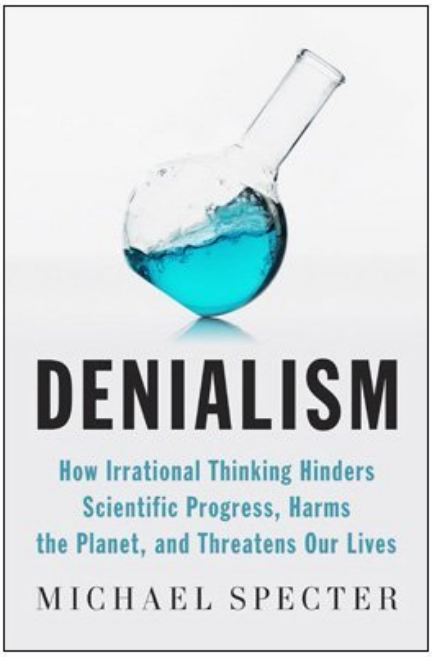

Denialism: How Irrational Thinking Hinders Scientific Progress, Harms the Planet, and Threatens Our Lives

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In this provocative and headline-making book, Michael Specter confronts the widespread fear of science and its terrible toll on individuals and the planet.

In *Denialism, New Yorker* staff writer Michael Specter reveals that Americans have come to mistrust institutions and especially the institution of science more today than ever before. For centuries, the general view had been that science is neither good nor bad—that it merely supplies information and that new information is always beneficial. Now, science is viewed as a political constituency that isn't always in our best interest. We live in a world where the leaders of African nations prefer to let their citizens starve to death rather than import genetically modified grains. Childhood vaccines have proven to be the most effective public health measure in history, yet people march on Washington to protest their use. In the United States a growing series of studies show that dietary supplements and "natural" cures have almost no value, and often cause harm. We still spend billions of dollars on them. In hundreds of the best universities in the world, laboratories are anonymous, unmarked, and surrounded by platoons of security guards—such is the opposition to any research that includes experiments with animals. And pharmaceutical companies that just forty years ago were perhaps the most visible symbol of our remarkable advance against disease have increasingly been seen as callous corporations propelled solely by avarice and greed.

As Michael Specter sees it, this amounts to a war against *progress*. The issues may be complex but the choices are not: Are we going to continue to embrace new technologies, along with acknowledging their limitations and threats, or are we ready to slink back into an era of magical thinking? In *Denialism,* Specter makes an argument for a new Enlightenment, the revival of an approach to the physical world that was stunningly effective for hundreds of years: What can be understood and reliably repeated by experiment is what nature regarded as true. Now, at the time of mankind's greatest scientific advances—and our greatest need for them—that deal must be renewed.

Denialism: How Irrational Thinking Hinders Scientific Progress, Harms the Planet, and Threatens Our Lives Details

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From Reader Review Denialism: How Irrational Thinking Hinders Scientific Progress, Harms the Planet, and Threatens Our Lives for online ebook

David says

This book is a polemic, railing against counter-culture anxiety toward technological progress and scientific illiteracy, as expressed in the anti-vaccination movement, organic ideology, GMO hysteria, etc. I've read several valid criticisms of the book, although most readers see at least some value in the message. One thoughtful review noted that the author failed to distinguish between science and technology (e.g., nuclear physics is science, nuclear weaponry is technology). The author is frequently excoriated for his harsh treatment of "denialists." One Amazon review received almost 200 affirmative responses—to a single 2-stars review. This is the first time I've seen the number of responses to a single review exceed the number of reviews. The reviewer observed that the author is too harsh in his condemnation and essentially preaches to the choir. The criticism is not without merit, but while I prefer to hear more dispassionate argumentation, that method is not universally effective. I'd like to think that if all the evidence is placed before people, they will make rational choices. As it turns out, this often just doesn't happen. As someone once said, "People who haven't been reasoned into a position can't be reasoned out of it." The Specter book doesn't attempt that impossibility. It is, after all, a polemic. I think Specter's target audience are those people waffling on the fence and the crowd who haven't repudiated the tenets of denialism, not so much out of ignorance than from an absence of conviction.

