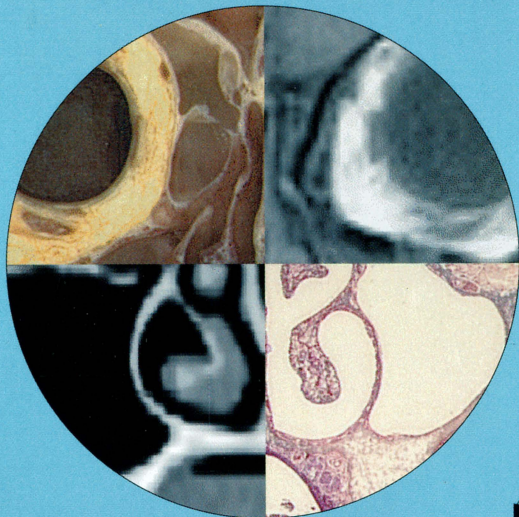


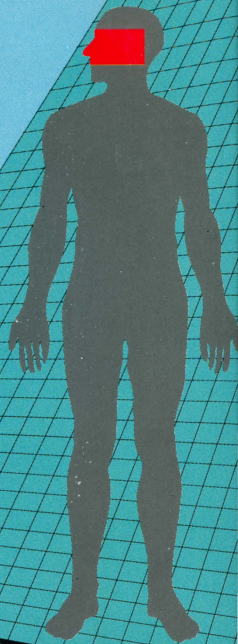
PARANASAL SINUSES & ANTERIOR SKULL BASE

USER GUIDE



EDITOR: BEREND HILLEN
Department of Functional Anatomy,
Utrecht University.

