

**August 7, 2018**

## **Announcements**

- Aug 8, noon: Final poster (send PDF, 44 x 32 in) due; if poster is not received by this time, you will be responsible for printing your own poster.
- Aug 13, 3 pm: Final Abstracts Due (send either text in an email message or file in WORD)
- Aug 14, noon: Final Talk Slides Due; send PPT.
- Aug 15: Research Symposium
- Aug 17: Last official day of summer research programs.





**CENTER FOR SENSORIMOTOR NEURAL ENGINEERING**

*Improving health and function by engineering neural devices*

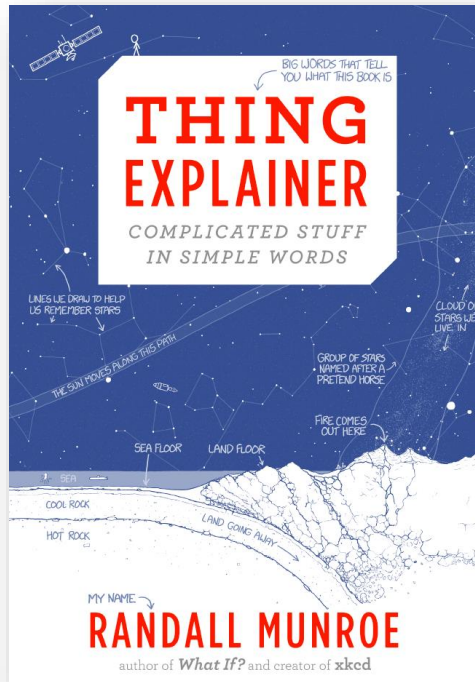
AUGUST 7, 2018

# Communicating Science to the Public the UpGoer Way

**Eric H. Chudler, Ph.D.**

*Center for Sensorimotor Neural Engineering*

# The Thing Explainer



<https://xkcd.com/thing-explainer/>

## TINY BAGS OF WATER YOU'RE MADE OF

Everything that's alive is made of tiny bags of water. Some living things are made of just one bag of water. Those things are usually too small to see. Other things are made of a group of bags stuck together. Your body is a group of lots and lots of these bags that are working together to read this page.

These bags are full of smaller bags. Life uses lots of bags. All life is made from different kinds of water, and a bag keeps the stuff inside it from touching the stuff on the outside. By using bags, living things can keep different kinds of water in one place without it all coming together.

Some of the little bags you see here were once living things on their own. Long ago, some little green bags learned to get power from the Sun. Then they got stuck inside other bags, and those became flowers and trees. The green color of leaves comes from the children of those little green bags.

### LITTLE ANIMALS

These are living things (not really "animals") that got stuck in our bags of water a long time ago, like the green things in tree leaves. Now we can't live without each other. They get food and air from our bodies and turn them into power for our bags.

### SIZE

These bags are almost always too small to see. In fact, they're almost as small as the waves of light we see with.

BLUE  
GREEN  
RED

### BAG FILLER

This machine fills little bags with stuff and then sends them out into the water. Some stuff gets sent out of the bag into another part of your body.

The machine also fills bags with death water, making them very carefully before sending them out so they don't get used in the wrong place.

### OUTSIDE WALL

The water bags that make up animals have soft walls. The bags in trees and flowers, which don't need to move around as much as us, have a less soft outside layer.

### GETTING IN AND OUT

Some things can go through the bag's wall on their own. Other things can only go through if the bag helps them, either by letting them through an opening, or by making part of the wall into a new bag to hold them.



### THINGS THAT MAKE YOU SICK

These tiny things can get into your bags and take control of them. When they do that, they use the bag to build more of them.

When the kind shown here gets into you, your body gets hot, your legs hurt, and you have to lie down. Your whole body feels bad, and it makes you hate everything. You feel like you're going to die but usually don't.

We say all life is made of bags, but these things aren't. They also can't make more of themselves; they have to get a bag to make them. So we don't know if it makes sense to say they're "alive." They're more like an idea that spreads itself.

### EMPTY POCKETS

This part of the bag has pockets to hold stuff that it might need later. It also makes a few things.

One of the things it makes is that stuff that helps your arms and legs get stronger. Sometimes, people who want to run or ride fast will put bottles of that stuff into their bodies and then lie about it.

### CONTROL AREA

This area in the middle holds information about how to make the different parts of your body. It writes this information in notes and sends them out into the bag.

Bags make more bags by breaking in half. When that happens, the control area also breaks in half, and each half gets a full set of the bag's information.

