

Richard P. Feynman, No Ordinary Genius!

By Judith Light Feather

The title of the video on the right sums up the mindset of one the most intriguing scientists of our time.

Professor Feynman truly understood the reason for studying science and math, which he tried to explain throughout his lifetime. He enjoyed teaching physics and as he answered unusual questions posed by his students, he found new facets of ideas that were stimulated for his work as a theoretical physicist. Why and why not? These were always questions he encouraged and expected from all students. In 1998, I read his now famous speech, "There is Plenty of Room at the Bottom," which challenged the minds of physicists to explore the world of atoms at the nano scale of science. Since that time, I have wanted to know more about this physicist who was also a visionary.



As I posted the book review on our website last month, announcing the release of "Perfect Reasonable Deviations from the Beaten Track: The Letters of Richard P. Feynman," I decided to look for some other books that might give me some insight into his life and his genius. While searching his publications, I decided on an older book first, which might introduce me to the man behind the science. The title was intriguing, so I ordered "Surely You're Joking, Mr. Feynman!"... Adventures of a Curious Character, which opened the door into the mind of Richard P. Feynman, allowing me to discover through his eyes and thoughts, a worldview that matched my own vision.

Reading the book had me wishing that I could have met Mr. Feynman while he was alive and exchanged thoughts with him on many subjects covered in his writings. I had a very strong desire to feel his presence so before I started writing this profile, I visited the website that markets his audio tapes and listened to a few of the tracks to hear his voice. His enthusiasm and sense of humor were very much evident in the stories recorded on those tapes, which were the basis for his books. I am sure that I will be collecting the entire set of tapes, along with the rest of his books and videos. They would make a great package of learning materials to stimulate the minds of students to explore their world, ask questions on everything they see in nature and experience the world with humor and curiosity. Many of the discussions that take place concerning education are directed at the lack of stimulating materials that would challenge a student to enter the many scientific fields of discovery.

This thought brings me back to one of the questions that reviewers of grant proposals for education projects seem to ask each time we submit a proposal. "Why do all children need to learn science since very few will actually become scientists?"

My answer has always been: "Science is the study of nature and how the physical world works! Therefore, if you make the classes interesting and challenging, rather than requiring the rote memorization of facts, labels and theories, more students would choose to learn science and try the experiments. You need to get them off the pages of the textbook and into the real world of discovery. They need to ask Why?... and Why not?... in order to learn."

Mr. Feynman asked a similar question after teaching a semester of science in Brazil and realized that the students did not learn any real science, they just memorized facts to pass the test. Therefore, when

he was invited by the students to give a review of his experiences of teaching in Brazil, he asked if he could speak candidly, without any limits, and they agreed.

As the lecture hall was full, he started out by defining science as an understanding of the behavior of nature. Then he asked, "What is a good reason for teaching science?, allowing of course, that no country can consider itself civilized unless...

Then he stated that, "The main purpose of my talk is to demonstrate to you that NO science is being taught in Brazil!"

He went on to point out that he was very excited upon arriving in Brazil, that he noticed so many young elementary school students were buying books on physics, as they do not teach physics to young children in the United States. However, the reason he found that amazing was that you do not find many physicists in Brazil...and he was wondering...Why is that? So many kids are working so hard and nothing comes of it.

Then he held up the elementary physics textbook they were using. "There are no experimental results mentioned anywhere in this book, except in one place where there is a ball, rolling down an inclined plane, in which it says how far the ball got after one second, two seconds, three seconds, and so on. The numbers have 'errors' in them--- that is if you look at them, you think you're looking at experimental results, because the numbers are a little above, or a little below, the theoretical values. The book even talks about having to correct the experimental errors---very fine. The trouble is, when you calculate the value of the acceleration constant from these values, you get the right answer. But a ball rolling down an inclined plane, if it is actually done, has an inertia to get it to turn, and will if you do the experiment, produce five-sevenths of the right answer, because of the extra energy needed to go into the rotation of the ball. Therefore, this single example of experimental 'results' is obtained from a fake experiment. Nobody had rolled such a ball, or they would never have gotten those results.

