Surely You're Joking, Mr. Feynman! Study Guide

Surely You're Joking, Mr. Feynman! by Richard Feynman

BOOKRAGS

Contents

Plot Summary

"Surely You're Joking, Mr. Feynman!" is an autobiography of the late physicist, Richard P. Feynman—a very unconventional one. Rather than relating the story of his life in a traditional manner, Feynman gives us a collection of unconnected anecdotes loosely organized into this book. After reading the collection of anecdotes, which focus more on mundane details of his life than on major life events (such as marriages, births, for example) and great career accomplishments, what we end up with is a pretty good idea of the day-to-day life and personality quirks of this particular man, and insight into what makes him tick. At the end of the book, the unconventionality of format makes perfect sense, since we know its author is not the kind of person who will do anything the way everybody else does it. That said, it is possible (if a little confusing) to piece together the major events of Feynman's life, in roughly chronological order, from the information garnered in this book.

As a child on Long Island, Feynman is clearly highly intelligent and curious—qualities clearly encouraged and nurtured by his parents. He goes on to excel in his study of Physics at MIT and Princeton.

Upon completing his studies at Princeton, Feynman goes to work with the Manhattan Project in Los Alamos, New Mexico (to develop the nuclear bomb). Although young and obscure at the time, he is able to work among many of the most distinguished scientists of the time—most notably Niels Bohr.

After the war, Feynman takes a job as a professor at Cornell. He works and teaches there for several years before moving to CalTech. He decides CalTech is everything he ever wanted in a workplace and settles down there permanently. He establishes a reputation as a brilliant and accomplished physicist, and achieves worldwide recognition—including a Nobel prize in 1965. (However, the book tells us very little about the actual physics he does in his career).

Along the way to becoming a famous physicist. Feynman puts his inquisitive nature to work in many other areas, and learns a lot about the world outside of his department. He learns about biology, Mayan hieroglyphics, and the ins and outs of Japanese culture. He learns to speak Portuguese, play the drums, profit from gambling, and achieves some recognition as an artist.

Feynman is speaking to us from late in his life, when he has reached the very top of his profession. While he is clearly aware of his own intelligence, his tone is very accessible and encouraging. (it is no wonder he places such a high value on teaching—which is somewhat unusual for a professor of his clout). He encourages his readers to take pleasure in exploring natural and cultural phenomena for themselves.

Vitals

Vitals Summary and Analysis

In less than two hundred words, Mr. Feynman gives us a summary of his life (birth, hometown, degrees earned, major accomplishments, marriages, kids, for example). After this point, the book ceases to be a traditional autobiography.

Part 1: He Fixes Radios by Thinking!

Part 1: He Fixes Radios by Thinking! Summary and Analysis

The book begins with Mr. Feyman's memories of being a boy, about eleven or twelve years old, who liked to build and fix radios. Rather than following a narrative arc, the chapter provides us with a collection of radio anecdotes, setting the stage for the anecdotal organization for the rest of the book, and introducing us to its central character who, even at this young age, is clearly inquisitive, highly intelligent, and mischievous.

Among the radio-related anecdotes are a "burglar alarm" prank he used to startle his parents when they walked into his room one night. He also tells us how he learned to pick up radio signals from other cities, which allowed him to learn what happened on syndicated radio programs an hour before his friends and family knew.

He also devises a radio station and is able to transmit signals short distances. He creates a radio program for his little sister Joan's birthday.

While still a child he is hired to fix the radio in a hotel (which turns out to be owned and operated by his aunt). After this point, he is hired by many other people around town to fix radios. He suspects his services were in demand because of the depression (since he was a kid, he worked cheaply). However, Feynman seems to believed that, since he was continually hired to take on more and more complicated radio repair jobs, his set of technical skills were greatly enhanced. One customer is so impressed with his talents that he decides young Feynman must be fixing radios by thinking.

He credits his success in fixing radios to what he calls his "puzzle drive"—the part of him that longs to find the solution to puzzles. The final few pages of the chapter are spent relating how this quality made him successful at riddles, brainteasers, and later complex math problems.

