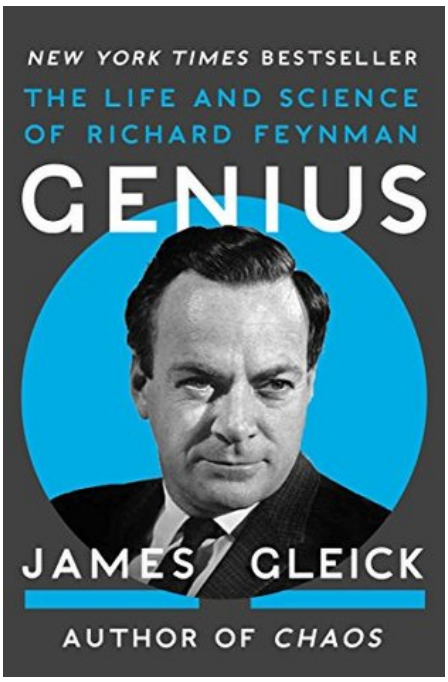


# Genius: The Life and Science of Richard Feynman

*James Gleick*

# Genius: The Life and Science of Richard Feynman

*James Gleick*

**Genius: The Life and Science of Richard Feynman** James Gleick
Genius is a brilliant interweaving of Richard Feynman's colourful life and a detailed and accessible account of his theories and experiments - nearly half a century of which amount to no less than the story of modern physics itself.

## Genius: The Life and Science of Richard Feynman Details

| | | |
|---|---|---|
| Date | : | Published February 22nd 2011 by Open Road Media (first published January 1st 1992) |
| ISBN | : | |
| Author | : | James Gleick |
| Format | : | Kindle Edition 489 pages |
| Genre | : | Biography, Science, Nonfiction, Physics, History |

# From Reader Review Genius: The Life and Science of Richard Feynman for online ebook

### Robert Bryce says

I recently finished reading Genius: The Life and Science of Richard Feynman, by James Gleick. I'm a big fan of Gleick's. His book on Isaac Newton was brilliant. And in this bio of Feynman, who was one of the midwives of the atomic bomb, Gleick illustrates just how important Feynman's thinking has been to our modern understanding of physics, and therefore, of energy. Feynman grappled with the big questions about matter, science, and the quest for human knowledge and understanding. One of my favorite parts of Gleick's book comes early on, when he talks about Feynman's effort to distill human understanding of science into as short a passage as possible. Feynman posed himself this question: what if all scientific knowledge were lost in a cataclysm? What statement would convey the most knowledge in the fewest words to the next generations? Feynman proposed this: "All things are made of atoms – little particles that move around in perpetual motion, attracting each other when they are a little distance apart, but repelling upon being squeezed into one another….In that one little sentence , you will see, there is an enormous amount of information about the world, if just a little imagination and thinking are applied."

Gleick is brilliant. For me, he's a little like Mark Twain in that when I read his stuff, it whispers to me that I should perhaps quit what I'm doing because I'll just never be that good.

---

### Carl Zimmer says

I do not do well with audiobooks. I quickly drift away to thoughts about other things. When I come back to the audiobook, I usually have no idea what's going on. I recently launched into Genius, James Gleick's biography of Richard Feynman, and this experience has been surprisingly different. I have immensely enjoyed having his words poured into my ears. I suspect it has to do with the gorgeous style and structure of Gleick's writing here. He clearly has amassed a staggering amount of vivid detail from Feynman's life, but he's selected from this mountain carefully, rather than dumping it all on the reader's head. To tell Feynman's story, he has to guide us through the recent history of physics, which he manages to do with remarkable grace. It's the story of a remarkable person in a remarkable time. I look forward to hours more of listening.

---

### Daniel says

I learned about Feynman as a teen, when I happened across an interview with him on tv. His character and intellect fascinated me, and years later I decided to learn more about him.

Gleick covers Feynman's entire life in this biography. His prose is good, and he maintains a pleasing balance of anecdote and historical fact. Feynman had a large, vital personality, and Gleick is able to convey this without parroting the tone and content that Feynman uses in his autobiographical work. I've always been able to appreciate Feynman based on his own words; thanks to Gleick, I had the chance to see him from another perspective, and appreciate him all the more.

### Jeremy says

A book that really re-awakened my inner science and math geek. In addition it introduced me to Feynman. I'm sure his name came up back in classes I took, but there is so much here that you'd never get from a one-liner in a textbook. A very interesting character.

By funny happenstance, I read this right before reading Cosmic Banditos by Weisbecker. Cosmic coincidence?