Specter doesn't contribute to discovery nor does he offer explanations and antidotes for wrongheaded thinking. Instead, he plays the role of public prosecutor. Prosecutors don't create evidence; they assemble it and present it with rhetorical flourish to persuade an undecided jury, a jury that may resemble naïve consumers more than rational deliberators. Denialists, like others in the arena of political extremism, are invigorated by fire-breathers. Sometimes fighting-fire-with-fire is a regrettable but necessary response. The risk of that strategy is that the responder himself becomes a fire-breather, sometimes indistinguishable from his adversary. This same dilemma is playing out in our political discourse. Some would say that if you repeat a lie long enough and there is no immediate and strong repudiation, the lie takes on an aura of credibility. In today's environment, speaking softly, regardless of how big your stick, is viewed as a sign of weakness and a tacit acknowledgement that your adversary's position is legitimate. Subtle nuance and active open-minded thinking is dwarfed by supreme confidence and bombast. People like Sam Harris, Richard Dawkins, and Michael Specter may be necessary gatekeepers willing to take on the ugly task of rigorously enforcing intellectual accountability. Thus, while I can't bring myself to adopt Specter's prosecutorial style and I don't want it to become the dominant response, I see a place for it. As Lincoln said of General Grant, "I can't spare this man; he fights!"

Darrell says

"Farm animals take up the vast majority of agricultural land and eat one-third of the world's grain. In the rich nations we consume three times the meat and four times the milk per capita of people in poorer countries. [...] Livestock already consume 80 percent of the world's soybeans and more than half the corn. Cattle require staggering amounts of fresh, potable water. It takes thirteen hundred gallons of water to produce a

single hamburger; a steak requires double that amount. [...] To make a pound of beef requires nearly a gallon of fuel. [...] If we all skipped meat and dairy just one day each week it would do more to lower our collective carbon footprint than if the entire population of the United States ate locally produced food every day of the year."

When most people hear the word denialism, the first things that often come to mind are global warming denial, evolution denial, holocaust denial and other conservative objections to science. In his book, Denialism, however, Michael Specter takes aim at liberal forms of denial such as the anti-vacine movement, opposition to genetically modified food, and belief in alternative medicine. It's good to be reminded that liberals can be just as opposed to science as conservatives.

With companies knowingly putting unsafe products on the market such as Merck's drug Vioxx and Ford's Pinto, it's no wonder that people think big corporations put profit before human lives. Although it's rare, companies are occasionally willing to risk wrongful death lawsuits in pursuit of the almighty dollar. Distrust of authority makes sense when seen in this context.

It's also natural that people want to be in control of their own bodies. The more technology becomes a part of our lives, the more we have to rely on other people: the farmer that grows our food, the pilot who flys our airplanes, the doctor who prescribes our medications, and the nuclear technician who provides our electricity. Occasionally, the people we rely on make mistakes. We never think about all the times they do their jobs perfectly, because that's expected, but when mistakes happen it's frightening. Nevertheless, short of moving to a secluded cabin in the woods like the Unabomber, we all have to learn to live with that risk.

Denialism is understandable, but that doesn't make it right. Just because doctors sometimes make mistakes, that doesn't mean that the entire medical establishment is wrong. There is a current movement of people lead by former Playboy model Jenny McCarthy who are opposed to vaccines because they think they cause autism. Countless studies have been done that prove vaccines don't cause autism, but for some people no amount of evidence will be enough. They'll always be in denial. Diseases such as measles which were nearly eradicated are starting to come back because of people refusing to vaccinate their children. While, it's true that in rare cases, some people have an adverse reaction to taking a vaccine, the evidence overwhelming proves that taking vaccines is safer than not taking them.

Genetically modified food, like all new innovations, can lead to disaster since it is always possible mistakes will be made, although none have happened so far. However, it's incorrect to think that organic food is healthier, as deaths due to salmonella poisoning and drinking unpasteurized milk prove. Organic is not synonymous with healthy. After all, arsenic and mercury are organic. With the world's population spiraling out of control, genetically modified food may be the only way to feed the world's hungry. Insisting on organic only is actually a death sentence for many in Africa because traditionally grown food isn't enough to feed them. Besides, organic food is itself genetically modified, just because it's been modified over generations instead of over a couple years doesn't make it any more natural.

Vitamins, while healthy when consumed in food form, have not proven to be beneficial when taken in pill form for the majority of Americans. Unless you suffer from a particular vitamin deficiency, chances are you get enough nutrition from eating regular food. Many vitamins taken in pill form don't get absorbed by the body and just end up passing right through the digestive system. This is why vitamin pills are sometimes referred to as "expensive pee". There are even some studies which indicate that certain vitamin supplements can do harm. It's natural for people to want to be healthier, but the evidence shows that vitamin supplements and other forms of alternative medicine just don't work.

I disagree with Specter that denialism is more rampant now than any other period in human history or that it's more rampant in America than anywhere else in the world. I also disagree with him that Whole Foods is far more expensive than other supermarkets, since on a recent trip, I found their prices were comparable for most products.

