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The Human Nervous System - An Introduction

THE ITEM

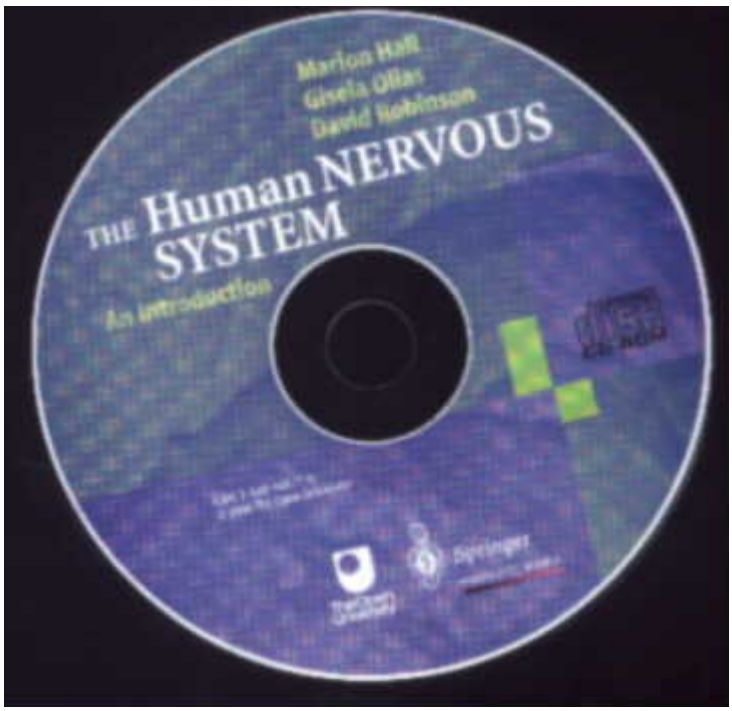
Format CD-ROM

ISBN-10 3-540-14877-9

Editor's recommendation — this book carries the editor's "must buy" recommendation.

A FASCINATING TOUR OF THE HUMAN NERVOUS SYSTEM

The Human Nervous System - An Introduction *by* Marion Hall, Gisela Olias and David Robinson Springer-Verlag, Electronic Media, Tiergartenstrasse 17, 69121 Heidelberg, Germany, 1 CD-ROM with booklet 16 pp. ISBN: 3-540-14877-9. Price: Not stated



The human nervous system is arguably the most complex system of the human body. Comprising of brain, spinal cord, and peripheral nerves, it is the most advanced system in the animal kingdom.

Some writers have termed brain as the most complex mass of matter in the whole universe. To understand such a complicated structure is undoubtedly not an easy task.

But now Springer-Verlag has come out with a highly interactive educational CD on Human Nervous System, which imparts knowledge on this complicated structure in a very user-friendly manner. The installation is easy (for more information, readers may like to refer to the accompanying box). When the CD is first started, the user is greeted with an opening window, having ten buttons: Contents, Index, Objectives, Test, News, Back, Trail, Tools, Help, Quit. These ten buttons take you to a fascinating tour of the entire CD.

Clicking the "Contents" button will take you to a window, having seven further buttons. These are: How to Use the System, Overview, The Nerve Cell, Motor Systems, Motor System Diseases, Touch and Pain, and Smell and Taste.

The button "How to Use the System" gives a general introduction to the CD in 8 screens. It introduces the reader to such concepts as hot spots, hyperlinks, text pop-ups, how to navigate the CD and how to open and close various windows. There are three levels of information in the CD. These levels begin from the very basic first level - which perhaps a twelve year old can understand - to the most complicated third level, which medical students can understand better. You can choose your level at will. And as you wade through this CD, you will find your skill level increasing. Thus this is a "mixed" kind of CD with a mass appeal. Laymen would enjoy this CD as much as medical students, because each viewer can choose his level. It would be very gratifying for the user to find his skill level increasing while he was using it.

