

Dutch botanist [Hugo de Vries](#) was once one of the most famous scientists in the world. De Vries gained fame in the first decades of the twentieth century for being the guy who finally figured out how evolution worked.

Of course today we credit Darwin for this discovery, and backdate it to the publication of *Origin of Species* in 1859. But for many decades, into the 1930s in fact, Darwin's theory of natural selection was considered insufficient (see [Bowler](#), 1992). In the minds of many, De Vries' idea completed the story of evolution.

MUTATION THEORY

Rather than suggesting that speciation resulted from an accumulation of small variations over long periods of time, like Darwin's theory suggested, De Vries posited that new species could actually pop into existence in a single generation. In fact, according to De Vries, multiple representatives of the same new species could pop simultaneously, creating a pool that would breed true.

De Vries seemed to have solved natural selection's most serious problem - how variations could avoid being swamped or blended back to average through interbreeding over succeeding generations.

De Vries wasn't just making stuff up. He was an experimentalist, and had evidence to support his idea. Unfortunately, the object of his research, *Oenothera lamarckiana*, the evening primrose, was a poor choice as a test subject. Shortly after De Vries announced his findings, *Oenothera* was found to be a [polyploid](#), an organism with more than two complete sets of chromosomes. What looked like spontaneous speciation was merely the result of the organism's complex biology.

Scientists moved on to observations of less problematic organisms, like [Drosophila](#).

But, despite concerns from specialists, the public remained fascinated with De Vries.

The possibility of rapid evolution, which held the promise of rapid and conscious improvement in plants and animals, was catnip in the Progressive Era. De Vries mutation theory dovetailed nicely with [Luther Burbank's](#) hybridization experiments. Together, they created a package that promised better living through science.

And, frankly, professional scientists had nothing better to offer.

Critiquing De Vries, Stanford's David Starr Jordan and Vernon Lyman Kellogg, in *Evolution and Animal Life* (1916), wrote:

At the present moment, probably because of a strong reaction against the too blind acceptance and general over-emphasis of the selection doctrines, and because, too, of the unusually extensive character of De Vries's experimentation and observation, and his trenchant criticism of the weak places in the other theories, with the generally weighty character of his work and reputation, because of all this the theory of species-forming by mutations has at the present moment a fairly large body of adherents among reputable biologists (115).

But, as Jordan and Kellogg admitted, they couldn't counter with much. While they were quick to point out the meagerness of evidence in support of De Vries' ideas, they also noted the meagerness of evidence in support of "direct species-forming" by natural selection, or any of the other theories purporting to explain evolution then in common circulation.

However, after [Thomas Hunt Morgan](#) began publishing more securely evidenced work on the function of genes around 1915, professional attention swung back to incrementalism. By the 1930s, with the publication of *Genetics and the Origin of Species* by Theodosius Dobzhansky (1937), a mathematically robust and testable theory of evolution, sometimes called neo-Darwinism, began to emerge, and De Vries was forgotten.

Or so the story goes.

In his recent article, "[Mutant Utopias: Evening Primroses and Imagined Futures in Early Twentieth-Century America](#)" (*Isis*, September 2013), Jim Endersby, an historian at the University of Sussex, tells this story: mutation theory, as described by De Vries, captivated both *elite* and *popular* audiences during the first decade of the twentieth century; however, the work of Morgan and others quickly undermined De Vries' credibility among specialists; still, the public refused to let it go, and this pulled professionals off track as they tried to compete with the tabloid press for attention from their funding sources, the [Carnegies](#), etc.

According to Endersby, because of its general popularity and play in the press, De Vries' mutation theory, even after it became scientifically suspect, had a major influence on how biologists imagined and talked about their role in society, and even what constituted "legitimate science." The author even seems to suggest that the biological authoritarianism, expressed by scientists like the eugenicist Charles Davenport, was at least in part the result of De Vriesian ideas filtering back into biology through the popular press.

Endersby's article is quite interesting, but his suggestion that De Vries' theory, through its play in the popular press, somehow unduly influenced science even after most professionals deemed it of little utility, is worth deeper examination. It's important, I think, because Endersby's conclusion presupposes that the social body would be better served if "scientific advances" (Endersby mentions GMOs and the MMR vaccine) met with less public resistance.

[On edit: See Endersby's comment below. While scientists advocating for use or disuse of GMOs or the MMR vaccine may see the public as an obstacle to "scientific advances," Endersby in fact makes no such value claim.]

With such a critical question on the table, let's make sure we have our history right.

WHAT DO BIOLOGY TEXTBOOKS TELL US?

Textbooks, because they are published and revised almost annually, allow us to date the introduction, development and (sometimes) demise of ideas over time. Twentieth century high school and college biology textbooks present an excellent record of the history and use of De Vries' ideas.

What we see immediately is that Endersby has the early history right. Though mutation theory, proper, never gained much play, De Vries was introduced without disclaimer in very early textbooks, including those of George W. Hunter, *Essentials of Biology* (1911) and *Civic Biology* (1914). However, again as Endersby relates, within a few years, textbook authors knew there were problems with De Vries' data, and started working to challenge popular misconceptions.

Clifton Hodge and Jean Dawson in their 1918 *Civic Biology* (not to be confused with Hunter's *Civic Biology*) pointed out the problematic complex biology of De Vries' test organism. They wrote, "It now turns out that ... *Oenothera lamarckiana* is a Mendelian cross, a hybrid; and this suggests that all mutations may be merely cases of segregation and recombination of unit characters in the germs of plants and animals" (338).

