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# Milk and Lemon

## Steven Shapin

- *Don't You Have Time to Think? The Letters of Richard Feynman* edited by Michelle Feynman Buy this book

Should you win the Nobel Prize in physics, a lot of people will get in touch. Some of them will be former students (wishing you well); some will be colleagues (saying they wish you well). Presidents and prime ministers, who have no clue what it is you've done, will write, expressing the nation's gratitude for whatever it is you've done. Childhood friends will write, saying they knew that nerdiness presaged Nobelity. Old schoolteachers will write, basking in reflected glory and taking their share of credit. The in-laws will write, implicitly retracting their former low opinion of their child's choice. From all over the world complete strangers will write, requesting photographs and autographs and asking for validation of a totally original unified field theory that somehow escaped Einstein's attention. Fathers of miserably lonely adolescent geeks will write, wondering whether it will turn out all right. And so too will the adolescent geeks themselves, asking what you were like at their age and whether you think they've got a genuine vocation for science.

After winning the 1965 prize in physics, Richard Feynman seems to have answered them all. He had been notorious for not answering letters, but the occasion appears to have got the better of him. Most writers received a formulaic response. Feynman told Lyndon Johnson that the presidential telegram made his day; he gave his former senior colleagues a version of an Oscar speech, saying how he couldn't have done it without them; he thanked his school and university teachers for their excellent service; he solicited practical advice from previous laureates about whether he'd have to walk backwards down the steps after receiving his prize from the King of

Sweden (about which he was seriously nervous); he traded bonhomous badinage with girlfriends from the distant past; he cheerfully sent the photographs and supplied the autographs; he commended the amateur physicists for their bold conjectures, which, unfortunately, he was obliged to refute; and he told the geeks and their parents not to worry. It was good to be an obsessive. Find your obsession and cultivate it. Don't worry about what the other kids think, and don't worry about 'balance'. You don't need 'two cultures' if you can take one really seriously. If you're obsessed with how a watch works, nobody should force you to figure out how a poem means. To the anxious father of a 16-year-old Alaskan nerd, Feynman wrote one of his gentler letters. When you're a young obsessive, Feynman counselled, 'you only want to go as fast as far and as deep as you can in one subject . . . But later on when you get older you find nearly everything is really interesting if you go into it deeply enough. Because what you learned as a youth was that some one thing is ever more interesting as you go deeper.' Finding out how things work is 'the real fun of life'. What is it that would 'make a smart 16-year-old stop for a minute and think'? 'Nothing, now, I hope. But to fall in love with a wonderful woman and to talk to her quietly in the night will do wonders.'

Feynman won his prize – shared with Julian Schwinger and Sin-Itiro Tomonaga – for 'fundamental work in quantum electrodynamics (QED), with deep-ploughing consequences for the physics of elementary particles'. Feynman's major contribution to the field was essentially a brilliant bookkeeping device, a set of stunningly simple graphic conventions ('Feynman diagrams') allowing physicists to describe the complex interactions of subatomic particles and to avoid some horrendous calculational problems that had bedevilled the field and threatened to block its advance. Initially, Feynman's diagrams met with blank incomprehension – their visual idiom was gibberish to other theoretical physicists – but, with the help of Freeman Dyson at the Princeton Institute for Advanced Study, the diagrams soon became the lingua franca of QED physicists and their use was extended to several other sorts of physics.

The diagrams have acquired iconographic status: Feynman decorated

his camper van with them and you can get Feynman diagram T-shirts at nerd supply shops everywhere. The diagrams are cult objects and so too, 17 years after his death, is their originator. There are now six biographies, of which the best remains James Gleick's inevitably-entitled *Genius* (1992). Feynman's Caltech *Lectures on Physics* and collections of miscellaneous anecdotes and essays remain in print and in demand, as do audiotapes and videos of his lectures: he was a scientific performance artist of remarkable appeal. There is a recording of Feynman playing the bongo drums with Siberian Tannu Tuva throat-singers. *Infinity* (1996) is a miserable Hollywood movie, starring Matthew Broderick, about Feynman's time as a very young man helping to build the atomic bomb at Los Alamos: 'He was no ordinary genius. Theirs was no ordinary love.' Alan Alda played Feynman in Peter Parnell's well-received New York stage play *QED*. Christopher Sykes's BBC *Horizon* programmes on Feynman were popular hits, in Britain and the US. (A female letter-writer announced that she'd 'fallen in love' with Feynman from seeing him on TV: 'You are a feyn-man. Are there lots of physicists with fans?') There are bidding wars on eBay for Apple Computers' 1998 'Think Different' advertising posters featuring Feynman. Another poster, with Feynman in what seem to be Buddhist monk's robes (or anyway something Eastern and mystic), adorns the rooms of physics undergraduates all over the world. Feynman's performance at the *Challenger* disaster hearings – dipping rubber rings in cold water and demonstrating their brittleness – remains an emblematic piece of theatre: scientific common sense and integrity seeming to cut through bureaucratic stupidity and obfuscation. And, just recently, Feynman was honoured with a US postage stamp, featuring the man and the eponymous diagrams. Many people who know nothing about QED and little about theoretical physics take their image of science and the ideal scientist from the person of Richard Feynman.

