

**Driving Mr. Feynman Chapters 1, 2 and 12**

**By Steve Watkins**

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## **This book is dedicated to the memory of Richard Feynman 1918-1988**

### **Acknowledgements**

Thanks to all the characters in this book whose presence at Caltech helped shape my life in a positive way. Any resemblance to actual events, locales, organizations, or persons, living or dead, is entirely not coincidental. The names have been changed to protect the guilty.

It has been many years since I knew Richard Feynman, and many of my memories have faded. The writings of Richard Feynman and Ralph Leighton, James Gleick's *Genius*, Leonard Mlodinow's *Feynman's Rainbow* and Martin Gardner's *The Night Is Large* helped refresh my memory. Also Douglas Hofstadter's excellent book on Godel's Theorem, *Godel, Escher and Back: an Eternal Golden Braid*, was immensely helpful.

### **About the Author**

Steve Watkins was born in Dayton, Ohio in 1950. He earned a B.S. with Honors from the California Institute of Technology, an M.S. in Computer Science and a Ph.D. in Electrical Engineering, both from the University of California at San Diego.

Steve's Ph.D. thesis was based on applications of neural networks to climate modeling, and he is also the author of *Hardware Design For Software People in the SoC Era* (UCSD 2005). He is a co-founder of Blue Pacific Computing, a company that provides integrated circuit design consulting services to Fortune 500 companies in North America, Europe and Asia.

On his Facebook page he labels himself a Buddhist and a Libertarian. He was raised as a Methodist and has studied Buddhism, Islam and Hinduism. Steve has traveled the world extensively, including a year long, overland trip through Europe, the Middle East and India. He has held a large variety of jobs in addition to being a high-tech professional, including professional musician, professional scuba diver, teacher, assembly-line worker, lifeguard and postman.

Steve lives with his wife Sebia, teenage son Matthew and Golden Retriever Gromit in San Diego. He occasionally plays with the band the Railheads in the San Diego area ([www.therailheads.com](http://www.therailheads.com)).

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## **Introduction**

Initially I was trying to write a book that was constructed around two intertwining themes: the past and the future, but that proved to be too clunky. So this is a book mostly about the past. I did add one bit that is fiction, it's a short chapter about Theories of Everything for human behavior.

The book is partly about Richard Feynman, but it's also about the students at Caltech during the late 1960's and early 1970's. The first theme is the true story of a short period in my life when I had the undeserved good luck to work for Richard Feynman, the world famous Nobel-Prize-winning physicist. As a student at the California Institute of Technology I was Richard Feynman's chauffeur for a period in the early 1970's. Once a week I drove him between Pasadena and the Hughes Research Labs in Malibu. Each week I had more than two hours alone with the Nobel Laureate where we discussed everything under the sun. You'll get to meet Feynman and sit in on some of our conversations, and you'll also get to meet some other interesting characters.

Hopefully, you'll feel like you got to meet Feynman and got to know him a bit. Feynman was a bigger-than-life character and he was interested in nearly everything. He was a wise old rogue uncle, who could be counted on for a balanced opinion. He was a caring curmudgeon, who pretended not to care about social responsibilities, but who then turned around and tried to make a difference.

This version of the book includes Chapters 1, 2 and 12 to give you a taste.

San Diego  
May 15, 2012

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## **Part I: Life at Caltech**

### **Chapter 1: Feynman's Chauffeur**

Poets say science takes away from the beauty of the stars - mere globs of gas atoms. I, too, can see the stars on a desert night, and feel them. But do I see less or more?  
- Feynman

#### **A Fine Pasadena Morning at Orange Grove House**

I woke up to the clanks and crashes of Stormking bashing pots and pans around out in the kitchen as he put them away. It was about 10 am on a warm Fall Monday morning, with a bright sun shining in a cloudless blue Southern California sky. I could hear birds chirping and warbling outside my window, and the occasional soft whoosh of a car rolling down Orange Grove Boulevard in the distant background. The sweet scent of blooming jasmine drifted into my room. I was a senior and had made sure I had no morning classes that quarter. Life was good, and it was about to get better.

I heard the phone ring, then the sound of Stormking knocking on my door saying "Watkins, phone for you." I threw on some torn jeans, a faded sweatshirt, stepped into my soft moccasins and opened the door. Chet came bounding in to say good morning. Chet was our Orange Grove House family dog; he was forty pounds of friendly, tail-wagging collie and shepherd mix. I gave him a quick pat and a scratch behind his fuzzy brown ears, went out to the hallway and picked up the phone.

It was Lorraine, the vivacious red head who worked at the student job center. She said, "I have a job for you, if you're interested. A Professor Faneman needs a chauffeur for about four months to drive him to a lecture in Malibu once a week. It pays twenty dollars per week plus gas. You interested?"

"Sure," I said. I had never heard of Faneman, but twenty dollars for some easy work once a week seemed like a good deal. I was on a scholarship and a little spending money was always welcome.

As you travel with me through this short period in my life, I will introduce you to a few Caltech inhabitants. Gary Stormking, the guy who woke me up that fateful morning, is someone important I want you to meet. In those days he looked like a cross between Tom Petty and Jon Bon Jovi, with long, straight blond hair and a square jaw. When I first met him he had short hair, dressed like a preppy and had the overall clean-cut air of a football jock, which he was. Over time he had morphed into longhaired hippie, funky overall-wearing, football jock.

Stormking is one of the few true Christians I have ever known. By this I mean he followed this creed: have faith, love your neighbor, love your enemy and don't throw stones. I think Christ must have been someone like Stormking. I attended a Methodist Church back home in Ohio until I was in high school, and my parents attempted to mold

me into a Christian, but it never took. Like most scientists, I have no capacity for faith. I have my own religious beliefs, but they have nothing to do with faith. I have to see everything for myself. I have to learn for myself, often the hard way. Also, I can see too many other reasons to explain why people believe in religion, reasons that have nothing to do with the existence of God. Somehow, Stormking was both a scientist and a Christian. Later on, while in grad school he took a leave of absence for a year, and helped me form a working rock band. But that's another story, so back to this story.

I exchanged my moccasins for my white Adidas running shoes, went out to the side street and hopped into my rusting, green 1965 Dodge van. I pushed Neil Young's *Everybody Knows This is Nowhere* into the 8-track and drove down to campus. After a short search I found a parking space on San Pasqual, strolled into the job center and saw Georgette at the desk.

Georgette was a dishy brunette, even more voluptuous than Lorraine (the secretary who called). I had tried for a year to date both Georgette and Lorraine with no luck, but I hadn't been a pest about it and they were both still really friendly. Besides, now Kathy with living with me so I had better not be trying to date someone else. Back in those days I was living in a testosterone fog. Women readers, please don't hold that against me. I've outgrown that today. Aah, OK. I've outgrown that today, mostly.

I chatted for a while with Georgette. As usual, our conversation was about her actor boyfriend whom she suspected of cheating on her. Lorraine and I usually talked about the latest fiction she was reading. She was an aspiring writer who would later move back to the East Coast and become a writer for the soap opera *All My Children*.

"Hey Georgette, Lorraine said there was a chauffeur's job available for a few months. Do you have the info on it?"

"Sure, here's the name, address and phone. Professor Faneman wants you to stop by today."

So I called Faneman on the phone. His voice sounded familiar, but I couldn't quite place it. I drove over to his house, because he said he wanted to see my van to make sure it was adequate. The house was a quaint, older place, kind of small, but very nice. It was on a quiet, tree-lined street in Altadena, mostly above the smog.

I parked the van, walked up the steps and rang the doorbell. Through the window I could see a guy limping over to the door on crutches. He opened the door, I looked at him, and did a cartoon double take. My jaw dropped. I said to myself, "*Jesus Hbar Christ! It's freaking Feynman!*" Lorraine hadn't recognized his name and had misspelled and mispronounced it (it's Fineman, not Faneman). I was thinking, "*Wow! I'm going to be spending some serious quality time with the High Priest of Physics.*" I couldn't believe it.

