb. akad. wiss. Wien*, p. 865). During the latter part of June he found within the nearly formed pupa of Rhizotrogus the second larval stage of the Hirmoneura, which resembles the first stage in the structure of the mouth-parts (see *Science*, No. 12), but lacks the pseudopods and ambulatorial filaments so characteristic of that stage. How and when the young Hirmoneura larva gets at the Rhizotrogus larva still remains unknown; but Brauer assumes (and I think he is quite safe in doing so) that it enters the larva (not the pupa) of the Rhizotrogus, and is a true parasite, and not merely a predaceous insect. Having entered the Rhizotrogus larva, it seems highly probable that the Hirmoneura larva has to undergo a kind of quiescent larval state of uncertain duration, but which suddenly changes to one of rapid development during the pupal state of the beetle, which lasts only from two to three weeks. Hirmoneura larvae in the second stage, of about eleven millimetres in length, were found in Rhizotrogus pupae; and ten days afterward the full-grown parasitic larva, twenty-two millimetres in length, was found. Brauer thinks it more than probable that the full-grown Hirmoneura larva, after emerging from the Rhizotrogus pupa, hibernates; the perfect fly appearing in July of the next year. This seems to me more doubtful. The Rhizotrogus larva is known to require two years for development. There are two alternatives for the Hirmoneura larva: either it is carried, by clinging to the beetle, into the ground, and remains quiescent, either attached to or near the Rhizotrogus larva, for nearly two years; or it is capable of independently discovering the Rhizotrogus larva when this last is in its second year's growth. The first seems to me the most probable, and would give two years for the development of the Hirmoneura, or even three if the full-grown larva hibernates. In either case, the young Hirmoneura larva is endowed with a sense which is truly marvellous, whether we choose to attribute to it consciousness of its acts, or ascribe them to 'blind instinct.'

Brauer raises a curious practical question, which would indicate that old pine fences or felled trees in a field may, in this particular case, serve to prevent the undue multiplication of the Rhizotrogus 'white grub.'

C. V. Riley.