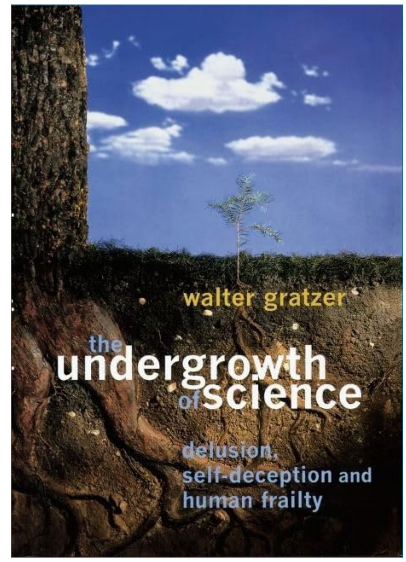
A troubled history of the reinforcement syndrome

The Undergrowth of Science: Delusion, self-deception and human frailty
Walter Gratzer
Oxford University Press, 2000



Michael Thompson

For over 150 years, *Nature* journal has been a mainstay publication of science and academia. Going through the *Nature* archives paints an interesting picture of the history of science, the good, the bad, and the ugly. *The undergrowth of science* is a historical telling of some of the stranger ideas in science that have emerged over the last 150+ years, through the lens of a secular scientist and longtime science writer for *Nature*, biophysical chemist Walter Gratzer (1932–2021).

The book is split into 12 chapters over 309 pages. The first seven chapters focus on ideas and theories that are now easily proven wrong but, at the time, took the scientific world by storm. The next four chapters continue telling stories of strange ideas emerging in science, but with a greater focus on the political drivers behind such strange science (e.g., communism, fascism, and nationalism). The last chapter includes the author's reflection on the history told.

Throughout the book there is a common theme of 'pathological science'. It is summed up nicely by this quote from Canadian-American economist John Kenneth Galbraith (1908–2006), "faced with the choice between changing one's mind and proving that there is no need to do so, almost everyone gets busy with the proof" (p. 81).

The book is written in a storytelling fashion, mixed in with commentary on related political and social issues. It is mostly easy to read, but at times a bit disjointed and can go on long tangential excursions. There are also sections where the author tries to explain various concepts in biology, chemistry, or physics to provide context to the stories, though the explanations still require a high school to undergraduate level of understanding. While the book is in no way pro-Christian (there are occasional dismissive comments towards Christian belief scattered through the book), for the most part it stays clear of religious/philosophical debates and focuses more on issues within academia and politics.

Even though *The Undergrowth of Science* is written from a secular perspective on science, it is still a useful read for the creation scientist. What stands out is how similar the 'pathological science' in the past was to the evolutionary stories being pushed in our culture today, even though the author thinks otherwise (see chapter 12, 'Envoi').

One hallmark of 'pathological science' is that measurements used for data are on, or beyond, the limit of detectability—yet great accuracy is claimed, common in evolutionary science. There is also the underlying worldview behind secular humanism driving the desire for evolutionary theory to be true, which can be seen clearly in a few chapters of the book (see chapters 8, 9, and 10).

The book also contains insightful history relating to creation/evolution topics, such as Lamarckism (chapters 2, 9), chemical evolution (chapter 5), vestigial organs (chapter 7), social Darwinism (chapter 10), and eugenics (chapter 11).

N-Rays

In chapter 1, Gratzer tells the fascinating story of a supposedly groundbreaking discovery, 'N-rays', named after the University of Nancy (France). At the start of the 20th century, electricity and radiation were the buzz in science (p. 3). X-ray experiments by French physicist Prosper-René Blondlot (1849–1930) produced what he thought were anomalous results. His conclusion was that a new type of radiation, 'N-rays', was the cause (p. 4).

Gratzer describes how the discovery quickly became accepted, especially within French science, and was even defended patriotically against external criticism from German scientists (p. 5). After much debate in the wider scientific community, and after many other laboratories failed to replicate the results, Blondlot's lab was inspected directly (p. 17). Those investigating found that the difference between Blondlot's results and results of other labs was actually just a matter of subjectivity in measurements or detections of the effect of N-rays by eye, prone to interpretation based on the *a priori* belief of the experimentalist (pp. 19, 23). Blondlot was convinced that those who disagreed with his interpretation of the data did so because they didn't have a keen eye, like himself or the lab assistants he had chosen.