-Jeremy

---

### Thorn says

doesn't really add anything to "surely you're joking" and "what do you care what other people think?" that we couldn't live without. it was interesting, but most of the same information is available in more-engaging form elsewhere.

---

### William Herschel says

This biography puts Feynman in a more balanced, neutral light for me. When reading his memoir(s) you only get a glimpse and rather slanted presentation if you are really wanting to learn about Richard Feynman.

This book is really heavy on his scientific endeavors, which shouldn't be surprising. Despite this the text is very readable and engaging, even for those less scientifically inclined.

In my review of Surely You're Joking Mr. Feynman! I mentioned how much I thought I related to him. Well, if you met me you probably wouldn't see any resemblance whatsoever most likely. It's simply the way he thought about things and his adherence to truth in social encounters, and how he was always figuring things out. I certainly do not relate to the magician, showman, or physicist he also was, or claim to be anything close to what he is. But his stories are very refreshing for me to read.

The biography goes into more of his personal life... mostly in regards to relationships. Reading about him and his wife is touching but I still do not think I fully understand the man in his dealings with women.

Talking merely about Feynman is an injustice to this particular book because his colleagues and the science of the time are heavily delved into, even more sometimes than about Feynman himself. In fact maybe the book is just that, a history of the physics at that time, and Feynman is the star of the show.

---

### Hadrian says

Very impressive biography of Feynman. Extremely interesting book - although with Feynman's life, it isn't

too hard to make an interesting story out of it. Good balance of lucid scientific explanations and biographical narrative.

---

### Bob says

This book made me cry. Weird, maybe, but true. In Gleick's portrayal of the true genius of Feynman, as well as some of his other contemporary genius physicists.

What made me cry? Reading it was a fundamentally humbling experience. These people are SMART! And not smart like most smart folks--not at all. Growing up, I always had the feeling that, given the time and effort to study something, that I was capable of learning anything. Obviously, one cannot learn everything, but I never, until this book, felt that avenues were not open to me, intellectually. In reading the stories in this book, it became clear to me that these people weren't just more educated than me in their academic specialties, but on an entire (much) higher plane--in some place I could NEVER achieve, no matter how hard I ever could work on it.

In the physical world, skills and capabilities are obvious. No matter how hard any of us train, we will never sprint faster that Usain Bolt. That's more tangible than intellectual barriers, which always felt more approachable to me. Well, this book slammed the door on that idea for me in a very enjoyable, yet humbling way. It was fun to read this book for me because it portray genius in a way that is entertaining to me, much like watching great athletes in the arena plying their trade. What do great physicists talk about and do to advance their field? A great read.

---

### Javier Santaolalla says

Anodino. Imposible de acabar. De los pocos que he tenido que dejar a medias.

---

### Mike says

I remember hearing about Feynman during the aftermath of the Columbia Space Shuttle explosion. I finally got around to reading about him and what a Brainiac this guy was. A certifiable genius. Gleick makes science and quatum mechancis readable, kind of. There is no way I could follow the discussion when he got deep in the math but, thankfully, much of the book is written so my poor brain could follow. I liked his description of how young Feynman played around as a kid, luckily he had tolerant parents:

(view spoiler)

Feynman was born at just the right time for a genius in physics. A revolution was occurring and discoveries

followed one on the other. The rise of quantum mechanics was strange and yet necessary to understand reality. A simple explanation courtesy of Mr Gleick:

(view spoiler)

Scientific questions lay around like potatoes in a field. Need something to study, just dig one up and dive in:

(view spoiler)

Feynman was picked to join the Manhattan Project. Security is paramount in the Manhattan Project. The people running the operation at the Oak Ridge, Tennessee plant refining uranium don't know what the material is going to be used for. Feynman is sent from Los Alamos to inspect the plants and probably saved us from an inadvertent nuclear event in the US:

(view spoiler)

If you are good at math and physics you will definitely enjoy all of this book. If, like me, you not quite up to the latest in quantum electrodynamics, you will still enjoy it but might have to skip over some parts. **4 Stars**
One question posed in the book: *"Where are all the genius's?" Where are the Shakespeares, da Vincis, Newtons? With populations now approaching 7 billion, shouldn't we have many more?*

---

### Max says

Gleick portrays Feynman as an irreverent spirit and productive scientist who deeply influenced his generation of physicists. A Nobel Prize winner, Feynman's contribution to physics was more about developing original techniques that clarified complex problems than any singular discovery. As we follow Feynman's life we learn how particle physics and its community evolved in the mid twentieth century from the formulation of quantum mechanics to the standard model. We witness developments in nuclear physics and quantum electrodynamics (QED). Gleick's biography is as much a personal story as one of science. Feynman was different from other physicists, a non-conformist who stood out and stood up, and this was an essential part of his greatness.