"I have discovered something else," he continued. "By flipping the pages at random, and putting my finger in and reading the sentences on that page, I can show you what's the matter---how it's not science, but memorizing, in every circumstance."

...another example...he stuck his finger in and began to read: "Triboluminescence. Triboluminescence is the light emitted when crystals are crushed..." ... "and there, have you got science? NO! You have only told what a word means in terms of other words. You haven't told anything about nature---what crystals produce light when you crush them, why they produce light. Did you see any student go home and try it? He can't.

“But if, instead, you were to write, ‘When you take a lump of sugar and crush it with a pair of pliers in the dark, you can see a bluish flash. Some other crystals do that too. Nobody knows why. The phenomenon is called “triboluminescence.” Then someone will go home and try it. Then there’s an experience of nature.”

Reading this explanation by such an honored and respected physicist was heartwarming. He also had a chapter on his experience with the State Board of Education in California, who requested that he serve on the State Curriculum Commission, which had the task of choosing new textbooks for the entire state.

To make a long story short, he ended up with a seventeen foot bookshelf full of new math textbooks, which he agreed to review for the state. It was a pretty big job, but he read every one of them, exploding like a volcano every so often as the books were so lousy. As he stated, “They were false, they were done hurriedly, and he felt everything was a little bit ambiguous---they weren’t smart enough to understand what was meant by ‘rigor’.”

The books were so bad that the commission ended up recommending supplementary books as a package to help the teachers. In the end the whole project was scrapped as the Board of Education did not have enough money passed by the Senate to purchase the recommended books. The following year they were going to review science textbooks and Mr. Feynman did look at a few of them, but they all turned out to be equally horrifying, which cinched his decision to resign from the Commission.

The saddest part of this story is the fact that these events took place in the decade of the 60’s and nothing has really changed. The textbooks are still lousy, and the structure of the original Department of Education system, which this country has totally outgrown, is still in place. Mandatory National testing is the lazy man’s way of checking education accountability and the consistent low scores reflect our failure as a nation to correct the flaws. The ‘Holy Grail’ of the departments in control of developing new instructional materials seem to be the National Standards. When I questioned the experts as to whether the flaws that have been discovered in the structure of the curriculum were corrected yet, I was told that we still do not know “how children learn.” More research is necessary. In the meantime another decade is slipping away.

I think if Mr. Feynman were alive, he would ask ... WHY they still have not addressed the problems he pointed out in the 60’s and WHY do they need National Standards and National Mandated Testing, when they are not permitted to develop excellent National Curriculum so that all children really have the same opportunities for excellence in education. How can you develop a national test when everyone is using different textbooks? The answer is... you can’t!

The ultimate proof is in the low test scores and proficiency rates for the entire country in math and science, along with the high drop out rates in 9th and 10th grade across the nation. June is the month that the NCES <http://nces.ed.gov/programs/coe> publishes the Condition of Education Report in the United States as mandated by Congress. You can download it online or order a copy sent to you at no charge.

In closing I would like to state that it would have been most interesting to have Mr. Feynman on board to help change the system. He would have made a great ally. The last chapter of the book is adapted from the 1974 Caltech Commencement Address in which Mr. Feynman addressed “integrity in science

and in taking our place in the world.” The closing remarks tell us so much about the World View of Richard P. Feynman...the man who enjoyed the simple pleasure of finding things out. No ordinary genius, but an exemplary role model in these troubled times as we struggle with the lack of good education and the loss of integrity to make the changes, due to the many stakeholders invested in our old outdated failing structure!

“So I have just one wish for you--- the good luck to be somewhere where you are free to maintain the kind of integrity I have described, and where you do not feel forced by a need to maintain your position in the organization, or financial support, or so on, to lose your integrity. May you have that freedom.”