Not all bags have these control areas. The bags in human blood don't (which means blood can't grow) but the bags in bird blood do. This control area may have once been a living thing on its own, just like the green things in leaves.

### INFORMATION

The information for how to make different body parts is stored here.

### READERS

These machines read the information about how to make parts and write it on little notes, then send them out through the holes in the wall.

### MACHINE MAKER

This part makes the little machines that sit outside the control area.

### STRANGE BOXES

There are lots of these little boxes in our water bags. We don't know what they do.

### BAGS OF DEATH WATER

These little bags are full of a kind of water that breaks things into tiny pieces. If something is just inside them, the water breaks it down into whatever it's made of.

If something does wrong, these little bags tear open and all their bad water falls out. That makes the whole bag around it fall to pieces and die. "Bags falling to pieces" sounds bad, since bags are what you're made of. But if a bag was having problems, it could hurt you. The death water helps clear it away so your body can make a new one.

### BAG SHAPERS

The space between bag parts is full of lots of very thin hair-like fibers. These are like bones for the bag. They help hold its shape, and do some other things.

Some of these shapers also have holes down the middle, and can carry things from one part of the bag to another.

### LITTLE BUILDERS

This area is covered in little building machines that build new parts for the bag. The builders sit just outside the control area, reading the notes from inside that tell them what to build.

After the builder makes a part, the control area tells the bag. Each part has a job to do. Maybe its job is to tell another part it's time to stop working. Maybe its job is to turn one kind of part into another. Maybe it makes another part do something different. Or maybe it has a job, but waits until it sees another part before it starts working.

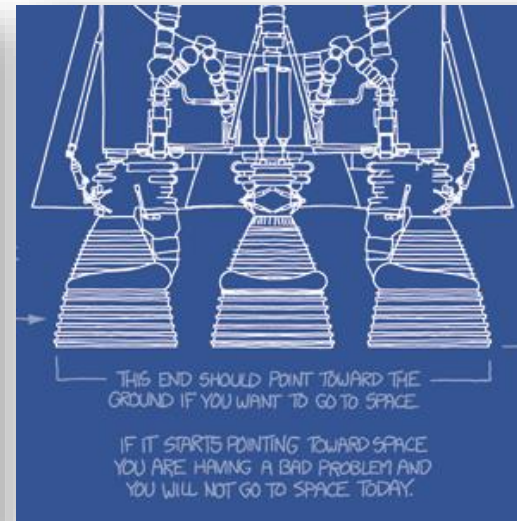
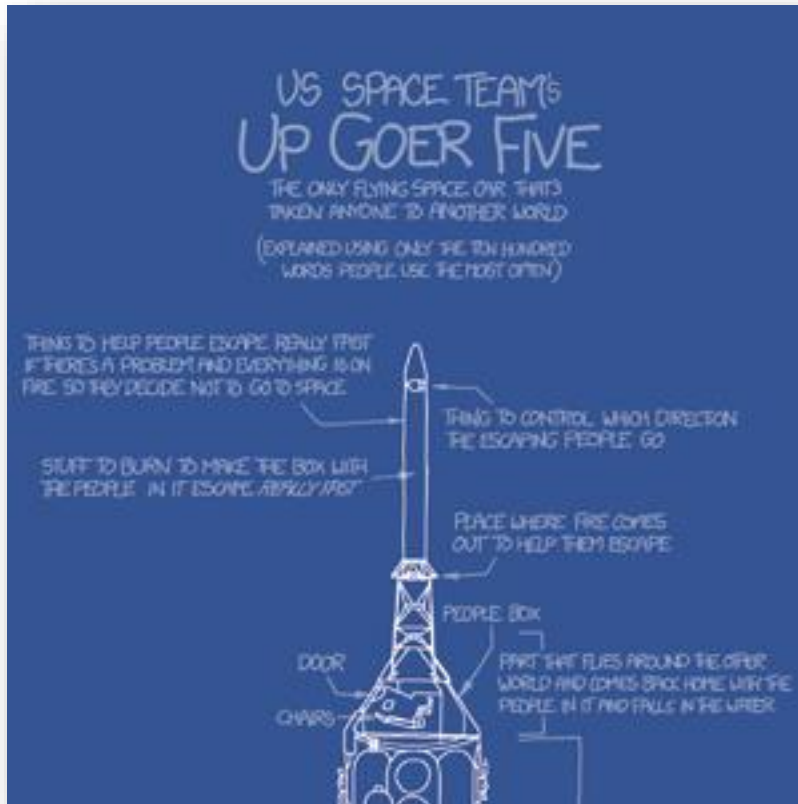
The strange thing is, no one tells the part where to go. It just falls out into the room with all the other parts, and hangs around until it runs into whatever part it's supposed to grab. (Or until another part grabs it.) This sounds strange, and it is. There are so many parts, and they're all grasping each other and dropping each other. The insides of these bags are harder to understand than almost anything else in the world.