Even though N-rays eventually faded out from science after being shown to be a false discovery driven by optimism, the concept captured the attention and belief of many scientists for a few years, with about 120 respected scientists publishing positively about N-rays (p. 23).

Strange ideas in biology

In Chapter 2, the focus shifts from strange ideas in physics, to those in biology. Gratzer spends a lot of time focusing on the history of 'mitogenic radiation', an idea developed by the Russian biologist Alexander Gurvich (or Gurwitsch, 1874–1954). Gurvich claimed to have discovered a new type of biological radiation that emanated from living things (p. 32). The way to detect such radiation was not a mechanical device, like a Geiger counter, but instead the measurement of cell divisions occurring at the tips of onion roots (p. 33).

As you can imagine, observations of how the tips of onion roots react when held near different biological sources of supposed mitogenic radiation were subjective. Before long, many other scientists latched on to the idea, using mitogenic radiation to explain things like animal tail regrowth and even cancer (p. 37).

Gratzer points out the diagnostic features of 'pathological science' in the concept of mitogenic radiation: "for instance, there were 'occasional failures', but these were due to 'poor' yeast cultures, used as detectors" (p. 39); also "the Gurviches selected the best roots for experiments that they expected to matter, while less uniform roots were thought to suffice for controls" (p. 40).

Laboratories in other countries attempted to replicate the results and, for the most part, could not. Those faithful to mitogenic radiation claimed

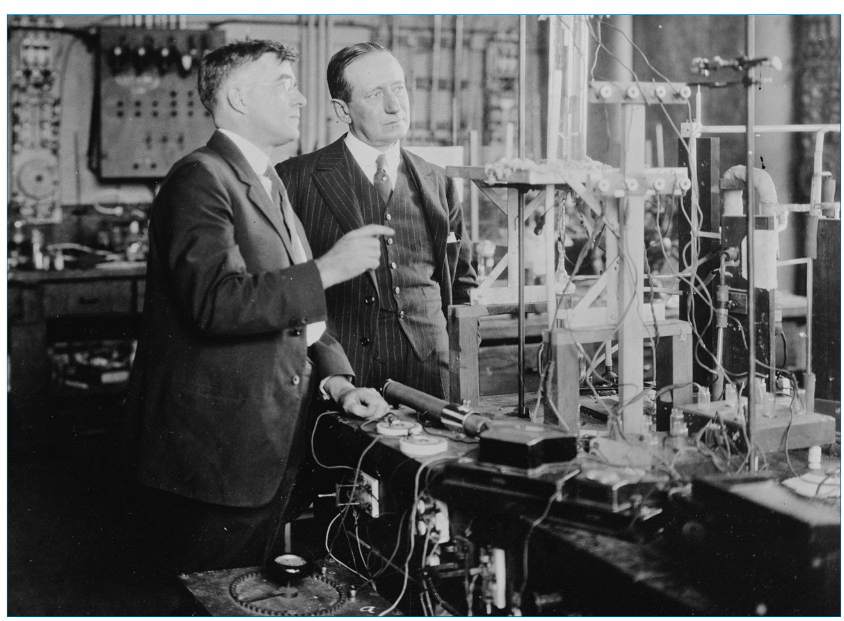


Image: Bain News Service (publisher), Wikimedia / Public Domain

Figure 1. Irving Langmuir (left) working in the General Electric Research Laboratory, with inventor Guglielmo Marconi (right).

that physical measurement systems, like Geiger counters (used by critics), were not sensitive enough to detect mitogenic radiation; only biological sensors like onion roots or yeast cells could be used (p. 41).

Eventually, the popularity of mitogenic radiation faded in science journals, mainly due to unrepeatability of experiments and observations (p. 41). Some research in this area was revived more recently (1980s and 90's), but with mixed results (pg. 43).

