From the Genesis Garden to Galapagos and Back

by Bill Sardi

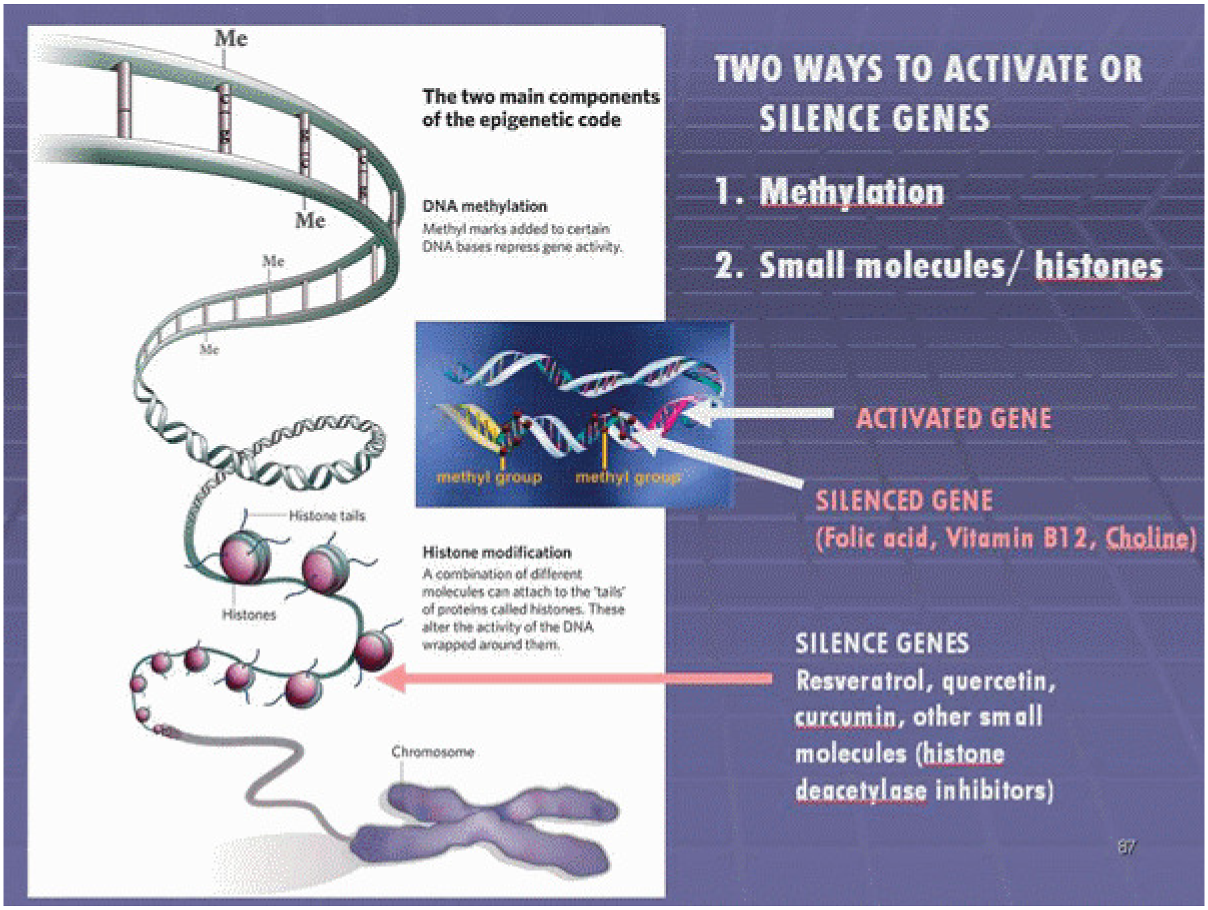
Recently by Bill Sardi: Gold: Get Some

At a birthday party for a 70-year-old relative on my wife's side of the family, I met one of his son's, in his 40s. His son had never been raised by his biological father, having lived out of State all his growing and adult years. Father and son had only belatedly become acquainted, as they had talked on the phone many times, and were physically meeting for the first time at this party.

