Grandma Is Remembering Names and Faces Again
HOW TO REWIRE YOUR BRAIN AND REVERSE MEMORY LOSS
Science Unravels Mechanisms Of Memory Retrieval

By Bill Sardi

Longevity poses dilemmas for many. With 25 percent of Americans now living into their 90s, will the last years of life be spent in a demented state? Once senility has set in and irreplaceable brain cells have died off, drugs can only slow down the inevitable process of brain aging. What's the use of living longer without quality of life, many people ask.

Memory decline is associated with normal aging. It greatly reduces the quality of life and affects at least 50% of individuals in their 60s according to estimations.

Is memory loss irreversible? Maybe not. According to researchers who recently conducted a remarkable experiment, memory and learning capacity can be regained even among those who already suffer from senility.

Read what this man in Great Britain has done to help reverse senility in his wife:

> *My wife was examined three months ago by a member of the Alzheimer's Assessment Team and I was told that she was suffering from the disease. They did not give me any hope at all. After that I decided to go my own way. The vitamins and resveratrol I have given my wife have had astounding results. She can now dress herself, cook meals and her temper has subsided. There are also other improvements. She may be recovered by the end of the year. I have told the family that she will be cooking the Christmas dinner this year. –Roy H., Yorkshire, UK April 30, 2007*

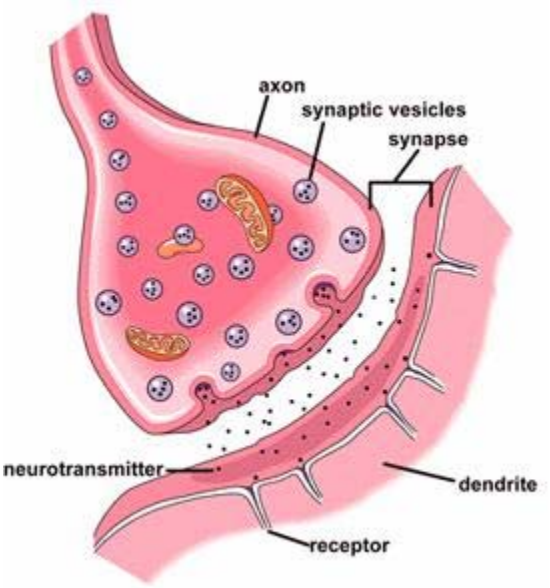
What causes loss of memory with advancing age? Researchers are now gaining a clearer picture of how memory is lost and regained, and they are reversing memory loss in animals and humans. Molecules like resveratrol may soon lead many people out of senility, like in the account above.

The human brain shrinks over time, but brain atrophy (shrinkage) is not necessarily the problem when it comes to impaired learning and memory. What scientists are finding is that memory banks can't be accessed efficiently with advancing age. The memories are there, but they can't be retrieved.

Researchers at the Johns A. Burns School of Medicine at the University of Hawaii write that: *"One of the remarkable features of the mammalian central nervous system is its ability to store large amounts of information for periods approaching a lifetime. However, during the aging process, long-term and working memory decline may occur in many individuals."*

These researchers say long-lasting changes in **synaptic transmission** and **plasticity** in the brain are all-important factors in memory retention. [Mini-Reviews in Medicinal Chemistry 7, 55-64, 2007]

What are synapses and how are they involved in memory



A **synapse** is a tiny gap between brain cells (neurons) that electro-chemical nerve impulses must jump across to send signals to neighboring brain cells. **Plasticity** refers to changes in the number, type and function of nervous system connections and in changes in the efficacy of synaptic transmission in the brain, in particular the hippocampus of the brain which is the learning and memory center of the brain.

Loss of long-term memory

In senility there is a decline in both learning and memory. For example, while senior adults may have difficulty learning new information, they may also suffer from inability to recognize close relatives, which is a long-term memory deficit.

Up till now it has not been clear whether memories are lost forever, or whether they become irretrievable owing to loss of neurons (nerve cells) and/or a decline in synaptic nerve transmission.

Scientists have now successfully demonstrated it is possible to re-establish access to memory banks if sufficient refinement of the remaining intact nerve network can be achieved.

Playground animals

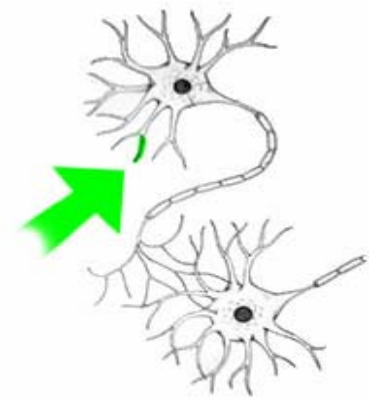
In the recent experiment, scientists gave mice tests where they learned to avoid an electric shock and to find their way through a maze to reach food. After six weeks with a chemical-induced form of brain disease, the mice were no longer able to remember how to perform these tasks.