It was a very public persona: theatrical, self-consciously paradoxical, both naive and faux naive, seemingly spontaneous and confessional but artfully prepared and always reserving something of himself from the public domain. The hand-waving, the shifting from foot to foot, the rapid-fire presentation, the Tony Soprano accent promising infinitely less intelligence than it delivered, the only-seeming

lowering of the scientific tone – a pose that Feynman himself called 'aggressive dopiness' – were all part of the most magnetic modern scientific act. To appreciate its power, you really had to be there. The gestures were often frankly charismatic, in the strictly Weberian sense: 'It is written, but I say unto you.' Feynman liked to represent himself as an autodidact, and used his immense personal authority paradoxically to commend autodidacticism to his followers. He made great play of a direct, intuitive and commonsensical approach to physics, but his lectures were so oracular, allusive and demanding that some of the Caltech undergraduates drifted away, their seats taken by Feynman's colleagues. Feynman's studied silliness challenged spectators to find the profundity behind the buffoon's mask. He made a character of himself, and the anecdotes he told about himself made great play of how little he knew about anything but physics: 'Surely you're joking, Mr Feynman,' a Princeton dean's wife allegedly responded, when, having asked the young Feynman whether he wanted milk or lemon in his tea, was told 'Both'. C.P. Snow said of Feynman that it was as if 'Groucho Marx was suddenly standing in for a great scientist.' But it was not so much Groucho as Trickster, Loki or Zebedee.

For all the studied naivety and scientific intuitiveness, Feynman's supreme skills were those of a rational calculator. As Gleick said in his biography, Feynman was 'mystifyingly brilliant at calculating'. The rational calculations were not, however, confined to the scientific sphere. In 1945, while he was calculating the shock waves of atomic implosion at Los Alamos, Feynman's much loved first wife, Arline, was dying of tuberculosis. In order to have her closer to him, he persuaded her to allow herself to be moved from a sanatorium in Albuquerque to the base hospital. Once there, she begged him to allow her to return to Albuquerque, where she was more comfortable and the staff were more attentive. From a distance of at most several hundred yards, Feynman wrote his wife a long letter, reasoning with her and urging her to use her own reason to overcome her emotions. Strangely, the letter referred to her in the third person and must be one of the more bizarre expressions of faith in the personal power of reason ever produced. The heart, Feynman evidently believed, has no reasons that reason cannot know:

> Hello Sweetheart . . . I have a problem which I can't handle and I'd like to discuss it with you . . . My wife and I thought that it might be a good idea to move her from Albuquerque . . . because we could see each other every day instead of once a week . . . Now . . . she is quite unhappy, and wants to return immediately to Albuquerque . . . Now the obvious (to my mind) solution to all this is to take it easy, have patience and just wait and see whether things can be made to get better . . . All I want to wait for is for her to get and feel strong enough to explain her needs patiently as many times as necessary to those who take care of her – and to feel strong enough to explain the problem in a reasonable way to me so that I'll see that it is *reasonable* to return to Albuquerque.

Feynman lost his marital battle of reason. Arline went back to Albuquerque, where she died within a few months. He noted with dispassionate curiosity that the clock in her room had stopped at the precise moment of her death, and years later, he published a story showing how scientific method could lay to rest any temptation to a mystical explanation of the phenomenon. Arranging for an immediate cremation, Feynman returned to Los Alamos the next day, and his colleagues, busy with their calculations, asked him what had happened: 'She's dead,' Feynman replied, 'and how's the program going? They caught on right away that I didn't want to moon over it. (I had obviously done something to myself psychologically: reality was so important – I had to understand what *really* happened to Arline – physiologically – that I didn't cry until a number of months later.)'

The same unremitting constitutional rationality informed his seven-year battle to resign his membership of the National Academy of Sciences, to decline all honorary degrees and to refuse to write letters of reference for scientists already known to those requesting the letter. It was always the principle of the thing and, for Feynman, the principle was rational instrumentality. In the case of prizes, degrees and membership of honorific societies, the principle was the otioseness of being doubly honoured, since 'the pleasure of finding things out', and, of course, the recognition of his colleagues, were prizes enough – though he made exceptions for the Nobel Prize, the

Einstein Award, the Niels Bohr Medal and the Presidential National Medal of Science. And when it came to the relative values of different forms of academic inquiry, the basic principle seems to have been the superfluousness of the humanities, since deep scientific inquiry into the causal structure of things made for both superior knowledge and superior aesthetic experience. The flower scientifically analysed was a more beautiful flower, though there is little evidence of aestheticism in his response to classical architecture: 'The Parthenon,' Feynman wrote home, 'looks pretty good.' He periodically insisted on his ignorance of the arts, humanities and social sciences, but one of his many party tricks was to immerse himself in some such inquiry and then publicly show how he could beat practitioners at their own game. Scientific genius of Feynman's sort was transferable; that of the artist or poet was not. He could be a pretty decent artist or actor or linguist if he wanted to put some time into it, but the artist couldn't pick up theoretical physics in the same way. So far as cultural value was concerned, so to speak, QED.