For some reason, Specter devotes the final two chapters of his book to wild speculations about the future of genetics and synthetic biology. These chapters are tangentially related to denialism, I suppose, since there will certainly always be people opposed to every new form of technology, however by attempting to predict the future, Specter is engaging in non-critical thinking. A couple of the people he interviews claim that huge technological breakthroughs are right around the corner, given enough funding. How many times have we been promised new technology that never materializes? The fact of the matter is, we simply can't predict what technology will be like in the future. People living in the 1950's predicted we'd have flying cars by the year 2000, but they never saw the Internet coming. Likewise, today's predictions will most likely appear foolish fifty years from now. The book, which was written in 2009, actually makes the prediction that creating new species using synthetic biology will be a 7th grade science experiment in 3 years. Really?

The book contains good information overall. I was interested to learn that some doctors refuse to take a patient's race into consideration when diagnosing illness out of a strange sense of political correctness even though genetics plays a major role in the treatment of many ailments. I just think Specter should be more skeptical when it comes to predictions about what technology we're going to have in the future.

Mark says

An OK survey of 'deniers' of modern science such as the anti-vaccine or alternative healing crowds. On one level it's a well written and well researched polemic--I certainly learned quite a bit about various movements, something about the science of different areas, and got quite worked up in places.

On another level, though, it's sort of oddly unsatisfying. By the end I got the feeling that Specter was primarily an optimist who just likes scientists as people and gets annoyed with idiotic conspiracy theories about pharmaceutical companies. But while he's aware that not every invention is good, or put to good use (the Vioxx chapter is excellent), he's mostly picking fights with popular-but-ignorant movements that don't require engagement on more challenging questions. Good if you want to stock up on arguments, so-so if you're curious about actual scientific work.

The decision not to give a chapter to creationism or climate skeptics (although he acknowledges both as 'deniers' in passing) is also a bit strange--is the homeopathic crowd really causing more damage than they are? I do suspect it's because his main focus is on fallacies embraced by the sorts of people he knows. and he doesn't hang out with that sort of person at dinner parties.

Amanda says

Not a good book. For the most part, it read like an extended blog post, with some case studies on cool technologies, but without a lot of discussion on why people tend towards being anti-science, or even about how culture discourages science literacy! It was just some guy saying hey! These people are stupid for taking person X's word for granted, and not taking scientist Y's word for granted, but they should totally take MY

word for granted, even though I am also picking what experts and quotes and facts to include, and look! I admit that scientists and the government sometimes do bad things, like the Tuskegee syphilis study, but hey, that shit is RARE, so we should totally trust whatever scientists are telling us now!

Thing is, for the most part, I do trust scientists! But I don't necessarily trust corporations, even ones that exist for SCIENCE! They have to have the same priorities as every other corporation-- turning a profit, NOT doing good for humanity.

Paul says

Very, very interesting book to read. Changed my thinking about a lot of things.

The author's basic premise is that some people, for whatever reason, want to believe whatever lunacy they've chosen to believe over hard, scientific fact. Normally that's not a problem. It's when people like this band together and start making noise that others, possibly suffering from the same issues, jump on the bandwagon.

I'd originally heard the author speak on NPR, and was interested in getting the book, mainly because they were talking about the vaccine issue (which totally irritates me, how some parents think they're smarter than doctors who've been in school for 12+ years - as if doctors WANTED to fuck their kids up).

The first chapter on Vioxx sort of set the stage, framing it all in the perspective of greed, trust (and losing it), and the mania that results afterwards, He makes very good points regarding the statistics and chances and the rational part of my brain wasn't surprised when he said he'd still recommend the drug. The author is as candid and open about these things, and I give him some points (in my book) for admitting to uncertainties or to the fact that the calculus might have people hurt, but overall more people benefit in the end (a pharmaceutical version of *realpolitik?*).

The vaccine chapter got my attention, and concerned me greatly not only for the attention its gotten in the media, but also for the shrillness (and total ignorance) of one of its "leaders", Jenny McCarthy, and due to the fact that I work in education. Honestly, if I know a kid has not been vaccinated for certain things, I don't want him in my class as he or she poses as much a threat to the health of everyone else (including myself). I have a right to make that choice.

What astounded me though was the body of scientific evidence (even now, they just denounced the initial study as a fraud), yet people still cling to this idea, when any number of things might be the cause for autism, such as the environment, the food, media (how many parents leave their kids watching TV?), and so on. Or maybe it's like the Joker's Smilex poison, where the individual components aren't dangerous but combined somehow they trigger autism? Point is, NO ONE KNOWS 100%, yet we have people acting as if they do.