It was interesting to observe that father and son had similar mannerisms, physically and verbally. It was striking.

Biologists think they now know what is responsible for this observed phenomenon: genes have memory. Oh, not memory in their structure (DNA ladder) but in their switching. You see, human genes are not only organized in a sequential spiral ladder of 25,000 or so-called lettered genes (a deletion or substitution in the letters results in a gene mutation), genes also have switching mechanisms that can cause a gene to produce or not produce proteins (what biologists call gene expression or gene silencing). This switching mechanism is called epigenetics and it is actively in play every moment of life, influenced by environmental factors such as temperature, food, radiation, and surprisingly, behavior.

A relatively new discovery is that via gene switching (epigenetics), your genes can be imprinted in a semi-permanent fashion that is transmitted to future generations.



The biological phenomenon called epigenetics has been known since the 1970s, but for unexplained reasons, not really discussed at large till recently. Keeping epigenetics obscure may have served a purpose – to advance and maintain the fading idea of Darwinian biology. Darwinian evolution demands millions of years for mutations to occur, whereas epigenetics is now.

Up till recently the prevailing thought has been that that only Darwinian *"natural selection"* can cause permanent genetic change. This is now being challenged. Dr. Asim K. Duttaroy, Professor at the Department of Nutrition, Institute for Basic Medical Sciences, University of Oslo, Norway, says: *"inheritance is not just about which genes we inherit but whether these are switched on or off, which is a whole new frontier in biology."*

Only a few biologists dare say what needs to be said. In a 2004 paper entitled *"Evolution by epigenesis: farewell to Darwinism, neo- and otherwise,"* Eugene K. Balon, of the University of Guelph in Ontario, Canada, wrote:

> In the last 25 years, criticism of most theories advanced by Darwin and the neo-Darwinians has increased considerably, and so did their defense. Darwinism has become an ideology, while the most significant theories of Darwin were proven unsupportable. The critics advanced other theories instead of 'natural selection' and the 'survival of the fittest'. … Darwinians, artificially kept dominant in academia and in granting agencies, are preventing their (other theories) acceptance. Epigenesis, the mechanism of ontogenies, creates in every generation alternative variations in a … way that enables organisms to survive in the changing environments…

One biologist says "*We stand on the threshold of the first paradigm change for 150 years*."

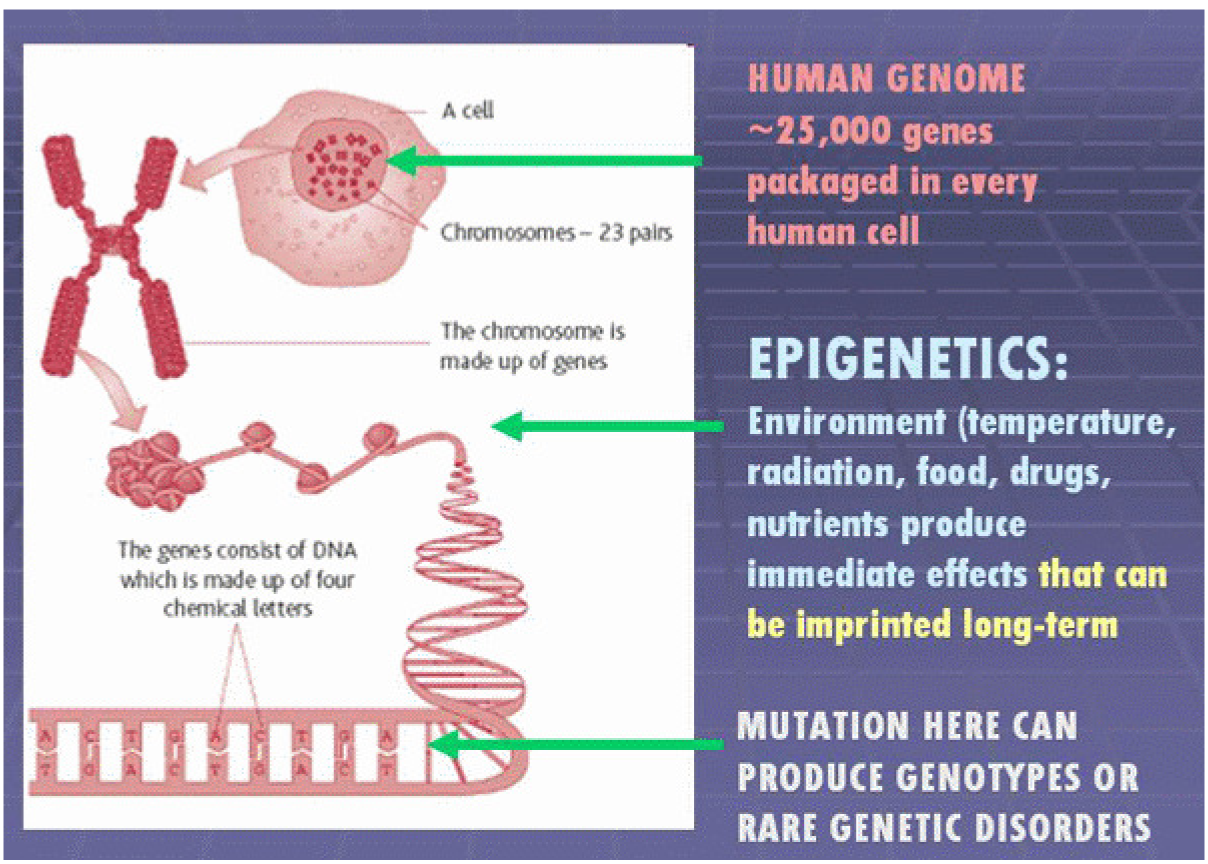
Now biologists are beginning to realize what Darwin observed on the island of Galapagos in the 1800s must have been epigenetics, not natural selection.