Gratzer goes on to discuss other strange ideas in biology, such as the idea of a noxious essence radiating from menstruating women (p. 44), strange biological pregnancy tests (p. 48), Lamarckism (p. 52), and even the idea that memory was carried in your RNA. To a radical degree, this supposed that if you ate the brain of a smart professor, you'd have some of his [or her] smarts (p. 59)!

Pathological science in physics

Chapter 3 is a key chapter of the book, which Gratzer often refers to in other chapters. Gratzer recounts two more examples of 'pathological science'. One has to do with alpha particle radiation (p. 67). Here the data collection depended upon counting faint flashes of light in a dark room with one's own eyes; a method open to being 'a threshold phenomenon' (p. 73). This is where the signal being looked for is at the edge of detectability, so much so that it can be subjective whether it has been detected or not.

A key scientist at the time, American Nobel chemistry laureate Irving Langmuir (1881–1957), who also did research with the General Electric Company (figure 1), led the investigation to uncover the faulty science going on in this experiment (p. 72). Langmuir was the one who coined the term 'pathological science' in 1953. The other example Gratzer gives again involves Langmuir critically investigating experiments, this time supposedly measuring time lags associated with polarized liquids (p. 76).

The key section of the book is quoted below, listing Langmuir's identifiers of 'pathological science' (pp. 79–80):

1. "The maximum effect that is observed is produced by a causative agent of barely detectable intensity, and the magnitude of the effect is substantially independent of the intensity of the cause.
2. The effect is of a magnitude that remains close to the limit of detectability or, many measurements are necessary because of the very low statistical significance of the results.
3. There are claims of great accuracy.
4. Fantastic theories contrary to experience are suggested.
5. Criticisms are met by *ad hoc* excuses thought up on the spur of the moment.
6. The ratio of supporters to critics rises up to somewhere near 50 percent and then falls gradually to oblivion."

In this chapter, it becomes apparent why this book holds relevance for creation scientists. These identifiers of 'pathological science' ring very true for many of the evolutionary science ideas that creationists expose. The only exception is the 6th identifier.

Polywater

Chapter 4 dives into the 'tale of polywater' of the 1960s and '70s. Water was frequently studied at the time. Russian physical chemist Boris Deryagin (or Derjaguin, 1902–1994) claimed to have discovered a new form or state of water, 'polywater', which had a much higher boiling point (250°C or 482°F), and a higher solidifying point (about 30°C or 86°F) (p. 85). The observations were made when water was "condensed at low vapour pressure in glass or quartz capillaries, less than one-tenth of a millimetre in diameter" (p. 86). Deryagin had already caried immense prestige, especially for the important Derjaguin–Landau/Verwey–Overbeek (DLVO) theory of colloid stability.

His 'discovery' created quite a stir in academia, with many scientists replicating his experiments (p. 89). Before long, people used the strangeness of polywater to explain other mysterious things—like how clouds work and water on Venus (p. 90). Over 500 papers and about 400 scientists supported polywater before it was shown to be wrong by experimentalists (p. 91). It was eventually found that the strange properties of polywater were simply an artefact of the experimental setup. Smaller capillaries meant more of the water passing through was in contact with the walls of the capillaries; therefore, more quartz particles from the capillary walls contaminated the water.

Magic and biogenesis

Chapter 5 moves from the harder sciences to pseudo-science claims relating to life energy, telepathy, mediums, and magicians—claims that were of course mixed in with concepts from the harder sciences to attract some credibility.

Towards the end of the 18th century, in France, German physician Franz Mesmer (1734–1815) claimed to have possessed the ability to "transmit his own superabundance of magnetic fluid to patients on the couch and thereby cure them of a host of maladies" (p. 97). The popularity of 'therapy by magnetism' spread, with more people claiming to be able to treat people with it. So much so, that the French government even offered "a pension and an order of chivalry" to Mesmer if he could prove his treatment worked and was willing to share the secrets of it (p. 98). Mesmer avoided formal tests of his treatments, but the popularity of the treatment still spread. These practitioners were known as 'magnetizers'.

