Nothing in the replies given by graduates casts doubt on these findings. Most graduates thought scientists could get to the top, but as one put it, "It depends how you define the top". He added that as a scientist he preferred to be managed by scientists, even by those who were not particularly good managers. Several expressed approval of a flexible management structure, enabling research scientists to move into management or to stay in research without loss of salary if they preferred.

The graduates were also asked why they thought more scientists did not enter industry. Two factors were blamed—prejudice in the universities, and the failure of industry to do more to improve its image. None thought it would be easy for industry to correct the situation. One man, a research chemist in a chemical firm, suggested that people in universities underestimate the quality of the work done in industrial laboratories because the companies are reluctant to publish results in scientific journals. This also makes it harder for an industrial scientist to gain recognition for his work, a most important consideration. Another, working for a computer company, seemed to feel that the task of presentation was hopeless. "The only way to find out about industry is to join it", he said. If it is true that students decide long before their final year to join industry, industry might be better advised to spread its recruiting campaign rather than concentrating on the final year students. What is necessary is to reach students at the point of decision, and the assumption that this occurs in the last year of a university course may not be justified.

One point which did emerge strongly was the importance of interviews. "It's the first interview that counts", said one London graduate in the motor industry. Companies clearly make no impression by sending unimpressive personnel to conduct interviews. Appointments boards, too, have an important role to fill. Several graduates admitted that their choice of company was decided entirely by what the appointments board had said. "At the time I thought they were wrong", said one Oxford graduate, "but now I think they were right."

¹ Clark, D. G., *The Industrial Manager, His Background and Career Pattern* (Business Publications, London, 1966).

² Political and Economic Planning, *Graduate Employment* (George Allen and Unwin, Ltd., London, 1956).

Helix Stability

by a Correspondent in Molecular Biology

THE fact that helical RNA is more stable than DNA, and the similar effects observed in their synthetic analogues, have been puzzling questions for some time. A substantial new study by Ts'o, Rapaport and Bollum (*Biochemistry*, **5**, 4153; 1966) presents many new data and offers a general explanation of the stability differences. Bollum's preparations of polydeoxyribonucleotides have made possible a direct comparison of their optical properties and thermal stability with those of the corresponding ribo-polymers, and the generality of the stability differences has been confirmed.

The properties of single stranded poly-dA, poly-rA, poly-dC and poly-rC have been examined. Poly-dC, by all the criteria which can be applied, shows negligible structure in solution at neutral pH, while poly-

rC is known to be substantially in a conformation involving stacking of the bases on one another. The acid forms of the two polymers (thought to be two stranded) also show differences, particularly in their pH stability: the transition to the single stranded form occurs at lower pH by 1.5 units in poly-rC, and a difference in this respect is also found in the poly-adenylic acids. Again, whereas poly-rT is known to enter an ordered (most probably two stranded) conformation under the right conditions, very little structure is observed in poly-dT.

Striking differences in optical rotatory dispersion between the various single and double stranded polymers are observed. The prominent system of Cotton effects seen in neutral poly-rA in the 260–280 mμ region are all but missing in poly-dA, although at shorter wavelengths the discrepancies are less. The hypochromicities of the two polymers are moreover comparable. The acid forms also show large differences. From the theory of optical activity in interacting systems of chromophores it is possible tentatively to infer that the bases in the ribose polymer are more skewed relative to their neighbours. Ts'o *et al.* draw a similar conclusion from optical rotatory dispersion studies of the four possible base-paired complexes of ribo- and deoxyribo- poly-A and poly-T. The distortion in the ribose containing strands is attributed to hydrogen bonding between the 2'-sugar hydroxyl (missing in deoxyribose) with the 2-carbonyl group of cytosine and uracil, and the N-3 ring nitrogen of adenine, and in particular it is suggested that this is also the origin of the differences in stability. Ts'o *et al.* have collected a considerable mass of supporting evidence in favour of such a scheme, including, for example, consideration of the positions available for attack by methylating reagents in native and denatured DNA and poly-dA, and many data indicating the existence of a similar hydrogen bond in mononucleotides.

At the same time, it is important that other types of hydrogen bond have been suggested as stabilizing agencies in polyribonucleotide helices. Models of helical RNA have been reported as showing that the 2'-sugar hydroxyl group can form good hydrogen bonds either with the ether oxygen of the neighbouring ribose or with the adjacent phosphate group. Arnott *et al.* have, however, recently stressed that no intramolecular hydrogen bond from the ribose hydroxyl is compatible with the X-ray data on crystalline helical RNA. The absence of X-ray data on single stranded helices leaves the issue in some doubt but, unless there is a configurational change during the transition from the crystalline state to dilute solution, there must be some other source of stabilization of ribo- relative to deoxyribo-helices.

Recent work by Brahms and Sadron (*Nature*, **212**, 1309; 1966) advances evidence based on the behaviour of polyinosinic acid, and the aggregation of monomeric 5'-guanylic acid, that hydrogen bonding, at least in these systems, involves the ribose hydroxyl and the phosphate group. The best evidence to implicate the latter derives from the rather narrow pH range, centred on the pK_a of the secondary phosphate group, over which helical guanylic acid aggregates will form. X-ray analyses of polynucleotide structures, especially those involving single strand stacking, will be awaited with interest.