In the creation versus evolution battle, Darwinian evolution appears to have met a trump card – epigenetics. Furthermore, the Biblical description of the fall of man in the book of Genesis appears to parallel epigenetics. (More about this below.)

How genes are regulated

There are two ways genes can be regulated, by donation of methyl groups, provided in foods, or by the wrapping of strings of DNA around something called histone bodies, as demonstrated in the following graphic. A methyl group is a basic unit in organic chemistry: one carbon atom attached to three hydrogen atoms. When a methyl group attaches to a specific spot on a gene – a process called DNA methylation – it can change the gene's expression, turning it on or off. Methyl groups are obtained entirely as nutrients from foods people eat (folic acid/vitamin B9, vitamin B12, vitamin A, trace minerals such as selenium and zinc, and the amino acid methionine).

Today a global analysis of the switching of your entire volume of 25,000 genes can be conducted, since the nucleus of every cell in your body contains a copy of your genome. This makes it possible to chart epigenetic changes to environmental factors.



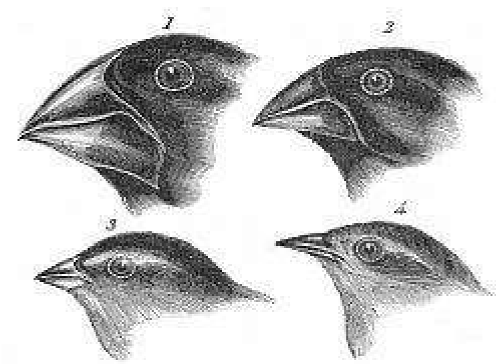
What did Darwin actually observe?

So what did Charles Darwin actually observe when he visited the Galapagos Islands near Ecuador over a century ago – gene mutations or gene switching (epigenetics)?

Before that question is answered, there is another model of biological change mixed in here – Gregor Mendel's work in the 1800's with common pea plants which showed that physical characteristics, such as color of pea plant flowers, are not immediately blended from parents in the next generation but emanate in future generations in a set ratio. You can visually learn about Mendel's discovery by clicking online here.

Darwin's prime example of evolution was the gradational changes in the bills of finches. Darwin also noted that young finches exhibit pink or yellow bills for a period of about two months. This transient coloration was obviously not evidence of a mutation. It was epigenetics.

