read the field notes of the dead and wrote letters to the living, reconstructed the journeys of early collectors, studied accounts of climate and vegetation, attempted to unravel the confusions caused by duplications and changes of place names and sought the assistance of botanists and other zoologists. Most widespread genera of reptiles have ranges centred on the tropics, but the New World species of *Natrix* are centred on temperate North America and extend southwards into the tropics. *N. rhombifera*, the diamond backed water snake, passes the isthmus of Tehuantepec on the Atlantic side and may just reach Guatemala. While the overall range is clearly extending southwards, there is evidence of local withdrawals associated with post-Pleistocene drying of the climate. *N. erythrogaster*, widespread in the United States, has a distinct race in the Rio Grande drainage on the border between Texas and Mexico and two well differentiated populations in high interior drainage basins two or three hundred miles south of the border. These are now isolated by dry and impassable country. *N. valida* of the Pacific slopes of the mainland has an isolated race in small rivers near the tip of the otherwise very dry Baja California peninsula.

N. rhombifera has a northern race in most of the Rio Grande valley, occurring alongside *N. erythrogaster*, the plain bellied water snake. A more southerly race, however, occupies most of the Rio San Juan tributary; this suggests capture of the latter by the Rio Grande, a hypothesis supported by the similar distribution of the fish known as the molly (*Poecilia mexicana*). In the Rio Salinas tributary of the San Juan is a population intermediate between the northerly and southerly races of *N. rhombifera*, indicating interbreeding between two previously separated and differentiated populations.

N. valida has northern and southern races on the west side of Mexico. In about the middle of the zone of intergradation between the two is a well differentiated race occupying a high valley drained by a tributary of the Rio Grande de Santiago that flows into the ocean. Elements of the colour pattern of this geographically restricted highland form are found at lower elevations in populations ranging over a much wider area, suggesting one way gene flow downstream.

PROTEINS

Molecular Weights Made Easy

from our Molecular Biology Correspondent

THE introduction of gel filtration methods has brought about perhaps the biggest change in the practice of biochemistry in the past ten years, and its ramifications are not yet exhausted. The determinations of molecular weights of proteins, especially in mixed solvents, such as are required to effect complete dissociation of subunits, has never been a task to be taken lightly; a melancholy history of disputed and endlessly revised values for the number of subunits in many enzymes bears witness to the practical difficulties in methods that are in principle soundly based and well understood. The picture may now be changing: new techniques, essentially empirical in nature but very possibly almost foolproof, have been devised, which must seem to many a physical chemist to be making a mockery of his craft.

These methods are based on one or other type of

molecular sieve, and began with the discovery that the elution volume of a globular protein from a gel filtration column depends on its molecular weight. Very asymmetric or unfolded proteins do not, however, fit on the same calibration. More recently, Davison showed that the determination could be performed in a denaturing medium, guanidine hydrochloride, and in the presence of a reducing agent. The fully reduced and unfolded polypeptide chains would all then be true homologues, the molecular volume of the coil depending almost solely on the number of residues. The scope of the method has been further examined by Fish, Mann and Tanford (*J. Biol. Chem.*, **244**, 4989; 1969). A wide range of proteins and peptides were applied to a column of agarose beads, equilibrated with 6 M guanidine hydrochloride, and a plot of elution volume (or better, the partition coefficient for entry of the protein into the bead matrix) against molecular weight gave a smooth, broadly sigmoidal curve for the entire range of molecular weights from 1,000 to 80,000. Over the central, more or less linear, part of the curve the accuracy of determinations is estimated to be 7 per cent, and at the extremes 10 per cent. The advantages are obvious enough: the procedure is simple, requires little material and makes possible the separate determination of components in a mixture without previous fractionation.

Another effective but wildly empirical approach was discovered in Maizel's laboratory, and consists in determining the rate of migration of the unknown in polyacrylamide gel electrophoresis in the presence of the detergent, sodium dodecyl sulphate. The quantity of sample required is minute, and the demand in time, skill and cerebation minimal. The detergent seems always to cause dissociation into single chains; the mechanism by which the mobility is rendered independent of the charge on the protein is obscure, but must be supposed to involve its association with many detergent molecules, so that the intrinsic charge is effectively swamped. Weber and Osborn (*ibid.*, 4406) have examined forty proteins by this means, and find that in the range 11,000 to 70,000, a logarithmic plot of mobility against molecular weight gives a good straight line. The method can be extended to embrace chains as large as 200,000, but the calibration then curves. Again, a whole range of proteins can be observed on a single gel. Similar findings are described by Dunker and Rueckert (*ibid.*, 5074). With rare exceptions, the precision over most of the range is 5-6 per cent, which for most purposes is all that even the most fastidious biochemist should desire.

VIROLOGY

The Rifampicin Target

from our Cell Biology Correspondent

THE discovery of an effective antiviral compound would guarantee fame and probably fortune as well. It is hardly surprising, therefore, that the rifampicin bandwagon still rolls merrily along, although the way in which this antibiotic selectively inhibits the replication of certain mammalian viruses is as obscure as ever. Rifampicin is an antibiotic because it blocks the initiation of RNA synthesis by bacterial RNA polymerase, and as soon as the compound's antiviral properties were discovered it was obviously tempting to suggest that it inhibits viral multiplication in the