Part 1: String Beans

Part 1: String Beans Summary and Analysis

This chapter chronicles Feynman's experiences as a teenager employed in his aunt's hotel. Mr. Feynman studies the customers (as well as his fellow staff members) in a scientific manner—perhaps viewing the hotel as an anthropological microcosm of human society at large. He comments on the formulaic way in which these people live their lives and the way they go to their jobs and play cards and eat their meals as if by clockwork.

Teenage Feynman is skeptical and vocally critical of social customs he finds ludicrous or even detrimental. He tells his boss he has a problem with the custom of tipping, and that employees should be paid more by their employers rather than depending upon tips from customers. His boss fails to understand his point and ridicules him for "not wanting his tips".

He also begins to learn about the workings of office politics from a poised hotel employee who manages to persuade others to do his dirty work for him (so if trouble should arise he would not likely be blamed). He also learns that by befriending the pantry lady, he can ensure desserts will be left for his enjoyment after he finishes his shift.

Feynman tries to develop new and improved ways of doing things in this place of employment. His "new" way of clearing the tables as a busboy results in him dropping full trays of dishes on the floor, making a mess, and getting a reprimand. The faster method he develops for cutting string beans results in him cutting his finger and bleeding all over the beans. His new method of slicing potatoes resulted in the slices sticking together. His new method for operating the phone system works well for him, but he runs into problems when his boss wants to operate the phone system and cannot (or will not) understand the system Feynman has put in place.

We get the impression the teenage Feynman is somewhat frustrated by the lack of innovation (or interest in innovation) he finds in others.

Part 1: Who Stole the Door?

Part 1: Who Stole the Door? Summary and Analysis

Feynman enters MIT as an undergraduate and joins the fraternity Phi Beta Delta. The Phi Beta Deltas seem to be divided into two factions. One faction includes the partiers and socializers (stereotypical "fraternity guys") and the other includes more studious types (stereotypical "MIT guys"). Feynman seems to have found this arrangement advantageous. He is able to learn social skills from his more socially adept fraternity brothers, and offer them help with their homework in return. His new fraternity brothers teach him to dance and how to talk to women.

They also teach him some unpleasant lessons about social prejudice. His fraternity brothers pressure him to break the date he has made with a waitress he has met, since they do not feel she is of an appropriate social class. He later regrets having been so easily influenced by them in this circumstance. Later, when he is able to stand up to his fraternity brothers, he attends public dances (the kind that "just anybody" is allowed to attend) much to their dismay. At one point, he finds himself at a dance for the hearing impaired, which he finds very interesting.

As part of his fraternity initiation, Feynman is subjected to standard hazing practices, such as being kidnapped in the middle of the night, abandoned in the middle of nowhere, and being held "prisoner" for a brief period of time.

One evening Feynman helps his two roommates, who are seniors, with a theoretical physics problem. He discovers this is a good way to learn physics and continues to work with them on their problems. As a consequence, when he takes the course himself the following year, he excels.

The last few pages of this chapter focus on practical jokes Feynman plays on his fellow students while a student at MIT. The first joke he pulls involves a French curve. Feynman convinces his friends he has found a "special" equation to the French curve—however you hold this particular curve, the bottom of it will always be tangent to a parallel. Feynman is amazed they all find this surprising, since they are all MIT students and therefore have all studied calculus (and should know that the tangent of a local minimum is ALWAYS a horizontal line). He muses about how people often fail to learn how to apply what they learn in class.

Feynman also plays a series of practical jokes on a couple of waitresses at a restaurant he frequents. The jokes essentially involve leaving the tip under an upside down glass full of water.

However, the prank he is most proud of is the time he stole the door from the room of some of his fraternity brothers and hid it in the basement. Whenever somebody would asked him about it, he would answer "Yeah, I took the door," in a sarcastic tone and

nobody would ever take him seriously. Later, when it is revealed Feynman did, indeed, take the door, he is accused of dishonesty. Feynman asserts, however, that he never lied.

Part 1: Latin or Italian

Part 1: Latin or Italian Summary and Analysis

Although Feynman does not understand Italian, he enjoys listening to the local Italian radio station, due to the rhythm of the language and the emotive quality of the characters on the programs.