But textbook authors (and presumably specialists) weren't quite as dismissive of De Vries as Endersby suggests. Though mutation quickly stopped meaning all-at-once speciation, De Vries still got credit for introducing the concept of mutation, even as the meaning of mutation changed.

In Benjamin Gruenberg's *Elementary Biology*, published in 1919, the author, after referencing De Vries, wrote of an experiment (by W. L. Tower) in which the larvae of potato beetles were subjected to variations in temperature, moisture and nutrition, and that these stresses somehow affected "the chromosomes of the cells that later became the germ cells" (462).

In the latter 20s, De Vries was linked with the geneticist [Hermann J. Muller](#), who famously demonstrated how mutations could be "accelerated" using X-rays.

In 1931, Henry R. Barrows in *College Biology*, referencing both De Vries and Muller's work, confidently wrote, "It is fairly well established that mutations are responsible for the origin of species" (275).

From the 1930s into the 1950s, De Vries, along with Lamarck and Darwin, became the origin story of modern evolutionary theory. It was simple. Lamarck thought it up. Darwin made it science. And De Vries made it work.

Yes, it was a terribly simplified story. But in the better textbooks, including Ella Thea Smith's high school text, *Exploring Biology* and George Gaylord Simpson's college text, *Life*, the Lamarck, Darwin, De Vries story served as a backbone for the introduction of Thomas Hunt Morgan's genetics, Hermann J. Muller's X-ray experiments and the collective consensus we now call the modern synthesis.

While the always execrable *Modern Biology* (Moon et al.) promoted De Vries' mutation theory in its original form through the end of the 1960s (see [related article](#)), the better authors got it right, more or less right away. They credited De Vries for the general concept of mutation while simultaneously deflating whatever misconceptions the popular press may have been pumping.

And there is very good evidence that the Lamarck, Darwin, De Vries origin story was completely acceptable to specialists within the field.

Sometime in 1956, Harcourt Brace sent George Gaylord Simpson, one of the fathers of the modern synthesis, a review copy of the 1954 edition of Smith's *Exploring Biology*, presumably in preparation for the text's later revision. In a tight scribble on the back of 7 sheets of American Museum of Natural History letterhead, Simpson provided a page-by-page critique of Smith's work. Simpson was famously cranky, and it comes through in his notes. However, nowhere in the notes is there mention of Smith's use of De Vries as a way to introduce students to the synthesis. In fact, Simpson himself would deploy De Vries similarly in *Life*, published the following year.

SO WHERE DID HUGO GO?

In 1963, a professional association called the Biological Sciences Curriculum Study (BSCS), finishing 4 years of work, directed the publication new 3 new high school textbooks. These textbooks set out a new origin story. Gone was De Vries, and his "wrong-headed" notion of all-at-once mutation. In its place, picking up from Simpson's text, the BSCS authors identified an American cytologist named Walter Sutton as the genesis point. Sutton, then, passed the torch to T. H. Morgan. Morgan, through his student, Hermann J. Muller, then carried the news to the biologists who formulated the modern synthesis.

Very neat and clean.

While Simpson was kind enough to give De Vries a footnote, the BSCS authors erased him altogether.

I've argued elsewhere that Muller, as a member of the BSCS steering committee, used the platform to try and reverse a slide in public affection for directed evolution (aka eugenics), an idea that had slowly, but progressively through the 1950s, become indefensible as the lessons of Nazism sunk in. Muller was unreconstructed. He disliked the ecological direction biology had taken (see [related article](#)), I think because it suggested evolution wasn't progressive. In fact, the BSCS text he most influenced, the "yellow version," directed by John A. Moore and [Bentley Glass](#), which directly linked organic evolution and cultural evolution, is probably the most unabashedly progressionist textbook published in the post-eugenics era.

Perhaps too, through the BSCS, Muller saw the chance to cut himself free from De Vries, with whom he had been coupled for a quarter-century, probably quite unhappily.

But even if Muller's influence was minor, and the BSCS authors' motivations more prosaic, the texts the group developed did whitewash, or at least clean up, the generally messy history of twentieth-century genetics and evolutionary theory.

Coming at the absolute nadir of creationism in the United States, its unlikely biologists finally buried De Vries in order to inoculate themselves from the critique of antievolutionary writers. And even if the intent was to open up space – a De Vries-free zone – for the modern synthesis to flourish, Smith's work shows that the effort was hardly necessary.

LESSONS LEARNED?

All of this is not to dispute Endersby's central claims. There is little question that "outsiders" – politicians, preachers, the press and the public – influence the direction, even the meaning, of science. There is also little question that, when it comes to science, the public often has it wrong. As I mentioned before, Endersby mentions public concerns about genetically modified foods and the MMR vaccine as examples of getting things wrong [again, see [Endersby's comment below](#)]. For further evidence, he points to advertisers' use of "evolution" as a synonym for "progress," which he considers proof that members of the general public, even when they claim to understand science, usually don't.

But scientists – very smart specialists – have had it wrong, and remarkably so, so many times in the twentieth century themselves (most mid-century biologists were decidedly progressionists), and the public – misinformed and reactionary as they so often are – have kept scientists from running amok during the same period (eugenics and the associated isolation and sterilization of the disabled, for example), that it is hard for me to see this as anything but one big messy necessity.

Sure, genetically modified foods may not be dangerous, per se. But the profit-at-all-costs capitalism that draws geneticists to their study most definitely is. Even if the popular press doesn't quite get the science right, history suggests the public might be sensing a danger science can't yet quite imagine.