Darwin showed that the bills on finches were an adaptation. The birds could eat different types of food depending on the shape of their bills. In 1845 Darwin said: *"Seeing this gradation and diversity of structure in one small, intimately related group of birds, one might really fancy that from an original paucity of birds in this archipelago, one species had been taken and modified for different ends."*



Finches from Galapagos Archipelago

But for that gradual change to have occurred, being a change that favored survival, it would have had to occur rather quickly, not over many generations, or even in future generations according to Mendelian genetics. It would have had to occur rapidly, immediately or in the next generation. What Darwin observed was likely epigenetics, not classically slow Darwinian mutant evolution, nor Mendelian genetics either.

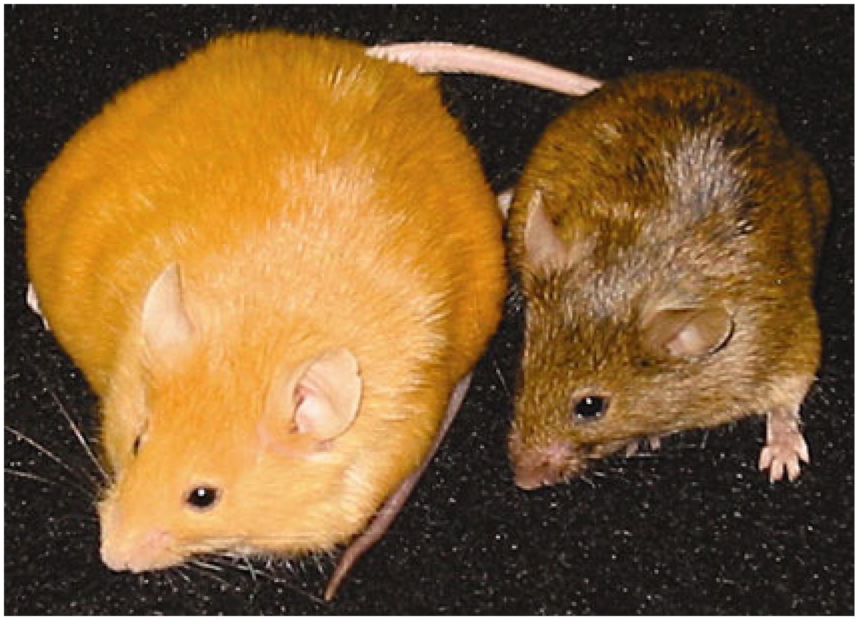
Time Magazine, in its February 18, 2010 issue, in an article entitled *"Why Your DNA Isn't Your Destiny,"* reveals more about epigenetics. *Discovery Magazine* also covered this topic in 2006. These articles provide incredible examples of how epigenetics imprints information into the human genome and transfers information to future generations.

For example, human populations in the barren lands of Northern Sweden typically faced near-starvation, but in some years food was abundant. Near starvation may have activated epigenetic survival mechanisms, now known as hormesis.

If suddenly food became abundant and Swedes engorged themselves with food for only a year, the lifespan of future generations was shortened by as much as 32 years, without having been directly exposed to conditions of famine.

This memory in the epigenome can be roughly explained as being similar to *"cookies"* being inserted on your online computer. When your computer accesses a home page, information is stored so your computer can quickly recreate that home page without having to download all the information each time that page is accessed. In our epigenome, this learning is accomplished via one of two processes, methylation or histone deacetylation (wrapping of DNA strands around histone bodies). Don't think this is Ouija board stuff – the FDA has approved a handful of drugs based upon epigenetics.