Feynman invited me in and I sat down on a big overstuffed sofa. He asked,

“So, you’re an undergraduate, and the Student Job Center sent you over, right?” He spoke with a harsh, clipped Brooklyn accent.

“Yeah,” I replied.

“OK, here’s the deal. I give a lecture at Hughes Research Labs in Malibu once a week, and I need somebody to drive me out there and back for about four months, starting tomorrow. I wrecked my knee when I tripped on a curb in Chicago last month, and the doctor says I shouldn’t drive for four months. I’ll pay you twenty dollars, plus expenses on your car. The main ground rule is that you *can’t* talk to me on the way to Hughes, because I want to use that time to prepare my lecture. It takes at least an hour to get there, and that’s just enough time for me to scribble some notes, so I can give a decent talk. But on the way back, we can talk. Maybe we can both learn something from each other. Is the deal OK for you?”

“Sure, sounds good.” I’m thinking, “Jesus, this is a *sweet* deal.”

“I’d like to check out your van.”

“OK.”

We walked out to the van, and I opened up the side doors. When I bought the van the previous year I had removed the back seats and replaced them with a custom-cut piece of thick foam, a big comforter and some big fat pillows. Feynman sat down on the edge of the van, swung his feet inside, propped himself up on one of the pillows, closed his eyes, and then smiled. Inside the van there was a hint of stale pot smoke, but it was mostly overwhelmed by sandalwood incense. Either Feynman didn’t notice, or he didn’t care.

“This will do just fine. See you tomorrow. Meet me on campus at my office in the physics building at 11 am.”

“OK, see you then.”

Feynman hobbled back into the house. I drove off. Halfway down the block I pumped my fist outside the window and shouted, “*YESSS!!*”

## **Feynman, The Man**

For those of you who never met Feynman in his prime, he cut an impressive figure. During this period he was in his early 50's, but looked to be in his early 40's. He possessed chiseled, good looks and a full head of dark wavy hair that he wore a bit long, down over his ears and collar. If this book were a film he would be played by a middle-aged Tony Curtis, but more rough and rugged and less pretty boy.

The main thing you noticed right away about Feynman was his presence. He radiated an attitude of confidence that said, "I can do anything". And yet he didn't come across as arrogant, he was just super confident and had charisma, boatloads of charisma.

He was the King of Caltech, and it wasn't just because of his Nobel Prize in physics and the rumor that he was the highest-paid professor at Caltech. It was because he was fun-loving and seemed to live life to the fullest. He played conga drums and he had dated Vegas showgirls. It was also well known that he had testified in court to help keep a Pasadena topless bar open. There were lots of famous scientists around Caltech, but only Feynman stood out as both a Nobel Prize winner and a bigger-than-life wild man. Even today, many years after his death, his myth remains powerful.

Other students would have killed to have the job I had just stumbled into. It wasn't fair, because I wasn't really dedicated to physics like many of my friends. I was interested in physics, but also philosophy, biology, history and many things. I didn't know what I wanted to be when I grew up. Once word got around about my new job the typical conversation went something like this:

*“Watkins, you dog! What kind of dirt do you have on those girls at the student job office? How could this happen?”*

Me: *“I don't know. Just lucky, I guess.”*

If there were a God in heaven, this chauffeur's job would have gone to a dedicated physics major. But maybe there *is* a God because this job came to me, a lost scientist, and my time with Feynman has helped me to find my way ever since.

## Chapter 2: Lecture One: Quantum Mechanics and the Nobel Prize

What I cannot create, I cannot understand.  
- Feynman

### My First Day as Feynman's Chauffeur

The next day, Tuesday, I woke up at 10 am and took an extra hot shower, steaming up the bathroom and really feeling the hot stream melt my neck and shoulders. Showering in an off-campus college house can be a challenging experience. If you've ever lived off-campus, you know what I'm talking about. We weren't particularly good at keeping the house spick and span, and the bathroom probably suffered the most. There were at least three different kinds of mold growing around the toilet, the bathtub, and the shower curtain. As usual, I just tried to stay away from the mold. Visiting girls sometimes refused to even venture into the bathroom. After my shower I headed to the kitchen for a quick bite.

In the kitchen I was greeted by the rich smell of freshly brewed coffee. Even though the kitchen was sometimes a little groaty, we actually ate pretty healthy food. We always had a big pitcher of freshly made OJ, fresh vegetables, fruit and eggs in the fridge. I poured myself some coffee, added cream and sugar, and took a big sip. Then I twice toasted an English muffin to make it nice and crispy, spread on some all-natural crunchy peanut butter, and poured myself a big glass of OJ. I finished up my breakfast, brushed my teeth, picked up my daypack and headed out.

I slid into the van, popped a tape into the 8-track, *Traffic's Low Spark of High Heeled Boys*, and drove down to campus. Along the way I enjoyed the tree-lined streets and Steve Winwood's guitar solo on *Rock and Roll Stew*, and relished my new job driving Mr. Feynman. I stopped by Feynman's office and picked him up.

We took the 110 Pasadena Freeway into downtown LA with its towering skyscrapers, then headed north on the 170 Hollywood Freeway up through Hollywood, then over to the 101 Ventura Freeway and on out towards Calabasas. Got off the freeway at Las Virgenes Rd and headed south again down through Malibu Canyon. We wound around on the two-lane, picturesque canyon road for six or seven miles, almost to the ocean at Malibu. I could see the labs, perched high on the mountain ridge, overlooking both the mountains and the ocean. We turned in the Hughes driveway and I dropped off Feynman by the expensive-looking, plate-glass lobby.

After levering himself out of the van and getting up on his crutches, he turned and said, "Meet me here in an hour and a half."

"OK. I'm going to visit a buddy who just lives up the road. I haven't seen him for a while, so I think I'll just hang out there."

"OK, see you in an hour and a half."

## **Conversations with Feynman**

After his lecture I picked up Feynman at the Hughes lobby and we headed back to Pasadena. I wanted to jump right in and ask him about his Nobel Prize and his reputed unique ways of thinking. As we stopped at a traffic light I looked back at Feynman who was reclining comfortably on the camper bed and said,

“OK. Of course, I know you have a Nobel Prize. What exactly was your work that earned you the Nobel Prize? What are you working on today? Was the Nobel Prize a good thing? I know your work is in quantum mechanics, so remember I’ve only had the standard physics program here, which means two years of physics, but only one quarter of quantum mechanics, so go easy on me.”

Feynman fixed me in the eye, but warmly, a slight smile played around the corner of his lips, he rubbed his chin and replied, “Tell me what you think you know. Tell me a little bit about physics in general too.”

Feynman was testing me. I hesitated and tried to sound sure of myself, “Well, to me physics is the mother of all sciences. The laws of physics are at the root of all the other sciences, although I think the chemists and mathematicians don’t agree. But what I like about physics most is that it offers some almost magical explanations for everyday things.”

Feynman looked worried and said, “What do you mean magical?”

“I mean the world is not what it seems to our senses, especially in three big ways: the nature of the solar system, the nature of time and the nature of atoms. Copernicus and Galileo shattered the illusion that the Earth was at the center of the solar system. Einstein proved that time is not constant, only the speed of light is constant. And you and the rest of the quantum mechanical Nobel Laureates proved that atoms behave in totally weird ways.”

Feynman looked pleased and relieved and said, “OK. I didn’t know where you were going with magical. What do you know about quantum mechanics?”

“I know that Heisenberg’s Uncertainty Principle is the main law of quantum mechanics, that is, both the position and momentum of an electron can’t be known at the same time. We can know where an electron is, but we can’t know its momentum, or we can know its momentum, but we can’t know where it is. The famous double slit experiment says it all. In this experiment when a series of single electrons (or photons) are fired at a screen through a partition with two slits, an interference pattern appears on the screen showing that electrons have a wave-like nature. But when a detector is added to determine which slit the particle passes through, the interference pattern disappears, showing the particle-like nature of electrons. Even more amazing is that when even a single electron is fired without a detector, a wave pattern appears. It seems that a single electron behaves both a

like a wave and a particle. It seems like the electrons know if you are trying to detect them or not.

