

¹ The newsletter title has been changed from **Aphasia Insights** to **Plasticity Insights** to encompass brain function and plasticity as the foundation of all learning as well as recovery.

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“In contrast to computers, the patterns of nervous system response depend on the individual history of each system, because it is only *through interactions with the world* that appropriate response patterns are selected.”

Edelman GM. Bright Air, Brilliant Fire, On the Matter of the Mind. BasicBooks, A Division of HarperCollins Publishers (1992, pp. 226).

Aphasia Nation, Inc. is committed to educating the wider public about stroke and aphasia and the “*Aim High for Aphasia!*” international Aphasia Awareness campaign.

Stroke Educator, Inc.
4 Aspen Drive
Brunswick, ME 04011
207-798-1449
tbroussa@comcast.net
www.strokeeducator.com
www.aphasianation.org
FB: DrTomBroussard
FB: StrokeEducatorInc
FB: AphasiaNationInc

Plasticity Insights!¹

Gerald Edelman: Second Nature; Brain Science and Human Knowledge.

By Tom Broussard, Ph.D.

This is the next in a series of articles about the science and scientists behind the brain, stroke, aphasia, plasticity and recovery.

Gerald Edelman
(July 1, 1929 – May 17, 2014)
was an American [biologist](#) who shared the 1972 [Nobel Prize](#) with [Rodney Robert Porter](#) on the [immune system](#).

As Edelman described it, the components of the immune system evolve over the life of an individual and is analogous to the way the brain itself evolves throughout a person's life. As a result, his work provides the connection between the immune system and his later work on [neuroscience](#) ([Wikipedia](#)).

He was born in [Ozone Park, Queens, New York](#), to [Jewish](#) parents, Edward Edelman, M.D., and Anna (née Freedman) Edelman, who worked in the insurance industry. He attended public schools in New York, graduating from [John Adams High School](#), and college in Pennsylvania

where he graduated *magna cum laude* from [Ursinus College](#) in 1950. He received his M.D. from the [University of Pennsylvania School of Medicine](#) in 1954 ([Wikipedia](#)).

Edelman became a [resident](#) at the [Massachusetts General Hospital](#) and then practiced medicine in France

while serving with [US Army Medical Corps](#). In 1957, Edelman joined the [Rockefeller Institute for Medical Research](#) as a graduate fellow, and received his [Ph.D.](#) in 1960.

He started as the assistant (and later associate) dean of graduate studies at the Institute, and became a professor at the school in 1966. In 1992, he moved to California and became the professor of [neurobiology](#) at

[The Scripps Research Institute](#). He founded and directed [The Neurosciences Institute](#), (1993 to 2012), and studied the biological bases of higher brain function in humans ([Wikipedia](#)).

Edelman wrote several scientific books (they are difficult to read but still highly educational) that help lay the foundation of how the brain works, alters and changes over the lifetime of an individual. [The Mindful Brain](#) (1978), develops his theory of Neural Darwinism, which is built around the idea of plasticity in the neural network in response to the environment. [Topobiology](#) (1988), proposes a theory



**Gerald Edelman
(1929 – 2014)**

of how the original neuronal network of a newborn's brain is established during development of the embryo. [The Remembered Present](#) (1990), provides his theory of [consciousness](#) ([Wikipedia](#)).

In one of Edelman's more recent books, he attempted to provide more lay explanation to the wider public about [Neural Darwinism](#) (1987) although it is still quite challenging to read his theory of neuronal group selection, natural selection and population thinking all in relation to behavior.

Darwin had identified that natural selection changes behavior in the population at large with altered and new characteristics of the population over time. In the case of Edelman's work, Darwin's definition of 'population' are humans, but Edelman's definition of 'population' are neuronal groups, neurons and synapses. Darwin's populations change very slowly and takes millennium to change. In Edelman's population, change happened quickly over the course of an individuals' life.

[J.M. Baldwin \(1861-1934\)](#), was an earlier scientist, and Edelman stated about whom he, "was one of the first to understand the importance of alterations of individuals during [ontogeny](#)" (Edelman, 1987). Ontogeny is the history of an organism going through all of the developmental stages over its *own* lifetime. It is distinct from [phylogeny](#), which refers to the [evolutionary](#) history of a species.

Edelman went on to say that, "Baldwin's ideas were directed toward explaining how further experience could facilitate and maintain such changes" (Edelman, 1987). This is the "[Baldwin effect](#)" of learned behavior in individuals as a factor of evolution.

Baldwin's [paper](#) proposed a mechanism for specific selection for general learning ability (Baldwin, 1896).

Baldwin survived a German torpedo attack on the [SS Sussex](#) in the [English Channel](#) in 1916 on the return trip from a visit at Oxford. In a twist of fate, he was on the same ship with [Wilder Penfield](#) when it was torpedoed. No Americans were killed on that attack but Penfield was grievously hurt and took months to recover.

Edelman's last book, [Second Nature, Brain Science and Human Knowledge](#) (2006) provides straightforward language regarding "brain-based epistemology" as the "theory of knowledge in an understanding of how the brain works" (Edelman, 2006) and as William James said, "That function is knowing" (James, 1904).

Given the tremendous range and scope of his research on consciousness and the brain for more than half a century, Edelman distilled the essence of his work, and followed in the "footsteps of William James who pointed out that consciousness is a process whose function is knowing" (Edelman, 2006).

Evolution and plasticity are the tenets of all learning and as a result, people [cannot not learn at any stage](#). Edelman concluded that the "plastic nature of brain development, which may be considered, never to stop until we die" (Edelman, 2006).

Signed: *The Johnny Appleseed of Aphasia Awareness*

The author is a three-time stroke survivor and has aphasia as a result of the strokes. His language skills continue to improve.

He is Founder and President, Aphasia Nation, Inc., a non-profit organization whose mission is educating the wider public, national and international, about aphasia and plasticity, the foundation of all learning.

1. Baldwin JM. [A New Factor in Evolution](#). "The American Naturalist," vol. XXX, no. 354, June 1896, p. 441-451, CrossRef, and vol. XXX, no. 355, July 1896, p. 536-553, CrossRef. doi:10.17684/i7A112en. ISSN: 2393-1140, [www.diacronia.ro](#).
2. Broussard T. August 2021, Vol 3, Issue 12, Aphasia Recovery, The Illusion of Reaching One's Plateau for People with Aphasia (PWA) (8-17-2021).
3. Broussard T. April 2023 Vol 5 Issue 06, Wilder Penfield, The Cartographer of the Brain (4-11-2023).
4. Edelman GM. Neural Darwinism, The Theory of Neuronal Group Selection. BasicBooks, A Division of HarperCollins.Publishers (1987).
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7. James, W. Does 'Consciousness' Exist? *Journal of Philosophy, Psychology, and Scientific Methods*, 1, 477-491 (1904).

