The BRAINet SYNAPSE

BRAINet is a friends group of the OHSU Brain Institute (OBI) that helps build community awareness, interest, and support for neuroscience research at OHSU.

BRAINet Synapse Newsletter **January 2016**

President's Column

I hope all of you had a happy 2015 holiday season and look forward to what the New Year will bring. I am most enthusiastic about our upcoming Brain Awareness Lecture Series, *Healthy Pleasures, Unhealthy Habits.* Now that marijuana use is legal for more than medical purposes, the science about its use and abuse is an important area about which we ought to become knowledgeable. I look forward to seeing you in 2016!

Warmest wishes,

Helen Richardson, President

2016 Brain Awareness Season

Visit www.ohsubrain.com/pdx or call 1-800-273-1530 for information on how to purchase tickets.

2/22/16 *2/29/16* *3/7/16*

January Lecture Luncheon

Join us on **Monday, January 18 at 11:30 a.m.** at the Multnomah Athletic Club for a lecture luncheon with Tarvez Tucker, M.D. Dr. Tucker will discuss *"The Female Brain: Is it Unique?"*

Dr. Tucker is a neurologist in the neuroscience intensive care unit. She specializes in TBI, headache and pain management, and hypothermia after cardiac arrest.

11:30-12:00 Registration and Social Time

12:00-1:00 Luncheon and Lecture

Cost
$25 Members

$25 Guests of Members

$30 Non-Members

To register and pre-pay to secure your reservation, please visit:

http://goo.gl/dTHqAd

Registration will close at midnight on Wednesday, January 13.

This month we will be served Chicken Tangine. Please note there is only one option for all vegetarian/ vegan/ gluten free requests. Substitutions and special requests cannot be accommodated.

December Lecture Luncheon

By Julie Branford, Past President

"A New Look on Bird Brains and a New Take on Bird's Songs"

Do you remember the song "Rockin' Robin"? Well, we learned a lot about robins, canaries, hummingbirds, finches, and other song birds at our December lecture luncheon. Claudio Mello, Ph.D., was our speaker. He is an associate professor in the Department of Behavioral Neuroscience at OHSU, specializing in communication, avian physiology, learning and memory.

Researchers learn a great deal from rats and mice, but cannot learn about oral communication from them because they do not have the necessary brain functions to create or learn specific sounds that humans, dolphins, and even bats can. Not all birds are songbirds, and it is the songbirds that have the special brain functions to enable the creation of specific songs (communications) as opposed to other birds and animals that make sounds (noises), but without being able to differentiate sounds and meaning. There are about eight to ten thousand types of birds in the world, and about half of them are songbirds. With these birds, vocalizations are learned and not "inherited."

With songbirds, the fathers sing songs to their baby birds, who then try to mimic them in order to learn. However, not all robins, for instance, have the same songs. Songbirds use their vocalizations as a way of "marking their territory" and attracting a mate, so the robins in your neighborhood have a different song pattern from the ones on the other side of town because they have been taught by different fathers. One of the problems that the Audubon Society has is that when a baby bird is rescued and brought to the Society, it may physically heal, but hasn't yet learned the songs from its father. If it has learned the songs, but then is placed in a neighborhood where the songs are slightly different, the young bird never "fits in" with the new environment. Baby birds learn their father's "local dialect"!

Baby birds learn by babbling, just as human infants learn sounds and words. Dr. Mello outlined these other similarities to human speech acquisition:

* the need for an auditory model

* a critical period for sensory acquisition

* the need for auditory feedback

* a babbling phase

* individual variability in vocalizations

* development of dialects

* phonological (syntactic) organization

* shared genetic mechanisms

Dr. Mello also noted that birds practice their songs much like a musician practices, so the songs are not always just to attract a mate or to protect territory.

Parrots and starlings have another unique skill: imitating other sounds. Parrots can speak all kinds of words they have learned. Starlings have been known to even learn to mimic car engines starting and other non-bird sounds.

Physically, songbirds have another unique feature. They have two sound sources. At the junction of the bronchia and trachea, they have the ability to make a sound out of one side while the other side is breathing. Non-songbirds do not have this system, nor do humans who are limited to vocal chords. Additionally, the gene FoxP2 is found in many creatures but "activated" only in a few species such as humans, dolphins, and songbirds. While these are all quite different creatures, gene

similarities for vocalizations in humans and songbirds are convergent. Evolution has come from very different "family trees," yet somehow the ability to create unique and differentiated sounds with meanings has converged with the FoxP2 gene.