I also know that in the early days two different schools of quantum mechanics developed, one around Heisenberg with his matrix algebra, and one around Schrodinger and Dirac with wave equations. Both of these schools said that the old picture of the atom from Bohr and Rutherford was flat out wrong. The atom could not be accurately described as a miniature solar system with electrons neatly orbiting a nucleus. The schools of quantum mechanics said that pictures and visualization were wrong, and that mathematics was the only way to describe atomic behavior. That's about sums it up for me."

Feynman nodded his head and said, "OK. That's a pretty accurate story. So both Heisenberg's approach and the wave equations of Schrodinger and Dirac produced theoretical approximations for experimental measurements that were pretty accurate, given the crude level of measurements we could make before the war. But the theory still had problems because when pushed to their limits they produced crazy results, like electrons with an infinite mass.

So right after the war there was kind of a feeling of gloom, that quantum theory really hadn't progressed. It was a dead period of about ten or fifteen years after great progress in the early days by Heisenberg, Schrodinger and Dirac. We could figure out how to build an atomic bomb to destroy humanity, but we didn't have a good theory even for the behavior of electrons. So many bright physicists had worked together on the bomb and pushed experimental understanding ahead, but the theory was really lagging behind. Gell-Mann said that theoreticians were in disgrace. Others said we had all been just knocking our heads against the same old wall. Rabi said that past decade had been one of the most sterile in the history of physics. People were saying a lot of stuff like that. So people were kind of depressed because the theory was stuck, and I was personally depressed because I was stuck. Also I felt like I couldn't live up to these great expectations that great physicists like Bethe and Oppenheimer seemed to have for me.

I think the best way to tell the story is to talk about the three key conferences and the key people involved. The conferences all took place shortly after the war, about one each year starting in 1947. First there was Shelter Island in New York, then the Pocono Conference in Pennsylvania, and finally the Oldstone-on-the-Hudson conference. All the conferences were really small, only with a couple dozen people. The attendees were there by invitation only, and they were all the biggest names in physics or the rising stars at the time. Like, the Shelter Island conference had Oppenheimer, Bethe, Rabi and Teller. I guess Schwinger and I were considered a couple of the rising stars. Although at the time I felt more like a falling star."

"Falling star?"

"Yeah, like I said, I felt depressed and I was having a hard time recapturing the old joy and excitement I felt about physics before the war. I was still depressed by the death of my wife, Arlene. And there was this general atmosphere of gloom among quantum

physicists right before the Shelter Island Conference. But then by the end of the last conference at Oldstone two years later, things had completely turned around, and we had created more accurate new theories that bypassed the problems with infinities. But I'm getting ahead of myself.

So I was depressed enough that I was even thinking I might have to give up physics because I was burned out and not coming up with any new ideas. I was just starting my first real academic job at Cornell. I was trying all kinds of things to break out of this funk. I even spent time with some *philosophers*! I hung out with biologists, with chemists, all kinds of other scientists.

It was my sister who first helped knock me out of my funk. I was explaining my depression, and how I was worried that my boss and others would think I didn't have it any more, that maybe I never really had it, that I had been fooling everyone all along. She said,

'What? Why should you care what they think? Just go have fun with your ideas like you always did before! You don't have to live to try to please others. You have to live your life, not Mom, not Dad, not your boss. It's your life.'

So I began to try to just have fun following problems that were interesting. These problems wouldn't have to have an obvious application, they just needed to be fun. One morning in the cafeteria a plate fell on the floor and wobbled in a weird way. I began to try to analyze why the weird wobble. That led me back to electron spin. So I was thinking a lot about electron spin and new ways to visualize the theory, even though visualization was now looked down on. It was considered kind of return to Bohr's solar system model, but I wasn't thinking about visualization along those lines. I was drawing pictures of electron and photon interaction, creating path integrals. I think I'm a visual person, more right brain than left brain. Soon after deciding I needed to have fun with physics again I went off to the Shelter Island Conference.

Probably the most important thing that happened at Shelter Island was presentation of the latest experimental data that didn't match the old theory. Willis Lamb had measured a gap between two electron energy levels in a hydrogen atom that the theory said shouldn't be there. So people went off to try to figure out how to change the theory to match what we started calling the Lamb Shift.

Also on the last day of the conference Oppenheimer asked me to give a talk to the group about my work. After my talk I had the distinct feeling that I had been speaking Martian or something. No one seemed to understand me."

I ventured, "That's part of what you're famous for, isn't it?"

"Yeah. Maybe that's good, maybe that's bad. So now to keep the story going you need to know about Julian Schwinger and Freeman Dyson. After Shelter Island Schwinger, who was at Harvard, seemed to be making real progress in extending quantum mechanics

theory in a very rigorous mathematical way. And I was struggling along with a kind of unorganized tool kit of partly visual methods, ideas and methods I could barely communicate to anyone else. Bethe and Rabi seemed to be getting pretty excited about Schwinger's progress. So it seemed like I was working on one way to extend the old quantum theory and Schwinger and Bethe were headed off in another direction. There were other guys too, like Weisskopf and some other guy, who were onto something. Both Schwinger and I warned them off, telling them their theory was off in an attempt to look at interactions that took relativity into account. Turns out they were actually right, but Schwinger and I were really competitive with each other and everybody else in those days.

Then there was Freeman Dyson. Dyson was a British grad student who wanted to leave the world of mathematics and come over to the dark side of physics. About the time of Shelter Island Dyson had arrived at Cornell to follow his new path. Dyson was a child prodigy who started writing science fiction at nine, and like me he became obsessed with calculus in his mid teens. He had worked in the war effort in England, but his experience had been very negative. His work was in operational research where the government wanted him to prove that the Allied bombing of Germany was a success, when his research has showed it was a spectacular failure. So, Dyson was kind of cynical, but he seemed to understand me when I explained my path integrals. He began working for Bethe and right away Bethe gave him a problem to work on related to the Lamb Shift.

Now the second conference comes along, the Pocono Conference, I think this was in the Spring of 1948. This was pretty much the same group as the Shelter Island people, but now Dirac and Bohr joined us. These guys were like physics Gods of course. Again, the latest experimental data from the biggest particle accelerators was presented, and there was new data on cosmic rays. The second day Schwinger gave a presentation on his theory. It was a tour-de-force, but it seemed like the crowd wasn't too receptive. Schwinger lectured without notes and just kept deriving equation after equation. But he had to introduce his own complex notation to describe the interaction of the electron with its own field, and this seemed to draw a lot of tough questions.

Then it was my turn. I had planned on emphasizing my visualization techniques, but Bethe had warned me to try to emphasize the mathematics. He was right for that crowd, but it threw me off. Just like Shelter Island I felt like I was speaking Martian. Both Bohr and Dirac gave me a hard time. I felt like I had bombed again. I heard later that Oppenheimer was definitely impressed by Schwinger, but not impressed by me. Also by that time Tomonaga had appeared on the scene. In the end it was the three of us, Schwinger, Tomonaga and me, who shared the same Nobel Prize. Anyway, Tomonaga was working independently in Japan. He had been isolated by the war, and now his work seemed to confirm Schwinger's work. I also know that Schwinger didn't think too highly of my approach. Things didn't look too good for me, but I didn't care."

"Wow. So didn't you feel even more like giving up?"

“No. By then I was starting to feel like I was onto something. Even though people had been more impressed by Schwinger, his mathematics were too complicated to be useful by others. But my visualization approach was accessible and my diagrams began to turn up in other people’s papers. This was partly due to Dyson.