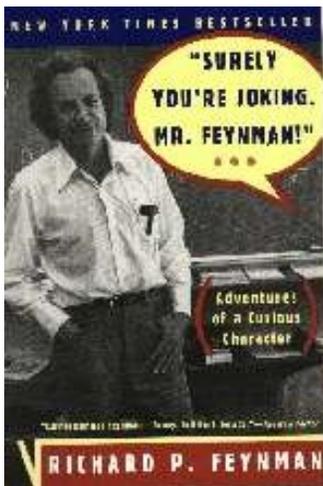
Richard P. Feynman 1974



Post Office Honors Richard P. Feynman with a Commemorative Stamp

Four American scientists-geneticist Barbara McClintock, mathematician John von Neumann, physicist Richard Feynman and thermodynamicist Josiah Willard Gibbs-also make the April stamp lineup, as does poet, novelist, educator and three-time Pulitzer Prize winner Robert Penn Warren.

Richard P. Feynman (1918-1988) developed a new formulation of quantum theory based, in part, on diagrams he invented to help him visualize the dynamics of atomic particles. In 1965, this noted theoretical physicist, enthusiastic educator and amateur artist was awarded the Nobel Prize in Physics.



"Surely You're Joking, Mr. Feynman!": Adventures of a Curious Character

by Richard P. Feynman, Ralph Leighton, Edward Hutchings (Editor) "WHEN I WAS about eleven or twelve I set up a lab in my house..."

Buy at www.Amazon.com

http://www.amazon.com/exec/obidos/tg/detail/-/0393316041/qid=1119798029/sr=8-2/ref=pd_csp_2/102-1881876-1735363?v=glance&s=books&n=507846



What Do You Care What Other People Think?: Further Adventures of a Curious Character

by Richard P. Feynman, Ralph Leighton (Contributor) "I HAVE a friend who's an artist, and he sometimes takes a view which I don't agree with..."

Buy this book at www.amazon.com

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The Feynman Tapes: Volume 1. (as recorded by Ralph Leighton)

"Chief Research Chemist" and other stories. Richard Feynman tells some of his legendary stories to Ralph Leighton. You've read edited versions of these stories in his books Surely You're Joking Mr. Feynman and What Do You Care what Other People Think, now hear them as "The Chief" told them! 57:29 running time.

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Horizon:
The Pleasure of Finding
Things Out

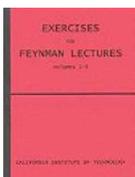


The Pleasure of Finding Things Out

is fifty minutes of pure Feynman, filmed in 1981 and at last available on home video to delight and inspire anyone who would like to share something of the joys of scientific discovery. Feynman is a master storyteller, and his tales -- about childhood, Los Alamos, and the Bomb, or how he won a Nobel Prize -- are a vivid and entertaining insight into the mind of a great scientist at work and play. 50 minutes, produced by Christopher Sykes.

The transcript for the video is also available. This 22 page booklet contains a complete and accurate transcription of the documentary done by Michael Okuda. Video includes transcript

<http://www.scs-intl.com/trader/>

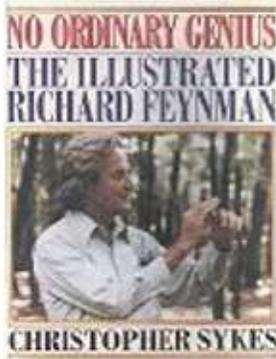


More Feynman Books

Exercises & Solutions for the Feynman Lectures on Physics by Robert Leighton. Three volumes (bound as one) designed to accompany the seminal series of lectures given by Feynman at Caltech in the early 60's. These volumes are very hard to find and no set of the lectures is complete without it! (Not all solutions are given.)

Note: Item ships directly from distributor on the west coast.

<http://www.scs-intl.com/trader/>



No Ordinary Genius by Christopher Sykes.

