Sam's Brainy Adventure

a play in one act, four scenes

by Eric H. Chudler

Eric H. Chudler
University of Washington Engineered Biomaterials
Department of Bioengineering; BOX 355061
University of Washington
Seattle, WA 98195-5061
Email chudler@u.washington.edu

Characters

Sam (male or female)

Neuron 1 (N1)

Neuron 2 (N2)

Neuron 3 (N3)

Mr. Brain Stem

Cerebellum

Thalamus

Hypothalamus

Cerebral Cortex (4 different actors for each of the different lobes of the brain)

Synopsis

Sam is a young student studying for a test about the nervous system. When Sam falls asleep, he dreams that three nerve cells (neurons) take him on a journey through his brain. In his dream, Sam learns how neurons work and about the different parts of the brain. When Sam wakes up, he feels refreshed and ready for his test.

ACT I, SCENE 1

As the curtain opens, a young student (Sam) is pacing around a room with notes and book in hand. Sam is worrying about the big test about the brain that will take place in school tomorrow. There are so many things he must remember. Sam falls asleep repeating some "brainy words."

SAM (Speaking to himself):

Cerebral cortex. Neuron. Axon. Dendrite. Brain stem. Cerebellum. I hope I remember everything about the brain for the big test! There are so many things to know about the brain. I'd better get some sleep.

(Sam sits down, gets ready to sleep; speaking to himself).

SAM: Cell body, thalamus, action potential, neurotransmitter.

(Sam yawns, stretches, drifts off to sleep)

ACT I, SCENE 2

Stage lights are dim. Sam is wandering about when he encounters three nerve cells (neurons).

SAM: Where am I?

N1: You are inside your own brain.

SAM: Who…or should I say, WHAT are you?

N2: We are nerve cells. Some people call us neurons.

N3: Yup. Nerve cells or neurons. I don't care which name you use. That's us.

SAM: How did I get here?

N1: You are dreaming.

N2: That's right. You are dreaming right now.

N3: Yup. Dreaming.

(N3 falls down, asleep, snores)

SAM: Hey! I'm learning about neurons at school. Neurons are the basic cells that make up the nervous system.

N1: Right! We are just 3 of the 100 billion neurons in your 3 pound brain.

N2: We take care of everything your brain does: thinking, talking, walking, riding a bike, reading a book, remembering your friend's phone number, smelling a flower, and a lot more.

N3: Like dreaming. I like dreaming.

(N3 falls down, asleep again, snores)

SAM: So, do you know your way around the brain? I've got a big test tomorrow and could sure use some help. There are so many different parts of the brain. I can't remember what they all do.

N1: Sure, we'll give you the grand tour of the brain.

N2: Yeah. We know our way around.

N3: Follow me. I know where to go.

(N3 runs into a wall, falls down)

SAM: Wait! Before we start the tour, can you remind me about how you work? How do messages get from one neuron to another neuron?

N1: Take a look at us. We have four basic parts: dendrites, a cell body, an axon and an axon terminal.

N2: The dendrites receive messages from other neurons and get this information to the cell body. Information leaves the cell body through the axon. Finally, the information gets to the axon terminal.

N3 (Holding/shaking his head): Too many names! Too many names!

N1: Ok, let's slow down. Let's look at this model that I just happen to have.

(Picks up rope neuron – other actors help)

N1: Here are the dendrites; here is the cell body, here is the axon and here is the axon terminal.

N2: The dendrites receive messages from other neurons; the cell body gets messages from the dendrites and the axon sends messages to other neurons.

N3: I get it now.

SAM: I remember that neurons don't actually touch each other. If this is true, how do neurons get information to other neurons?

N1: Excellent question! You are right…neurons don't actually touch each other.

N2: There is a small space between neurons.

N3: Wait a minute. If there is a space between neurons, how does information get across?

SAM: Don't neurons use electricity and chemicals to pass messages?

N1: Yes, they do. Neurons are like little batteries that can make their own electricity. When neurons send an electrical message down an axon, the message ends at the axon terminal.