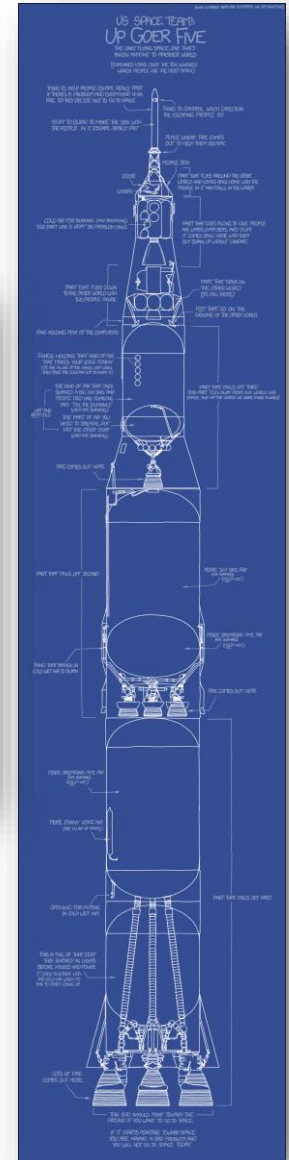
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# Space Travel Simplified



<http://xkcd.com/1133/>



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# A Scientist/Engineer Walks into the Room...

## **Modeling Conduction Velocity After Activity Dependent Electrical Stimulation Alters Myelin Post Spinal Cord Injury**

Following an incomplete spinal cord injury (SCI), axons undergo demyelination, and oligodendrocytes begin remyelinating the remaining, intact axons. However, these new sheaths of myelin result in a slower conduction velocity of action potentials partially because they are thinner. Previous research has shown that neuronal activity can increase myelination and improve gait. In this blind, pilot project, we explore whether *in vivo* targeted activity driven spinal stimulation (TADSS) has similar effects. We have seen substantial recovery of forelimb motor performance after cervical SCI with TADSS; this project examines whether faster conduction velocities due to alterations in white matter could serve as a mechanism explaining this phenomenon. We hypothesize that activity dependent stimulation will globally mitigate thinning of descending motor axons found at the epicenter of the injury and caudal to it. Eventually, we will measure other parameters that affect conduction velocity such as the internode length of myelin and more fully test the conduction speed by looking for evoked responses *in vivo*.



# Jargon?

## Modeling Conduction Velocity After Activity Dependent Electrical Stimulation Alters Myelin Post **Spinal Cord Injury**

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# Advanced/Specific Vocabulary? Requisite Knowledge?

**Modeling Conduction Velocity After Activity Dependent Electrical Stimulation Alters Myelin Post Spinal Cord Injury** (Alexis Drake, 2015, abbreviated abstract)

Following an **incomplete spinal cord injury (SCI)**, **axons** undergo **demyelination**, and **oligodendrocytes** begin **remyelinating** the remaining, intact **axons**. However, these new **sheaths** of **myelin** result in a slower **conduction velocity** of **action potentials** partially because they are thinner. Previous research has shown that **neuronal** activity can increase **myelination** and improve **gait**. In this blind, pilot project, we explore whether **in vivo targeted activity driven spinal stimulation (TADSS)** has similar effects. We have seen substantial recovery of **forelimb motor performance** after **cervical SCI with TADSS**; this project examines whether faster **conduction velocities** due to alterations in **white matter** could serve as a mechanism explaining this phenomenon. We hypothesize that **activity dependent stimulation** will globally **mitigate** thinning of **descending motor axons** found at the **epicenter** of the injury and **caudal** to it. Eventually, we will measure other parameters that affect **conduction velocity** such as the **internode** length of **myelin** and more fully test the **conduction** speed by looking for **evoked responses in vivo**.



# A Journalist, Kid, Your Grandma Walks into the Room...

(UpGoer statement)

The brain controls our body. It talks through cells in our backs that go all the way to our other body parts and make them move. The brain tells them what to do like cars driving down a fast road.

When someone hurts their back, it's like a car hits another car and causes a back up, blocking the road. They then lose some control over moving their body. Cells in their back try fixing themselves. However, the new cells don't work as well. They are slower. It is like the cars have to go out of their way and use smaller roads, and it takes longer to get places.