Sykes is a documentary filmmaker for BBC TV who grew to know the great physicist while making two films about his life. He has compiled selections from Feynman's writings and other sources and arranged them in topical chapters, supplemented with photos. This photo-album tribute presents a series of quick-but-intimate portraits through photographs of Feynman and friends and a selection of entertaining and revealing excerpts from interviews and conversations. The supporting cast includes physicists Richard Davies, Freeman Dyson, David Goodstein, and John Archibald Wheeler as well as a couple of computer scientists, artists, musicians, and Feynman's children. The main events of Feynman's life--winning the Nobel Prize; working at Los Alamos; discoveries in superfluidity, diffusion, and radioactive decay; and investigation into the "Challenger" tragedy -- are all discussed, as is Feynman's gift for having fun.

Also now in Paperback <http://www.scs-intl.com/trader>

QED: A play \$8.95

by Peter Parnell, Richard Phillips Feynman, Ralph Tuva or Bust Leighton

"QED is a seductive mix of science, human affections, moral courage and comic eccentricity... not to be missed." - John Simon, NEW YORK MAGAZINE "...The play itself is a kind of proof, dramatically illustrating how a man who happens to be a genius elegantly and movingly works through the human problem of how to face the end of his life." - Nancy Franklin, THE NEW YORKER With a moving and powerful introduction from Alan Alda. Who knew that quantum electrodynamics could make for a dramatic read? In the hands of the late, great physicist Richard Feynman, it does. Feynman's theory of QED is just one of the many topics the playwright Peter Parnell explores in this nearly-one-man show, a recent Broadway triumph for star Alan Alda as Feynman. Set in Feynman's office on the weekend of his realization that he has terminal cancer, this play is an intellectual tour-de-force that captures the unique, hilarious, and puckish genius that Feynman was. From his work on the Manhattan Project to the death of his beloved first wife, from his mission to reconstruct the Challenger space shuttle tragedy to his Nobel-prize winning physics ideas, the mere resume of Feynman's life is fascinating. But Parnell give us more, letting Feynman fill in the details of his life. When he reads a letter he wrote to his wife after her death, or flirts with a student, or chillingly recalls walking around Manhattan calculating how much damage an atomic bomb could do, we grow to love the man behind the scientist. And we read in fascinatin as he puzzles out the problem of his own death. Combining the current interest in science and math in the entertainment world with one of the most entertaining scientists in U.S. history, QED is a tour-de-force.

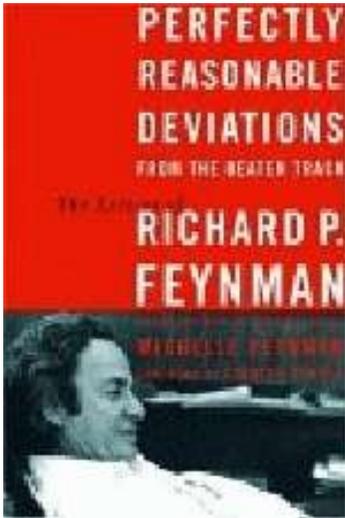
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and the latest Book...

Letters of Richard P. Feynman

Brendan Boyle

nonfiction



Perfect Reasonable Deviations from the Beaten Track: The Letters of Richard P. Feynman edited by Michelle Feynman

En route to a conference on liquefied helium and high-energy physics, Richard Feynman wrote to his young niece describing the work that scientists do. "Atoms are complicated," he explained in a letter datelined "flying over England." "Maybe like watches are -- but atoms are so small that all we can do is smash them together and see all the funny pieces (gears, wheels, and springs) which fly out. Then we have to guess how the watch is put together... Now it looks like we know most of the parts that go in -- but nobody knows how they fit together."

Feynman won the Nobel Prize in Physics in part for figuring out how all those parts that go in fit together. Technically, in the words of the Swedish Royal Academy, he won it for "fundamental work in quantum electrodynamics with deep-ploughing consequences for the physics of elementary particles." Feynman was already on his way to minor celebrity before the prize. His Lectures on Physics had brought him great acclaim but television made him famous. "Dear Richard," wrote one swooning fan, "I've fallen in love with you from seeing you on NOVA." Only Captain Kirk could make time travel sound sexier. But Kirk could only say, "Beam me up." Feynman could actually explain it.