I could go on, but the main point is this: the book does a good job of looking at issues that people are getting all hyped up or bent about, and tries to treat them rationally and scientifically. That's the only way we can know more about them in a way that allows us to possibly control and direct how such things will affect and benefit us later, or at least mitigate their deleterious effects. Getting hysterical does no one any good, and its the first step to things like mass panic, mob mentality, and other crazy shit.

The author is, again, refreshingly frank and open when it comes to admitting the shortcomings and faults and drawbacks of the scientific approach, the gaps in knowledge, and the lack of information in some areas, but

that's not so much because he's a good person (though I think he is somewhat for trying to bring this issue to light) - it's because that is **how science works**. If you don't know something in science, then you are *allowed* to say that you don't know. In this age of instant gratification and online research, so many people are used to getting answers, and the honest truth is that while we are capable of amazing things, we still are mere mortals.

What really frightened me in the book are how people are wholly willing to shut down the rational part of their brains in order to focus on the thing (a fetish, if you will, in the traditional sense of the word) that is fucking up their lives, and make it the source and cause of their pain, so that if they can either attack it or find a cure for it, they can have some control over their issue and feel better about themselves. Sorry, but the truth is that this world can be an ugly, random place to be, and nature doesn't choose sides.

I'd recommend this book to anyone who wants a clearer perspective on these issues, or, alternately, to anyone who buys into any of the topics presented in the book (I was a supplement user for a while), and wants an honest, critical look at them. The truth doesn't choose sides, it just is, and how we receive and interpret it is really what matters.

Susan says

I read about two thirds of this book. The point that it generally makes is good: that it's good to embrace scientific progress and be logical. However, I find in a number of his arguments he is rather simplistic, assuming that the situations are strictly black and white. Notably, in the section on organic food: he points out how companies noticed that transferring genes from a brazil nut to another plant, caused an allergic reactions to it that had not happened before (and the company stopped their trials). He doesn't address, though, that some companies may not be as diligent in testing for allergens that they might be introducing via genetic modification--and there are many possible allergens, so it's unrealistic to expect a company to check from them all. Also while he mentions that one reason people are sometimes against GMO is that it gives seed companies greater control (farmers have to buy new seed every year instead of re-using seed that they've stored), he paints the seed companies are largely benevolent, that it's a choice to use GMO seeds and that farmers can still continue to use seeds that they can store. As media like Food, Inc. has shown, this is increasingly not the case. Given the opportunity the seed companies would very much like all farmers to have buy seed from them every year and aren't above law suits and other actions to help their cause. Mr. Spector blithely ignores all of this, just focusing on the parts of the argument he wants. (As a side note I am in favor of GMO,s especially for helping developing countries).

I find his book so irritating that I no longer want to finish.

Lena says

Over the last few years, I've become increasingly interested in the gap between scientific and technological developments and the public perception of those developments. In Denialism, journalist Michael Specter dives straight into this gap and makes a compelling argument that this problem is among the most dangerous we currently face.

Specter does decent job of outlining where the gap between scientific data and popular myth comes from and why it seems to be growing. In the middle part of the century, the authority of science, and our faith in its ability to cure our ills and improve our lives, was much stronger. But as the population as a whole became less inclined to accept authority on its face, and people witnessed gross scientific missteps such as the Challenger explosion and the Vioxx disaster, public trust began to erode.

Specter opens his book with a detailed discussion of the Vioxx tragedy and the very reasonable fears it left in its wake. He does not shy away from discussing the real limits of our scientific feats, but focuses his energy on those places where irrational overreaction to these events has taken over to great detrimental effect.

Among the topics he covers are the tremendous setbacks in public health brought on by the anti-vaccination movement, the elitist push towards organics and against GMO's, the billions of dollars spent on supplements in absence of evidence that they work, the resistance of people to acknowledging that race is a factor in the development of disease, and the implications of biotechnology on all areas of our lives.

Throughout each of these chapters, Specter makes clear that all advances in science and technology come with some sort of risk. But he makes a strong argument that those who demand our technology should be 100% risk free before it is unleashed on the world have seriously misplaced their fears. He points out that we have taken what he calls a "Hollywood approach" to risk - failing to think twice about getting inside a car, which actually IS quite dangerous to our well-being, while expending great effort to avoid even the tiniest amount of theoretical risk in, say, eating a conventionally grown banana.

Specter provides a good amount of supporting evidence in favor of his arguments, addressing concerns in enough detail that I learned some new things both about topics I was already familiar with, as well as those I had not yet considered. The chapter on genomics and the value of having your personal genome sequences was of particular interest to me, as I was unaware that the technology has advanced so rapidly that, contrary to earlier arguments, it actually can offer individuals information that will allow them to take definitive action to address their particular genetic health risks.