In the most recent experiment, some of the mice with memory decline were then placed in a more stimulating environment with toys, treadmills and other mice. The playground mice were able to remember the shock test far better than the mice in other cages. They were also better at learning new things.

Mice in a playground environment were able to regain lost memories

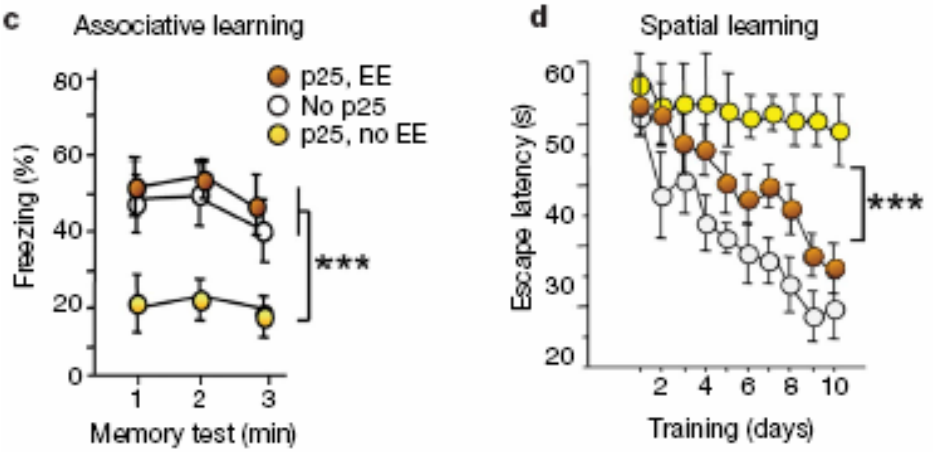
This environment facilitated learning ability and caused elevated levels of proteins that are markers for synaptic integrity and plasticity, indicators of "*dendritic branching and synaptogenesis.*" An enriched environment actually "*re-wired*" the brain. This experiment suggests that an enhanced environment can reinstate learning ability in mice with severe brain deterioration, said researchers at Massachusetts Institute of Technology.

This same effect has recently been demonstrated in humans. Six groups totaling 2832 persons, mean age 73.2 years, were given intense memory and reasoning sessions over a period of months, which resulted in less mental and functional decline for periods up to 5 years. [Journal American Medical Association 296: 2805-14, Dec. 20, 2006]



Arrow shows branching of dendrites in brain cells (neurons)
A dendrite is an extension from the neuron (brain cell) that receives messages from other neurons. Named after the Greek word meaning "*tree,*" these branch-like projections relay messages to the cell body before they're passed down to the other neurons.

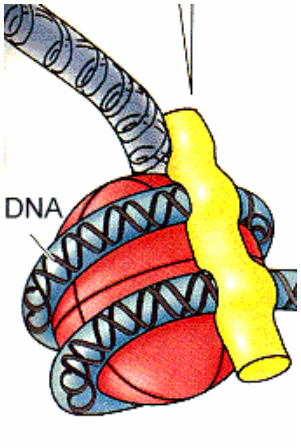
Enhanced mental activity, or a chemical mimic of same, have now been shown to promote growth of new dendrites and synapses in brain cells



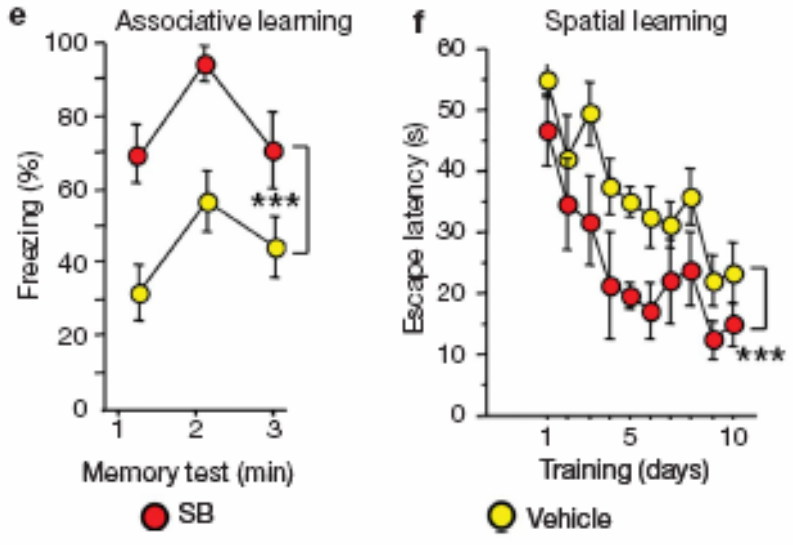
Laboratory animals who remain mentally active regain memory and learning capacity.
EE = enhanced environment (animals living in playground environment)
P25 is a chemical used to induce memory loss.
[Nature April 29, 2007, advance online report]

