concentrations than wild type repressor, while another mutant repressor elutes only at higher salt concentrations than wild type. Second, they have shown that the phage 434 repressor only binds to DNA from phage containing the 434 immunity region.

Both the λ and 434 repressors sediment at 2.7 to 2.8S in sucrose gradients, but on electrophoresis the 434 repressor migrates a little faster than the λ repressor; the 434 repressor probably has a molecular weight of about 25,000 daltons whereas the molecular weight of the λ repressor is estimated as 27,000 daltons. The elution properties of the two repressors and their behaviour on electrophoresis suggest that they may also differ in net charge—the 434 repressor is probably the more basic of the two.

Now that three repressors have been isolated, interest really centres not on more of the same but on the much more difficult problem of finding out how the repressors function. It will probably be a long time before we know precisely what sites and sequences on the DNA are recognized by repressors, how they bind and why this blocks transcription.

PROTEINS

Hydrogen Exchange for All

from our Molecular Biology Correspondent

THE standing of hydrogen exchange as a method for the study of protein conformation has passed through many vicissitudes. For some years after its introduction by Linderström-Lang, it provoked much interest and optimism, and was commonly held to provide a measure of the degree of α -helical structure in the molecule. It later became clear that it chiefly reflected merely the inaccessibility of the interior of native proteins, and also that it was subject to catalysis by particular side chains and ions in the solution. The method then fell more or less into desuetude, until it was revived recently through new techniques, developed largely by Englander and his associates. Whereas exchange had previously been performed against deuterium, and followed either by density or by infrared spectroscopy, the new procedures involve the use of the tracer, tritium, which is exchanged against hydrogen. The release of tritium as ^3HHO is followed by some form of rapid separation, most often on 'Sephadex' columns, followed by scintillation counting. The speed and precision of this approach have made it possible to follow exchange kinetics in nucleic acids, previously dismissed as exchanging "rapidly", and to relate the results to the extent and stability of base pairing.

Gantt, Englander and Simpson (*Biochemistry*, **8**, 475; 1969) report the results of a comparison of transfer RNA with and without its amino-acid. At a time of mounting activity in the X-ray analysis of tRNA crystals, it is especially relevant to enquire into the possibility that the molecule may adapt to its various roles of recognition by changes of shape, gross or localized. It is reasonable, for example, to suppose that such a change on aminoacylation could explain why the affinity of the aminoacyl-tRNA for the ribosome is so much greater than that of uncharged tRNA. Gantt *et al.*, in fact, observe a small but definite increase in the rather large number of slowly exchanging hydrogens. The evidence is that the latter reflect the

extent of base pairing, and the difference, which is some 4 per cent of the total, is therefore most simply interpreted in terms of a small increase in the number of base pairs. This adds weight to the rather tenuous evidence previously adduced in favour of a limited isomerization, amounting to a small diminution in sedimentation coefficient on aminoacylation of some, though not other, tRNA species, and changes in optical rotatory dispersion, which, however, are supposedly manifested only in the absence of magnesium. Gantt *et al.* have also shown that there is no transitory change in the exchange rate during the aminoacylation reaction itself.

It may be necessary, when considering the relation of exchange rates to conformation, to include also the effect of single strand stacking. Maslova, Lesnik and Varshavsky (*Biochem. Biophys. Res. Commun.*, **34**, 260; 1969) note that single stranded poly A exchanges more slowly than AMP. They interpret this in terms of a stacking effect, for the difference between the polymer and monomer diminishes with rising temperature to the same extent as the stacking. At the same time, as Klotz and co-workers have shown, exchange rates in polymers are expected to differ from those in small molecules because of the importance of the microscopic dielectric constant.

Another example of the sensitivity of the tritium exchange technique comes from Laiken, Printz and Craig (*Biochemistry*, **8**, 519; 1969), who have observed classes of exchanging protons in the small cyclic peptide, gramicidin S-A. Exchange in peptides is strongly pH dependent, as Klotz and others have shown; by working at the pH of slowest exchange, all eight peptide protons can be observed. Only two exchange rapidly, taking poly-D,L-alanine as a standard for "unperturbed" exchange, and two are more than an order of magnitude slower. The corresponding residues are tentatively identified, in terms of structural parameters, derived from a model based on high-resolution nuclear magnetic resonance analysis.

BOTANY

Naming of Plants

from our Botany Correspondent

MANY visitors to the Royal Botanic Gardens, Kew, for its open day on May 3 must have been surprised to find the herbarium much more than a home for a handful of ancient botanists reverently caring for a collection of dried plants. The collection at Kew is a source of reference for anyone who wants to know about the names of plants or their geographical distribution. The permanent staff is actively engaged on taxonomic work in the herbarium and, on a more adventurous scale, regularly takes part in expeditions to botanically uncharted places.

The herbarium was founded in 1852, and the basis of the present collection was added in 1854 and 1866 in the form of the herbaria of George Bentham and William Hooker, joint authors of a system of plant classification which is still largely respected by taxonomists. Today there are between four and five million sheets of pressed specimens, and more than 60,000 are received each year. Parcels pour in from individual collectors or expeditions in exotic places and from other herbaria all over the world. Although about 90 per