

Epigenetics Around the Web: Should theory of evolution expand to include epigenetics?

I think it's going quite well. It hasn't gone to fisticuffs yet.

Kevin Laland of the University of St. Andrews in Scotland on a meeting about expanding the theory of evolution

Epigenetics Around the Web is a weekly roundup of the latest studies and news in the field of epigenetics presented by GLP sister site the [Epigenetics Literacy Project](#). This week features insights from the Royal Society's meeting about expanding the theory of evolution and a possible mechanism for how the microbiome influences gene behavior.

Epigenetics

[There's More to Cancer Than Just Genetic Mutations](#)

The prevailing view in science is that genetic mutations cause cancer. These changes to a gene's sequence (which can be caused by bad luck, inheritance, or exposure to a carcinogen, such as cigarettes) can alter a gene's function and behavior leading a cell to become cancerous. However, epigenetic changes to genes can alter behavior too. A story on Futurism discusses how — in patients with a rare brain tumor called ependymomas — alterations to histones may be driving the disease. The knowledge could lead to new treatments.

[DNA Methylation in Schizophrenia](#)

Schizophrenia has a 50 percent concordance rate of illness in monozygotic (identical) twins, which means the disease has a strong genetic component. But it also suggests that genes don't tell the whole story. Augusta University psychiatrist Brian Miller has an excellent discussion in the *Psychiatric Times* of the potential epigenetic causes of schizophrenia. One piece of evidence Miller points to is a large genome-wide [DNA methylation study](#) which found that in people with the disease there are significant abnormal methylation levels on several genes thought to be involved with the onset of the disease.

[Scientists Seek to Update Evolution](#)

In November, the Royal Society hosted a meeting entitled "New Trends in Evolutionary Biology." The purpose was to discuss changes to the theory of evolution. Before creationists get too excited, it should be noted that the intent was not to throw out Darwin's seminal theory of evolution by natural selection — but to consider updating it with new insights, data and technologies. It's not the first time scientists have done this. In the mid-1900s scientists met to add new understandings from the (at the time) emerging field of genetics. They left with what is called the Modern Synthesis.

Denis Noble now sees a need for an Extended Evolutionary Synthesis. Credit: Tom Parker for Quanta

Magazine

Kevin Laland, who co-hosted the Royal Society meeting, and his colleagues believe Modern Synthesis needs to be expanded to include transgenerational epigenetic inheritance. They call their new theory of evolution the Extended Evolutionary Synthesis. Carl Zimmer covered the meeting for Quanta, and described some of the evidence presented:

The evidence for this effect is strongest in plants. In one study, researchers were able to trace down altered methylation patterns for 31 generations in a plant called *Arabidopsis*. And this sort of inheritance can make a meaningful difference in how an organism works. In [another study](#), researchers found that inherited methylation patterns could change the flowering time of *Arabidopsis*, as well as the size of its roots. The variation that these patterns created was even bigger than what ordinary mutations caused.

“This strategy is to produce rapid evolutionary genome change in response to the unfavorable environment,” Oxford researcher Dennis Noble explained to the audience. “It’s a self-maintaining system that enables a particular characteristic to occur independent of the DNA.”

However, not everyone was convinced. David Shuker of the University of St. Andrews stood up and challenged Noble to explain a biological mechanism. It was something, Zimmer said, Noble struggled to do.

Douglas Futuyma of Stony Brook University in New York presented the opposing view, which he joked was “the Jurassic view of evolution.” Futuyma argued that the core principals of Modern Synthesis are strong. He left the door open for dialogue, but made a strong call for data over rhetoric, saying: “I think what we find emotionally or aesthetically more appealing is not the basis for science... There have been enough essays and position papers.”

Laland agrees, “It’s doing the research, which is what our critics are telling us to do. Go find the evidence.”

Microbiome

Graphical representation of microbiome-epigenetics-genetic axis

[Diet-Microbiota Interactions Mediate Global Epigenetic Programming in Multiple Host Tissues](#)

Changes in the composition of a person’s microbiome have been discovered in almost every human disease. This includes diseases you may expect, such as colon cancer, and some you may not, such as asthma. There is even a conference about the role of the microbiome in autism. Are these changes a cause or an effect of the disease? That’s the central question that has yet to be sufficiently answered with data. A recent study published in *Molecular Cell* finds evidence of microbiota influencing gene behavior by affecting histone methylation and acetylation. The study was done on mice.

Endocrine Disruption

[Stand firm on hormone disruptors](#)

This month, European Union member states will review criteria proposed by the European Commission for identifying and regulating endocrine disruptors. The decisions made by the EU could lead to the banning of a number of substances, including pesticides. In the journal *Nature*, Leonardo Trasande a pediatrician at New York University School of Medicine, discusses the complex science of endocrine disruption. He makes a strong plea for regulators to make decisions based on hard, solid science and asks leaders not to confuse hazard and risk.

For more epigenetics news—as well as news about the microbiome and endocrine disruptors—check out the [Epigenetics Literacy Project](#), a sister-site to the GLP.

Nicholas Staropoli is the director of the [Epigenetics Literacy Project](#). He has an M.A. in biology from DePaul University and a B.S. in biomedical sciences from Marist College. Follow him on Twitter [@NickfrmBoston](#).