Running this CD on your computer
What would you need to run this CD? What do you do if you happen to experience problems? Check out below.

System Requirements
IBM compatible PC with Pentium (or equivalent) processor, 16MB of RAM, 6x speed CD-ROM drive, mouse and SVGA monitor. 8 MB of free space is required on a hard disk.
Windows 95 or Windows 98 must be already running on the PC.
A faster PC with more memory (e.g. Pentium II processor, with at least 32 MB of RAM) and a higher speed CD-ROM drive will also improve performance.

Installation
To install The Human Nervous System:
1. Insert The Human Nervous System CD-ROM into your CD-ROM drive.
2. Run Windows 95 or Windows 98.
3. The installation process should start automatically. If it does not, click on the Start button and select Run. In the Command Line box type x:\setup.exe, where x is the letter of your CD-ROM drive. For example, if your CD-ROM drive letter is D you would type: "D:\setup.exe".
4. Press Enter or click OK.
Follow the instructions on the screen. The installation program will ask for the drive and directory on which to install The Human Nervous System. The default drive and directory is C:\HumNerv, but you may change it.
The installation program creates a program group with the window title "Human Nervous System", and places The Human Nervous System program icon in it.

Graphics Display

The Human Nervous System contains over four hundred and fifty high quality images. To view these images at their best you should ensure that your computer is set up to display at least 32,000 colours. To change your display, see CHANGING YOUR DISPLAY below.

You can enjoy The Human Nervous System when your screen is set up to display 256 colours, but you will experience what is known as 'palette flashing'. The Publishers strongly recommend that you change your display to use the highest Possible number of colours.

Technical Support

If you experience problems installing or running this product, you can contact the Helpdesk (Springer-Verlag) at or via e-mail at helpdesk-em@springer.de.

The CD has a central workspace area, where the contents of the CD are presented. In this workspace area, you get pop-up text boxes, glossary, index, video and everything else that the CD contains. There are a number of tools you can work with. This includes a so-called "camera tool", which can capture images in the workspace area, the "photo album tool", in which you can "paste" these pictures for later viewing, the "measuring tool", the "calculator tool", the "writing pad" tool and the "glossary" tool, through which you can jump to the glossary. Another interesting thing is that the cursor changes its shape according to what you are about to see. Thus if you reach a place where the CD allows you to go to a higher level, the cursor shape will change to that of a thick arrow; if you go to a word, whose meaning will appear in glossary, the cursor will change to a question mark; if you go to a place, where a reference is linked, the cursor will its shape to that of a book. Similarly the cursor will change into the shape of a kangaroo - yes, kangaroo - if you can jump to two or three places from there, it will change its shape into that of a magnifying lens if you can magnify that object further. This reviewer found this feature very helpful and self-explanatory.

At most of the screens, a voice explains you the main feature of the structure on that screen. If you want to listen to that voice again, you can repeat the sound, by clicking on the sound button on the top left hand corner of the workspace. Or if you just want to read the text, you can click the text button (again in the upper left hand corner) to get a pop-up text box. This is like a book, and you can go on clicking on "next" buttons to go to further pages. The facility of going back and forth is there in all screens.

About other areas of the "Contents". Overview of the Human nervous system is explained in 15 screens, "The Nerve Cell" in 8, "Motor Systems" in 12, "Motor System Diseases" in 6, "Touch and Pain" in 4 and "Smell and Taste" in 3.

