

## **The Digital Anatomist Series: 3-D, Segmented, Dynamic Atlases of Body Regions**

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Spatial concepts of the human body's organization are critical for diagnosing health and disease and also for selecting and administering many types of treatment. Therefore, anatomy, the science concerned with the three-dimensional (3-D) structure of the body, has remained an indispensable component in the training of all health care providers. The substantial investment of time and effort necessary for both student and instructor can be attributed to the difficulties of representing and communicating the 3-D and dynamic nature of anatomic structures and body regions. Although computers have the potential for representing and displaying 3-D spatial information, the majority of computer-based programs that have been developed transfer traditional representations of anatomy from hard copy to electronic media, or present 2-D coplanar images derived from cadaver sections, CT, and MRI scans.

The Digital Anatomist Program has established a client-server framework for organizing and disseminating structural information. Our knowledge sources, which include 3-D reconstructions based on segmented datasets obtained from serial sections of cadaver specimens and MRI scans of living subjects, are being developed at the highest level of granularity for macroscopic anatomy. This necessitates that work proceeds by body regions. Our products are distributed as electronic atlases in videodisc and CD-ROM formats, as well as an Internet-accessible version. Methods are being developed for accessing the 3-D data efficiently via the World Wide Web.

The Digital Anatomist Series currently includes two videodisc and three CD-ROM publications. Atlases in this series are unique in that they promote a 3-D concept of body regions by presenting the anatomy and relationships of organs and other structures through the animation of 3-D reconstructions. The animations offer many advantages: they allow for 360 degree views; simulated dissection and reassembly of organs and body regions; sectioning; and viewing of deep structures through translucent surfaces. Furthermore, the atlases demonstrate spatial relationships that are difficult, if not impossible, to display by cadaver dissection or through radiologic imaging.

Videodiscs and CD-ROMs in our atlas series are structured for use in different environments. Our videodisc publications (Human Brain Animations and Animations of Thoracic Viscera) each contain approximately 50,000 frames of 3-D animations and labeled images. The subject matter is subdivided into chapters, based either on animation technique (brain) or region of study (thoracic viscera), and each demonstrates the anatomy by telling a story in an animation sequence. The contents of each disc can be accessed through a barcode manual or computer-based index. This architecture makes the videodiscs especially useful for lectures or for linking to electronic syllabi.

CD-ROMs in our series include Interactive Brain Atlas, Interactive Atlas of Thoracic Viscera, and Interactive Atlas of the Knee. These Macintosh-based atlases contain menus that organize the materials by region as well as by presentation method. Navigation tools allow movement between menus and among the images and movies stored within. A large and varied selection of static images includes 3-D reconstructions, CT and MRI scans, and anatomical sections. The static images are segmented to allow for interactive browsing and self-assessment. QuickTime animations of 3-D reconstructions can be launched from the static images and also independently from icons in the "movies" menu of each atlas. The portability and rapid access to high quality images make the Interactive Atlases a reference source well suited to a wide variety of environments such as teaching laboratories, clinical sites, and home study.

Publications in the Digital Anatomist Series provide a substantial body of anatomical information for the development of educational programs that can test the value and advantages of the 3-D, dynamic representations of anatomy. Our goal in publishing the series is to allow educators to experiment with new methods of teaching and learning that can cultivate the development of spatial cognitive skills.

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