their favourite hormones.

In the absence of information about three-dimensional structure, knowledge about structure–function relationships must come from other sources. Species specificity is marked among the GHs (thus, non-primate growth hormones are not active in man) and comparisons of GHs from different species may eventually provide clues to structure–function relationships. Purification and characterisation of GHs from various lower vertebrates was described by H. Papkoff *et al.* (University of California, San Francisco). Immunological and physicochemical differences between the hormones mainly reflect the extent of phylogenetic divergence, but biological activities are rather variable and do not follow phylogenetic relationships so closely. Sequence information for these proteins is eagerly awaited, but for the present our knowledge of the molecular evolution of this protein family remains based largely on the sequences of mammalian hormones. Studies on chemically modified forms of GH, and on synthetic fragments, may also help relate structure to function, and were described by A.C. Paladini *et al.* (University of Buenos Aires) who are attempting to define precisely which residues are required for activity. At least one antigenic site has been tentatively identified as associated with a region of 30–50 amino acid residues long, near the centre of the primary structure.

The mechanism of action of GH remains unclear. In particular it remains uncertain (and a matter of considerable controversy) as to which of the actions of the hormone are direct and which are mediated by somatomedins. Like other polypeptide hormones, GH is thought to bind initially to a membrane receptor, and the nature and characterisation of receptors was discussed in several papers. Direct actions of the hormone on erythroid colony formation *in vitro* were described by D.W. Golde (University of California, Los Angeles) and direct actions on amino acid uptake and incorporation by diaphragm *in vitro* were discussed by K. Albertsson-Wikland, A. Lindahl and their colleagues (University of Göteborg).

However, most of the discussion about the actions of GH centred on the somatomedins and their role in mediating these actions. Various forms of somatomedin have been described, at least some of which are very similar to the insulin-like growth factors IGF 1 and IGF 2, which have now been quite well characterised and which were discussed by J. Zapf and E.R. Froesch (University Hospital, Zurich). J.J. Van Wyk *et al.* (University of North Carolina) described studies on the characterisation of human somatomedin C, including determination of a partial amino acid sequence; the hormone is similar to IGF 1. Somatomedin C stimulates growth of various types of cell *in vitro* and was also shown to have *in vivo* actions on the frog lens epithelium. Studies on somatomedin A were described by A. Skottner *et al.* (A.B. Kabi, Stockholm) though amino acid sequence data are still not available for this hormone, and its relationship to the IGFs is uncertain. Somatomedin B, is now thought to be without somatomedin-like properties, and therefore inappropriately named. Although somatomedins A and C are thought to mediate at least some of the actions of GH, and although they have many biological effects *in vitro*, attempts to show GH-like actions of somatomedins *in vivo* have previously met with little success. However, J.V.L. van den Brande, S.C. van Buul-Offers and their colleagues (Wilhelmina Children's Hospital, Utrecht) reported that clear-cut growth hormone-like effects (including increase in body weight and length) have now been obtained when human somatomedins were injected into hypopituitary dwarf mice. Somatomedins are thought to be produced in the liver in response to stimulation by GH and other factors. Studies on the biosynthesis of somatomedin in cultured Buffalo Rat Liver cells were described by S.D. Schalch *et al.* (University of Colorado) who presented evidence for a precursor of the hormone of molecular weight about 32,000. Other hepatocyte systems which produce somatomedins (and also their binding proteins) were also described (G. Haselbacher *et al.*, University of Zurich; M. Binoux *et al.*, Trousseau Hospital, Paris); stimulation of somatomedin synthesis by GH was claimed. □

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The physics of biology

from H. Eisenberg

THE business-like mood at EMBL's Hamburg laboratory at the DESY synchrotron installation was a welcome change from the *fin-de-siècle* recreational workshop atmosphere one sometimes encounters at fashionable watering places. At the recent EMBO-EMBL workshop* held there, hope, progress, expectation, and fulfilment in the biological applications of neutron and X-ray scattering, in particular with synchrotron radiation, were discussed in depth.

The ILL neutron reactor in Grenoble has now been active for several years and an EMBL outstation, to provide the infrastructure for experiments in biology, was established some years ago. Synchrotron radiation provides information additional and complementary to the neutron scattering and, in particular, the high intensity and pulsed nature of the beam presents unique opportunities. The EMBL laboratory in Hamburg, directed by Heinrich Stuhrmann, has made great strides in the continuing development of suitable facilities to explore these opportunities. Also, construction of new facilities for chemistry and biology at the DORIS storage ring in Hamburg is now underway and, in large measure, success will depend on the concomitant development of appropriate two-dimensional fast detector systems.

Sessions at the workshop reflected the varied interests of the workers involved. Muscle and collagen are two systems long studied by both X rays and neutron fibre diffraction. In particular, hope was expressed that considerable reduction of data collection time into the millisecond range, in the case of synchrotron radiation, will enable performance of dynamic studies and characterisation of individual states in the contractile systems. In solution studies a major tool is the application of contrast variation, particularly favoured by the dramatic difference in neutron scattering between hydrogen and deuterium (with little change in structural or functional properties); complementary information is provided in the case of X-ray scattering by the use of the more classical contrast variation media such as sucrose or salts. These and other theoretical aspects were discussed, as well as the possibility of obtaining information-rich three-dimensional reconstructions from the analysis of spatial fluctuations from random systems. This should be useful for complex biological systems which have not been obtained in crystalline organised form, useful for X-ray diffraction. Problems related to anomalous scattering were also discussed.

Protein–nucleic acid interactions were discussed in sessions devoted to progress in the study of ribosomes, chromatin and viruses. In chromatin we are gaining more understanding on the higher order structures of solutions of finite chains of nucleosomes in a variety of experimental conditions. Additional major topics of discussion involved membranes and lipoprotein complexes, as well as proteins and protein assembly complexes, such as microtubule structure.

The close encounter between about eighty molecular biologists, theoreticians and instrumentalists led to a frank exchange of ideas, created new and extended existing paths of communication in a field of great topical interest.

*The second EMBO-EMBL workshop on 'X-Ray and Neutron Scattering of Biological Structures' took place in Hamburg on 24–28 September, 1979.

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