PLUS
CD-ROM
VERSION



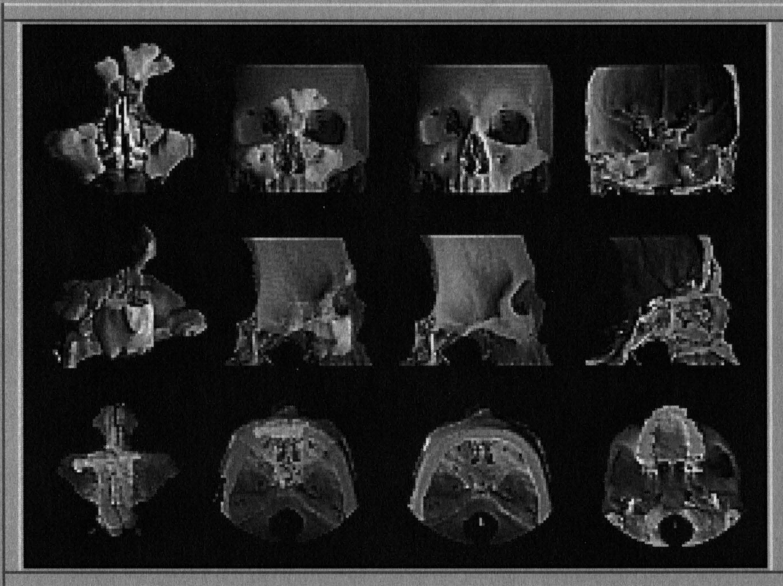
VOLUME 1 - I
THE HEAD & NECK



ELSEVIER'S

INTERACTIVE ANATOMY

ATLAS OF CONTINUOUS CROSS-SECTIONS ON FULL-MOTION CD-I



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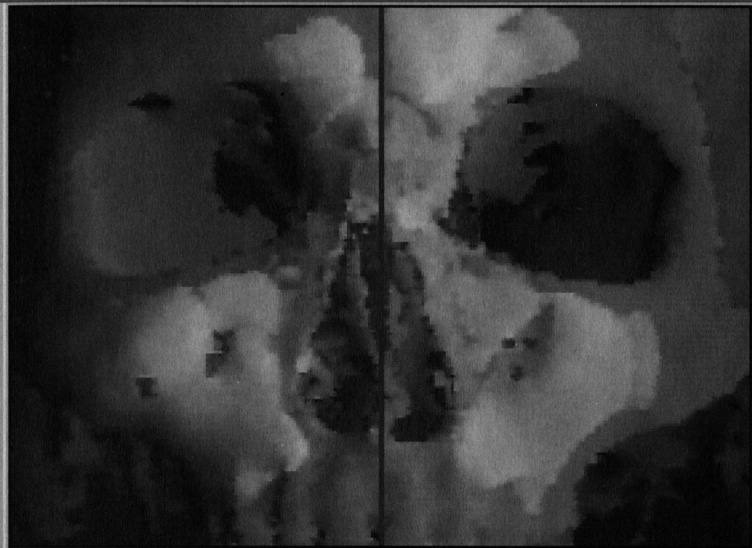
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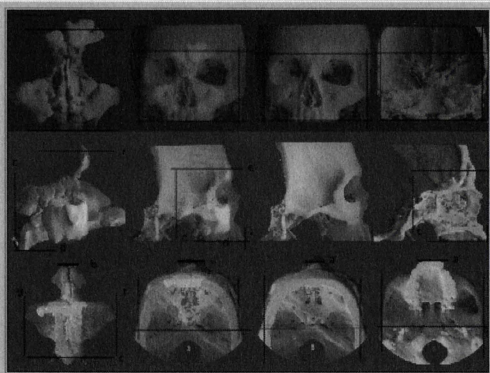
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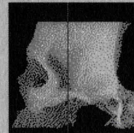
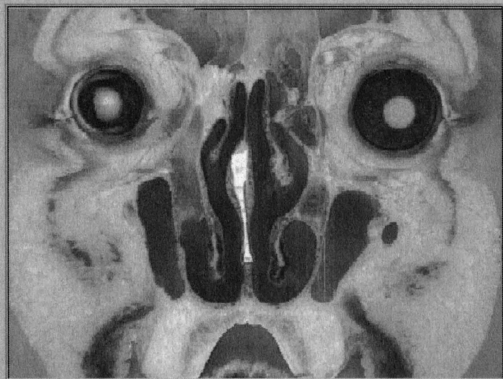
Elsevier's INTERACTIVE ANATOMY

Atlas of continuous cross-sections on full-motion CD



Volume 1: THE HEAD & NECK

Paranasal Sinuses & Anterior Skull Base



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CT

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Paranasal Sinuses & Anterior Skull Base



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ELSEVIER'S

INTERACTIVE ANATOMY

ATLAS OF CONTINUOUS CROSS-SECTIONS ON FULL-MOTION CD-I

Volume 1.I



ELSEVIER'S

INTERACTIVE ANATOMY

ATLAS OF CONTINUOUS CROSS-SECTIONS ON FULL-MOTION CD-I

Volume 1: THE HEAD & NECK

I. Paranasal Sinuses & Anterior Skull Base

Series Editor:

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NOTE FROM THE PUBLISHER

Dear Reader,

Welcome to the exciting new world of Compact Disc Interactive. We are pleased to offer you a view into the 'Paranasal Sinuses & Anterior Skull Base', the first disc in our series called Elsevier's INTERACTIVE ANATOMY.

With this remarkable disc, you can travel through the human head, between the eyebrows and the upper jaw. Using CD-I technology, a series of 11,000 cross-sectional photographs has been transformed into a movie, which can also be viewed in still-frames and compared with 700 correlative images from CT, MR, and histology. The disc invites you to experience a three-dimensional world by allowing you to view all tissue in coronal, transverse and sagittal directions.

To enable you to make your own choice between the two leading compact disc media, viz. CD-I and CD-ROM, we have included a CD-ROM as well.

Future discs will present additional segments of the human head and neck, and ultimately, the entire human body in 16-20 discs.

As we continue to pioneer in the publication of new technologies for medicine, we hope that you will find this new product an important and useful addition to your reference library.

Elsevier Science Publishers
Amsterdam

FOREWORD

Throughout the history of medicine there have been a number of substantial innovations in the way in which anatomy has been depicted and visualized. These perceptions have been applied to human illnesses so that there has been major benefit to all humankind. Two publications are examples of a critical increase in the anatomical basis for the understanding of disease and the care of the individual patient. The first of these was the publication in 1543 of *De humani corporis fabrica* by Andreas Vesalius which laid the foundation for all of surgery and the further study of anatomy for the next 500 years. The second was the letters sent by Antoni van Leeuwenhoek to the Royal Society in London from 1673 to 1718 which opened the study of microscopic anatomy. These innovations, the direct observational anatomy of Vesalius and the microscopic anatomy of van Leeuwenhoek have, to now, been the principal means for students to learn human anatomy.