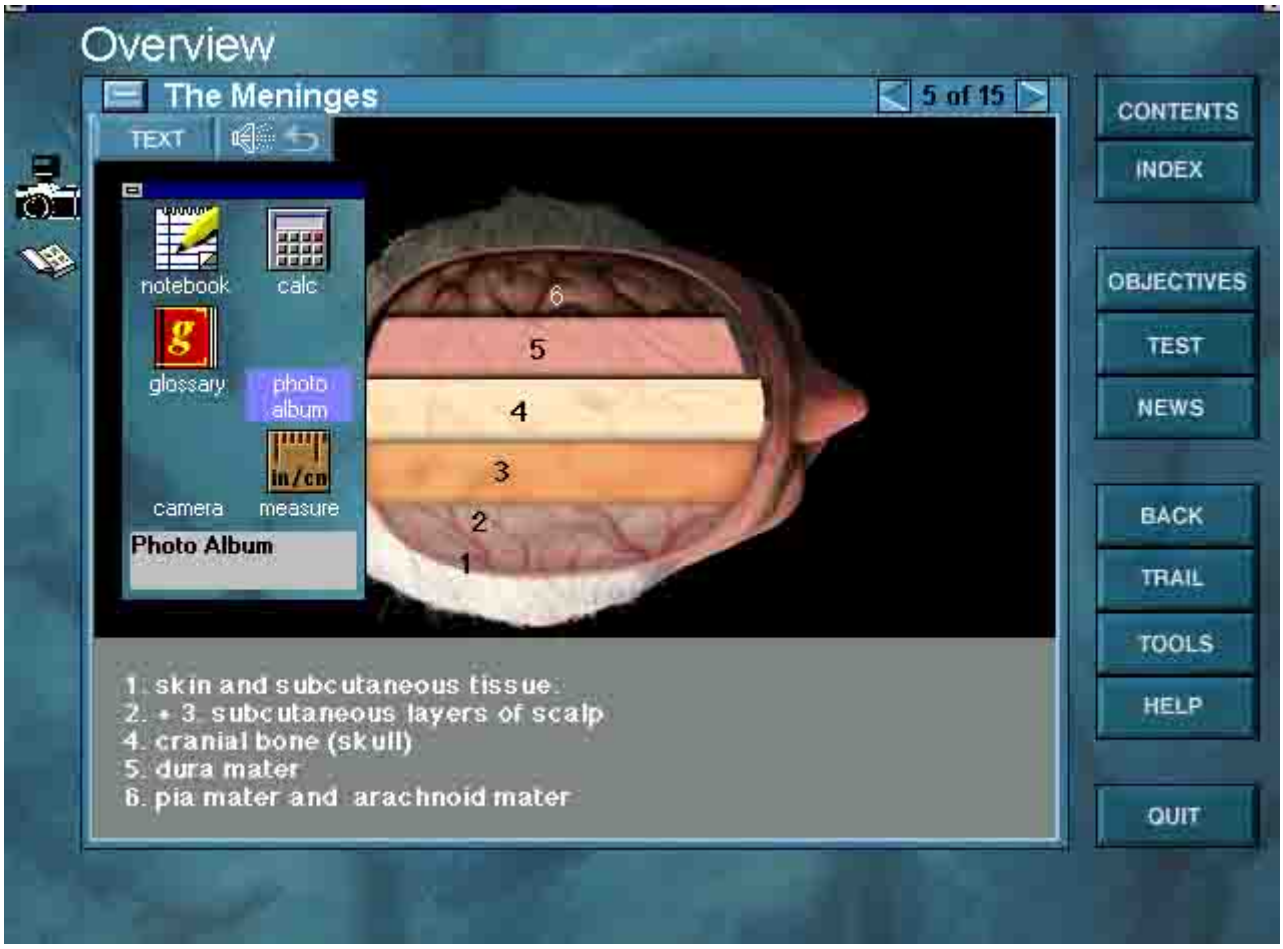
When you are in any section, you can click on the "Objectives" button, and you will be told about the objectives of that section. For instance, if you are in the section called "Motor System Diseases" and click on the "Objectives" button, you will be told something like this:

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After completing this section, you should be able to 1. Explain the
neuropathology of the basal ganglia, in people with movement disorders, such
as Parkinson's Disease and Huntington's disease. 2. Describe the
neuropathology of Multiple Sclerosis and name and explain a method which is
used to diagnose multiple sclerosis....
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Sounds complicated? I would expect that. Because you have not yet gone through the CD. After you are through with this section, these terms will appear quite familiar to you, and you will be quite

comfortable with them. Therein lies the real value of this CD; it imparts education, while you are enjoying all the time. And it teaches you concepts which you may not find very palatable in some books on the same subject.