About half a century later, interest in magnetism and electricity continued, with British scientist Andrew Crosse (1784–1855) experimenting with electrolysis (p. 100). Crosse's experiments were much more scientific and controlled than the pseudoscience of the magnetizers, but the results were no less strange. Small white growths on the electrodes appeared in the days following electrolysis experiments, which then hatched and flew away (p. 100)! More experiments gave the same results, and before long the word spread about a possible cause of abiogenesis (p. 101) or fossil revival (p. 102).

The insect eggs would have simply been present beforehand and survived the electrolysis (p. 100). Gratzer also describes events from the 19th century, when some scientists turned their interest and even experimentation to spiritualism, investigating, with intent to prove true, mediums, magicians, and even spoon bending. (A famous spiritualist was Darwin's co-inventor of evolution by natural selection, Alfred Russel Wallace.) This chapter, overall, was a bit disjointed and a slow read.

Cold fusion

Gratzer turns our attention to a more recent episode of error in science, the idea of 'cold fusion', popularized in the late 20th century. Around the 1980s and '90s, the race was on to be the first to achieve fusion of hydrogen at relatively low temperatures (p. 111). The key research groups were that of Pons and Fleischmann at the University of Utah, and that of Jones, from Brigham Young University (p. 112).

After Pons and Fleischmann found hints of success in their experiments (p. 116), Jones was also making some progress (p. 120). The founder of Jones's research group became aware of Pons and Fleischmann's work, and so wanted Jones to publish early to avoid being beaten by Pons and Fleischmann (p. 120). The pressure was on both groups to publish first on this new technology with the potential to reshape the energy industry, with the hosting universities of these researchers both wanting glory (p. 121).

The work of Pons and Fleischmann was published first, in a somewhat less well-regarded journal, with quicker publishing time (p. 122) than that of Jones in *Nature* (p. 123). Before long, researchers all around the world, backed by millions of dollars from their governments, were working on cold fusion (p. 123).

The cold fusion paper by Pons and Fleischmann was eventually found to be flawed (p. 131), but, before then, a lot of damage had been done. During the cold fusion frenzy, palladium rods were in short supply globally due to the mad scramble of researchers and governments to create cold fusion (p. 123).

What could have prevented this scientific blunder? Gratzer says that "It is entirely possible that a year or two [more] of careful research [before publishing] would have persuaded all parties that they had not after all found a route to cold fusion" (p. 134). This is a reminder of the dangerous pressures of publishing early in science.

Evolution-inspired medicine

Medical science has always been less verifiable than sciences like physics, biology, and chemistry, because we simply can't (and obviously shouldn't) experiment on humans in the same way. In chapter 7, Gratzer recounts the history of several faulty medical beliefs in the past that unfortunately affected many lives.

Many of the problems stemmed from an eagerness of surgeons to remove body parts without a proper knowledge of their full function or without a proper diagnosis of the true problem. This involved removal of kidneys, ovaries, the colon, portions of ribs, and tonsils (pp. 138–148). Often these practices stemmed from the belief in 'vestigial' organs—that "the human body was littered with 'evolutionary relics', redundant and at best useless, at worst pernicious" (p. 143).

Furthermore, strange implant ideas arose, again from the idea of evolutionary ancestry, including that of slices of monkey testicles implanted in human patients to increase sexual prowess (p. 151)! Gratzer describes other odd medical fads, such as homeopathy (still practised today), the consumption of radium water, craniology, and even surgical removal of parts of the brain (frontal lobotomy) (pp. 153–157).

This chapter is of particular interest for creation scientists, because of the number of examples of faulty medical practices driven by a belief in evolution. The author is honest about evolution being the underlying belief driving some of these faulty practices, while still accepting the theory (seen in chapter 12).

Nationalism and science

From chapter 8 onwards, Gratzer shifts focus from isolated ideas in science to the ideologies and political influences driving them; in particular, nationalistic ideologies. Patriotism and nationalism are shown through an example of the competition between French and German science in the 19th century (p. 162).

The French approach to science (in the French opinion) possessed "the *esprit de finesse* [spirit of finesse], while the Teutonic [German] mind can encompass only the *esprit géométrique* [geometric spirit]. The first conceives, the second only elaborates [emphasis in original]" (p. 168). In some ways, a creativity vs discipline tradeoff. Prejudice between the two countries in matters of science was further pronounced after WW1, and hostility between English and German science grew as well (p. 174).

