



CASE TEACHING NOTES
for
**"It Takes a Lot of Nerve: A Two-
Level Case Study
Designed to Teach the
Physiology of the Nervous System"**



by
Tangi Mitchell and Cheryl L. Watson
Biological Sciences
Central Connecticut State University

INTRODUCTION

The purpose of this case study is to use simple, non-clinical events drawn from real life to illustrate basic principles of the nervous system. The nervous system generally works so well as to be "invisible" to students, and it takes effort for them to dissect the various aspects of the system. Using common, everyday events in their lives and asking them to explain the physiological mechanisms at work helps my students realize that physiology is a dynamic, continual part of their lives, not just a subject they study to prepare for medical school. Scenario 1 is designed for freshmen level students. Scenario 2, while it appears equally simple, is actually an advanced problem. I use it for senior biology majors and graduate students.

Objectives

For Scenario 1, the objectives are to demonstrate (i.e., have the students discover) that neural pathways are linear and traceable. This scenario is also useful for teaching the concepts of the parts of a neural pathway:

- the sensory receptor;
- the sensory tract;
- the spinal cord and interneuron; and
- the motor effector neuron.

For Scenario 2, the objectives are for students to enumerate some of the neural pathways involved in balance. This will include:

- flexor reflex;
- crossed extensor reflex;
- spinocerebellar tracts, the sensory tracts giving position information to the cerebellum;
- vestibulospinal tract, giving position in space information to the cerebellum; and
- corticospinal tract, providing motor control.

Pain pathways could be discussed as a supplement, since Amanda hurt herself and was rubbing her foot. In my course, pain pathways are generally covered in a previous unit and therefore are not discussed in this case study.

CLASSROOM MANAGEMENT

I have used these scenarios in a variety of ways in my classes, always successfully. They both make excellent essay exam questions, although Scenario 2 can be quite lengthy.

I generally use them as classroom discussion questions with students filling in the pathways as we talk. This technique allows me to guide them into a mechanistic way of thinking that encourages them to think of the sensory receptor, the neural pathway, and the effector pathway. Freshmen students, particularly non-majors, believe that they are disinterested in the nervous system and are unlikely to have read the chapter carefully. However, they have *all* burnt themselves and are interested in this personal experience. I use leading questions to bring them to the "conclusion" represented by each objective. The discussion is integrated into the lecture. I explain a concept, and then go to the case, or the inverse. Discussion intermingled with lecture has several advantages: (1) I can cover a large amount of material and (2) students are regularly drawn into short discussions and engage in active learning. I find that interspersing the interactive portion of the class with the lecture encourages student participation and questions. Students who will not commit to long discursive interactions are willing to make short contributions. Scenario 1 can be easily discussed within a one-hour period and is well within the capability of even non-major biology students.

Scenario 2 is more complex and I frequently use it as a longitudinal problem that spans the entire unit on the nervous system over the course of several weeks. We gradually "build" a nervous system that will allow Amanda to keep her balance while hopping around on one foot. In general, I use the same technique of mixed discussion and lecture. Advanced students immediately respond to the scenario with the reflex arc pathway, with which they are familiar. For many, the crossed extensor reflex is also reviewed, so we quickly have one flexed and one extended leg. At this point, the discussion generally slows down. Even students who have covered the nervous system in a junior level anatomy and physiology course are rarely able to apply it to a real-life situation. I leave Amanda standing ridiculously on the beach on one foot, unable to hop, while we go off to cover the sensory tracts. We return to our stranded Amanda during the lectures on sensory/motor tracts, describing how she feels pain, how positional information is conveyed to the cerebellum, and finally how she manages the complex act of hopping through motor and communicating pathways. Short discussions initiated by my questions bring the class back to Amanda at each new pathway. Because this scenario takes several lecture sessions to complete, I generally assign a concept map or essay exam explaining a similar scenario following this case and lecture unit. This demonstrates that students: (1) know the pathways and their connections, (2) know when and why they would be used, and (3) understand intercommunication between parts of the brain.

BLOCKS OF ANALYISS

Detailed case analysis is provided in a separate file that is password-protected. To access this information, go to the [detailed case analysis](#). You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our [password policy and then apply online](#) or write to answerkey@sciencecases.org.

REFERENCES

- Affi, Adel K., and Ronald A. Bergman. 1998. *Functional Neuroanatomy*. McGraw Hill.
- Snell, Richard S. 2001. *Clinical Neuroanatomy for Medical Students*. Lippincott, Wilkins and Williams.

Acknowledgements: This case was developed with support from The Pew Charitable Trusts.

Date Posted: 03/29/02 nas

Originally published at http://www.sciencecases.org/nervous_system/nervous_system_notes.asp

Copyright © 2003 by the [National Center for Case Study Teaching in Science](#). Please see our [usage guidelines](#), which outline our policy concerning permissible reproduction of this work.