Overall, I would say this book is a valuable primer on places in crucial areas of public health where irrationality has trumped science, and it is particularly useful as a myth-debunking tool. The fact that the book focuses mainly on health could also be considered a flaw - when discussing the dismissal of scientific evidence in favor of personal ideology and fear, it seems odd that he mentions climate change and evolution denial only in passing. In addition, while he is compassionate in his discussion of aspects of human nature that make us so susceptible to the kind of denialism he describes, I didn't come away from the book with much of a sense of what could actually be done to change things. Yes, people need to be educated and learn to rely on data rather than the opinions of friends, education which this book does a decent job of providing. But aside from the suggestion of having an open conference to address the risks of the rapidly developing field of biotechnology, there were fewer practical ideas for how to change public perceptions than I had hoped there might be.

In the chapter on parents who are afraid to vaccinate, Specter provides a moving quote from Benjamin Franklin - afraid of the potential risks of the smallpox inoculation, he refused to let his son receive it. After his son contracted the disease and died at the age of four, he spoke out to urge other parents not to make his same mistake. Mr. Franklin painfully demonstrates that we are capable of overcoming our irrationality and learning to appreciate those places where the value of science outweighs its risks, but the fact that we are still having the same debate over 200 years later points to the fact that this is a lesson we are probably going to have to keep learning over and over again.

Menglong Youk says

3.5/5 stars

As many reviewers have pointed out, this book has some flaws in terms like science and technology, contains harsh treatments to the denialists, and lacks of supportive evidence and further suggestions on how to deal with the issues, but by no means that it has no good points whatsoever.

While it is true that waking a sleeping person up is a waste of time, maybe among those who we think pretend to sleep, some are actually sleeping and waiting for the right methods (evidence) to tackle them to wake up. Absolute proofs of the safety of, say, GMOs and vaccines, are nearly impossible to present; however, it does not mean that the results from observations and experiments have to be rejected altogether.

We live in a world where some regions shower with food while others could not even find anything edible. When foreign organizations offered to help the starving people with GMO food, African leaders refused to accept it and instead let the people starve to death. In the western world, dangerous common diseases in the past like smallpox were totally forgotten, which is why there is an increasing number of parents refusing to vaccinate their children due to the doubt of autism.

It is easy to be concerned about the risks caused by vaccination, and ignore the horror caused by those preventable diseases because we carelessly forget their existence. Yet, I believe those risks are worth taken. As the author puts it, "without accepting some risk we would never have had vaccines, X-rays, airplanes, or antibiotics. Caution is simply a different kind of risk, one that is even more likely to kill people."

David says

I'm sure there's some good stuff in this book - possibly enough to raise the review to two stars. However, Specter's starting point is so horribly flawed that I can't continue reading this, and wouldn't recommend it to anyone else.

Denialists piss me off. Climate change deniailists, the anti-vaccine movement, etc. The thing we must be cautious about, however, is that because denialists have a completely warped view of reality, and ignore evidence and science, if you call someone a denialist you will subsequently ignore *any* argument they make. Instead of carefully building up his arguments first, Specter just leaps in and throws about the denialist epithet.

I also object because Specter does not understand the distinction between science and technology. A surprisingly large number of people don't, but I can't imagine how someone who didn't undertook to write this book. He's not a scientist, but journalists are still perfectly capable of understanding the distinction, if they take the time to figure it out. Science is a method of understanding how the world works. Technology is the practical application of that knowledge to solve specific problems. Nuclear physics is science. Nuclear weapons are technology. It is possible to wholeheartedly support science without supporting every technological application.

Specter also hates people who are anti-GMO and pro-organic, because they are all denialists (by which he says he means people who don't support science). I really think he should have a talk with the Union of

Concerned Scientists, who, as you might guess, like and understand science. But they're still concerned about harmful agricultural practices. UCS started as a group of scientists against nuclear weapons - another example of pro-science, anti-specific-technological-application.

Specter also thinks the "two cultures" of C.P. Snow's The Two Cultures are no longer distinct. Which is pretty insane. Especially for someone who you'd think would be well aware of both, given that he's a science journalist.

Donna says

What I expected from this book was a neurological explanation of the propensity we all have for denialism--from the psychologically protective mechanisms involved in absorbing tragedy in stages to the obstinate refusal of sometimes educated or influential people--from Samuel Shenton (founder of the Flat Earth Society) to Sarah Palin--to acknowledge scientific fact. I still think that would be a very good book, and someone ought to write it.