Dyson was the first one to see that Schwinger, Tomonaga and I were all talking about the same elephant and to get the word out. He even made some improvements in unifying our theories. As soon as I met Dyson and began talking to him about my ideas, it seemed like he was getting it.

But it was the summer after Pocono that everything began to come together. I had to go to Albuquerque and Dyson wanted to go to Ann Arbor to take a seminar that Schwinger was giving. Somehow we decided he should go with me to Albuquerque, and then he would backtrack to Ann Arbor. So we had a Kerouac road trip where we took Route 66 out west. Dyson got a chance to really see America, the green fields and black smokestacks of the Midwest, the wide Mississippi, the flat plains of Kansas, the barren desert of New Mexico. But more importantly for both of us, we spent long hours talking physics. We talked a lot about other stuff too. But we always came back to physics. We had some adventures along the way. We picked up hitchhikers. We spent the night in a brothel.”

“In a brothel?”

“I meant a seedy old hotel. Anyway, that trip seemed to light Dyson’s fire. It became his mission to find a new way to explain Schwinger’s approach and my approach in the extension of quantum mechanics theory. Dyson took the bus back to Ann Arbor, and he also took a really long bus trip back from California to Princeton at the end of the summer. He said that last bus trip was when he had his epiphany, a true flash out of the blue in how to unify our theories. Dyson said that his unification was ‘more reliable than Feynman and more usable than Schwinger’. Still not sure about that.

Dyson began to publish his unified theory and the tide began to turn. Bethe liked Dyson’s approach and he helped bring Oppenheimer around. Then Oppenheimer set up a series at Princeton for Dyson to present his ideas. By the time of the yearly American Physical Society Meeting, Dyson was on a roll and his talk was a standout at that meeting. I told him, ‘Doc, you have arrived.’

Then came the final important conference from my point of view, the conference at Oldstone. Dyson actually didn’t get to attend Shelter Island or Pocono, but now he was the star of the show at Oldstone. And I began publishing a ton of papers over the next few years. I think they totaled more than a hundred thousand words. It seemed like Schwinger was fading into the background. His approach was good and right, it was just too complicated. People couldn’t use it easily, but they could use my diagrams. People began to cite Dyson’s papers and my papers more and more. I think Schwinger even said something like ‘Feynman brought quantum mechanics computation to the masses.’ I don’t think he meant that as a complement.

So, to finish up, in 1965 I shared the Nobel Prize in Physics with Tomonaga and Schwinger for the work we did in the late 1940's on quantum theory. Dyson should have also shared the award, but the Nobel committee doesn't like to split the award more than three ways. I wish I had never received it."

"Why?"

"The fame has mostly been a pain in the ass. I don't care about money and power. I just need enough money to take care of my wife and kids, and to give me a roof over my head. My joy comes from being alone in my office, sitting and thinking or thinking at my whiteboard. Sometimes I like thinking and arguing with colleagues, working out ideas in a group. All I have ever really cared about are ideas, ideas that explain why the world works the way it does."

"But how was it a pain in the ass?"

"Let me give you a few examples. First of all, the day they announced the Prize awards the phone started ringing about 4 am with the first reporters. That went on all day, and that's when I first thought, 'I'm just not going to accept the damn thing.' So I mentioned this to the reporter from *Time Magazine* when he called. He said there would be a much bigger commotion if I didn't accept it. He was really nice because we talked for about twenty minutes, going back and forth. Finally he convinced me that I had better accept. By the way, the *Time* guy kept all that off the record, for which I was very grateful."

"That doesn't sound so bad."

"But it just gets worse. From that point on I was never able to give a talk without a crowd turning up. I like to please my audiences and when you get a bunch of non-scientists at your talk, then it's almost impossible to please your audience. If you give a detailed talk on the latest research, the average guy has no clue what you're talking about. But if you direct the talk to the lowest common denominator, the average guy, then the talk is worthless to other scientists. This happened at U.C. Berkeley and other places too many times.

So then I got the bright idea to give talks as a fictional professor. I tried this at U.C. Irvine when the physics club asked me to give a talk. I said I would do it on the condition that we came up with a boring title and a fictional professor, Warren or Waring or something like that. That worked out great at first, because only the dedicated physics club members showed up and we all had a good time. When the talk started I announced that Professor Warren couldn't make it, and he had asked me to fill in, since I was doing similar work. But then the faculty advisor got upset because he wasn't in on the joke."

"Yeah, I guess you're not the first one to say that fame is not all it's cracked up to be."

Feynman said, “OK, let me finish up on QED. The body of theories about electrons, photons, electromagnetism and quantum mechanics is now called Quantum Electrodynamics or QED. As much as I complain about Greek Theories of Everything, QED was kind of a Theory of Everything for a while. It explained almost everything in the experimental world of physics, until the zoo of the Standard Model started to show up with new particle accelerator experiments.

Since the late 1950’s I moved from thinking just about electrons to the nucleus of the atom. Physics dealing with the nucleus is sometimes called nuclear physics and sometimes called particle physics. Because doing particle collisions with the nucleus involves very high energies for the particle accelerators, its also called high-energy physics. (Particle physics theories would later be lumped into Quantum Chromodynamics or QCD). QED is kind of simple compared to particle physics, because there are so many more particles associated with the nucleus. Maybe the building blocks of these particles have fractional charges and don’t even exist free in nature, and so on.

Murray Gell-Mann has really kind of led the field in particle physics with his building blocks with fractional charges that he named quarks. I came at the nucleus from a different direction. I got interested in firing electrons into protons instead of firing protons into protons. I thought that proton-to-proton collision results were too complicated, kind of like smashing two pocket watches together, then trying to understand what the watches were made of by analyzing all of watch parts that remained. In analyzing electron and proton collisions I could see the idea of an elementary nucleus building block emerge, and I called this sub-particle a parton. It was essentially Murray’s quark, but I get a kick out of needling Murray, so I would call these building blocks partons whenever I could in conversation with him.”

“So, what about now?” I asked. “What are you working on now?”

“Right now I’m kind of struggling again. I’m bored with the old stuff, but I’m not sure where to go next.”

I became brave and asked a dumb question, “Since you’re Feynman diagrams can depict a positron as an electron moving backwards in time, does that mean time can travel backwards? Can we build a time a machine? Is that a dumb question?”

“No, that’s not a dumb question. That’s a *good* question. The kind of question many people are afraid to ask, because they don’t want to appear dumb. And no, I don’t think we will *ever* build a time machine.”

## The Legend of Quefithe

Dirac once created a fable that told the story of quantum mechanics up to the point of his contribution. Another physicist created the Legend of Quefithe (or Quafithe for Quantum Field Theory) to update Dirac's original fable. The original reference has since been lost, but I found it in both Gleick and on the web at:

[www.physics.ucf.edu/~costas/Courses/advQFT/MISC/Quefithe.html](http://www.physics.ucf.edu/~costas/Courses/advQFT/MISC/Quefithe.html).

In the legend Feynman, Schwinger and Dyson are the main characters. Feynman is the crow.

Once (and it was not yesterday) there lived a very young mole and a very young crow who, having heard of the fabulous land called Quafithe, decided to visit it. Before starting out, they went to the wise owl and asked what Quafithe was like.

Owl's description of Quafithe was quite confusing. He said that in Quafithe everything was both up and down. If you knew where you were, there was no way of knowing where you were going, and conversely, if you knew where you were going there was no way of knowing where you were. The young mole and the young crow did not understand much, so they went instead to the old eagle and asked him what Quafithe was like. The eagle shook his white-feathered head, sized them up with his fierce eyes, and said: "*Action gives automatically invariant description of Quafithe. You must study the unitary representations of the Lorentz group*". The mole and the crow waited for more, but the eagle remained silent, his gaze fixed on an unfathomable string in the sky.