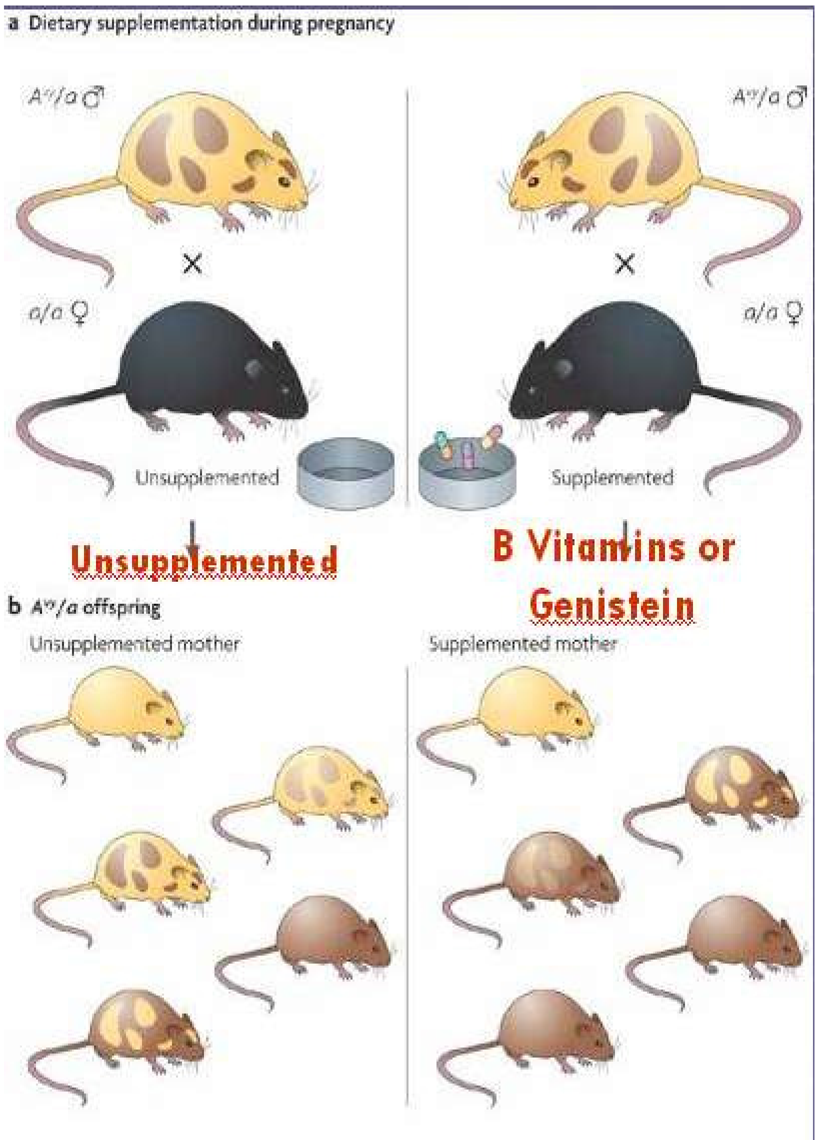
While Darwin taught many generations are required for a genome to evolve, researchers have found that it takes only the addition of a methyl group to change an epigenome. When a methyl group attaches to a specific spot on a gene – a process called DNA methylation – which can be accomplished by provision of B vitamins – it can change the gene's expression, turning it off or on.



With no more than a change in diet, laboratory agouti mice (left) gave birth to young (right) that differed markedly in appearance and disease susceptibility.

The Duke University experiment

Whereas Darwinian evolution has never been demonstrated, epigenetic changes have been repeatedly demonstrated in the laboratory. In the year 2000 Duke University researchers Randy Jirtle and Robert Waterland conducted an experiment, employing B vitamins among mice with a faulty agouti gene which produces obese offspring with golden yellow coats who are prone to develop diabetes and cancer. Provision of B vitamins (folic acid, vitamin B12) during pregnancy completely negated the effect of the agouti gene in offspring, producing mice of normal weight and a dark coat, without the propensity to develop diabesity or cancer.



How long do epigenetic changes last?

Just how long these epigenetic effects last is not completely known.

