

# Aphasia Insights!

November 2021  
Volume 3, Issue 15  
November 16, 2021

## Thinking About Mechanisms

“Activities are types of causes...An entity acts as a cause when it engages in a productive activity. This means that objects *simpliciter*, or even natural kinds, may be said to be causes only in a derivative sense. It is not the penicillin that causes the pneumonia to disappear, but what the penicillin does.”

Machamer P, Darden L, Carver C. Thinking about Mechanisms. *Philosophy of Science*, Vol. 67, No. 1. (Mar., 2000), pp.1-25.

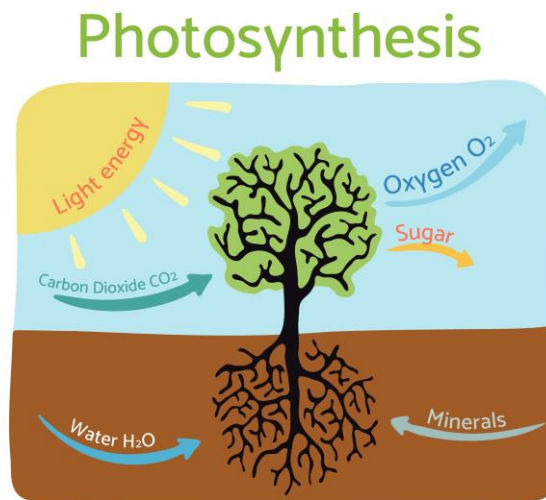
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Stroke Educator, Inc. is committed to educating the wider public about stroke and the 50 state “*Aim High for Aphasia!*” Aphasia Awareness campaign.

## Photosynthesis and Plasticity: The Magic of Creating Something from Nothing.

By Tom Broussard, Ph.D.

Photosynthesis is a process that converts sunlight into green leaves. The plants and leaves contain light-dependent reactions that provide almost all the energy required to sustain life on earth. The leaves change sunlight into chemical energy (usually sugar) and give off oxygen (amazingly) as a waste product.



I learned about photosynthesis when I was in third grade but I never heard about plasticity until I had my first stroke and aphasia in September 2011. I was an associate dean at The Heller School at Brandeis University when I fell down on Main Street, Waltham, MA and lost my language. I could not read, write or speak well.

As I got better, I started reading about the brain and plasticity. The

full term is called *experience-dependent neural plasticity*. The activity-dependent reactions convert thought (it might as well be sunlight) and cognitive activities (reading, writing, and speaking among other things) into neural (brain) matter.

Photosynthesis is a wonderful metaphor for plasticity, especially for people with aphasia (PWA), who regain their language through plasticity which creates dendrites

and synapses, the metaphorical branches and leaves of photosynthesis. Even the physical resemblance between the two is quite similar, developing root-like structures (leaves/cells) in both cases.

We have seen the process of photosynthesis daily and have learned about it mostly by osmosis. But most of us do not know much about plasticity, the foundation of *all* human learning.

We see the results of learning a new language, pursuing a new

challenge, getting a new job, or regaining one's language from a stroke, but if those are the effects, we have very few clues about the causes.

Speech therapy is a black box. It is a theoretical device with known inputs and (somewhat) predictable outputs, but much is still unknown about the method of operation that transforms the input into an output of a different kind.

People with aphasia (for the most part) don't know much about the process of recovery (the operation within the black box of speech therapy). Yet they *experience* the emerging recovery process on a moment-to-moment basis but are unable to express it until more branches grow and leaves sprout.

People with aphasia are typically exposed to an enriched (and therefore therapeutic) environment during formal therapy but are still not consciously aware of the brain processes largely hidden within the black box.

This requires an ongoing process of regular and repetitive experience-dependent activities that provide the fuel needed to keep the black box operation running.

But the machinery doesn't happen on its own. It starts with conventional therapy with various therapeutic activities that begin the process. It is not unlike the hand crank used to start the engines in

early 1900's cars. But after it starts, you stow the crank.

It isn't enough to demonstrate one set of activities or another for a few minutes in any speech therapy session and consider it to be therapeutic enough to induce plasticity and the resultant long-term learning. The activities themselves must become habitual such that once they are deeply rooted, they can induce plasticity long after formal therapy has ended.

More sunlight creates more photosynthesis; less sunlight, less photosynthesis. In much the same way, more thought and cognitive activities create more plasticity; less thought and cognitive activities, less plasticity and learning.

That is the direct link between cognitive activities, plasticity and rewiring the brain for people with aphasia.

Signed: *The Johnny Appleseed of Aphasia Awareness*

Machamer P, Darden L, Carver C.  
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