Clearly, if they were going to learn anything about Quafithe, they had to see it for themselves. And that is what they did. After a few years had passed, the mole came back. He said that Quafithe consisted of lots of tunnels. One entered a hole and wandered through a maze, tunnels splitting and rejoining, until one found the next hole and got out. Quafithe sounded like a place only a mole would like, and nobody wanted to hear more about it. Not much later the crow landed, flapping its wings and crowing excitedly. Quafithe was amazing, it said. The most beautiful landscape with high mountains, perilous passes and deep valleys. The valley floors were teeming with little moles who were scurrying down rutted paths. The crow sounded like he had taken too many bubble baths, and many who heard him shook their heads. The frogs kept on croaking "*it is not rigorous, it is not rigorous!*" The eagle said: "*It is frightful nonsense. One must study the unitary representations of the Lorentz group.*" But there was something about crow's enthusiasm that was infectious.

The most puzzling thing about it all was that the mole's description of Quafithe sounded nothing like the crow's description. Some even doubted that the mole and the crow had ever gotten to the mythical land. Only the fox, who was by nature very curious, kept running back and forth between the mole and the crow and asking questions, until he was sure that he understood them both.

Nowdays, anybody can get to Quafithe --- even snails.

## **A Very Short Explanation of QED**

Here is a really short summary of QED from *Great Physicists* by William H. Cropper. QED is based on interactions of only two particles: electrons and photons. There are only three types of interactions:

The photon goes from point A to point B.  
The electron goes from point A to point B.  
The electron emits or absorbs a photon.

The theory begins to get a bit more complicated as you compute the probabilities for different kinds of interactions..

If you want to better understand QED, check out Feynman's book *QED: The Strange Theory of Light and Matter*. It's a compilation of four lectures on QED.

## **Other Resources on Feynman**

If you are new to the Feynman cult and would like to learn more biographical details there are many good resources. A good place to start is *Surely You're Joking, Mr. Feynman*, The New York Times Bestseller where you can hear Feynman tell many stories in his own words. James Gleick's *Genius* is an excellent and thorough biography. Leonard Mlodinow's *Feynman's Rainbow* paints another picture of Feynman shortly before he died through the eyes of a young colleague. Images of Feynman are scattered throughout Martin Gardner's *The Night Is Large*, where you can get a better feeling for how Feynman fits into the world and history of physics.

The Internet is also a good resource for all kinds of Feynman information; just Google "Richard Feynman".

## **It's Your Life to Live**

That first driving session had the biggest impact on me. I had been thinking a lot about what I really wanted to do, that I had to find a way to live that was for me, not for my parents or my old teachers, or for anybody else. School and science had become a grind. I wanted to have fun and enjoy what I was doing. Feynman had struggled with the same issue; he had almost given up on science because life wasn't fun anymore. I began to think seriously about not looking for an engineering job or applying to grad school, but to try to make it as a musician when I graduated later that year.

## **Chapter 12: Theories of Everything**

Until we see how many dimensions of behavior even a one-celled animal has, we won't be able to fully understand the behavior of more complicated animals.

- Feynman

May you live in interesting times.

- Chinese curse

I had thought about scientific techniques for solving [social] problems, and how there are certain limitations: moral values cannot be decided by scientific methods.

- Feynman

### **The Greeks and the Babylonians**

Feynman was contemptuous of Theories of Everything (TOE's). He divided people (especially theoretical physicists) into two classes: Greeks and Babylonians. He used the term Greek with some disrespect to mean physicists who wanted to create Theories of Everything, like String Theory today. He considered himself a Babylonian who just needed to create limited theories to explain specific phenomena. I'm a Greek. We had lots of disagreements.

### **Conversations with Feynman**

I always thought I would make it back to Pasadena one day to have a beer with Feynman and reconnect. But Feynman died on February 15, 1988, so that never happened. But now I want to imagine what it would be like if he were still alive, if I could go back and drive him on one last trip. The conversations in the first part of the book really happened, although my recollection has been filtered by the passage of time. The following conversations are fiction, they never occurred, but if they had, they would have gone something like this:

I started off with, "It's been over thirty years since I saw you last. You look good, only a bit more gray hair."

Feynman came back with, "You're looking a little old. You've lost most of your hair, and what's that spare tire you're wearing?"

"Yeah, well, bad genes and not enough exercise. So, aah, what's it like on the other side?"

"I could tell you, but you wouldn't understand."

“I have lots of other questions. You know we talked about Carlos Castaneda, Ram Dass, Eastern philosophy and drugs. At the time you were pretty negative about these things. But I know from reading your books and Gleick that you later met Ram Dass, and you spent some time in John Lilly’s sensory deprivation tanks and at the Esalen Institute in Big Sur. Did any of our conversations influence you in that direction?”

“I don’t know. Maybe.”

I continued on, “So, here’s mostly what I want to talk about on this trip: the big questions, Theories of Everything, the problems of the world and how to solve them.”

Feynman was silent, then said, “You *must be crazy*. You know how I feel about that kind of philosophical baloney. I *won’t do it*.”

“Come on. It’s just you and me. You can’t do anything else but sit there while I drive, and you don’t have any more lectures to prepare. The problems of the world are getting more intense, and life is looking more uncertain for a lot of people, everywhere, in the U.S., in other developed nations and in developing nations. The threat of nuclear war seems to have backed off, but other scary stuff is happening: Islamic terrorists, jobs being outsourced, global climate change, illegal and legal immigration issues and rising (then falling) gasoline prices. Politics and economics are affecting people’s daily lives.”

Again silence, then, “OK. OK. But on one condition: you don’t hold me to *any* of the baloney we come up with. Also politics and economics are especially boring for me, so don’t be surprised if I fall asleep and you end up talking to yourself.”

“Fair enough. So, what do you think of the model of the future that I just laid?” I asked.

Feynman blew out his breath, shook his head and replied, “*Bah!* You know what I think of Theories of Everything. They’re *Baloney!* But to be fair, your model of the future isn’t bad. Good point about not depending on space travel as a solution; people have been watching too much *Star Trek*. It seems pretty clear that humans are one of the causes of global climate change. I just don’t think models and the scientific method work very well when applied to social situations. Social science is an oxymoron. How are you going to cause people to change from within and eradicate extreme selfishness?”

I replied, “I don’t know exactly how people are going to change from within, but I think there’s hope. Before Jesus and the Buddha came along, no one even seemed to raise the concept that one could be too selfish or too rich. In the Middle Ages no one questioned that the King could have too much power or wealth. So the case could be made that we’re making progress. If humans can’t get beyond ‘I want it all, I want it now’, the quality of life for everyone on the planet will continue to do downhill. I’m not saying people should follow an organized religion, but Buddhism is kind of interesting. The meditation techniques associated with Buddhism seem pretty beneficial.”

Feynman shrugged and said, “I don’t know much about mediation, although I have experienced Lilly’s sensory deprivation tanks. I’ve never been susceptible to ideas of religion. I’ve never had any religious experiences. I do have a bone to pick with your big questions. Your big questions are for philosophers, and philosophy is mostly a waste of time. What does it *ever accomplish*?”

Also, you spend too much time worrying about the future. Humans are sometimes smart and sometimes stupid. We don’t do very well with long term planning when that planning expects human behavior to change in some big way. We’ll get by somehow.”

I was quiet for a minute then asked, “That’s it? Humans are smart and stupid? We’ll get by somehow?”

He came back with, “Hey, what more do you want? That’s the *truth*. Sometimes the truth can be *very simple*. You make things too complicated. You worry too much. Humans are very smart. We’ve survived and made huge progress over the past few hundred thousand of years, or millions of years, depending on where you draw the starting line. OK, so we’re stupid too and we make lots of mistakes. If you could travel ahead to the future in a time machine a few hundred years, you would probably be amazed at how we got through whatever current crisis you’re worried about now. And you would probably be amazed at whatever new crisis we face at that point in the future.”