Soviet science

Chapter 9 explores the approach of science from a very different culture and political ideology to Western European countries, that of the Soviet Union during Stalin's reign.[1] The communist Soviet Union had little sympathy for academic 'theoreticians' and instead supported 'barefoot professors' or 'peasant scientists' like Lysenko (p. 180).

Lysenko was made famous for his different approach to agriculture, known as 'vernalization', focused on cold conditioning the seed of a plant before it is planted, rather than using crop breeding techniques to develop resistant crops (p. 181). The acceptance of this was largely down to ideology; the concept of Lamarckism was much more welcome to communists than that of genetic inheritance (p. 181).

Eventually, Mendelian inheritance was labelled as evil (p. 187), and any opposers to these strange views were labelled as 'fascist' and removed from academic positions (p. 190). It wasn't until Stalin's death, in 1953, that Lysenko's reign over Soviet science was reduced (p. 194).

While biology suffered under the reign of Stalin, physics, especially that to do with bomb-making, fared well (p. 204). Quantum physics and relativity, very much theoretical, were initially not welcome to the Marxist ideology (p. 205), but the usefulness of an atomic bomb outweighed the ideological issues of theoretical physics. Gratzer sums up the situation well: "Stalin reassured Beria, who was still worried about the physicists' ideological unreliability. 'Leave them in peace', Stalin told him, 'We can always shoot them all later'" (p. 212).

Nazi science

The most evil application of science ever is discussed in chapter 10—science during Nazi Germany. Much of it was from an obsession with genetics and survival of the fittest. The author is quick to defend one of the evolutionary heroes, Ernst Haeckel (figure 2), but admits that the evolutionary theory was a serious force behind the Nazi atrocities.

> "Racism, whether in Germany or anywhere else, has never originated in the theories of scientists and it would be absurd to make Ernst Haeckel out to be the father of National Socialism and of the evils that flowed from it. But Haeckel's science served the Nazi regime as a fig-leaf, and gave rise to a hideous pseudo-science, which Haeckel, ferociously nationalistic as he was, would probably have abjured" (p. 219).

However, Haeckel wasn't as honourable as evolutionists like to claim (see Haeckel fraud proven). A quote from Haeckel further shows his racism:

> "All these five races of men, according to the Jewish legend of creation, are said to have descended from 'a single pair'—Adam and Eve, and in accordance with this are said to be varieties of one kind or species. … The excellent paleontologist Quenstedt is right in maintaining that, 'if Negroes and Caucasians were snails, zoologists would universally agree that they represented two very distinct species, which could never have originated from one pair by gradual divergence.'"[2]

The seeds of social Darwinism were sown by Haeckel, and later reaped by Nazi Germany (p. 223). Interestingly, at the time of Haeckel, there was some resistance to evolutionary thinking from a respected scientist, Virchow, who held to ideas which are relevant even today: "Any alteration in cellular function would, conversely, lead to disease: thus in essence all mutations were deleterious, and not, as Darwin argued, the random agents of change" (see The evolution train's a-comin'), and "Neanderthal man … was not a member of a distinct species" (p. 222).

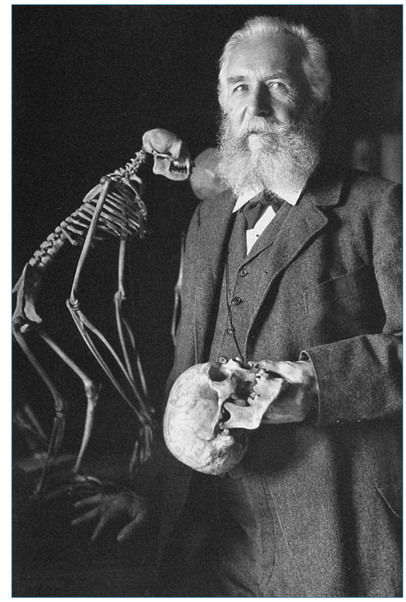


Image: Nicola Perscheid, Wikimedia / Public Domain

Figure 2. Portrait of the naturalist, Ernst Haeckel

After discussing more background history, Gratzer then describes the science during Hitler's reign (p. 227). One of the chief characters who applied social Darwinism in Nazi Germany was Heinrich Himmler. He wasn't much of a scientist himself, at times sidetracked by superstitious myths of Aryan and Nordic races (p. 231), but he did welcome social Darwinism as an excellent tool to accomplish his goals (p. 239). The Nazi scientific establishment was also quite anti-Einstein (not least because he was Jewish) and even anti-Heisenberg (p. 262), whose theoretical views in physics at times didn't fit well with the Nazi ideology.

