in its cage can be inhibited from doing so by an appropriately timed electric shock or by the administration of chlorpromazine. As both Lagerspetz and Dr R. Ulrich (Western Michigan University) showed, shock can not only act as a punishment to inhibit aggression, but also as a painful stimulus which elicits or increases aggression.

One of the many problems in fitting together the various pieces of evidence about aggression is that different workers measure so-called aggressive behaviour in very different ways. Wild animals usually fight with members of their own species, and, even then, ritualized threat behaviour is more common than overt fighting. The extent to which this type of aggressive behaviour is related to the biting of a piece of rubber hose by a monkey strapped into a chair and given an electric shock, or a rat killing a mouse, is by no means clear. Nor was the problem solved in discussions at the conference.

One of the reasons for the recent increase of interest in aggression (and whether or not it is controlled by an inborn drive) is the spate of popular books, such as those by Lorenz and Ardrey, about man's own, ever apparent, violence. Dr J. P. Scott (Bowling Green University) stressed that animal societies are, once inter-individual relationships have been established, peaceful organizations with little sign of violence. But any form of disturbance to a stable group of animals—for example the introduction of strangers, the removal of residents or excessive crowding—is likely to lead to an outburst of fighting. This type of disturbance, Scott argued, is largely responsible for human violence. Areas in which the problem of violence is most acute are those where the social organization is most frequently disturbed, for example, in the ghettoes of large cities, where people live in crowded conditions, and strangers frequently move into the area.

The only contribution to describe actual research on human aggression served as an illustration to underline the difficulties of the type of cross-species comparison made by Scott, even between monkey and man. The results presented by Dr W. C. McGrew (Edinburgh) suggested that aggression increases during the first seven days in which a group of nursery school children are put together for the first time. Similar research on several species of monkey has produced the opposite result—aggression decreases during the first few days of group formation. Whatever the reasons for this difference, the moral is clear: generalizations from animals to man must be treated with caution.

PROTEIN SYNTHESIS

Exposing Start Signals

from our Cell Biology Correspondent

THE cellular machinery responsible for translating the codon sequences of mRNAs into amino-acid sequences faces problems analogous to those of a person reading a foreign language containing words with the same spelling but totally different meanings. Only the sense of the sentence can indicate which alternative meaning to attach to such words. Likewise the translation machinery must be able to recognize some extra information when it translates AUG or GUG codons at chain initiation as formylmethionine, and during chain elongation as methionine or valine.

The way to identify precisely the nature of this additional signal is to determine the base sequence and structure of messengers and so characterize the environment of initiating AUG or GUG codons. But so far the only mRNAs which have been even partially sequenced are the RNA phage genomes, and from the fragmentary base sequences that have been determined it seems likely that the secondary structure of these molecules may play a crucial part in regulating their translation. The idea which has emerged is that internal AUG and GUG codons are not available for initiation because they are buried in regions of base pairing while the initiating codons are at the ends of hairpin loops in the molecule. Now Lodish (*J. Mol. Biol.*, **50**, 689; 1970), in an ingenious set of experiments involving the translation *in vitro* of f2 RNA mildly reacted with formaldehyde, has provided further support for this notion.

His idea was simply to disrupt partially the secondary structure of f2 RNA and see what effect that has on its capacity to programme protein synthesis. If the secondary structure is important for the specificity and control of the extent of translation, formaldehyde might be expected to alter the amount of the three phage proteins made and might also result in false initiation at internal AUG and GUG codons. And, sure enough, those were more or less the results he obtained. Although the formaldehyde-treated RNA is 30 per cent less effective as a messenger for synthesis of coat protein, it programmes a four to twenty-fold greater synthesis of maturation (A) protein and RNA replicase. Treatment with formaldehyde also abolishes the polarity of polar amber mutations in the coat protein cistron, and polarity in the RNA phages has been interpreted as a consequence of the secondary structure of the phage RNA.

Furthermore, by omitting elongation factors from the cell free system and so halting protein synthesis after the formation of the first peptide bond, Lodish has been able to assay the effect of formaldehyde treatment on initiation alone. Formaldehyde treatment of f2 RNA increases the extent of initiation of both maturation and coat proteins and large amounts of formylmethionyl-serine, the amino-terminal dipeptide of the RNA replicase, are produced with the treated f2 RNA. By contrast with untreated RNA, none of this dipeptide is made. In addition, with formaldehyde treated RNA as messenger, at least three extra formylmethionyl dipeptides are produced. These are presumably the products of initiation at normally internal AUG or GUG codons which have been rendered accessible for initiation by reaction with formaldehyde. As Lodish comments, it seems likely that only a few of the nucleotides in f2 RNA are reacting with the formaldehyde, but that is apparently sufficient to destroy locally base pairing and disinter buried AUG and GUG codons.

X-RAY ANALYSIS

Coenzyme Conformations

from our Molecular Biology Correspondent

THE co-factor, NAD, as a number of enzymologists surmised, and Rossmann and his group have shown by X-ray analysis, engenders appreciable conformational changes in lactate dehydrogenase. There has also