He begins to mimic the sound of the words, creating his own "fake" Italian. He discovers that if he speaks "Italian" with confidence, people will not realize he does not actually understand the language.

At a girls scouts' banquet he attends with his younger sister, Feynman is called upon to provide impromptu entertainment to the girls, their fathers, and the troop leaders. He tells them he is going to read a poem, apologizes for it not being in English, and rattles off several stanzas in fake Italian.

The girls are highly amused by his performance, but the adults present do not know what to think of it. Two of them wish to know whether he was speaking Latin or Italian.

Part 1: Always Trying to Escape

Part 1: Always Trying to Escape Summary and Analysis

As an undergraduate, Feyman is only interested in science, but his degree plan requires him to study English literature, as well as two humanities courses. He is pleasantly surprised to find Astronomy listed as a humanities course, but still is required to take another one. He chooses Philosophy.

In English class he has to write a number of critical essays on various works of literature, he usually manages to get out of providing insightful criticism by parodying the work instead, but he finds he is unable to parody Goethe's Faust. A fraternity brother advises him to take a paper he has written on an unrelated topic and draw parallels between that and Faust. The professor more or less falls for it, although he acknowledges the material relating directly to Faust is scanty and awards Feynman a B+.

Feynman finds the Philosophy class equally problematic. He complains he is unable to understand anything in the class due to the professor's mumbling. When he hears he has to write a theme paper, he is nervous because he has not picked up much from the class.

He is somewhat comforted when he hears the professor make a reference to "stream of consciousness." This reminds him of a conversation he had with his father concerning sleep. By observing the way he himself falls asleep and making observations, Feynman is able to use his talents as a scientist to create a successful Philosophy paper. The professor is so impressed by his paper that he chooses it as one of a select few to read before the class.

This project sparks his interest in observing sleep, which later leads him to observe his dreams, and he conjectures many possible interpretations for his dreams. He discusses his dreams with a friend of his, who is from a family of prominent psychoanalysts. Feynman and the friend agree dreams may carry hidden meanings, but the friend warns Feynman not to be too simplistic with his interpretations.

Part 1: The Chief Research Chemist at the Metaplast Corportation

Part 1: The Chief Research Chemist at the Metaplast Corportation Summary and Analysis

After completing his studies at MIT, Feynman briefly goes into business with a friend of his from his hometown of Far Rockaway. As children, these two performed science demonstrations together for the amusement of the other kids in the neighborhood. The friend developed a method for metal-plating plastics, and wants Feynman's help getting the business (called the Metaplast Corporation) off the ground. Feynman is assigned the title of "Chief Research Chemist" and is largely successful in working out a lot of the kinks in his friend's metal plating process.

The company decides to run advertisements, featuring photographs of their best work, in Modern Plastics magazine.

Business really takes off when the company is hired to create metal plated plastic pens. The pens are sold widely, and Feynman is proud to be associated with a product in such common use. However, the company runs into problems when the "pen" clients realize the metal peels off the pens too easily. The situation ends so disastrously that the company ultimately fails (by this point, Feynman is at Princeton and no longer associated with the business).

Years later, Feynman speaks with a colleague in Los Alamos who also worked in a laboratory that metal-plated plastics. He learns that the laboratory this man and his colleagues were working in had been completely intimidated by the advertisements the Metaplast Corporation had run in Modern Plastics. When asked, this man tells him that he assumed the Metaplast Corporation had a major research department with twenty-five to fifty scientists. Feynman is amused to inform him that he himself had been the only research scientist at the Metaplast Corporation.

Part 2: Surely You're Joking, Mr. Feynman

Part 2: Surely You're Joking, Mr. Feynman Summary and Analysis

Feynman concludes his undergraduate work at MIT. He wishes to remain there for graduate school, but is advised to do his graduate work at a different institution. He decides to attend Princeton.

He is a little nervous about Princeton, since the school has a reputation for formality and elegance, and vows to make an attempt to improve his social graces.

When he arrives at Princeton, he notices that everybody speaks very formally, lives in nice rooms, and wears academic robes when taking daily meals in the elegant dining hall.