Born in 1918, Feynman grew up in Far Rockaway on the ocean in Queens, NY. He loved math. As a child he was always playing with problems in his head. He kept a notebook that he filled with math exercises. By high school he was ahead of his teachers. Columbia rejected him because it had filled its Jewish quota, but MIT took him and he quickly distinguished himself. Realizing that there was little practical he could do with math he switched to electrical engineering and then physics. Physics was just getting established as a discipline in its own right. He graduated from MIT in 1939.

Feynman was enamored with quantum mechanics. For his graduate education he elected to go to Princeton which was becoming a leader in nuclear physics. He turned down a scholarship he won to Harvard. Princeton was taken back by his terrible grades in everything except physics and math, and concerned that he was Jewish. They took him anyway based on recommendations from his MIT professors and an unheard of perfect score on the physics entrance exam. He soon impressed everyone including department head Eugene Wigner, who would win a Nobel Prize and whose mathematics provided an important foundation for

quantum mechanics. Wigner would later describe Feynman as a second Paul Dirac, only human. The extremely reticent Dirac had mathematically defined the electron predicting the positron. Wigner's sister was married to Dirac, who was a hero to Feynman.

In 1939 John Wheeler, a distinguished theoretician who later would coin the term "black hole", was a 28 year old Professor at Princeton. A disciple of Niels Bohr, Wheeler drew Feynman into collaboration on his work in quantum field theory. Wheeler postulated that there is only one electron that goes forward and backward in time. At any given time only isolated parts of its path are exposed which is the particle we recognize. Feynman didn't quite buy this but did develop a theory showing the positron as an electron going back in time. In this work on electrodynamics Feynman explored new techniques. He used path integrals which summed all possible paths a particle could take generating the wave function using a measure called probability amplitude. These concepts would be fully developed later in his version of QED. By the time he was a 22 year old graduate student Feynman with Wheeler's help was giving a presentation attended by Einstein, Pauli and mathematical genius John von Neumann.

Feynman had fallen in love with Arline Greenbaum, who he had known since high school. In 1941 she was diagnosed with lymphatic tuberculosis, an unusual form of the disease with a poor but uncertain prognosis. Also in 1941 WWII started. Wheeler left for Chicago to work with Fermi. Feynman engaged in isotope separation work at Princeton. Wigner told him it was time to write his thesis and move on. Feynman graduated and had planned to marry Arline. But what about the disease: Could he catch it, could they have children? He married her anyway, despite his mother's objections, and even though Arline had to stay in a nearby hospital afterwards.

In early 1943 Feynman received a call from Robert Oppenheimer saying he had found a nice sanatorium for Arline near Albuquerque, New Mexico. He needed Feynman in Los Alamos. Feynman became a group leader and made significant contributions to the calculations critical to the bomb's success. He streamlined the use of the simple calculation devices available. His unmatched speed at complex mental calculations often delivered answers more quickly. He served as a sounding board for the eminent Bohr who realized only Feynman was brazen enough to point out his mistakes. Feynman also inspected and made important recommendations that prevented disastrous explosions at Oak Ridge and Hannaford where uranium was purified.

In 1945 Arline died and it affected Feynman deeply for the rest of his life. Distraught he was given leave and just made it back in time to witness the Trinity explosion. He had impressed Oppenheimer who wanted him to come to Berkley after the war but he followed his Los Alamos department head and future Nobel Prize winner Hans Bethe to Cornell.

At Cornell, Feynman formed a relationship with a young Freeman Dyson, the English mathematician. Both agreed on the importance of visualization. Quantum descriptions of the electron made this impossible. Bohr had given up on his original conceptualization of the atom as some kind of mini solar system. Describing electrons as particles with orbits, angular momentum and spin alluded to a physicality that did not exist in the quantum world. Yet visualization was important. Einstein's greatest achievements were inspired by visualization such as traveling along with a beam of light. Just manipulating equations proved less productive. Even Dirac who eschewed experimentation, would visualize geometric shapes first then translate them into equations. Feynman tried to visualize the world he was describing mathematically. One can use lines to represent a magnetic field but are there really any such lines. Mathematically a field is just an array of values in space. Feynman said, "I have a terrible confusion between the symbols I use to describe the objects and the objects themselves."