Eugenics

Gratzer, in chapter 11, explores another example of social Darwinism, that of eugenics. The beginnings of eugenics go back to the cousin of Darwin, the scientist Francis Galton. He believed that intelligence was fundamentally genetic, and "urged the government to do all it could to promote genetically advantageous unions" (p. 284).

The eugenics movement blossomed and was eventually embraced by the US (p. 286), where compulsory sterilization of the unfit was practised (p. 289). In the US court case *Buck v. Bell* (1927), it was concluded that "it is better for the world if society can prevent those who are manifestly unfit from continuing their kind" (p. 289).

The definition of 'unfit' was easily stretched to suit one's agenda. This occurred in the US (p. 290), and in other countries, like Sweden and Canada (p. 290), but nowhere as much as in Nazi Germany (p. 293). Gratzer delves into the history of Nazi eugenics in light of chapter 10. As in the US, sterilizations were deemed appropriate for conditions such as "feeble-mindedness, schizophrenia, epilepsy, hereditary deaf-mutism, alcoholism, Huntington's disease, manic depression, and bodily malfunctions" (p. 293), but, in Hitler's Germany, euthanasia for such conditions soon followed (p. 296).

Envoi

In the final chapter, Gratzer reflects on the strange, and at times dark, history of science. Gratzer concludes that "It is confusion, rather than error, that impedes progress" (p. 303). This final chapter mostly serves to bring attention to the identification of 'pathological science' in relation to other chapters, such as to reduce lasting confusion in science moving forward (p. 306).

Even though Gratzer seems to be a strong advocate of the evolutionary worldview, he concedes that "Geological, like astronomical phenomena could not be tested experimentally, a circumstance that invited philosophical wrangling" (p. 305), showing some awareness of the limits of historical science and of how worldviews affect people's interpretations of data.[3] He also reveals a common trait of 'pathological science', "An honest striving after objectivity is distorted by an inner conviction about the answer" (p. 308). That is so true in historical sciences today.

Conclusion

Even though *The Undergrowth of Science* is written from a secular perspective, it reveals interesting characteristics and signs of dodgy science through history. Most of the same characteristics and signs of 'pathological science' are readily applied to evolutionary science today. From the criteria of 'pathological science' presented in chapter 3, one can easily see how biological, geological, and cosmological evolution in secular science today fit the mould well for five out of the six criteria (since the sixth requires acceptance to reach no more than 50%).

This exception is probably because of the huge worldview implications; believing in six-day creation and, by implication, the truth of all that Scripture teaches points the finger at one's own hopeless standing before God, if outside of Christ. I would recommend this book to creationists who are interested in science history and particularly to creationist researchers and writers who spend a lot of time refuting evolutionary 'pathological science' in their scientific disciplines. I think the diverse examples of 'pathological science' in history give the reader better insight for detecting the same happening in science today.

References

1. See also: Ambler, M., Book review: Stalin and the Scientists by Simon Ings, *J. Creation* **36**(3):33–37, 2022.
2. Haeckel, E., *The History of Creation, or the Development of the Earth and its Inhabitants by the Action of Natural Causes*, vol. II, English edn, translated from the 8th German edn by Prof. Ray Lankester, Fellow of Exeter College, Oxford, pp. 412–413, 1909. See also: van Niekerk, E., Ernst Haeckel: a hostile witness to the truth of the Bible, creation.com, 3 Mar 2011. For more details, see Wieland, C., *One Human Family* (ebook), CBP, creation.com/s/35-5-521.
3. Batten, D., 'It's not science': Is evolution 'science' and creation 'religion'? creation.com.