“OK. I probably do worry too much, but it’s just in my genes to want to build these models to predict the future. And I can’t resist philosophy. I do want to come back later to some of these challenges we currently face, but for now let’s go back to those days when I was your chauffeur.”

Feynman closed with, “Well, You are who you are. Just don’t think about your models too hard when you’re driving. I want to get where we’re going in one piece!”

I continued our conversation with, “Before getting more into this social science stuff I do want to mention one other thing. Since you’ve been, aah, gone, some amazing things have been happening with nanotechnology. You know everyone gives you credit for launching nanotechnology, and it’s become a huge new field. It seems like you just threw out that speech in 1959 to American Physical Society as a one-off kind of thing, you know the *There’s Plenty of Room at the Bottom* speech, and it’s become a big, big deal.”

“Really?”

“Yeah. It could be that a hundred years from now you’re going to be better remembered as the founding father of nanotechnology than for your Nobel Prize in QED. They’ve been giving out a Feynman Prize for pioneering nanotechnology work since 1993. First it was every two years, now it’s every year. There are graduate programs in nanotechnology at major universities, and nanotechnology is starting to crop up everywhere, in semiconductors, in medicine, in agriculture.”

“Huh. What do you know! Well, that’s good. Now back to your social science, which I’ve already told you is an oxymoron. I am not a good person to ask for solutions to the problems of the world, because mostly I don’t care about this kind of stuff. My attitude goes back to my days at Los Alamos. Maybe it’s partly a way to distance myself from that fact that I helped create the first nuclear weapons, maybe it’s just the way I am. I used to go for Sunday walks with Bethe and John von Neumann. You probably know about von Neumann. John was a great mathematician and he’s also known as the inventor of the stored-program computer. Anyway on one of these walks von Neumann told me, *you don’t have to be responsible for the world you’re in.*”

That was an interesting and powerful idea for me because it allowed me to develop a powerful sense of social irresponsibility. I’ve been a very happy man most of life after I got over the death of Arlene, and I think this concept of social irresponsibility is the main reason.”

I replied, “I can relate to your social irresponsibility. Although I try to behave in a socially responsible way, I don’t always succeed. I try to drive less and consume less of everything and guide my wife and son to do the same, but we have two cars and drive more than we should. We consume a lot of energy with our big-screen TV’s, computers, stereo systems and so on.

I kind of agree with you and von Neumann. No one can make others behave in a socially responsible way. But even though you say you have a sense of social irresponsibility, you seem to behave in a socially responsible way when the chips are down. It’s like you can’t avoid thinking about everything and worrying about things, even though you say you don’t care. You worked on the Manhattan Project when you had decided not because it would be bad for your career. You got involved with the Challenger inquiry when you already knew it would be a whitewash and make you miserable.”

Feynman shot me a wry grin, “OK, Doctor Freud. Yeah, sometimes I am kinda stupid and don’t follow my own rules.”

I continued, “One thing is for sure. No matter how much educate people to encourage the Social Instinct people will continue to behave in selfish and dumb ways. But then again, sometimes people will surprise you and there will be a major shift in thinking and some behavior actually changes.”

Feynman came back with, “Before we get too far into this, I need to say something else. This discussion is making a little nervous because I had an experience with this kind of thing before. I went to a conference where the idea was to gather a whole bunch of experts together from different fields to solve the problems of the world. I must have been going through a mid-life crisis or something and was in the mood to give some philosophical talks about science.

This conference was such a failure for me that I said I would never do anything like that again. I was the lone scientist at the conference, and at the end I made everyone mad by telling them that the conference had been a big waste of time because nothing was solved. I told them there had been no real dialog, only a lot of chaos. And worse than that, they were pretending that we had made some kind of great progress! Most of these experts were pompous fools. They covered up their simple, trivial ideas with a bunch of jargon and hocus-pocus. They created great clouds of verbal fog. The experts spent a lot of time trying to convince the other experts how wonderful they were. *Jesus! I cannot stand that kind of thing!*

To show you what I mean I need to tell you about the stenographer. The conference had hired a stenographer to record the most important sessions. He came up to me after a session and we had this conversation:

He asked, 'What is your profession? Surely not a professor?'

'Yes, I am a professor!'

He asked, 'Of what?'

'Physics, a branch of science.'

'Oh, that explains it.'

'Explains what?'

'Well, when I am recording the other experts I don't understand what they're talking about. But when I record your speech and questions I understand completely. So, I figured you couldn't be a regular professor!'

## **Theories of Everything**

This rest of this chapter is a collection of a few light Theories of Everything. You might also call them belief systems or worldviews.

### **T.C. Hu's Three Laws for Optimal Human Quality of Life**

- Choose the right parents.
- Choose the right mate.
- Choose the right livelihood.

T.C. Hu was one of my computer science professors at UCSD. He was a near-perfect stereotype of the wise old Confucian Chinese professor, smart, but absent minded. In class T.C. would stand still, quietly dispensing his wisdom, his 1950's shirt and slacks hanging on his wire thin frame, his bushy eyebrows moving up and down like a pair of caterpillars, his cowlick sticking up from his unruly salt and pepper hair. It was rumored that T.C. did not need to work, because he was very wealthy due to his investments in shopping centers in Southern California. He seemed mostly theoretical and not practical, so I was quite shocked when one day he gave us his very practical Three Laws in class, completely out of the blue. His laws are from the Selfish Gene point of view, since they are instructions on how to maximize personal success and happiness.

T.C. is the main reason I went to UCSD for graduate school instead of another UC school, because he found a fellowship for me. When he called up to offer me the fellowship I blew him off at first. He said he was Doctor Who, so I thought he was one of my buddies having me on, pretending to be the BBC science fiction character.

When I answered the phone T.C. said, "This is Doctor Who from UCSD."  
I said, "Right. Are you still offering the Brooklyn Bridge for sale?"

### **Conversations with Feynman**

Feynman asked, "Is this Who guy Chinese? Is he talking about reincarnation when he says you need to choose the right parents?"

"Yes, he is Chinese. No, he isn't talking about reincarnation. He's a scientist and doesn't believe in reincarnation. He's just being profound and funny at the same time."

"Oh. I get it. Ha, ha. Very funny."

"Well come on. If you could choose your parents that would be the biggest choice you ever made, because the genes and the environment they give you pretty much determine the rest of your life."

Feynman shrugged and said, "OK. Profound and funny."

## Shoulderbone's Three Laws of Human Behavior

- Pubic hairs are everyone.
- Call a guy an asshole and he'll go to any length to prove it.
- The geekiest guys get the prettiest girls.

Shoulderbone's Three Laws come from Dave Shoulderbone. He was a mysterious character who lived in Orange Grove House during his senior year, the year before I moved in. I never got to know him very well, but I know that he rarely went to class but still managed to graduate, he often watched old movies on television all night long and slept during the day, he had a fiancé who often visited from out of state. He was famous for his Three Laws, and these laws were my first encounter with a practical belief system.

## Conversations with Feynman

I started off with, "I didn't know Shoulderbone very well. I never thought to ask him about the details of his laws, but I can guess. What do you think of this as a Theory of Everything?"

Feynman laughed and replied, "Well, for a Theory of Everything, it's somewhat useful, at least it's good for a laugh. But I don't agree with his third law. It's not true that the geekiest guys get the prettiest girls."

I laughed too and said, "I'm with you on that one. What parallel universe was he living in? He must have had some experiences on some other planet besides Earth. He was pretty handsome and looked kind of like Dante in *Clerks*. I'm guessing that he must have lost a woman to a guy that he thought was way geekier than him."

I really like the second law. It almost captures all of human nature. How many times have you seen someone prove that?

I'm not sure what he meant by his first law that pubic hairs are everywhere. I think he meant that sex is behind everything we do, and that sex permeates modern Western Civilization, especially in the media. I have to agree with that. But having lived at Orange Grove House, he may have just been commenting about the state of its infamous bathroom."