On the day of his arrival he is invited to a "tea". Feynman has never been to a tea before, and is not sure how he is supposed to behave, but it is clear to him that he has committed a social faux pas after he requests both cream and lemon in his tea (although he has not the faintest idea why). He stumbles through the rest of the event, trying to figure out the social rules for the situation.

The thing he most looks forward to at Princeton is seeing the cyclotron particle accelerator. He fell in love with the cyclotron at MIT, and looks forward to seeing the facility at Princeton, since Princeton has been leading the way in cyclotron research at this point.

The cyclotron more than lives up to Feynman's expectations. Later, he has an argument with colleagues at a social function about which way an "S-shaped sprinkler head would rotate if the water were sucked into rather than pushed out of it." He decides to use the cyclotron to prove his point. He ends up making a huge mess and irritating the professor in charge of the cyclotron.

Part 2: Meeeeeeeeee!

Part 2: Meeeeeeeeee! Summary and Analysis

Feynman eagerly volunteers to participate in a hypnosis demonstration that will be performed by a visiting psychology professor. He is very excited about the idea of a new learning experience.

When Feynman is in a trance, the hypnotist tells him things like, "You can't open your eyes." The entire time, Feynman is pretty sure he could open his eyes and yet he chooses not to. Before he lifts the trance, the hypnotist tells Feynman that he will not walk straight back to his chair after his experience, but instead will take the long way around the room. This time, Feynman is consciously determined to resist. However, later when he is walking back to his chair he feels so uncomfortable that he is forced to turn around and walk the other way. Feynman then realizes he had been under the false illusion that he was in control of his actions the entire time.

In yet another experience with hypnotism, a woman tells him that she will light a match, blow it out, quickly press it against the back of his hand, but he will feel no pain. She does so, and he feels no pain. He would have thought she cheated—that the match was not really hot—but a real blister forms in the place where he is burned.

Part 2: A Map of the Cat?

Part 2: A Map of the Cat? Summary and Analysis

Feynman notices Princeton graduate students tend to socialize among members of their own departments (physicists eat with other physicists, for example). He decides he wants to see what people outside his department are doing, and begins to eat in the dining hall with people from other departments.

The philosophy students he eats with invite him to a seminar. At the seminar they get into a discussion where they are trying to define an "essential object," which leads to related series of arguments about the nature of a brick. At the end of the seminar, Feynman still is not sure what an "essential object" is, but is fascinated at the number of ways people have found to look at a brick.

When he has dinner with the biology students, it leads to even greater involvement. He is soon enrolled in a graduate level biology class, learning about cell physiology. One of the first things he learns about cell physiology is that there is a great deal in this field that is completely unknown in the 1940s. You did not have to dig too deeply to find a question nobody knows the answer to (like you do in physics).

Feynman does his assignments along with the rest of the class, and understands them pretty well, but is unfamiliar with the jargon of the department and often mispronounces words when giving presentations in class. At one point, he horrifies (or amuses) a biology department librarian by asking for a "map of the cat" instead of a "zoological chart."

One summer, many years later, Feynman decides to spend his vacation working in a different field, and returns to biology. Before he begins his genetics research project, he takes a course in phages to prepare. He finds that, since he already has a firm grasp on the math needed for statistical analysis, the chemistry needed to understand how the atoms worked in liquids, and the physics to understand centrifugation, he is able to spend all of his time catching himself up on biological concepts, and is therefore able to keep up with the rest of the class.

He finds the actual experiment slow, and a little tedious. He begins to think about methods for doing this more efficiently, but the summer is over before he is able to go very far with it.

He later decides to spend his sabbatical year doing biology research—this time involving ribosomes. However, there is a flaw in the experimental method, so nothing ever comes out of it. While he is working in this lab, he gives some of his excess ribosomes to a Dr. Hildegarde Lamfrom, who needs them for the very important research she is doing in the field. However, Feynman inadvertently destroys her results when he carelessly gives her contaminated ribosomes.

He never publishes his work in biology due to lack of motivation. However, at one point he is asked to give a talk at Harvard by genetics great James D. Watson. In the end, he is glad to return to Physics, since that is where his true talents and interests lie, and where he does his best work.