N2: The axon terminal contains special chemicals called "neurotransmitters."

N3: "Neuro" what?

N1: "Neurotransmitters"

N3: "Neuro" what?

N2: "Neurotransmitters"

N3: "Neuro" what?

N1 (Speaking to the audience):

Let's help him out. The special chemicals in the axon terminal are called "neurotransmitters." If he asks again, you tell him "neurotransmitters."

N3: No one answered my question! Will some one please tell me the name of those chemicals that transmit messages?

N1 and N2 together (Speaking to the audience):

1,2,3 -- all together: "NEUROTRANSMITTERS!"

N3 (Stumbles back, falls):

Ok, Ok…I get it. Electrical signals travel down the axon and cause neurotransmitters to come out of the axon terminal. But what happens next?

N1: We'll show you.

(Begin rope neuron demonstration; see: http://faculty.washington.edu/chudler/chmodel.html)

NI: Here we have parts of three neurons. Neuron 1 is just an axon terminal. See the neurotransmitters it is holding?

(Points to neurotransmitters)

N1: Here is neuron 2 with its dendrites, cell body, axon, and axon terminal. Also notice that the axon terminal has neurotransmitters.

(N1 points to the parts)

N1: Neuron 3 is way over there…you can only see its dendrites. Neuron 1 is going to release some neurotransmitters and they will float on over to the dendrites of neuron 2. When enough of the neurotransmitters reach the dendrites, they will cause an electrical signal to travel down the axon. When the electrical signal reaches the end of the axon it will cause more neurotransmitters to be released. They will float across the space between neuron 2 and neuron 3. We'll see how many neurotransmitters neuron 3 can catch.

(Demonstrate neurotransmission)

N1 (To the audience):

Does anyone want to be a dendrite? See how many neurotransmitters you can catch!

(Repeat neurotransmission demonstration with audience members)

SAM: I get it now! A neuron uses electricity and chemicals to send messages. Electrical signals are used to get a message through a neuron and chemical signals are used to get messages from one neuron to another neuron.

N1: That's right!

N2: You've got it!

N3 (Muttering): Dendrites, cell body, axon, axon terminal, neurotransmitters, electrical signals, chemical signals….Hey! I think I've got it too!

N1: Are you ready to start the tour?

SAM: Sure, let's go!

ACT I, SCENE 3

(S, N1, N2, N3 enter from side.)

N1: Let's start at the back of the brain and work our way up to the front.

SAM: Where are we?

N2: We are at the top part of the spinal cord. The spinal cord runs down your back where it is protected by your backbone. Some animals don't have a backbone or a spinal cord. For example, jellyfish and insects don't have spinal cords.

N3: I hope you are not a spineless jellyfish.

SAM: Don't worry…I am a mammal…all mammals have backbones and spinal cords.

N1: Anyway, the spinal cord ends when it connects to the brain. It connects to the brain at the brain stem.

N2: And here we are at the brain stem.

N3: Hello, Mr. Brain Stem.

(Brain stem is working a bellows and/or beating a drum to simulate breathing and heart beating)

SAM: The brain stem looks busy.

N1: It is. The brain stem is responsible for controlling heart rate and breathing. It even works when you are asleep.

(N1 points to a drum to show heart rate; points to a bellows to show breathing.)

N2: All of the messages traveling from the brain down to the spinal cord and from the spinal cord to the brain must travel through the brain stem.

N3: Work, work, work - that's all the brain stem ever does - work! All work and no play.

SAM: I suppose there has to be a place in the brain to control the heart and lungs. I'm glad my brain stem is working right. Without it, I'd be dead!

(Brain stem stops for a second and gives a thumbs up to the student.)

SAM (Pointing):

What's that over there?

N1: That's the cerebellum.

N3: Sarah Bellum? Who is she?

N2: No, not "SARAH" Bellum – "Cerebellum." It's located just above the brain stem. The cerebellum is the part of the brain the helps with posture and balance.

(Cerebellum is balancing on one foot.)

N3: Oh…I get it. The cerebellum keeps me from falling over and helps me move too.

N1: That's right!