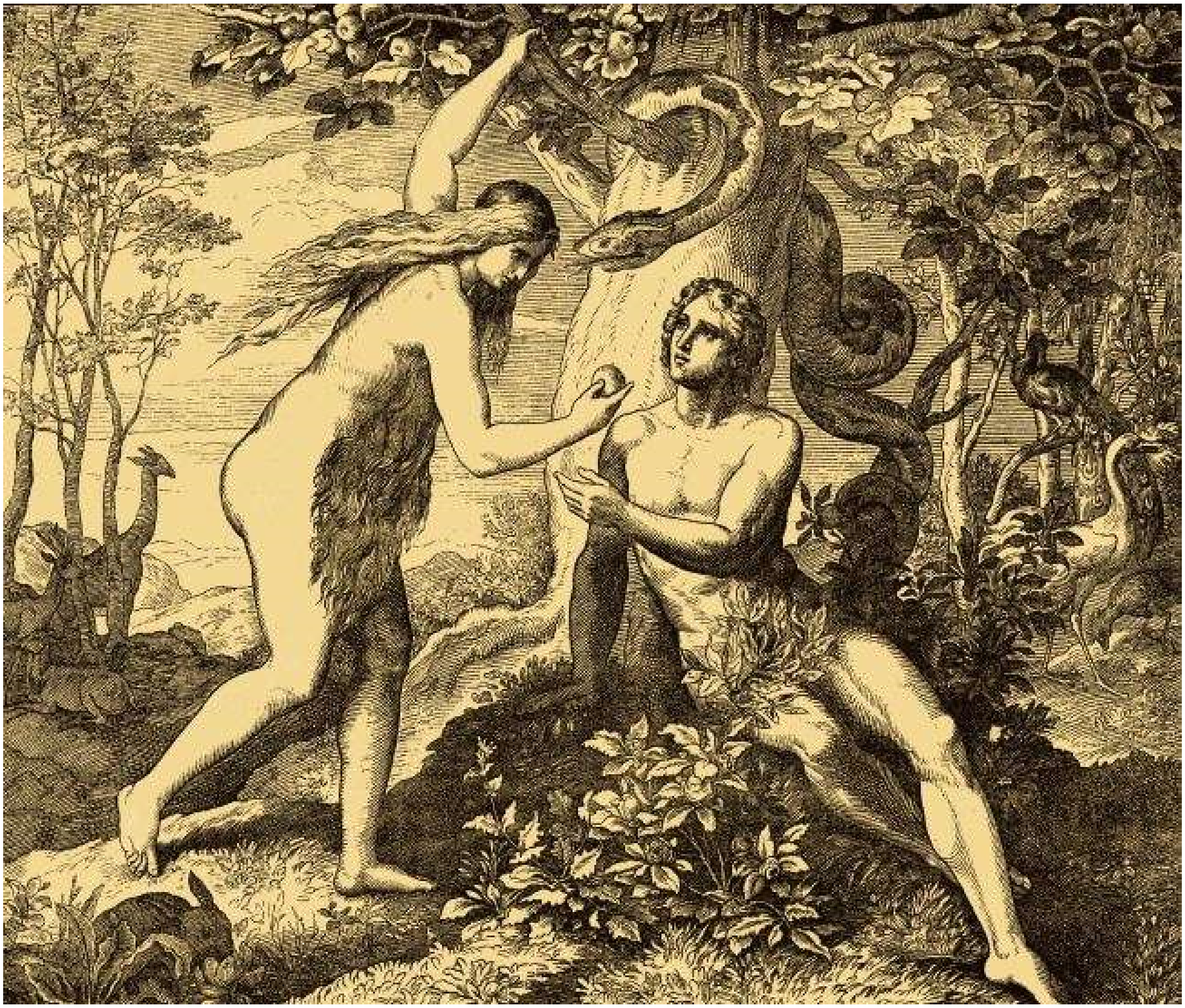
Other recent studies have also shown the power of environment over gene expression. For instance, fruit flies exposed to a drug called geldanamycin show unusual outgrowths on their eyes that can last through at least 13 generations of offspring even though no change in DNA has occurred (and generations 2 through 13 were not directly exposed to the drug).

In another study, roundworms fed with a particular type of bacteria exhibit loss of a green fluorescent protein and a small dumpy appearance that lasts 40 generations. In human terms, factoring for 40 years equaling one generation, would represent 1600 years of generational history.