Hillen's 'Interactive Anatomy' is another quantal contribution to teaching, learning and understanding of human anatomy. As his predecessor's have done, Hillen has taken advantage of new techniques and applied them to human anatomy. The present atlas enables the user to learn the relationships between the anatomical structures in the three planes, coronal, sagittal and axial. The user is now able to appreciate relationships in the three dimensions and may repeat the process as often as needed. The ability to interact in the three dimensions will

enable the user to gain his own dimensional image of any and all of the areas of this complex anatomical region. Until now, this has been only been possible after numerous dissections and years of clinical operating-room experience. The unique ability of viewing all the dimensions and their relationships with or without a label will allow the user to gain new insights and familiarity with the anatomical regions of her or his special interest. This form of knowledge is of contemporary importance for surgeons who are now intervening with the uses of operating telescope and microscope in the area of the paranasal sinuses and/or the anterior skull base. For all of these, this atlas is essential.

It is expected that the availability of the new three-dimensional information will be the basis for new effective forms of invasive interventions, be they surgery as we now know it, the uses of images to control the invasions, the placement of osmotic pumps, the repair of tissue, or the creation of new organs.

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INTRODUCTION

Anatomical cross-sections have always been an important and useful means of studying topographical relationships. Compared with dissection, the objectivity of the technique is a great advantage. The major disadvantage is that it requires some imagination and three-dimensional interpretation skills to extrapolate from the basically two-dimensional cross-sections to the three-dimensional morphology.

Over the past twenty years a strong revival of the interest in anatomical cross-sections has occurred under the influence of computed tomography (CT) in the seventies and magnetic resonance imaging (MRI) in the eighties. New techniques for the preparation of cross-sections were employed because the old-fashioned bandsaw resulted in a loss of tissues, which was considerable compared with the potential 1 mm section thickness of modern imagery modalities. Instead, large heavy-duty microtomes were employed. These microtomes were originally developed by Ullberg (1977) for the sectioning of complete laboratory animals, but appeared to be an excellent tool for sectioning human tissues as well, especially for the study of anatomical correlations of CT and MRI.

Rauschnig (1979) was the first to describe the techniques of photographing the surface of the tissue block in the microtome. Later, van Leeuwen et al. (1987) developed a staining procedure for the large

sections that came off the tissue block. These histologically stained sections provide complementary information in addition to the natural colour images that are recorded of the surface with a camera (for an extensive review of the technique, see Zonneveld, 1988). The only disturbing thing about this microtome, however, is the abundance of cross-sections. In contrast to the bandsaw, which produced too few cross-sections and too much tissue loss, the microtome can produce a cross-section every 20 or 25 μm . Since it is not feasible to record every cross-section photographically, much information had to be thrown away. To overcome this problem the photo-camera can be replaced by a video-recording system (Hillen et al., 1987).

Provided that the position of the tissue block under the camera is always the same, a sequence of video frames of cross-sections can be obtained which can be replayed like an animation film, thus resulting in a 'journey' through the tissues. In fact, the original third dimension is replaced by time.

These animations appeared to be of great help in overcoming the limitations of slice-by-slice visualization. The extrapolation of the relations in the third dimension is facilitated, even for those who have a poor three-dimensional imagination. The merits of the 'animated' cross-sections could be enhanced considerably in an interactive multi-media environment.

CD-I and CD-ROM, with their own advantages and disadvantages, therefore seem at this moment the best vehicles for these images together with the necessary software for optimal profit for the user.

Brief introduction to CD-I

CD-I is still a new medium, and unknown to many physicians. In order to give you some general and technical information about CD-I, we felt the need to include this chapter. The technical notes related to the DV cartridge, are of importance to all starting up with this electronic publication.

CD-I: a new medium

CD-I is an exciting new multimedia system for information, instruction, training and entertainment.

Based on the familiar 12 cm (5 inch) optical Compact Disc, the system merges audio, video, text and graphics into one digital system, bringing a flexibility to the presentation of information. In addition, it adds a new ingredient – interactivity – thus creating a dialogue between the CD-I user and the system, enhancing the exchange of knowledge. (The interactive exchange of high density anatomical information is what we trust you will achieve using Elsevier's INTERACTIVE ANATOMY.)

CD-I is the interactive multimedia system designed for use by many professions, and by many consumers also. As a physician, you will be pleased to hear that Elsevier Science Publishers has more anatomy CD-I titles in preparation, (see Forthcoming titles on page 27) and that also other medical CD-I and CD-ROM titles are now under consideration.

Easy-to-use

CD-I discs look just like audio CDs and most CD-I players look like normal Compact Disc players. They are also just as simple to connect to any audio system, offering the same stereo sound quality. The difference with a CD-I player is that it can also be connected to your TV set so that you can use the visual possibilities of the system. Each CD-I player comes with its own remote control.

Worldwide standard

CD-I standards have been set and internationally agreed upon. As a result, 200 manufacturers have been licensed to produce CD-I related hardware. As a world standard, every disc from this series is compatible with every CD-I player throughout the world.