N1: Let's keep moving. Over here, in front of the brain stem and cerebellum is the thalamus.

(Thalamus is acting like a switching station receiving signals and passing them to on; like a railroad conductor; with flags or alternatively can act as if guiding an airplane on the ground)

N1: The thalamus receives information from most of your senses and relays it to other parts of the brain.

N3: The senses..ah yes. Touch, hearing, smell, taste and ….Wait, I know there is one more.

N2 (Speaking to the audience):

Can anyone tell him what sense is missing?

AUDIENCE: Seeing.

N1: Just below the thalamus is the hypothalamus.

(Hypothalamus is busy changing water levels, adjusting temperature, etc.)

N2: The hypothalamus is important for emotions and for regulating many of the body's functions such as body temperature, thirst and hunger.

N3: Speaking of which…I'm hungry. I forgot to have lunch.

(N3 pulls out piece of bread or apple and starts eating.)

SAM (Pointing):

What's that up there? It seems to cover most of the brain like bark covers the trunk of a tree.

N1: Great observation! That's the cerebrum. Notice that the cerebrum is divided down the middle into two halves. The outside part of the cerebrum is the cerebral cortex.

N2: Each side of the cerebral cortex can be divided into 4 parts called lobes.

(Cerebral cortex actors split into four color-coded parts.)

N1: The back lobe is called the occipital lobe. It gets information about what we see.

N3: (N3 puts on oversized glasses)

N2: The side lobe, over the temples, is called the temporal lobe. It is important for memory and It gets information about what we hear.

N3: What did you say?

N2 (Louder): I said, the temporal lobe is important for hearing.

N3: What did you say?

N2: (Louder): The temporal lobe is important for hearing!

N3: What?

N2 (To the audience):

The temporal lobe is important for _____.

(Audience should fill in "HEARING.")

N3 (Meekly): Oh…you don't have to yell.

N1: The temporal lobe is also important for memory.

N3: Oh yeah…I forgot that.

SAM: What about the other two lobes of the cerebral cortex?

N1 (Pointing): The lobe in front of the occipital lobe and above the temporal lobe is called the parietal lobe. It gets information about what we touch.

N3 (puts on oversized gloves; or Velcro gloves and catches something)

N2 (Pointing):

And this large lobe in the front of the brain is the frontal lobe. The frontal lobe is important for reasoning, planning, speech and movement, emotions, and problem solving.

N3 (pulls out oversized crossword puzzle)

SAM: So the cerebral cortex is important for thinking, moving and our senses.

N1: Correct!

N2: Our eyes, ears, and skin sense things in our environment and send this information to our brains. I suppose you could say that it is our brains that make "sense" of what our senses send us.

N3: That makes sense to me.

SAM: But sometimes our senses get fooled! My teacher showed us some pictures that looked one way, but actually were drawn another way.

N1: Oh…you mean visual illusions!

N2: Visual illusions take advantage of the way our eyes and brains work to fool us.

N3: Hey…no one can fool me!

N1: Oh really. Take a look at this one.

(Show some visual illusions to audience)

SAM: So that's it. We've traveled from the spinal cord, to the brain stem and cerebellum, up to the thalamus and hypothalamus and finally to the cerebral cortex.

(N3 jumps from place to place as it is named)

N1: That's right. Those are the basic areas. There are many parts to each of the areas.

N2: And all of these areas work together to do all of the great things the brain does.

N1: That's why it's important to protect your brain.

N2: You know what to do: eat good foods to give your brain energy, avoid drugs that could damage your brain, and….

N3 (wearing a helmet and skateboarding across the stage):

WEAR A HELMET!

(N3 crashes off stage.)

SAM: Thanks!. You really helped me. I'm ready for my test tomorrow.

N1: You're welcome.

N2: Good luck.

N3: (N3 stumbles back on stage): Bye.

ACT I, SCENE 4

(Student back in room. An alarm rings)

SAM: Seven o'clock already? That was a strange dream! But I'm ready for my test of the nervous system!

N1, N2, N3 (Looking on, on stage, off center – they shake hands together)