This is how this Reviewer's Tools appeared after a few hours with this CD. The Camera tool is still outside, while most other tools have been "used" and have been brought within the workspace.



Whenever you are in a section, you can click on the "News" Button to give you the latest news related to that particular section. This is what I got by clicking on the News Section, when I was in the "Smell and Taste" section. The readers may note that the news are from such reputed journals as *Brain, Nature* and *Cell.*

BLIND SMELL: BRAIN ACTIVATION INDUCED BY AN UNDETECTED AIR-BORNE CHEMICAL
Adapted from N. Sobel et al. Brain 122, February 1999, pp. 209-217

Biologists from the University of Stanford, California, have produced evidence suggesting that airborne chemicals, without being consciously detected, can activate certain areas of the brain.

Using MRI they localized brain activity that was induced by high and low concentrations of the airborne compound oestra-1,3,5(10), 16-tetraen-3-yl acetate.

First, the scientists presented the compound to the eight subjects, who all reported that they did not consciously detect any odor. Forced choice detection performed during the investigation revealed a 'greater than expected' detection of the higher concentrated compound, whereas the lower concentration compound was found to produce a 'no better than chance' detection within the subjects.

Both concentrations were found to induce significant brain activity, mainly in the inferior frontal gyrus and anterior medial thalamus. It was seen that activation in the inferior frontal gyrus was significantly greater in the right hemisphere than it was in the left when exposed to the high concentration compound. They also found that there was greater thalamic activation with the higher concentration compound than there was with the lower concentration compound.

These findings localize human brain activation that was induced by an undetectable airborne chemical (the low concentration compound).

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THE WORLD SMELLS DIFFERENT TO EACH NOSTRIL

Adapted from N. Sobel et al. Nature 402, 4 November 1999 p. 35

Researchers at Stanford University, California, have shown that the difference in airflow between the nostrils affects the way in which the brain perceives the wide variety of odors that surround us.

This is how this Reviewer's Photo Album appeared after some time. Note that three pictures have been taken with the "Camera tool", and pasted in the Album (the fourth space is empty). You can save any number of pictures. Readers can save these pictures in a file, when leaving the session.



At any one time, airflow is greater into one nostril than it is into the other. This is due to a slight turbinate swelling in one nostril restricting airflow into that nostril and affecting how quickly the scent is drawn in to the nostrils. Every few hours, the swelling moves from one nostril to the other. Also, different odors are absorbed and cross the olfactory mucosa at different rates.

The researchers thought that these two factors may cause a difference in odor detection and set out to investigate using human subjects. The hypothesis was that slowly absorbing substances might smell stronger if sniffed through the restricted nostril, as they have more time to cross the olfactory mucosa whereas quickly absorbing substances might be detected easier in the unrestricted, high-airflow nostril.

The subjects were asked to sniff a substance containing equal proportions of the highly absorbent odorant L-carvone and the low-sorption odorant octane, through one nostril at a time. The

researchers also measured airflow for each sniff using anterior rhinomenometry. Seventeen of the 20 subjects said that the substance contained a higher proportion of octane when they sniffed using the low-airflow nostril and more L-carvone when sniffed through the high-airflow nostril.

Once the swelling had switched to the opposite nostril the investigation was repeated using eight subjects. Seven of the eight subjects reported that their perception of the same substance had reversed, indicating that odor perception is dependent on airflow rate and not on whether the left or right nostril smelled the odor.

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HOW DOES THE NOSE KNOW: A COMBINATION OF ODOUR RECEPTORS

Adapted from B. Malnic et al, Cell 96, March 1999, pp. 713-23

Scientists from Harvard Medical School and colleagues from the Life Electronics Research Centre, in Japan, claim to have solved one of the biggest mysteries in olfactory research: How can the nose, which has a relatively small number of olfactory receptors, have the sensitivity to discriminate between roughly 10,000 different odors?