## **Laws of Human Female and Male Behavior**

- Human females are from Venus
- Human males are from Sirius (the Dog Star)

Human females are associated with the Social Instinct, nurturing mother, peace, cooperation, shopping, favoring the heart over the brain and openness to the others (other's ideas, cultures and religions).

Human males are associated with the Selfish Gene, conserving the status quo, strict father, war, competition, ever-more expensive toys, favoring the brain over the heart and suspicion of others (other's ideas, cultures and religions).

In other words, women are from the planet of love and men are dogs. Of course this is not very fair, and often not true. Everyone is different and most of us have a mixture of both female and male traits.

## **Laws of Teenage Human Male and Canine Male Behavior**

These laws are from the perspective of the teenage human male and/or canine male.

- I look to my parent or master to be the pack leader and set boundaries for me.
- Feed me and shelter me.
- Love me (hug me or pet me, but don't beat me).
- Entertain me.  
Human: provide short-attention-span media and experiences using the five senses.  
Dog: take me for walks so I can enjoy the universe the way it was meant to be enjoyed: with the nose.
- Bark at strangers in my territory. Attack if I'm feeling brave, hide if I'm not.
- If it moves, try to mate with it. If it doesn't move, try to mate with it anyway.

## **Conversations with Feynman**

Feynman laughed and said, “I definitely agree with your bit that women are from Venus and men are from the Dog Star, if you mean that we are so different we may as well be different species.”

“Yeah, that’s exactly what I mean. John Gray, Deborah Tannen and a thousand comedians have already covered this territory thoroughly, but we need to say something here. I think that the biggest mistake men and women make is to try to over-analyze behavior when trying to understand the other side. When it comes to understanding the opposite sex, being a Babylonian is better than being a Greek.

I really like this advice from Thom Hartmann: take your significant other out to dinner and ask her/him, ‘What exactly is it that I do that makes you feel loved the most?’ You might be very surprised at the answer. Whatever the answer, try to do more of that for them in the future.”

Feynman nodded his head and said, “Yeah, that’s all good advice.” He hurried on with, “I to have to say I’ve been through several different sets of Babylonian rules on how to deal with women. I’m not proud that some of my most successful rules have caused me to treat some women badly in the past, but that’s water under the bridge.”

## Appendix

### References

#### Internet

<a href="http://www.wikipedia.org">www.wikipedia.org</a> :	Wikipedia encyclopedia online
<a href="http://www.worldaudit.org">www.worldaudit.org</a> :	Global democracy and economics
<a href="http://www.transparency.org">www.transparency.org</a> :	Global democracy and economics
<a href="http://www.publicintegrity.org">www.publicintegrity.org</a> :	U.S. democracy and economics
<a href="http://www.economist.com">www.economist.com</a> :	online version of the magazine <i>The Economist</i>
<a href="http://www.reason.com">www.reason.com</a> :	online version of the Libertarian magazine <i>Reason</i>
<a href="http://www.hti.umich.edu/k/kjv">www.hti.umich.edu/k/kjv</a> :	The King James Bible at the University of Michigan
<a href="http://www.hti.umich.edu/k/koran">www.hti.umich.edu/k/koran</a> :	The Koran at the University of Michigan
<a href="http://www.buddhanet.net">www.buddhanet.net</a> :	Teachings of Buddha
<a href="http://online.sfsu.edu/~rone/Buddhism/Buddhism.htm">online.sfsu.edu/~rone/Buddhism/Buddhism.htm</a> :	more Buddhism
<a href="http://en.wikipedia.org/wiki/Tao_Te_Ching">en.wikipedia.org/wiki/Tao_Te_Ching</a> :	<i>Tao Te Ching</i>
<a href="http://en.wikipedia.org/wiki/Hinduism">en.wikipedia.org/wiki/Hinduism</a> :	Hinduism

#### Feynman's 1959 Talk that Launched Nanotechnology

[en.wikipedia.org/wiki/There's\\_Plenty\\_of\\_Room\\_at\\_the\\_Bottom](http://en.wikipedia.org/wiki/There's_Plenty_of_Room_at_the_Bottom)

#### Google These Topics When You Have Some Spare Time

Richard Feynman  
Joseph Schumpeter  
Club of Rome  
Alex de Tocqueville  
Rumi

## **Books**

## **Travel**

*The Blue Nile* by Alan Moorehead  
*The White Nile* by Alan Moorehead  
*Honeymoon with My Brother: A Memoir* by Franz Wisner  
The Lonely Planet travel guides

## **Science and Mathematics**

Books by Richard P. Feynman  
*The Origin of Species* by Charles Darwin  
*The Selfish Gene* by Richard Dawkins  
*Godel, Escher and Bach an Eternal Golden Braid* by Douglas Hofstadter  
*Genius* by James Gleick  
*Feynman's Rainbow* by Leonard Mlodinow  
*The Night Is Large* by Martin Gardner  
*The Structure of Scientific Revolutions* by Thomas Kuhn  
*The Elegant Universe (String Theory)* by Brian Greene  
*Molecular Biology of the Gene* by James Watson  
*A History of Mathematics* by Carl Boyer  
*Physics and Philosophy* by Sir James Jeans  
*Physics and Beyond* by Werner Heisenberg

## **Psychology, Philosophy, Religion**

*Memories, Dreams and Reflections* by Carl Jung  
*On Becoming a Person* by Carl Rogers  
*You Just Don't Understand* by Deborah Tannen  
*Creative Dreaming* by Patricia Garfield  
*Toward a Psychology of Being* by Abraham Maslow  
*A History of Western Philosophy* by Bertrand Russell  
Books by Alan Watts  
Books by Antonio Damasio  
Books by Baba Ram Dass  
Books by Carlos Castaneda  
Books by Coleman Barks on Rumi  
Books by Joseph Campbell  
Books by Thom Hartman  
The Bible  
The Koran  
The Teachings of Buddha

## **Politics, Economics, Culture**

*The Sorrows of Empire* by Chalmers Johnson  
*The End of History* by Francis Fukayama  
*The Next Hundred Years: A Forecast for the 21<sup>st</sup> Century* by George Friedman  
*The Return of History and the End of Dreams* by Robert Kagan  
*So Damn Much Money* by Robert Kaiser  
*Moral Politics* and *The Political Mind* by George Lakoff  
*What's the Matter with Kansas?; The Wrecking Crew* by Thomas Franks  
*Gun, Germs and Steel* by Jared Diamond  
*What Orwell Didn't Know* by George Soros  
*The Black Swan* by Nassim Taleb  
*Freakonomics* by Dubner and Levitt  
Writings in *Slate* by Christopher Hitchens  
Books by Niall Ferguson  
Books by Howard Zinn  
Books by Kevin Phillips  
Books by Marshall McLuhan  
Books by Noam Chomsky

## **Fiction**

Books by:  
Agatha Christie  
Anthony Burgess  
Charles Bukowski  
Colin Dexter  
Dashiell Hammett  
Donald Westlake  
George MacDonald Fraser  
Graham Greene  
Jack Kerouac  
Janwillem van de Wetering  
Jules Verne  
Lawrence Durrell  
Laurence Gough  
P.G. Wodehouse  
Rex Stout  
Robert Van Gulik  
Sir Arthur Conan Doyle's Sherlock Holmes stories  
Somerset Maugham  
Walter Mosley  
William Gibson's *Neuromancer*