As a universally accepted system for sharing knowledge, CD-I is more multifaceted than any book, catalogue, journal, or video recording because of its excellent ability to integrate text, audio, spoken language, high-density still-images and video sequences. In fact Elsevier's INTERACTIVE ANATOMY only made use of some of these multi media

possibilities: we left out audio (and spoken language) since the images, text, and animated sequences of this CD-I will speak for themselves.

Elsevier is not the first major Publisher to have realized the potential for CD-I. However, Elsevier is the first science publisher who turned this understanding into action: we truly believe that CD-I is an excellent medium for visually oriented medical disciplines.

PRODUCTION

General

The production is based on a continuous series of sections of a specified tissue block. The tissues are from normal dissecting room cadavers after standard embalming procedures. The dimensions of the tissue block are determined by a number of variables, such as anthropometric measurements, limitations of the microtome, the area of interest, resolution, section interval, etc. A careful trade off has to be made: the smaller the dimensions of the tissue block, the better the resolution and vice versa. The number of images that can be stored on the medium is limited and 3-D manipulation such as the multiplanar reformatting give the best results when voxels are cubic, i.e. when the slice interval is equal to the pixel size of the original acquisitions. As a result, a number of structures will surpass the boundaries of the tissue block. This can sometimes be disappointing but it is an inevitable consequence of the technique. However, other discs will be produced that cover the adjacent areas.

The sections in the original cutting direction are made with a large, heavy duty microtome (PMV 450). At fixed, small intervals (40-100 μm), the surface of the tissue block is recorded with a video camera (SONY 3 CCD) and captured (digitized) with a framegrabber (NUVISTA) in a computer (MAC Apple IIcx). From this digitized series of images the two perpendicular planes are reconstructed with a special software tool in a powerful workstation (HP 720). During sectioning every tenth

section is gathered on tape and stained with a modified Mallory-Cason procedure (van Leeuwen et al., 1990). These sections are digitized with the same equipment, but no multiplaner reformatting was performed.

The CT scans of the specimen were made at the University Hospital of Utrecht on a Philips Tomoscan LX. These scans per se are not included on the disc, because post-mortem artifacts lead to considerable differences with CT scans of the living anatomy. The scans were used for the 3-D reconstructions that are included on the disc as reference images. These 3-D reconstructions were executed with a CEMAX 1500 X 3-D workstation (Cemax, Fremont, CA, USA) at Philips Medical Systems (Best, The Netherlands). The CT scans on the disc are made on the same scanner of a healthy volunteer. The MR scans were made at the Philips Gyroscan ACS at the 'Medisch Spectrum Twente' in Enschede, The Netherlands.

Care has been taken to get the cross-sections with the different modalities as comparable as possible. However, due to small inaccuracies in positioning, the different techniques and anatomical differences between the cadaver and the healthy volunteer, a complete match cannot be obtained. As stated previously, CT and MRI are taken from a living subject, consequently differences will be present. Unfortunately, this medium does not provide the freedom to influence the setting of the grayscale (window) in CT and MRI. The settings were done in the best possible way to show all relevant tissues; even so, the

images may seem inferior to ones to which you are accustomed, especially if you operate the series on a video monitor. Obviously, the resolution of a video monitor is inferior to the monitor in a viewing console or a hardcopy of the CT or MRI. Furthermore, the size of the image is larger than those you normally observe. In spite of these disadvantages, these images have been included on the disk to study the relation between the detailed anatomy and its clinical presentation as provided by modern imaging modalities. For that reason, the CT and MR images are not labelled; the emphasis here is on the anatomical images.

Specific

This production is focussed on the nose and the paranasal sinuses and includes the orbit, the sphenopalatine fossa, the hypophysis and the cavernous sinus.

The specimen is from a 57-year old edentulous female without obvious pathology in the head-neck region. The relevant anthropometric dimensions are presented in Table 1.

The head was deep-frozen and with a bandsaw the selected area was trimmed to the required dimensions. First the occlusal plane was determined, since this was chosen to be the plane of reference. As argued in the previous section, limits have to be established arbitrarily after a careful trade off of the various parameters. In this case the choice

Table 1
Anthropometric dimensions (mm)

	Cadaver	Volunteer
Head length	194	187
Head breadth	148	155
Bizygomatic breadth	136	139
Pupillar distance	71	63
Head height	220	229
Facial height	121	116
Head circumference	565	557

Table 2
Dimensions

Dimensions of the tissue block (mm)	120 x 90 x 110
No. pixels in the (frontal) acquisition plane	768 x 576
Slice thickness (μm)	26
Acquisition interval (μm)	78
Voxel size for multiplanar reformatting (μm)	156 x 156 x 156

was made for the dimensions as presented in Table 2. As a consequence of the choice, the superior part of the frontal sinus and the posterior part of the sphenoidal sinus are not included. This choice was made explicitly to save the proper resolution for the details in the ethmoidal sinuses, the orbit, the sphenopalatine fossa and the cavernous sinuses,

which, in our view, put a heavier weight on the scale than the outer limits of the sinuses.