The scientists report that instead of dedicating an individual odor receptor to a particular odor, the mammalian olfactory system uses a combination of receptors, to create a specific smell response within the neurons of the brain. This can be compared to an alphabet, for example, with receptors being used over and over again to define the different odors, just as letters are used over and over again to create words. So the olfactory system appears to use combinations of receptors, to greatly reduce the number of receptor types that would otherwise be needed to detect a wide range of odors.

Using a technique known as calcium imaging the team exposed individual mouse neurons to a range of odors, allowing the team to detect which nerve cells were stimulated by a particular odor. This technique enabled the team to measure the influx of calcium ions into the nerve cell. This method enabled the researchers to show three things: that a single receptor could recognize many odor molecules; that a single odorant is usually recognized by more than one receptor; and finally, that different odorants are recognized by different combinations of receptors. These findings explain how the 1,000 or so receptors in the nose can describe many thousands of odors. It also shows that different concentrations of the same odorant or slight differences in the chemical structure, of the same odorant can produce different smells.

QUICK NOTES

Some major highlights of *The Human Nervous System* at a glance:

- Follows on from the highly successful CD-ROM produced by the Open University, "The Human Brain".
- Human Nervous system introduced in an easy-to-follow format.
- No previous knowledge of Neurobiology is required.
- Can be used by both students and general audiences.
- Interactive features which are instructive and entertaining, such as quiz, news, photos, pictures, movies, sounds.
- Each section ends with a series of self-test questions and answers.
- Designed by specialists in distance learning.

This is really a very lengthy and valuable section. I have just reproduced three news items here to show what the CD has to offer you.

At most of these screens you can also take tests. There are the so-called "quick tests" and "concept tests". The Concept test - specially designed to test the reader's understanding of the key concepts in a given section - is a new and interesting idea. After the test is complete, the reader will be given a table showing his results by Concept name and the objectives to which each concept relates. You may revise any concept by clicking on the appropriate line in the table and pressing the Revise button. When revising the relevant pages, you can browse freely and return to the current page of the revision sequence by pressing the Return button. Otherwise one can press the Next button to continue, or the Finish button to quit the Revision sequence.

This reviewer took his test when he was in the "Touch and Pain" Section. A click on the "Quick test" popped up questions like this one;

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Q. Touch is mediated by a special class of sensory receptors called.. .. ?
A. Chemoreceptors
B. Proprioceptors
C. Mechanoreceptors
D. Thermoreceptors
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You have a choice to click on just one of the answers. If you click on, say, "Proprioceptors", it will ask you if you have really finished. If you have, just clicked on the "Finished" button, and then it will tell you if your answer was correct. In this reviewer's case (when he pressed the "Proprioceptors" button), it said, "Sorry, that's the wrong answer. Try again". Clicking on "Mechanoreceptors" then evoked the "right" response. But I did not get any score for this question. My score was displayed as 0/1.

But there is nothing to get depressed. You can go on to the next question, and improve your score!

What about "Concept tests"? These are more subtle, and ask you to do such things as labeling diagrams, dragging some words in appropriate boxes and so on. Out of the two types of tests, concept tests are more innovative and interesting. Another interesting thing is that each test will tell you, which of the stated objectives, is it supposed to fulfill.

When you finish your session with this CD, it gives you an option to save your records (like test scores, your photo album pictures and so on), and if you click "yes", it saves the records in a *.mdb file. And the next time you access the CD, it asks if it should load your previous records or not. This feature comes in handy, if you want your album to grow and you want to keep it with you.

Want to know more about this CD? Well, I can go on and on, and never finish. The best thing is to purchase the CD and discover it yourself. Fully recommended for you and your children. In fact the whole family is going to love and enjoy this CD.

Order this CD by clicking here

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-Editor-in-Chief