In 1948 Julian Schwinger presented his work on quantum electrodynamics at a meeting of the world's top theorists who were duly impressed. Feynman followed presenting his version of QED including his soon to be famous Feynman diagrams but it was not well received. Afterwards Freeman Dyson put together a paper which refined the mathematics supporting Feynman's ideas, and then Feynman published again. Gradually physicists began adopting Feynman's techniques instead of Schwinger's. Feynman's approach incorporated the principle of least action applied to particle paths, the path integrals Feynman had worked on under Wheeler. Summing of the probability amplitudes of these paths yielded the wave function. Implicit was the electron going back and forth in time. As Feynman put it, "It may prove useful in physics to consider events in all of time at once and to imagine that we at each instant are only aware of those that lie behind us."

In 1949 Feynman decided it was time to move on from Cornell. His personal life was unsettled and disorganized. He had numerous short term relationships with women and never established a permanent residence. He left for Brazil where he lived it up and accepted an offer at Caltech which gave him a first year sabbatical he could enjoy. In 1952 he married one of his many romantic interests. The marriage lasted four unhappy years and ended bitterly. In 1960 he married an English woman he met in Switzerland. This one was happy and lasted the rest of his life. They had a son and adopted a daughter. Feynman settled down.

At Caltech Feynman turned to the study of superfluidity, but he would return to QED. In the 1950's the accelerator age of particle physics was beginning. Caltech recruited Murray Gell-Mann who would lead mainstream particle physics in the sixties and seventies and open up the world of quarks. He also brought out Feynman's competitive instincts. But in 1957 under pressure from their department head they collaborated on an important paper proposing a theory of the weak interaction. While Gell-Mann respected Feynman's ability, he had little respect for Feynman's lack of decorum and sketchy documentation. Asked by a student about copies of some of Feynman's notes that he found, Gell-Mann replied that Feynman's methods are not used at Caltech. The student asked what Feynman's methods were. Gell-Mann replied "You write down the problem. You think very hard. Then you write down the answer."

Feynman's genius came in broad leaps often not explaining the intermediate details which were all computed or visualized in his head. Other physicists made their contributions methodically addressing the next unanswered question. But genius is more than excellence, something that could be expected of someone brilliant. Genius delivers the unexpected. It is brilliance combined with originality. Feynman didn't research all the available knowledge then proceed to the next step. Thus he would take on problems others might dismiss as already solved or unsolvable. He focused intently only on those parts that interested him and wrestled with problems in his head often using visual pictures that he would later turn into equations in some ways similar to Dirac, his hero.

In the 1960's Feynman was asked to help with the undergraduate program at Caltech. The result was a series of lectures for freshmen that were published, widely acclaimed and used by many universities. He began with the atom and looked at physics in his own unique if disjointed way. These lectures and many others have been packaged up in books for different levels of readers and are still popular today. In 1965 Feynman along with Schwinger and Tomonaga from Japan were awarded the Nobel Prize for their "fundamental work in quantum electrodynamics with deep ploughing consequences for the physics of elementary particles."

At a 1967 conference James Watson gave Feynman a copy of what would be his popular *Double Helix*. Feynman was impressed and immediately shared it with a friend who commented, "It's amazing that Watson made this great discovery even though he was so out of touch with what everyone in his field was doing." Feynman retorted, "That's what I've forgotten." He recognized that his best work had resulted from defining problems in ways others hadn't considered or proposing new solutions to problems considered already solved.

In 1977 Feynman was diagnosed with a rare cancer perhaps due to his work on the Manhattan Project. Another rare cancer would strike in the 1980's. But he had one last hurrah following the Challenger disaster in 1986. The only non-political appointee to the president's investigating commission he sought out his own set of facts as he always had. The disaster had been caused by an O ring that lost resilience at the cold temperature at the time of launch. When the commission was dancing around the responsibility for the O ring failure, Feynman was simple and clear. At a hearing he took a C clamp, pressured a sample of the material after putting it in a glass of ice water and showed everyone in the room that the material would not bounce back. This way of cutting to the chase was so typically Feynman and a fitting end to a remarkable career.

Richard Feynman died in 1988. Fellow physicist Paul Olum summed it up. "How could someone like Dick Feynman be dead? This great and wonderful mind. This extraordinary feeling for things and ability is in the ground and there's nothing there anymore… He was such an extraordinary special person in the universe."

---

### Josh Friedlander says

Gleick is a thorough, intelligent science writer able to give over complex ideas without sacrificing too much depth. He still lost me with some of the particle physics stuff.