Feynman's virtuosity in rational calculation was not just a technical skill but a basic character trait, defining his attitude to moral judgment. On the one hand, he wanted no part of the notion that atomic scientists bore the slightest 'social responsibility' for what they had done. At Los Alamos, Feynman wrote, the great mathematician John von Neumann 'gave me an interesting idea: that you don't have to be responsible for the world that you're in. So I developed a very powerful sense of social irresponsibility . . . It's made me a very happy man ever since.' The great thing about science – properly so called – was that it was capable, Feynman insisted, of yielding 'yes' or 'no' answers. How could you be responsible for, or be expected to take a position on, matters incapable of such certainty, such as what will happen in the future, what uses will be made of scientific findings and technological innovations, or how to take a position on actions whose consequences were too complex to calculate? So Feynman said: 'I don't know myself whether I am for nuclear testing or against nuclear testing. There are reasons on both sides.' Maybe it will kill people; maybe it will prevent war and save people's lives. 'I don't know . . . That's why I can be abjectly honest on this one.' Feynman needed to discover the philosophers' 'naturalistic fallacy' for himself:

'As far as I know in the gathering of scientific evidence, there doesn't seem to be anywhere, anything that says whether the Golden Rule is a good one or not . . . The common human problem, the big question, always is "Should I do this?"' As a scientist, Feynman couldn't answer such a question, and he reckoned that scientists had no business offering answers. On the other hand, Feynman's public identity hinged on repeated public displays of personal moral integrity. As a self-advertised autodidact, he was his own man, counselling adolescent admirers never to believe what the authorities said, even pouring praise on a young woman who found a mistake in one of his own books: 'You should, in science, believe logic and arguments, carefully drawn, and not authorities.' Writing to his third wife from the *Challenger* hearings, he admitted: 'I have a unique qualification – I am completely free, and there are no levers that can be used to influence me.'

It must have been awkward for his daughter, in editing these letters, to decide what to leave out. In the end, the decision was evidently taken on traditional grounds: Feynman comes out of this selection looking a better man than he was, and little or no reference is made to the epic scale of his sexual predation. While Arline was dying, he thought it OK to tease her about flirtations with other women, and after the death of the love of his life, all women seemed fair game, and he reasoned out a wholly instrumental approach to sexuality that balanced the moral books. Women used him, and it was both fair and rational that he should use them: prostitutes, bar girls, undergraduates, the wives and girlfriends of colleagues, and graduate students. Scientists at other institutions understood that they had to provide for Feynman when he visited, and such was his genius and – in a way – his charm that they generally did provide. He worked out the rules governing successful encounters with bar girls. Don't buy them expensive drinks, treat them with contempt, and they'll sleep with you. He bragged that he told one 'You are worse than a whore,' and got a result. Amazingly, Feynman did not seem to run out of predatory objects, though things did begin to turn nasty. One of his many girlfriends asked for money for an abortion, but then admitted it was a ruse and came back for more. 'You were too much of the "playboy",' she wrote in a letter printed in Gleick's biography, 'but I

was both embarrassed & intrigued by the effects that your girlfriends had on you when they called you in my presence. Sometimes you left the phone, shaking & foaming at the mouth . . . I recognised a baseness in you.' She intercepted an anonymous letter that had come to Feynman's house, addressed to 'Occupant': 'Dirty Dick, Filthy Fucking Feynman dates you. He will never marry you. Tell him he has made you pregnant. You'll make a quick $300-$500.' The girlfriend took the Einstein Medal hostage, and her husband threatened legal action and demanded money.

It was never clear with Feynman which lines, if any, separated moralism from libertarian amorality, the private from the public, the personally performative from the scientific residue of those performances. It's always a proper question to ask what difference a scientist's private life makes, but the answer to that question can never be glib, and in Feynman's case it's almost impossibly difficult: so much about the man's science was a public performance; he worked so hard to use his public performances and personal authority to extend his sensibilities, both about theoretical physics and about science in general. The material that his daughter excludes from this collection of letters is largely stuff that Feynman himself put into the public domain, boasts he made as a way of showing what an unconventional, rational and calculative man he was, how scientifically he lived his life. Feynman erupted when a Swedish correspondent suggested that playing the bongo drums was a way of showing that a physicist was human too. 'Theoretical physics is a human endeavour,' Feynman replied, 'one of the higher developments of human beings – and this perpetual desire to prove that people who do it are human by showing that they do other things a few other humans do (like playing bongo drums) is insulting to me. I am human enough to tell you to go to hell.' All too human.

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**Steven Shapin** teaches at Harvard and has written several books on the history of early modern science. His next will be *The Life of Science: A Moral History of a Late Modern Vocation*.

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