The CT scans and the MR images are both from a healthy 47-year old male volunteer. For the CT scans the standard setting was chosen for imaging the sinuses. For the MR images the parameters were set such that the mucosa in the nose and the sinuses was visualized. The parameter settings are presented in Table 3.

Table 3
Parameters of the MRI on the Philips Gyroscan ACS-II

	Coronal	Axial
Multislice TSE		
No. slices	80	80
Slice thickness (mm)	1.8	1.8
Slice gap (mm)	1.5	1.5
Field of view (mm)	250	250
TE (ms)	19	19
TR (ms)	600	600
No. samples	4	4
Turbofactor	3	3
Rectangular field of view (%)	70	65
Scan percentage	100	100

Production Team

This production was made by the Department of Functional Anatomy, Utrecht University, Utrecht, The Netherlands⁽¹⁾, with contributions from the 3-D Computer Vision Group, Utrecht University⁽²⁾, the Department of Radiology, Utrecht University Hospital⁽³⁾, and the Department of Radiology, Medisch Spectrum Twente, Enschede⁽⁴⁾, The Netherlands.

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Karel Zuiderveld⁽²⁾

CT and MR images

Frans W. Zonneveld⁽³⁾

Jan A. den Boer⁽⁴⁾

Anthropometry

George J.R. Maat⁽¹⁾

The software for the interaction and the transcription of the images to CD-I were done by Tom Zoutewelle Studio, Doorn.

IMPORTANT POINTS - BEFORE YOU START

- ▶ While installing Elsevier's INTERACTIVE ANATOMY on your CD-I player, please be sure to install the disc labelled 'Compact Disc Interactive'. The disc labelled 'Compact Disc Data Storage' contains the CD-ROM version of this product.
- ▶ Elsevier's INTERACTIVE ANATOMY only runs the video sequences when your CD-I player is upgraded with a CD-I Digital Video extension unit, the so called 'DV cartridge' (for information on the DV cartridge see 'Technical specifications CD-I'). The DV cartridge offers features not available on the 'linear' programs of video or laser disc of the late 1970s and 1980s. In an interactive title like Elsevier's INTERACTIVE ANATOMY, you can select the nature of the information, the viewing angles, the speed of the video - from stills to 5 images per second, or activate the reverse mode.
- ▶ To get the most out of your CD-I player, always use the connection that will ensure the best possible picture quality for the available TV set. The optimal connection for a CD-I player to your TV set is RGB, provided via the so-called 'SCART connector'. The SCART connector is the only option where the red, green and blue components are fed directly from the source to the picture tube ensuring full dynamic range, a maximal signal-to-noise ratio and minimal distortion. The result is an excellent resolution, natural colours and no colour displacement, ensuring optimal use of Elsevier's INTERACTIVE ANATOMY.

INTERACTION

For starting the interaction, normal procedures for your CD-I player or CD-ROM player (and computer) have to be consulted. After starting up, the title screen will be displayed on your monitor. The interaction in the CD-Rom follows the standard 'Windows' conventions. In general, the interaction is performed by moving the cursor on the screen to an active region with the device that comes with your equipment. This device can be a mouse, a trackerball or a remote control with a joystick. Basically there is no difference in conducting the interaction. The active regions on the screen can be either 'buttons', which execute a certain manipulation or define areas in the cross-sections. The specific buttons will be discussed in detail in the next sections. In general, a button is a clearly defined area at the right-hand side of the screen. Buttons may not be active in certain situations. In the CD-I version, active buttons become dark grey when the cursor is positioned on them; inactive buttons do not. In the CD-ROM version, they are shaded and clearly distinguishable from the buttons that are active. The defined areas in the cross-sections will be discussed in that specific section. To activate a button, position the cursor in that field and click on the left mouse button. On the title screen there is a button DEMO. After clicking on this button a brief introductory demonstration of the possibilities of the disk will be given.

The anatomical nomenclature is either provided as the official *Nomina*

Anatomica (1989). Finally, a choice was made to name the three different planes: coronal, axial and sagittal which are commonly used by clinicians.