As it turns out, *Denialism* is more about the scientific facts themselves and the consequences--actual and potential--of public ignorance and denialism. In six chapters, Michael Specter brings readers up to date on recent research in specific areas of science and public policy, from vaccines and vitamins to creating entirely new organisms from basic genetic building blocks. (The notion of smart kids building designer dinosaurs and turning them loose in their backyards may be enough to make a "denialist" out of almost anyone.)

Although Specter doesn't offer solutions, he does illustrate how wide-spread misconceptions and ignorant attitudes can derail progress and cause harm. Science geeks should enjoy this book immensely.

Sarah says

This book is an excellent source of information and proof that our self-inflicted ignorance is limiting progress on a massive scale. Specter cites vaccine misinformation, myths of the organic food movement, and the overarching misunderstanding of biotechnology and its potential as a few examples of this terrifying “denialism”.

I consider myself to be a fairly inquisitive and knowledgeable person when it comes to the things that I endorse. Specter brought up many arguments in this particular book that made me think twice about what I’m endorsing and why. I was astounded at the statistics and credible information presented- all things of which I was completely unaware. He is absolutely correct in stating that irrational thinking and denial hinders progress and does much more harm than good.

Take home message: know what you believe and why you believe it. Have scientific evidence to back up your claims and don’t assume that you have the right answer- ever. Dig a little deeper. Take time to discover the realities behind the denial and irrational thinking that seems to be the knee-jerk reaction of society at large. This book was challenging, fascinating, and enlightening.

Emily says

I really wanted to like this book, especially since I agree with the author's premise that some segments of our society have developed a knee-jerk distrust of all things scientific which is endangering lives, wasting money and distracting us from making scientific progress. In Mr. Specter's words, "Denialism is denial writ large - when an entire segment of society, often struggling with the trauma of change, turns away from reality in favor of a more comfortable lie."

Mr. Specter opens Denialism by describing in thorough detail the Vioxx case (an arthritis wonder-drug that was pulled from the market in 2004 after an increased risk of heart attack and stroke was found to be linked to its usage). He uses Merck's shortsighted and selfish mishandling of the drug's shortcomings as a powerful example of why so many people are distrustful of scientists and large corporations. The next chapter outlines the anti-vaccine movement - his disdain for Jenny McCarthy, in particular, is palpable. Fear of genetically engineered foods is next along with society's "organic fetish" that is not supported by scientific data and is, in some cases, preventing starving people from receiving food. Then vitamin and herbal supplements are up - again, Mr. Specter's disgust with Dr. Andrew Weil was dripping off the page. Genetic variations between races follows, with Mr. Specter lamenting the "political correctness" that refuses to acknowledge any difference based on race and leads to inappropriate or ineffective medical treatments. The final chapter talks about synthetic biology and some not-so-distant possibilities for sticky ethical applications.

While Mr. Specter has obviously done his homework, each of these topics has been covered individually and more thoroughly in full-length books of their own. It's interesting to have them assembled in one place, the better to make his argument that society is trending toward distrust of science. But it was also incredibly frustrating that he didn't offer much in the way of solutions, particularly since he starts out with such a clear example (Vioxx) of why people don't trust science, the government or Big Pharma anymore. He also mentions the Tuskegee experiments, Ford's Pinto, SARS and Chernobyl, to name a few. Information is withheld, bureaucracies move far too slowly or have too little actual authority, self-interested companies stonewall and spin their PR machines. So what is the wo/man in the street supposed to do about it? What sources should we trust for scientific information? How do you see through the spin?

I admit to having little patience with those who ignore all scientific evidence in favor of the anecdotes and non-peer-reviewed information available at the "University of Google", especially when their ignorance puts others at risk. Mr. Specter seems both angry and defensive throughout this book - which he certainly has a right to be. I just wish more of that energy was directed towards helping the average person figure out how to know what to trust rather than railing against the ignorant and the charlatans.

For more book reviews, visit my blog, Build Enough Bookshelves.

David Dinaburg says

Confirmation bias is a harsh mistress. Denialism: How Irrational Thinking Hinders Scientific Progress, Harms the Planet, and Threatens our Lives stands a testament to that, and—whether it meant to or not—forced examination of how I process and internalize information in order to form opinions.