Localization of this specific gene has interesting and possibly important implications for humans who have severe speech and language disorders, such as people with Huntington's Disease. Perhaps up to 50 genes are involved in speech and vocal learning.

One other interesting fact is that hormones are clearly tied to vocalizations. Songbirds go silent during the fall and winter when reductions in testosterone and estrogen shrink brain size in the areas tied to vocalizations. In the spring, when hormones increase, vocalizations again are heard.

Next spring, when you hear robins "rockin'" (and other songbirds singing), think of all we might learn about human speech and language capacities from our fine feathered friends.

Brain in the News

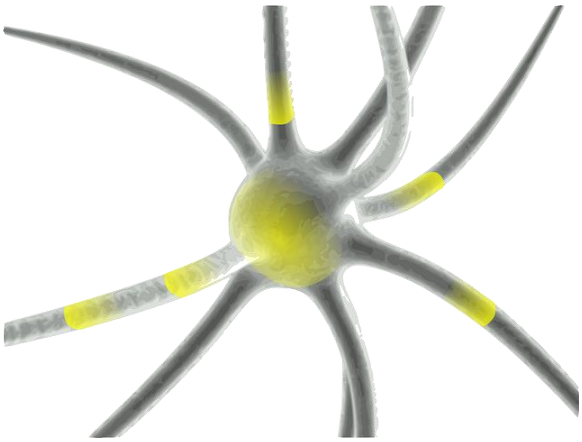
By George Ivan Smith,
BRAINet Member

Neurodegenerative disease may start with the synapse, the small gap between two neurons in which neurochemical messages are passed, rather than with plaques and brain atrophy. In "It Starts at the Synapse," Nov. 19, 2015, Kayt Sukel writes that, like neurodevelopmental disorders, neurodegeneration may begin with the small gap. Beth Stevens, a neurologist at Harvard Medical School, is studying how the brain determines which synapses will be cut in developmental growth.

When synaptic pruning goes awry there are big consequences. "If we could answer this fundamental question of how these synapses are being tagged for elimination, we may be able to intervene and help" in schizophrenia and autism, Stevens says. Too many snips (or too few, depending) may set the brain up for disease.

Many common neurodegenerative diseases show early synapse loss in important areas of the brain. The complement system, part of the immune system that works with phagocytic cells that "eat" debris to keep the body healthy, also works with the brain. It offers proteins that "tag" synapses for elimination during development to somehow tell the brain which synapses go and which stay so that the brain connects correctly as it matures. Stevens asked when does a developmental virtue become a degenerative vice?

Stevens and colleagues learned that complement protein C3 increases in amount prior to neuron loss in neurodegenerative diseases like Alzheimer's and Parkinson's. When they knocked C3 out of mice, the group protected them from synapse loss and cognitive decline.



Steven McCarroll, a geneticist at Harvard Medical School, says a single nucleotide polymorphism (SNP) for the C4 gene has been long associated with schizophrenia, but they didn't know what it does in the central nervous system influencing the development of this disease. In collaboration with Stevens' lab, McCarroll learned that C4 marks synapses and debris for removal, driving increased amounts of C3 at synapses to remove debris during synaptic pruning. Both proteins play an important part in the pruning process.

For the full article see
www.dana.org/News/It_Starts_at_the_Synapse/

Happy New Year!

We hope 2016 brings all good things to our members. With your participation, we can make this year another successful one for BRAINet. Have you renewed your membership dues yet? Membership dues help BRAINet produce this newsletter, support the Brain Resource Center in the Neurology Clinic, and bring OHSU neuroscientists to the luncheons each month.

For just $25, you can be a BRAINet member in 2016!

Please mail a check made out to "OHSU Foundation" to:
OHSU Brain Institute
Attn: Kate Stout
3181 SW Sam Jackson Park Road
Mail Code CR120
Portland, OR 97239

You will receive an email confirmation upon receipt. Your membership will be in good standing through August, 2016. Thank you for your interest and support!

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