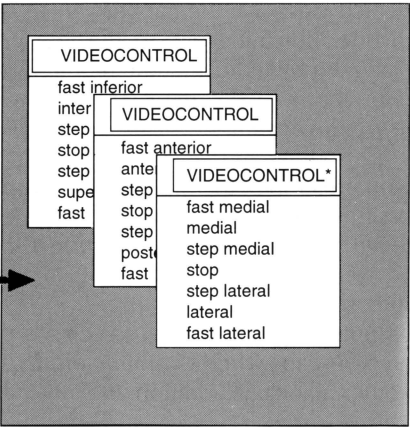
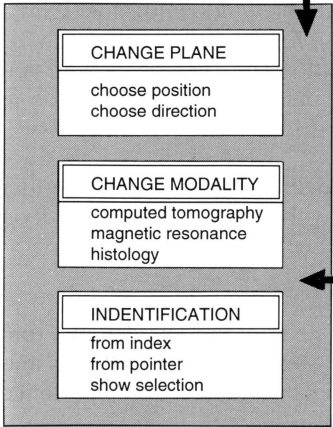
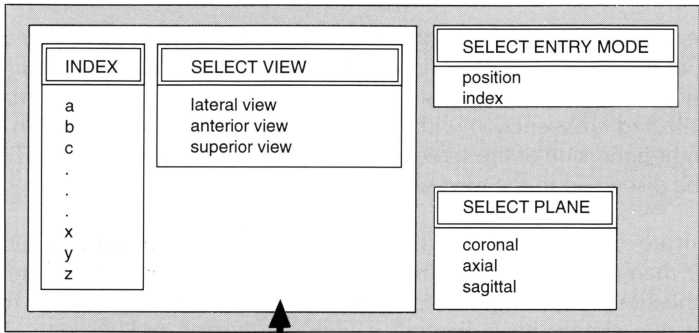
These buttons have identical meanings in the screens in which they appear. The HELP button gives you access to text which will help you to become acquainted with the program. The EXIT button will always bring you back to the previous mode in the system hierarchy – details are given in the sections dealing with the different screens. The OK button confirms and executes your decision. A short cut can be made by clicking the right mouse button when executing the action that has to be confirmed.

A scheme of the interactions is given in the figure on page 19. A quick reference is included on the cover fold-outs.

The entry screen

In the title screen several decisions have to be made. Either a combination of plane and position or a combination of a plane and the name of a structure has to be chosen. If you decide to look for a structure you click on index, after which an alphabetical list of names and a scroll bar will appear in the window.

By scrolling you will find the name of the required structure – if it is included in the list. Only those structures that are relevant and/or visible



in the series, are included in the list. If you click on the name, you will have to decide on the plane in which to begin your journey, the latter decision may be made first as well. After both choices have been made the selected cross-section with the name will appear on the screen. At the right-hand side of the screen a new set of buttons will appear. These will be discussed in the next section.

If you are familiar with the anatomy, an obvious decision is position rather than a name. In the window 3-D reconstructions of the skeleton and the sinuses are displayed in different viewing directions. You may select one simply by indicating it with the cursor and clicking. The selected view will then appear enlarged in the window together with a red line indicating one of the two possible planes. The line can be positioned by indicating the required position and clicking. Should you prefer another view, the EXIT button will put the complete selection in the window again.

If you prefer the other plane, go to the plane buttons and select the other possibility. The choice can be confirmed with the OK button. A click on the left mouse button will give you a short cut.

Mode screen

The buttons in the 'mode' screen are the heart of the interaction. From here you can switch to animation, to the other imaging modalities and to other planes. In addition, the index can be consulted for the presence

and position of structures in this section on the screen or to step through the sections. In the cross-sections a number of structures is labelled with names. When moving the cursor on the screen you will see that it changes shape from → to ⬤ (CD-ROM) or from red to blue (CD-I). This indicates that you are in an area that is labelled. By clicking, the name will appear of the structure over which the cursor is positioned. This function is only present in the stills.

VIDEO MODE/STILL MODE

From every keyframe, i.e. every 10th frame from the original recording of the surface of the tissue block or the reconstruction of the perpendicular planes it is possible to go to the video mode and travel forward and backward at different speeds. Position the cursor on the VIDEO button and click: the program will replace the 'mode' buttons by the VIDEO CONTROL buttons which enable you to influence the direction and speed of your journeys; these will be discussed in the next section.

This switch cannot be made directly from the histological sections, the CT or the MRI. When one of these modalities is displayed on the screen the upper button will be labelled 'STILL' and, if activated, will bring you back to the stills in the same plane and position.