Part 2: Master Minds

Part 2: Master Minds Summary and Analysis

Feynman works with his graduate advisor, John Wheeler, on a problem concerning forces on electrons. They make some impressive progress with this very difficult problem, and Dr. Wheeler encourages Feynman to give a talk on the subject (since he believes it would do him some good to gain some speaking/presenting experience).

Dr. Eugene Wigner takes an interest in the work Wheeler and Feynman are doing, and invites several very famous physicists to attend it: Norris Russell, Johnny von Neumann, Wolfgang Pauli, and Albert Einstein. Feynman is very nervous. He is only a student, giving his first technical talk, and yet many of the world's most famous scientists will be attending his lecture.

Afterwards, Pauli and Einstein politely argue the pros and cons of Feynman's idea. Years later, Feynman understands why the theory he and Dr. Wheeler had proposed was problematic. Neither he nor Wheeler were ever able to work out the quantum aspect of their idea.

To the average reader, the memorable aspect of this chapter is the appearance of the legendary Albert Einstein, who comes across as kind, supportive, and surprisingly humble in his interactions with Feynman and Pauli.

Part 2: Mixing Paints

Part 2: Mixing Paints Summary and Analysis

Feynman meets a painter who has been hired to paint the walls in a restaurant he frequents. The man seems to be knowledgeable and good at what he does, and Feynman is interested in what he has to say. The man insists he can make yellow paint by mixing red paint with white paint.

In spite of the fact that he is working on his doctorate at an Ivy League University, Feynman still values the working class laborer over the university intellectual (which may have something to do with conventional notions of masculinity), and is convinced this man might be aware of some physical phenomenon of which he and his colleagues are unaware. He asks to see the man make yellow paint by mixing red paint by white.

In the end, the man is unable to make the paint yellow until he actually adds some yellow paint to the (pink) mix. Feynman observes he is often too quick to disregard established theory on little or no evidence.

Part 2: A Different Box of Tools

Part 2: A Different Box of Tools Summary and Analysis

While Feynman is studying at Princeton, the physics and mathematics departments have tea together every afternoon at four o'clock. During the teas, students from the two departments discuss topics of interest to both physicists and mathematicians (such as the topology of an orange) although they often view the topic in distinctly different ways.

Although he likes to argue with them and give them a hard time, Feynman befriends many of the math students. They teach him a lot about mathematics, and he is surprised to discover there are things he is able to teach them about math as well. He credits this to the unconventional way in which he learned calculus—he was self-taught from a book his high school physics teacher gave him. The book taught him some obscure methods that are not taught very much in university math departments. Since he developed unusual ways for working the problems, he is sometimes able to solve a problem after the more traditional methods of the math students fail. He is working with a "different box of tools" than the math students are.

Part 2: Mindreaders

Part 2: Mindreaders Summary and Analysis

When Feynman's father is a young boy, he receives private tutoring from a man who has a carnival-style mind-reading act. He asks the tutor what the secret of the trick is, and the tutor explains it to him. Many years later, Feynman (the son) tries the trick on his fellow students at Princeton, and is surprised by how effective it is.

Several years later, father and son attend a carnival in Atlantic City where they see a mindreading act. Feynman, the son, figures out the mindreader must be communicating with this accomplice but is unable to decipher the code. Feynman, the father, schmoozes with the mindreader and convinces him to explain the entire code to him in detail. Feynman (junior) acknowledges he will never have the salesmanship skills his father has.

Part 2: The Amateur Scientist

Part 2: The Amateur Scientist Summary and Analysis

As a child, Feynman likes to play in his "lab." He does not do much in the way of actual experiments, but he likes to play around with the equipment and observe nature in a disorganized fashion.

When observing the behavior of paramecia under a microscope, he notices the paramecia do not act in a way that is as simple or one-dimensional as he has been led to believe in textbooks. He thinks a lot may be lost by oversimplifying the behavior of the paramecia into something easy for the observer to understand, but may or may not be accurate.