Perfectly Reasonable Deviations From The Beaten Track: The Letters of Richard P. Feynman brings together previously unpublished letters, organized more or less chronologically. The early letters, mostly sent to Feynman's convalescent wife Arline, carry an Albuquerque postmark. It was there that the twenty-four-year-old Feynman, fresh out of graduate school, was working on the atomic bomb. The bulk of the material comes from Feynman's days at Cal Tech. The recipients are a motley gang -- professional colleagues, old girlfriends, depressed former students whose experiments were going nowhere, crackpot amateur physicists, and Gweneth, Feynman's third wife. The letters are brisk, unpretentious, and, above all else, amazingly clear. Even the rarefied stuff of quarks and mesons seem a short step away from the levers and pulleys of high school physics lab.

Making straightforward sense of the natural world was Feynman's goal. He wrote this short note to a colleague's son who had asked why the sun looked red at sunset. "Air molecules scatter blue light more than red... The light that is not scattered -- that passes from the sun to the eye directly -- has less blue in it -- and even less blue the more air it goes through. Thus as it sets, and we look at it through a very long column of air, [the sun] looks very red indeed." This explanation is classic Feynman: short, clear, and utterly free of condescension. And Feynman wasn't just being nice. He's almost always gracious, even when it probably wasn't warranted. Some of the most enjoyable letters are to the various day-dreamers who claimed to have stumbled upon a fundamental theory of physics from the comfort of the living room. It's a wonder that Feynman even wrote back to these mopes. That he did so with great patience, kindly pointing out where each wild theory goes wrong, makes him very attractive.

The letters are full of homely advice. "If you have any talent, or any occupation that delights you, do it, and do it to the hilt. Don't ask why, or what difficulties you may get into," he tells teenager after teenager. The sentiment is nothing special, but I suspect that it was just what the little brainiacs who wrote to him needed to hear. The same for the former student upset that he isn't talented enough to work, like Feynman, on "problems close to the gods." "No problem is too small or too trivial if we can really do something about it."

Only with his first wife Arline does Feynman sound awkward and uncertain. Three months before her death he writes, "So long sweetheart. Everything will probably come out OK." That "probably" is, of course, correct. Everything wasn't going to come out OK. But it sounds horribly wrong and needlessly scientific. It stands out as a rare moment when Feynman's quantum-mechanical brain got the better of him. But perhaps this brain got the better of him for more than a moment. His second marriage lasted less than a year. Because this collection includes no letters from that time, we're left wondering whether science sunk this relationship too. By the time he married his third wife in 1960 the "probably," at least in matters of love, had changed to "absolutely." The marriage lasted until Feynman's death in 1988.

Feynman could be testy, particularly when someone wrote to him with a question without thinking hard about it first. But he was also short with anyone who questioned the value of scientific inquiry. After Feynman had disparaged modern poets for a lack of curiosity, an admirer sent him a copy of Auden's "After Reading a Child's Guide to Modern Physics" and invited him to recant. "Mr. Auden's poem," Feynman wrote in response, "only confirms his lack of response to Nature's wonders for he himself says that he would like to know more clearly what we 'want the knowledge for.' We want it so we can love Nature more. Would you not turn a beautiful flower around in your hand to see it from other directions as well?" By putting science in the service of beauty and awe, the ever-romantic Feynman beats the poets at their own game. Wonder and imagination were his main tools. Particle-accelerators and electron-microscopes just made the job easier.

**Perfectly Reasonable Deviations from the Beaten Track: The Letters of Richard P. Feynman
edited by Michelle Feynman**

Basic Books

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384 Pages

<http://www.amazon.com/exec/obidos/ASIN/0738206369/artandlies-20/002-6829595-361606>

Featured Profile of Richard P. Feynman was written as a Teacher/Student resource to encourage young students to explore science for a greater understanding of Nature and How the World Works. A wonderful role model for challenging young minds... as Professor Feynman was no Ordinary Genius!