In the long run, we are trying to see if shocking the cells in the back when a hurt animal is trying to reach for a piece of food will help them. We hope that the shock will give the cells a thicker covering because a thicker covering is like a faster road.



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# The challenge: Can You Explain a Hard Idea Using Only the Ten Hundred Most Used Words? It's Not Easy!

<http://splasho.com/upgoer5/>



[HINTS](#) [TOP](#) [LATEST](#) [LIBRARY](#) [RANDOM](#)

## THE UP-GOER FIVE TEXT EDITOR

CAN YOU EXPLAIN A HARD IDEA USING ONLY THE [TEN HUNDRED](#) MOST USED WORDS? IT'S NOT VERY EASY. TYPE IN THE BOX TO TRY IT OUT.

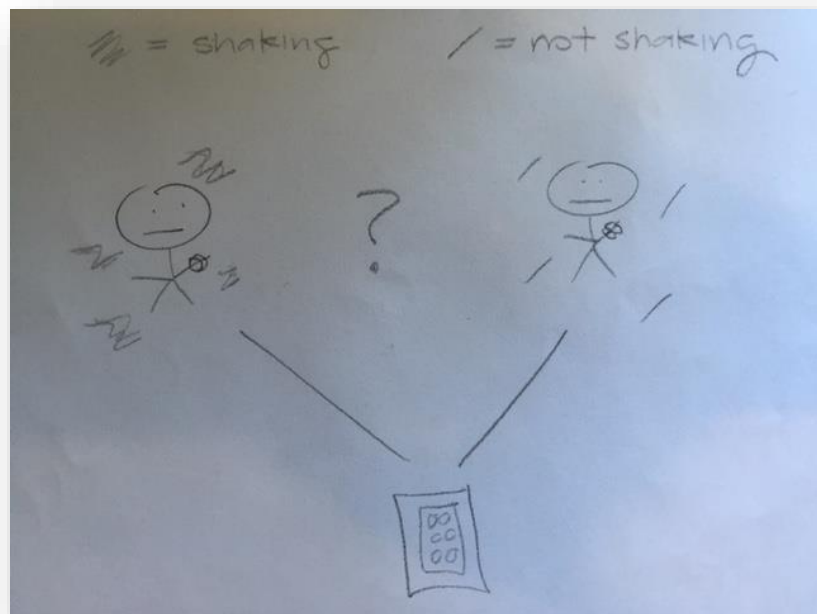


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# Sketch, Write & Compare Your Research!

1. Find a partner (someone who knows nothing about your project).
2. Draw a quick sketch of your own research abstract.

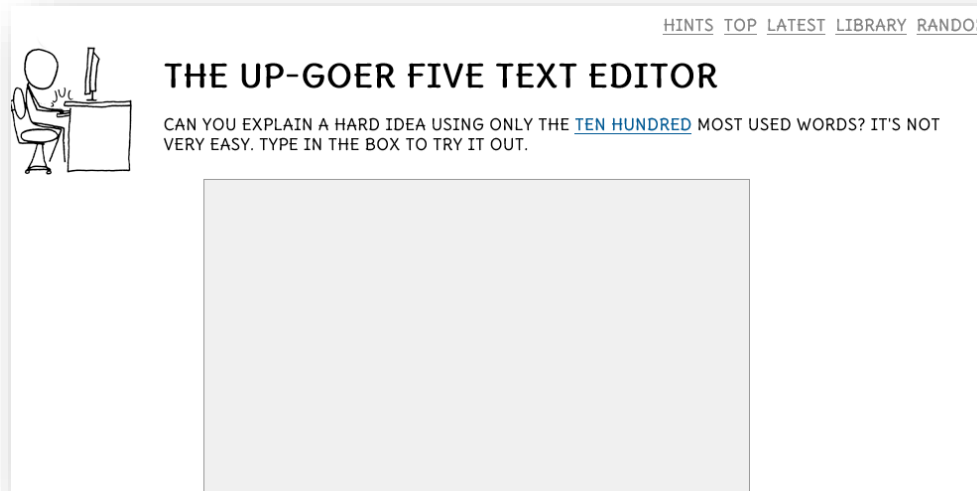


## Sketch, Write & Compare Your Research!

1. Find a partner (someone who knows nothing about your project).
2. Draw a quick sketch of your own research abstract.
3. Use the UpGoer text editor to write your UpGoer statement.  
[www.splasho.com/upgoer5/](http://www.splasho.com/upgoer5/)
4. Trade electronic devices with your partner. Read your partner's UpGoer Statement. Quickly sketch their statement.
5. Compare the sketch you made with the sketch your partner made of your research.



# Share your UpGoer Statements! (Optional)



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