HISTOLOGY/CT/ MRI

Switching to other imaging modalities in the same plane and position can be achieved by activating one of these buttons. The histology is only

available in the frontal or coronal plane, which is the original plane of sectioning. Contrary to the CT and MRI these sections are identical to the surface recordings.

PLANE

The PLANE button can be activated in the stills, the CT and MRI. It will bring on a new set of buttons to determine the plane and position of the perpendicular cross-section that will be discussed later. This button does not change the imaging modality and is not active in the histology mode.

STEP FUNCTIONS

These buttons provide a step function in the keyframes in all images. The interval between the keyframes, both the surface and the histology is 780 μm . Since the CT and MR images are from different subjects, intervals will vary as a consequence of selecting the best matching image. This facility has been implemented to step through the series without leaving the options of the mode screen. The step is also present in the video mode. The button ◀ indicates the superior, the anterior directions, respectively, in the axial and coronal planes. In the sagittal series it takes you further to the right. Consequently, the button ▶ produces the opposite effect. The same conventions are used in the video mode.

INDEX

Activating the INDEX button will bring on a window displaying the names of all labelled structures in the section under consideration. This does not mean that every tiny detail in the cross-section has been labelled. Factors such as size, visibility and importance have been included in the considerations of what to label or not. This function is only available in the stills and histology.

ZOOM (only CD-ROM)

Activating this button will display a new screen and the tools to make an enlargement of selected area of either the stills or the histology. Details can be found on page 25.

EXIT

The button EXIT brings you back to the entry screen where you can have access to the full index or to the 3-D's to make a new entry into the series.

HELP

The HELP button activates help texts basically identical to what you find in the manual.

Video control

After activating the VIDEO button in the mode screen, the program will move to the video file of the cross-section that is on the screen. You can

play forward and backward through the series at different speeds. The symbols on the buttons indicate the direction of video play and follow the conventions mentioned in the section on Step Functions in the mode screen. In addition, the directions are indicated above and under the menu bar. The buttons with the double arrows double the normal playing speed. The central button is stop. The adjacent buttons provide a 'step' function identical to the one in the mode screen. The EXIT button will bring you back to the mode screen in the same position where you stopped the video.

Plane

Clicking on the button PLANE will open the possibility to go to a perpendicular cross-section. However, you will have to define the plane and position. These decisions can be made with the buttons in the right-hand margin. The upper buttons are for choosing the direction of the plane. The symbols indicate the intersection of the new plane and the plane on the screen. Once you have chosen the plane, a red line will appear on the screen. This line may be positioned by putting the cursor in the required position and clicking. This can be repeated if you are not content with the position of the plane. When you are satisfied, activate the OK button and the required cross-section will appear together with the buttons from the mode screen. A short cut can be made by using the right mouse button when positioning the line.

Zoom

In this screen mode an enlargement of a selected area can be made (CD-ROM only). To select the area, position the cursor at the centre of the region of interest and hold the left mouse button down. Then, by moving the cursor, a rectangle is drawn on the screen which defines the area to be enlarged. Upon releasing the left mouse button, the defined area will appear enlarged on the screen. This procedure can be repeated. The buttons in the screen have the identical functions as described earlier. The step function offers the possibility of 'stepping' through the sections with the same zoom. The EXIT button will bring you back to the mode screen.

LITERATURE

Hillen, B., Deddens, A.J.H., Gerrits, P.O. and van Leeuwen, M.B. (1987) Developments in anatomic cross-sections. *Radiology* 165: 324.

Rauschnig, W. (1979) Serial cryosectioning of human knee-joint specimens for a study of functional anatomy. *Sci. Tools* 26: 47-50.

van Leeuwen, M.B., Deddens A.J.H., Gerrits, P.O. and Hillen, B. (1990) A modified Mallory-Cason staining procedure for large cryosections. *Stain Technol.* 65: 37-41.

Ullberg, S. (1977) The technique of whole body autoradiography. Cryosectioning of large specimens. *Sci. Tools* 2-29.

Zonneveld, F.W. (1987) Technique of cryosectioning. In: *Computed Tomography of the Temporal Bone and Orbit*. Chapter 3, pp. 53-62, Urban and Schwarzenberg, Munich, Vienna, Baltimore.

Nomina Anatomica, Sixth Edn. (1989) Churchill Livingstone, Edinburgh.