Feynman started his academic career as a precocious math undergrad at Princeton, and went to the pinnacle of modern science, first at the Manhattan Project and later designing a daunting freshman physics curriculum at CalTech later published as "Six Easy Pieces". His career neatly parallels the modern perception of science: theoretical physics was transformed from a discipline akin, in practical application, to "medieval French", to a near-religion, captivating the awed respect of the public, and leading to enormous increases in governmental research spending and the development of "Big Science". And later, as the pace of new developments dropped, and scientists, confronted with an ever-increasing list of particles, gradually gave up on finding a unified theory of the atom, more mystical and antiscientific thinking gradually re-emerged.

Notable personal aspects of Feynman were his pre-feminist attitudes toward women, culminating in protests at some of his public talks, and, related, his near-constant womanising. (He never recovered emotionally from the death of his beloved first wife.) Also worth noting is that his quips and stories, seemingly off-the-cuff, were carefully rehearsed in his notebooks.

All of which shouldn't take away from the scope of his genius. Gleick sees his subject as the genius *par excellence*, akin to Einstein and Newton (the latter a previous biographical subject). He devotes a chapter in the final section to a fascinating discussion of the nature and history of "genius". Feynman's thinking was, in speed and clarity, unlike that of normal people.

One final point: in an interview with the BBC retold by Gleick, Feynman becomes quite agitated when asked to explain in layman's terms how magnets work. He insists that they just work. This is quite out of the ordinary, as in every other regard Feynman seemed to consider the ability to explain something in simple terms as the hallmark of a clear understanding. This just adds to my conviction that the Insane Clown Posse was really onto something.

---

### Darwin8u says

*"The first principle is that you must not fool yourself and you are the easiest person to fool."*
- Richard Feynman

*"Physics is like sex: sure, it may give some practical results, but that's not why we do it."*
- Richard Feynman

Feynman was lucky in three ways. First, the guy was born with a brain that somehow gave him access to problems with a speed and a dexterity that seemed magical to his peers, and his peers are people that already often stretched the capacity for knowledge and intelligence. Second, Feynman was lucky to be born at the right time. He came into his abilities at the right moment for Physics. He was there when physicists (post Einstein's relativity) seemed to grab a larger piece of global attention. Third, Feynman was lucky to have participated in WWII's war of the magicians (Los Alamos and the Atomic Bomb). All of these things combined with Feynman's iconoclastic nature, his perseverance and single-mindedness, his capacity to get to the root of problems, put Feynman second to Einstein in 20th century minds.

The book itself is a very good example of scientific biography. Gleick doesn't stray, however, too far from the anecdotal autobiography of Feynman in Surely You're Joking, Mr. Feynman!: Adventures of a Curious Character. Gleick elaborates, provides more detail, adds interesting vignettes on other Physicists that fell into Feynman's orbit (Wilson, Oppenheimer, Dyson, Dirac, Bohr, Schwinger, Gell-Mann, etc). Those diversions and Gleick's occasional riffs on the idea of genius keep this from being just an average scientific biography. It also was a bit stronger and more robust than Gleick's earlier work: Chaos: Making a New Science.

All that said, it still wasn't an AMAZING biography. I appreciated the time spent on the details. The accuracy and notes associated with this book, but a lot of the magic of the book existed in Feynman himself and not in the telling of it.

---

### Arjun says

Fantastic bio of Feynman, and likely the best (in the same vein as Isaacson's takes on Einstein or Jobs) that we'll see.

Highly recommended for anyone interested in the nature of science during Feynman's rise — a period where quantum mechanics was very much developing and characters like Feynman were radically unorthodox.

Hearing Feynman's story is truly inspirational and makes you want to go out and *discover* things.

---

### Greg Brozeit says

I doubt I've ever read a longer book. The text was only 440 pages, but I found that I re-read (and re-re and

re-re-re-read) a number of sections because the physics described was very deep and complex, especially for a layperson. But I feel I have a better understanding of the significant advances in physics in the 20th century as seen through the lens of Feynmman's intellect, methods and, as the title so ably states, genius. Although I still don't have a deep knowledge of concepts like quantum theory, quantum mechanics, quantum electrodynamics or quantum chromodynamics, I do feel as thought I understand why they are important in physics and other sciences.

I found the human stories of Feynman's first love (and marriage), his time at Los Alamos and his essential contributions to understanding the causes of the Challenger disaster to be great history and human interest. Also, his views on the math and science textbooks used in grade schools was a refreshing episode that humanized him even more for me.

And I learned that this book is really about two geniuses, Feynman and the author of the book, James Gleick. Gleick's narrative demonstrates an amazing gift of writing and synthesis that few could ever hope to achieve.

---