The first half of the book is appealing, in both the "this content is informative" way as well as the "I agree with this general sentiment" way. The early chapters bounce from vaccines to Vioxx, Complementary and

Alternative Medicine to organic produce. It shows its age a bit—it was published in 2009—by continuing to flay Jenny McCarthy for her hardline stance on the non-existent link between vaccines and autism, rather than flay her for her nearly-as-irresponsible tepid recant. She could be positioned as a type of "born-again" rationalist, where she admits her own error, but instead has abdicated any responsibility for the near-decade she was the public face of the anti-vaccine movement.

As far as vaccination news goes, measles were mostly a theoretical threat when this book was written; while I was reading it—in 2015—measles were being reported as sweeping through Disneyland. Prescient and horrifying. Over fifty people have been diagnosed with measles from that outbreak. Between 2001 and 2011, 911 cases of measles were diagnosed in the United States. Of them 220 were in 2011 alone. That is 24% of the total measles cases being reported a full decade after the CDC declared endemic measles in the United States eliminated. The CDC's declaration was right around the time of another declaration; that of Andrew Wakefield, the British ex-doctor who was stripped of his license for falsifying data about the non-existent link between autism and vaccines. It's almost as if the decline in vaccination—encouraged by a fear-mongering fraud—has allowed space for a horrific disease to resurface.

This is where Denialism shines, and where my guard was initially lowered; the book is preaching to the choir. My choir. The incredibly combative subtitle, How Irrational Thinking Hinders Scientific Progress, Harms the Planet, and Threatens our Lives, is not an open invitation to the science-illiterate to seek enlightenment. I am the target-market for this book; I know that. I accept that. But it makes what happens next all the more troubling:

> Our ability to cut genes from one organism and paste them into another has transformed agriculture. But it is a change of degree, not of type.

Is that the case? I don't think we're in a position to make that call yet; it isn't denialism when the data simply isn't in. Even over the last five years, genomicists have only begun to realize that the non-coding genes still do things; and that we don't know what. So, "*Life on earth proceeds in an arc—one that began with the Big Bang, and evolved to the point where a smart teenager is capable of inserting a gene from a cold-water fish into a strawberry to help protect it from the frost,*" is simply not accurate. Not with the knowledge we have about genomics right now, and certainly not in 2009.

When you dump a gene from one organism that you "understand" into a different organism, there is no true way to predict how that gene is going to be expressed or, further, how expression of the ectopic gene ("ectopic" means "out of place," or "abnormal") may alter expression of all endogenous genes (which a specific term that means the cell's "normal" genes). Genome-wide off-target effects could be disastrous: neighboring genes may up- or down-regulate. Or they might not. Or if they do, they might not have any perceptible effect. The gene that allows cold-resistance in the fish may do the same for the strawberry; it may also alter strawberry transcription so that the strawberry becomes less red as a result of the fish manipulation. Or maybe the strawberry becomes less delicious to people's taste buds. Or more people begin to have allergic responses to the gene that is now expressed differently—was up- or down-regulated—in the strawberry because of the fish-gene insertion.

Or maybe the strawberry is fine and the human strawberry-eater is fine. But when the digested strawberry makes its way back to the earth as fertilizer, some up- or down-regulated strawberry gene destroys the soil ecosystem. Or the strawberry genes express in such a way that there is no scent to the fruit at all; bees and bugs and everything else just pass it by, like there wasn't a strawberry plant. How many genes need to be manipulated before you can no longer call it a strawberry plant? There are nearly infinite permutations that may create downstream effects for which one might need to prepare. Which isn't to say research should not be continued—it should. Just more cautiously than the cavalier "all progress is implicitly beneficial" way

that the latter half of this book implies.

The first half was window-dressing, priming the reader for an if/then reaction: if you trust vaccination, then you should be fine with gene manipulation, otherwise you're some kind of science-hypocrite. People cautious of GMO foods are implicitly branded the new Luddite anti-vaccination lunatics, willfully blinding themselves to the awesome powers of science. Except the kludgy way genomics is cited in Denialism is not established science—not even remotely as understood as something like vaccines—the book itself admits as much:

> These are still early days in genomics, but it won't be long until people will carry their entire genome on their cell phone—along with an application that helps make sense of it all. When you pick up those dozen eggs at the store your phone will remind you that not only do you have high cholesterol but you have already bought eggs this week. It will warn a diabetic against a food with sugar, and a vegan to skip the soup because it was made from meat stock. It would ensure that nobody with hemochromatosis slipped up and bought spinach, and in my case, when I buy coffee beans, it would nag me to remember that they had better be decaf.

It is speculative futurism, not to mention absurd. Since when was veganism a genetic predisposition, disease, or disorder? Also, what sort of pie-in-the-sky future society has created a pocket nagging device that comprehends and interprets how your particular genome will be impacted by every single outside stimuli, but has created no way to assist someone who is genetically predisposed to metabolize caffeine slowly?