Behavior also alters the epigenome

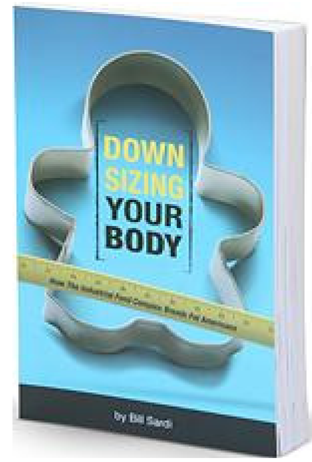
But if nutrition or the lack thereof can apply biological stress that influences future generations, what about stressful emotional events? Michael Meany at McGill University in Montreal, Canada, found that newborn mice that were neglected by their mothers are more fearful and agitated in adulthood which correlated with much higher levels of methylation of certain stress-response genes. Epigenetic patterns have also been demonstrated in humans with mental disorders and suicidal intentions. Behavior alters the epigenome into succeeding generations.

Back to the Garden of Eden



Only recently has a childhood development researcher written a paper entitled "*Developmental origins of disruptive behavior problems: the 'original sin' hypothesis, epigenetics and their consequences for prevention*." Did the original sin in the Garden of Eden produce humans that would forever be prone to be disobedient via epigenetics?

We must now revisit the Garden of Eden. The Book of Genesis account describes a scenario where Adam and Eve, the first man and woman, failed to follow instructions and ate the fruit from the forbidden tree of knowledge of good and evil. Eve first tasted the fruit and then Adam. A behavior, an act of disobedience, was said to have caused all succeeding generations to suffer the consequences – humans were now mortal. Did this act of defiance forever alter the human epigenome, just as the offspring of agouti mice were forever doomed to develop obesity, diabetes and cancer, and un-nurtured mice who were prone to stress and anxiety?

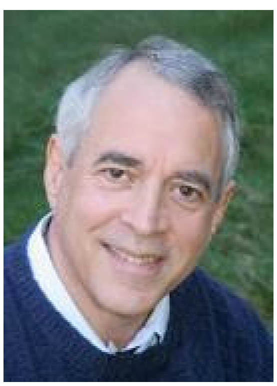


Another important question arises. Does the inheritance of disobedience (sin) emanate from the male or female? The impact of an imprinted gene copy depends on which parent it was inherited from. For some imprinted genes, the cell only uses the copy from the mother to make proteins, and for others only that from the father.

There are differences between male and female inheritance. Dr. Duttaroy of the University of Oslo, says: *"Centuries ago, mule breeders in Iraq noted that crossing a male horse and a female donkey created a different animal (Hinny) than breeding a female horse and a male donkey (Mule). In the modern scientific era, however, the initial evidence for parent-of-origin effects in genetics didn't appear until the mid 1950s or so."*

Certainly, as now demonstrated in animal studies, nutrition during conception and pregnancy affects epigenetic imprinting. But also the sperm of the male may transmit trans-generational epigenetic changes. Dr. Duttaroy says epigenetic changes in DNA can be carried along with the sperm to the next generation.

The Bible teaches, even though Eve was the first to sin, that the fall of man was transferred from generation to succeeding generation via the first male, Adam. *"Wherefore, as by one man sin entered into the world, and death by sin; and so death passed upon all men, for that all have sinned."* (Book of Romans 5:12 King James Version)



While epigenetic imprinting, which is believed to be facilitated by just 300 or so of man's 25,000 genes, can produce permanent changes across generations, these changes are not necessarily irreversible. Re-imprinting the human epigenome can be accomplished in adulthood. The human epigenome is not locked.

Certainly the biblical description of what happened in the Garden of Eden is consistent with epigenetics. The Bible speaks of reversal or redemption. The apostle Paul, writing in the Book of Romans, says it this way: *"For as by one man's disobedience many were made sinners, so by the obedience of one (Jesus) shall many be made righteous."* (Book of Romans 5:19 King James Version)

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Bill Sardi [send him mail] is a frequent writer on health and political topics. His health writings can be found at www.naturalhealthlibrarian.com. He is the author of You Don't Have To Be Afraid Of Cancer Anymore*. His latest book is* Downsizing Your Body*.*

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