Symposium on Computer Modelling for Anatomists and Clinicians

The following review articles are based on presentations given at a Symposium on Computer Modelling for Anatomists and Clinicians held in July 1997 at the Department of Anatomy, University of Edinburgh. The Symposium formed part of the Summer Meeting of the Anatomical Society of Great Britain and Ireland. There were 6 invited speakers, and 4 of these have produced review articles which are published in this issue of the Journal. In 3 of the presentations, recent advances in the use of 3D methodology to analyse mouse and human developmental anatomy were described. The reviews by Kaufman et al. and Baldock et al. (the latter to be published in a forthcoming issue of the Journal) complement each other in that they describe different aspects of a collaborative project (the Mouse Atlas Project, or MAP) involving the preparation of a *text* database of mouse developmental anatomy and a *digital* Atlas of normal mouse development. In the first of these presentations the principles underlying the methodology employed to reconstruct a range of early post-implantation mouse embryos spanning the stages between the primitive streak and the early limb-bud that had previously been serially sectioned was briefly described. Because of the efficiency of the computer technology involved (termed the warping program), the grey level images of the embryo histology could be arbitrarily resectioned to view the embryo as if sectioned in any orientation. Furthermore, all anatomically-defined tissues could be individually delineated (or painted) and viewed either in isolation or in combination with other appropriately labelled tissues and organs. In addition to its research potential, this methodology could also be used as a valuable teaching aid. In the complementary presentation, other aspects of the MAP were described, particularly its role in the preparation of accurate spatial maps of gene expression throughout all stages of development from fertilisation to birth. The methodology described in these 2 presentations, combined with the text database of mouse developmental anatomy which has recently been completed, also allows detailed cell lineage analysis to be undertaken. The third presentation in this group, by Whiten et al., discussed the advantages to be gained by using a relatively simple computer-based approach to display 3D reconstructions of sequential early stages of human cardiac development. The computing system employed used commercially available software designed for the creation of 3D models and virtual reality environments. This approach allows images to be constructed in a relatively short period of time which are capable of displaying complex 3D information relating to events occurring at successive stages of human cardiac development. This methodology has proved to be an extremely informative teaching aid, as it allows a greater degree of understanding of the developmental events occurring during this complex period of cardiogenesis to be achieved than has previously been possible from the analysis of serially sectioned material.

In the other 3 presentations, the use of 3D reconstruction methodology was discussed in so far as it relates to widely different areas of clinical practice. In Dr Hawkes' presentation, advances in the 3D visualisation of the skull and brain were described and illustrated using advanced image registration methodology. The particular value of this approach for diagnosis, planning treatment and monitoring the progression of disease states was emphasised. This new approach complements other imaging methods currently available to the clinician for clinical investigations including MR images, various types of scans, video images from endoscopy and microscopy, as well as conventional radiographic techniques. The range of registration methodologies now available, as well as approaches to devise more accurate and robust algorithms for registering different types of images, and their applications in clinical practice was also considered. In his presentation, Dr ter Haar Romeny particularly emphasised the value of 3D rendering software, combined with recent developments in computer software, for the visualisation and manipulation of volumetric data, with the ultimate aim of providing sophisticated real-time images that may be viewed using relatively inexpensive but powerful workstations. In the third of the presentations, Mr Neave described the use of modern 3D imaging techniques to reconstruct the facial features of individuals in forensic investigations, and for the analysis of the facial features of individuals from the historical past. He emphasised that modern computer-based approaches require minimal computer skills on the part of the operator, and are more flexible than the conventional approaches that are presently employed to achieve the same end result. Only the Abstract of Mr Neave's presentation is available. (*J. Anat.* **192**, 146, 1998)

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