## **Educational Television**

*Booknotes*, CSPAN

*Nova* and other science programs, PBS

Science programs on The Discovery Channel

Science programs the National Geographic Channel

Science and history programs on the History Channels

*The Mechanical Universe*, Caltech and Annenberg CPB

*Beyond The Mechanical Universe*, Caltech and Annenberg CPB

*The Fabric of Life*, Palomar College

*Art of the Western World*, WNET and Annenberg CPB

*This is Civilisation* with Matthew Collings, Ovation and Channel 4

*Earth: The Biography*, the National Geographic Channel

*The Edge of the Universe*, the National Geographic Channel

*The Universe*, the History Channel

*The Planet Earth*, the Discovery Channel

*Red Dwarf*, BBC Science Fiction Series

*The Daily Show* with Jon Stewart, Comedy Central

*The Colbert Report*, Comedy Central

*South Park*, Comedy Central

*Hogan's Heroes*, CBS 1965-1971

## Film

Films by John Sayles  
Films by Jim Jarmusch  
Films by Ang Lee  
Films with Anita Mui  
Most James Bond films  
Most Laurel and Hardy films  
Mystery and detective films made in Hollywood between 1930 and 1950  
*A Prairie Home Companion* by Robert Altman with Garrison Keillor  
*Blade Runner* by Ridley Scott with Harrison Ford and Rutger Hauer  
*Clerks* by Kevin Smith with Brian O'Halloran and Jason Mewes  
*Dark Star* by John Carpenter with Dan O'Bannon  
*Dogma* by Kevin Smith with Jason Mewes, Linda Fiorentino and Ben Affleck  
*Drunken Master* by Jackie Chan  
*Easy Rider* by Dennis Hopper  
*Eve and the Firehorse* by Julia Kwan  
*Fight Club* by David Fincher with Brad Pitt and Edward Norton  
*FX* by Robert Mandel with Bryan Brown and Brian Dennehy  
*In the Mood for Love* by Wong Kar-wai with Maggie Cheung and Tony Leung  
*Irma Vep* by Olivier Assayas with Maggie Cheung  
*It's a Mad, Mad, Mad, Mad World* by Stanley Kramer and all-star cast  
*Kung Fu Hustle* by Stephen Chow with Qiu Yuen  
*Laura Croft: Tomb Raider* by Simon West with Angelina Jolie  
*Mash* by Robert Altman with Donald Sutherland, Elliot Gould and Sally Kellerman  
*One Night at McCool's* by Harald Zwart with Matt Dillon and Michael Douglas  
*Payback* by Brian Helgeland with Mel Gibson, Maria Bello and Lucy Liu  
*Pale Rider* by Clint Eastwood with Michael Moriarity and Sydney Penny  
*Pulp Fiction* by Quentin Tarantino with John Travolta and Samuel Jackson  
*Shaolin Soccer* by Stephen Chow with Wei Zhao  
*Soapdish* by Michael Hoffman with Sally Field and Kevin Kline  
*Starwars Episode IV* by George Lucas with Harrison Ford and Alec Guinness  
*Supercop* by Jackie Chan with Maggie Cheung and Michelle Yeoh  
*The Animal* by Luke Greenfield with Rob Schneider and Colleen Haskell  
*The Fifth Element* by Luc Besson with Bruce Willis and Mila Jovovich  
*The In-Laws* by Andrew Fleming with Michael Douglas and Candice Bergen

## **Music**

Blues  
Soul  
Motown  
Most British Rock  
Some classical  
Some jazz  
Alison Krauss  
Eric Clapton (not *461 Ocean Boulevard*)  
Emmylou Harris  
Graham Parsons  
John Mayer  
J.J. Cale  
Little Feat  
Neil Young  
Pink Floyd  
Santana  
Suzanne Vega  
The Allman Brothers  
Traffic with Steve Winwood  
Vince Gill

## **First Section of The Declaration of Independence**

Primary Author: Thomas Jefferson, borrowing from:  
George Mason's *The Virginia Declaration of Rights*  
John Locke's *Two Treatises of Government*

When in the Course of human Events, it becomes necessary for one People to dissolve the Political Bonds which have connected them with another, and to assume among the Powers of the Earth, the separate and equal Station to which the Laws of Nature and of Nature's God entitle them, a decent Respect to the Opinions of Mankind requires that they should declare the causes which impel them to that Separation.

We hold these truths to be self-evident, that all Men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the Pursuit of Happiness—That to secure these Rights, Governments are instituted among Men, deriving their Just Powers from the Consent of the Governed, that whenever any form of Government becomes destructive of these Ends, it is the right of the People to alter or to abolish it, and to institute new Government, laying its Foundation on such Principles, and organizing its Powers in such Form, as to them shall seem most likely to effect their Safety and Happiness.

## **Additional Quotes**

I believe that a scientist looking at nonscientific problems is just as dumb as the next guy.  
- Feynman

Explanation for Einstein's Theories of Relativity:  
When a pretty woman sits on your lap for an hour, it seems like a minute. When you sit on a hot stove for a minute, it seems like an hour.  
- Einstein

A philosopher is a blind man in a dark room looking for a black cat that isn't there. A theologian is the man who finds it.  
- H.L. Mencken

Philosophy is the no-man's land between science and theology, exposed to attack from both sides.  
- Bertrand Russell

The Golden Rule: those who have the gold, rule.  
- Anonymous

The biggest fear a Puritan has is that someone, somewhere, might be having fun.  
- H.L. Mencken

The idea of Christianity is so magnificent. It's a pity it's never been tried.  
- Gandhi

The tolerance of the Christians turned into intolerance by the Christians of every other competing religion.  
- Eugen Weber

[A politician is] but a walking shadow, a poor player, that struts and frets his hour upon the stage, and then is heard no more; it is a tale told by an idiot, full of sound and fury, signifying nothing.  
- William Shakespeare

Most of the elected officials in the governments around the world are clowns, wearing grease-paint smiles as they pretend to entertain the people, while they line their pockets behind the scenes. But they prove they are very smart clowns when the people let them get away with it.  
- Anonymous

Having religious faith means being one hundred percent certain you are right when you guess the nature of the Wizard of Oz behind the curtain.

- Anonymous

Christ came into the world to save sinners, of whom I am chief.

- I Timothy 1:15

Love is patient and kind. Love is not jealous or boastful or rude. It does not demand its own way. It is not irritable, and it keeps no record of being wronged. It does not rejoice about injustice, but rejoices whenever the truth wins out. Love never gives up, never loses faith, is always helpful, and endures through every circumstance.

- Paul in Corinthians I, 13:4-7

Love your enemies, bless them that curse you, do good to them that hate you, and pray for them which despitefully use you, and persecute you.

- Jesus in Matthew 5: 44

Love God with all your heart, soul, mind and strength. Love your neighbor as yourself.”

- Mark 12: 30-31; Luke 10: 27

There is no God but one God and Mohammed is his prophet.

- Koran

The causes of suffering are desire and ignorance.

- Buddha

The manifestation of unusual magic power is but a means for delivering the ignorant. To achieve enlightenment it is wiser to concentrate on chopping wood and carrying water.

- Buddhist saying

I have finally found a way to live, in the presence of the Lord.

- Eric Clapton

H.L. Mencken had many great one liners, here a few on religion:

The only problem with Christianity is the Christians.

It is now lawful for a Catholic woman to avoid pregnancy by a resort to mathematics, though she is still forbidden to resort to physics and chemistry.

We must respect the other fellow's religion, but only in the same sense that we must respect his theory that his wife is beautiful and his children smart.

When you have assembled your facts in logical order, it is like an oil lamp you have fashioned, filled and trimmed; but which will shed no illumination unless you first light it.

- Saint-Exupery

The faults of the burglar are the qualities of the financier.

- George Bernard Shaw

Bring me a beaker of wine, so that I may wet my mind, and say something clever.

- Aristophanes

What is a committee? A group of the unwilling, picked from the unfit to do the unnecessary.

- Richard Harkness

Little by little the agents have taken over the world. They don't do anything, they don't make anything, they just stand there and take their cut.

- Jean Giradoux

Every roof is agreeable to the eye, until it is lifted; then we find tragedy and moaning women and hard-eyed husbands.

- Ralph Waldo Emerson

An association of men who will not quarrel with one another is a thing which never yet existed, from the greatest confederacy of nations down to a town meeting or a vestry.

- Thomas Jefferson

The most powerful word in the English language is unbutton.

- Colin Dexter