Molecular mimicry

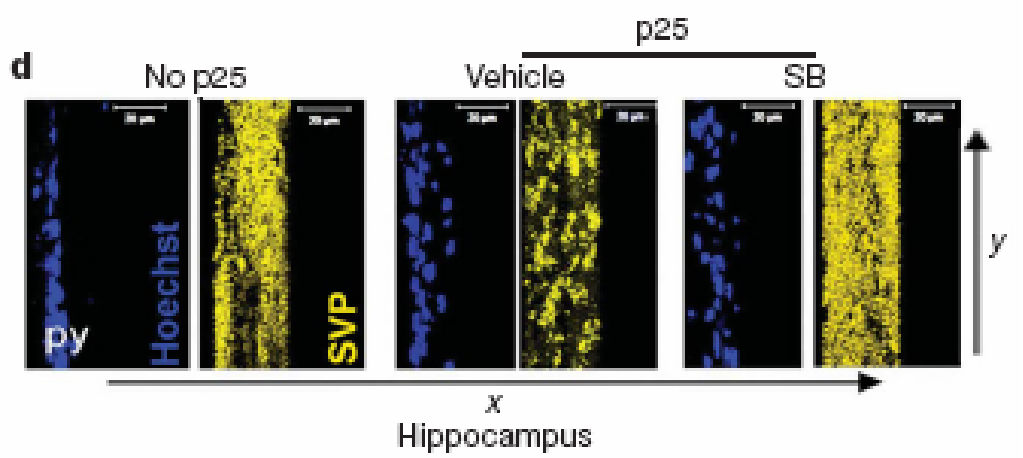
The next step for researchers was to determine if the improvements achieved by stimulation of mental activity in a playground environment can be mimicked molecularly. Scientists tested a class of molecules called histone deacetylase inhibitors (butyrate, trichostatin) which keeps strands of DNA tightly wrapped around histone bodies. (See below) To visualize this, think of an electric cord wrapped around a tennis ball (the histone bodies). The wrapping of DNA around histone bodies determines the accessibility of information from DNA.



DNA strand wrapped around a histone body. Molecules that influence the tightness of DNA wrapping around histone bodies, called histone deacetylase inhibitors, can molecularly mimic the memory enhancing effect of stimulated brain activity in laboratory mice placed in a playground environment. Resveratrol is a histone deacetylase inhibitor and may prove to be effective in maintaining and restoring memory in humans as they age.



SB (red) = sodium butyrate (histone deacetylase inhibitor)
Vehicle (yellow) represents mice treated with inactive substance.
Butyrate-treated animals exhibited improved memory.
[Nature April 29, 2007, advance online report]



p25 is chemical used to induce brain deterioriation.
Picture above depicts action in synapses of brain cells (neurons).
P25 column (center) shows effect of brain disease and
SB (sodium butyrate) shows effect of a chemical that restored memory.
[Nature April 29, 2007, advance online report]

Therefore, say researchers, *"it is possible that histone deacetylase inhibitors would be capable of re-establishing neural networks in human brains."* If so, this suggests that using small molecules like resveratrol, that are histone deacetylase inhibitors, could facilitate access to long-term memories in patients with senile dementia.

People like Roy in Britain aren't waiting, they are getting ahead of the researchers, and demonstrating the remarkable properties of a natural molecule like resveratrol. With so many adults in their 60s beginning to struggle with their memory, resveratrol pills may be useful long before the onset of Alzheimer's disease.

Resveratrol is a widely available dietary supplement, though quality between brands varies greatly. Be aware, newly introduced high-dose resveratrol pills derived from Giant Knotweed (botanical name, *Polygonum cuspidatum*) may induce loose stool due to its emodin content.

Reference: Opposing Roles of Transient and Prolonged Expression of p25 in Synaptic Plasticity and Hippocampus-Dependent Memory. Andre Fischer, Farahnaz Sananbenesi, Petti T. Pang, Bai Lu and Li-Huei Tsai. Nature April 29, 2007, advance online report]