So what, then, is there to do when confirmation bias rubs up against misinformation? The transition from what I wholly agree with into what I think is patently speculative passes through the grey area of farm crops, where the lines aren't so militarized. There's nothing inherently wrong with calling for the organic production of edible foods, but there are organic pesticides that are still incredibly toxic and damaging to the soil, and organic fertilizers that are shockingly expensive to the point that developing nations are priced out of growing their own produce. These are salient points that Denialism raises, and they do require some consideration. But the author also blithely raises an argument that biofuels will destroy the edible food crop chain, and that is an issue that has been addressed:

> In order to keep the global food supply secure, the next-generation bioethanol from non-food lignocellulosic biomass has been proposed. For many years, photosynthetic autotrophic plants and microalgae have been considered as a possible biofuel feedstock, inasmuch as they can be harvested and use sunlight to convert CO2 into a wide variety of metabolites.

I am particularly lucky to have access to the above article for the same reason I am lucky to have insight into cutting-edge genomics and genetic theory; I am dating a genomicist PhD candidate at a major university. She is very smart. And I get to come at her with my science layperson's questions, and she gets to spend four pages worth of pencil drawings explaining to me what a five-prime carbon end is, and why knowing how it differs from the three prime is necessary for intuiting directionality in mRNA transcription. And why gene manipulation, which is what she does every day, results in her saying, "Basically. We don't know. Maybe nothing will happen. But maybe something will. Off-target effects of many advertised drugs warn of cancer, bleeding, death risks. And those are narcotics, which affect your system only until they pass through. Genetic manipulation is permanent. As such, it shouldn't be taken lightly."

Without her passionate and evidence-based discussions of why things in Denialism were misleading or incorrect, I fear I may have taken the bait and allowed my confirmation bias—my agreement about vaccination rates, or how "*Cattle require staggering amounts of fresh, potable water. It takes thirteen hundred gallons of water to produce a single hamburger; a steak requires double that amount,*"—to

crystallize my thoughts on genetic modification into what Denialism believes my thoughts should be. I am a strong supporter of the science in the world of research; putting the pressures of industrial applications or commercial releases before long-term scientific testing has been done is both dangerous and disingenuous to a book that purports to uphold the scientific method.

There is much to be learned from Denialism, but is not without its flaws; it trades heavily in the rhetorical flourishes of the anti-science brigades it purports to scorn. "*Denialists like Lord Melchett replace the rigorous and open-minded skepticism of science with the inflexible certainty of ideological commitment.*" There is no open-minded skepticism when one interprets all advances as progress, or all progress as beneficent. That way ideology lies.

John Anderson says

This book is excellent for what it is: a general overview of several examples which illustrate "denialism".

No, it doesn't offer much in the way of solutions to the issues it addresses: I didn't expect it to. Of course it would have been nice, but I'm against the idea that people should not promote awareness without also providing a solution (except for when it's used as a political tactic to avoid actual discussion of solutions).

Yes, it bypasses issues such as global warming and creationism in favor of health and medicine: That's okay. I would have loved to read a chapter by Specter on each of these issues and many more. But he didn't write them, and again, that's okay. I understand the view that Global Warming should have taken precedence as a more relevant, pressing issue but that does not negate the validity of this book. The parallels to other issues are there for anyone to make use of whether in conversation, debate or the writing of their own book/article (i.e."Denialism and Global Warming").

Yes, each of the issues addressed warrant their own book: Write them. If that's not your thing, then as noted by other reviewers, those books exist: Read them. This book is about "denialism" and though it presents what I think are excellent crash-courses in the issues it uses as examples, it isn't and shouldn't need to be a comprehensive study of any of these issues.

Finally, this review is intended as a light rebuttal to some of the complaints I read in other reviews. Please don't take offense. After reading several of the other reviews I just felt the need to briefly defend why I went with 5 stars rather than the 3-4 stars that most others who also enjoyed the book went with.

Trish says

Sometimes one just wants to give up on people. Maybe give them what they want, doubled, in a place they will notice its presence. Who knows if the science is right or wrong. It's the best attempt of a blind man to determine the extent of an elephant. If we put aside our greed and made a good faith effort not to blow the planet to smithereens, I think we could claim the joy the Buddhists tell us is our birthright.

In this book Specter voices his frustration at the illogic, misinformation, and downright politicking plaguing important discussions of the planet's future. Sometimes it is hard to want to save mankind from itself. But we need to keep trying to keep the discussion as honest as we can make it, to bolster the weary. I still want that

g-d joy.