FORTHCOMING TITLES

It is presently the intention of Elsevier Science Publishers B.V. to follow the publication of Volume 1.I with the publication of other discs. Here is an overview of the series:

Volume 1:	THE HEAD & NECK
Disc I:	Paranasal Sinuses & Anterior Skull Base
Disc II:	The Ear/Petrous Bone
Disc III:	The Neck and Larynx
Disc IV:	The Brain/Neurocranium
Disc V:	The Eye
Disc VI:	The Head (Overview)
Volume 2:	THE TRUNK & VERTEBRAL COLUMN
Volume 3:	THE UPPER EXTREMITIES
Volume 4:	THE LOWER EXTREMITIES

Note:

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TECHNICAL SPECIFICATIONS

CD-I

Elsevier recommends the use of the Philips CDI 220, or the portable CDI 350 player: these players are the only CD-I players available **now** with the full screen full motion option (DV) which you need in order to run Elsevier's INTERACTIVE ANATOMY.

The CD-I players are designed to make operation as simple and quick as possible. Commands that are familiar from audio CD technology have been utilized to increase user-friendliness.

The CD 200 can be simply connected to any TV set (with SCART connector), providing high density pictures and video.

The portable CDI 350 incorporates its own 6-inch colour LCD screen, of sufficient calibre to use Elsevier's INTERACTIVE ANATOMY at any location desired.

The picture (and sound) quality of the CDI 350 player is similar to that of the CDI 220. If a larger screen is required, the CDI 350 can be easily connected to any standard TV.

Both players have the following features:

- ▶ high resolution picture quality
- ▶ the latest bitstream technology
- ▶ ability to play all CD-I titles

- ▶ ability to play audio discs with on-screen control features
- ▶ possibility of playing photographs for Photo CD discs
- ▶ digital video and audio processing
- ▶ simple to connect to any standard TV and/or hifi system
- ▶ easy operation using on-screen program display
- ▶ facility for extension to play CD-I discs with full motion video remote control (CD-I 220)

Additional features of the CDI 350 portable player:

- ▶ combination CD-I player with 6-inch colour LCD screen
- ▶ operation from mains or battery power supply

The DV cartridge makes it possible for you, while running a sequence from, for example, the transversal cross-section of continuous anatomy photographs, to switch *seamlessly* to the transversal images from histology, CT or MR, or switch *seamlessly* to any image sequence from sagittal or coronal direction, *without leaving the exact tissue location!*

(Note): Discs from Elsevier's INTERACTIVE ANATOMY do not show video sequences on CD-I players which are not extended with an DV cartridge.

The features of this DV cartridge are:

- ▶ simple plug-in mounting in all (Philips) CD-I players
- ▶ full-screen full-motion video

- ▶ world wide compatibility with all 50 Hz and 60 Hz broadcasting standards
- ▶ up to 72 minutes of quality video from any CD-I disc
- ▶ conforms to worldwide MPEG1 digital video standard (ISO 11172)
- ▶ digital sound reproduction
- ▶ full range play mode control includes stills and slow motion

Hardware discount for Elsevier clients

Elsevier is not responsible for any CD-I related hardware. However, Elsevier customers are offered discount prices for CD-I players and the DV cartridge.

In case you wish to use this option, please use the discount card enclosed with this product. Should you need additional information please contact: The Promotion Manager, Elsevier Science Publishers, Dept. of Medical, Pharmaceutical, and Biological Sciences, P.O. Box 181, 1000 AD Amsterdam, FAX (+31-20)5803249.

CD-ROM

The CD-ROM version of Elsevier's INTERACTIVE ANATOMY uses established CD-ROM technology and features interactive playback of all video material on your desktop. The combination of Microsoft® Windows™ and Video for Windows™ * makes this product easy to use and provides a rich, graphical working environment.

*Microsoft is a registered trademark of Microsoft Corp.

System requirements

- ▶ IBM-compatible PC with a 33 MHz 486 CPU or better,
- ▶ 4 Mb internal memory,
- ▶ 5 Mb available on hard disk for installation,
- ▶ CD-ROM player with adequate access time (less than 400 milliseconds),
- ▶ MS-Windows 3.1,
- ▶ mouse or other pointing device compatible with MS-Windows,
- ▶ accelerated 256 colour VGA adapter compatible with MS-Windows (resolution 640 x 480)

If your configuration has a less powerful CPU (386 is a minimum) or a non-accelerated VGA adapter, this application will run but video playback will be at a lower speed.

Recommendation

Imaging and video technology benefits from the fastest hardware available. To get the most out of this application a faster CPU is recommended (e.g. 66 MHz) and a double speed CD-ROM (with a data throughput rate of 300 kb per second or better).

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