account for supercoiling, and indeed for the uniformity of length observed in such systems as bacterial flagella.

It was noted long ago that the monomeric *vulgaris* and dahlmense proteins, though differing considerably in sequence, have sufficient underlying similarity to copolymerize to particles with properties intermediate between those of the pure forms. An interesting experiment of a similar kind has now been performed with the closely related spherical bacteriophages MS2 and Q β (Ling, Hung and Overby, *Biochemistry*, **8**, 4464; 1969). Heterologous combination of the RNAs with either protein is possible—though this is no longer surprising in view of the ability of viral proteins to assemble onto different RNAs and even unrelated polyacids. The infectivity of the hybrid particles was minimal, however, and it is not yet clear whether this may result from incompatibility of a minor protein component, known to be essential for activity, with the heterologous coat protein. In competition experiments the RNAs showed preference for their own proteins, but in the converse situation Q β protein would associate with either of the RNAs more strongly than MS2 protein. The most interesting observation is that no particles containing both coat proteins could be made: the demands for steric compatibility in the spherical shell are perhaps too stringent. It is not yet determined, however, whether the selectivity is a thermodynamic or only a kinetic effect.

AGRICULTURE

Trees to Improve Soil

by our Botany Correspondent

THE neem tree, which has been introduced widely into the tropics from India, is not only a valuable source of wood but also an improver of poor soils. S. A. Radwanski of the United Nations Food and Agriculture Organization has found that soil planted with this tree at Sokoto in north-western Nigeria has a higher pH and more available plant nutrients than nearby farmland (*J. Appl. Ecol.*, **6**, 507; 1969).

It is not surprising that the neem tree (*Azadirachta indica*) is a popular introduction in the arid and semi-arid tropics. It is a deciduous tree of the mahogany family that has proved easy to establish without irrigation in northern Nigeria, where the rains are usually confined to the period between May and September, and the daily temperatures vary from 8° to 43° C. The tree grows rapidly, providing sufficient wood for fuel and timber in five to seven years. Unlike most shrubs and trees in Africa the neem tree is seldom, if ever, browsed, and so is rarely damaged by wandering animals.

At the Majiya Fuel Plantation in Sokoto, neem trees grow on red, sandy acid soil, which Radwanski has analysed and compared with samples of the same type of soil from nearby farmland. In physical characteristics the soil varied little inside and outside the plantation, but chemically there were considerable differences. The pH of the farm soil averaged 5.4, whereas under neem trees it was nearly neutral. In the plantation, top soils contained more carbon, nitrogen, sodium, potassium, calcium and magnesium than in the farmland. In the case of carbon, farmland soil contained 0.12 per cent and plantation soil 0.57 per cent, and for nitrogen the values were 0.013 and

0.047 per cent respectively. Only phosphorus was less abundant under neem trees, possibly because this element is stored in the aerial parts of the trees or in their extensive roots. Another feature of the plantation soil was that in the dry season, lower horizons, from 30 to 150 cm deep, were still moist, although the farm soil was dry throughout.

Neem trees certainly seem to be able to extract considerable quantities of plant nutrients from inherently poor and leached soils and make them available to other plants. Radwanski suggests that this property could be exploited to advantage on the so-called "problem" soils of Nigeria which at the moment can be used relatively little. Farmers tend to abandon their sandy acid plots for several years, presumably hoping that they will improve. But the natural regeneration of plants is too slow to prevent erosion, so that the soil deteriorates rapidly instead of improving. If neem trees were planted between cropping periods, however, they would grow rapidly and soon add valuable nutrients to the soil, and help to protect it from erosion by wind, while themselves providing useful fuel and timber. In India, all parts of the neem tree—wood, fruit, bark, leaves and so on—are used for medicinal and other purposes, and the chances are that the same could be done in Africa. Some form of rotation scheme involving a tree fallow lasting several years might bring great economic benefits.

ENTOMOLOGY

New Beetles

NINE new beetles have been described recently, all in the genus *Rhyparus*. The report from Oscar L. Cartright and Robert E. Woodruff is the first for this genus from the western hemisphere (*Smithsonian Contributions to Zoology*, No. 21; 1969). *Rhyparus sculpturatus*, shown in the figure, is 5.0 mm long and comes from Costa Rica.