He also enjoys observing insects, and this fascination follows him into adulthood. While at Princeton, Feynman studies ants—not as a part of his professional research, but merely for recreation. He is fascinated by the means in which the ants engage in tasks such as moving aphids from plant to plant, and picking up water with their bare hands. He does some experiments with a group of ants he finds in his room, to answer questions such as "how do ants find things (like food)?" "How do they signal other ants?" and "How to they form such perfect lines?" He continues his informal ant research (in his spare time and with simple household items as equipment)) later in life, both in Brazil and in southern California.

After concluding his experiments in his room at Princeton, Feynman is left with a dilemma—how to get the ants out of his room without killing them. He achieves this by utilizing what he has learned about the way ants move, locate their food, and create trails. He is able to use what he has learned to direct the ants out of his room.

Part 3: Fizzled Fuses

Part 3: Fizzled Fuses Summary and Analysis

With World War II is on the horizon, Feynman begins to wonder if there is a way he can use his technical expertise to serve his country. He asks an officer how to go about doing this, and the officer tells him he can enter boot camp with the other recruits. When Feynman asks if there is a more direct way to put his technical skill to work, he is quickly shot down. He considers going to boot camp but decides against it.

After taking several tours of the Bell Labs in New York, he is finally offered a summer job. However, shortly afterward he is offered a job with the army and accepts that instead. He later regrets this decision, since he could have helped the war effort in the Bell Labs while doing more interesting and more challenging work.

During the time he spends working for the army, he is employed in the use of a large mechanical computer. He seems to find the device interesting enough, but his particular role in the project mindless and boring. However, with the passage of time, Feynman demonstrates his abilities to his supervisors and is promoted to more challenging tasks.

He performs so well that the army tries to dissuade him from returning to Princeton in the fall. They even offer to make him director of a large project if he stays. Feynman chooses to return to school, however.

Part 3: Testing Bloodhounds

Part 3: Testing Bloodhounds Summary and Analysis

Feynman reads a magazine article that tells him how bloodhounds are able to identify, by smell, the objects that people have touched. This fascinates him, and he asks his wife to help him experiment with this idea.

He leaves the room and his wife picks a book off the shelf and handles it. Later he comes back into the room, and is surprised by how easily he can identify the book she was holding by smell.

He later repeats this as a "party trick" during his time at CalTech. Although he explains to his audience that he is identifying the books by smell, he has difficulty convincing them that his act is genuine.

Feynman is astounded what a human being can determine through the smells secreted by a person's hands as well as by most people's complete ignorance in this matter.

At this point, Feynman is evidently already living in Los Alamos, working on the Manhattan project, and married to a woman named Arlene, who has become ill and is hospitalized. Aside from a brief mention in the "Vitals" section, this is the first we hear of any of these developments. We will get a little more background about how he comes to be in this position in the next chapter, however.

Part 3: Los Alamos from Below

Part 3: Los Alamos from Below Summary and Analysis

This very long chapter begins its life as a lecture Mr. Feynman gives at a conference at Los Alamos, and has been previously published as one of nine lectures in a volume called Reminiscences of Los Alamos.

The chapter is called "Los Alamos from Below" because he is very low on the totem pole during his time at Los Alamos (and not the distinguished professor he would eventually become). Therefore he is showing us the Manhattan Project through the eyes of the common worker, rather than through the eyes of project leaders forced to make very difficult decisions. Although he later admits that, while he was not exactly running the place as a newly minted Ph.D., he was not the lowliest grunt worker either.

We hear about how he learns about the Manhattan Project while at Princeton. He is initially hesitant to become involved in such a project, but when he considers the real possibility that Nazi Germany may obtain the bomb first, he decides to attend a meeting on the subject—and within hours he is busy performing calculations for a bomb-related project.

He finishes his doctorate shortly before making the move to Los Alamos. His wife is ill with tuberculosis, and must stay in a hospital in Albuquerque where Feynman can visit her on the weekends. Feynman lives on site in the men's dormitory, a situation which gets him into some humorous situations involving his desire to not have a roommate.

It seems to take some time to settle in at Los Alamos, and to get the facility fully operational. However, since Feynman is working on the theoretical aspects (thinking and doing math) and does not need much in the way of specialized equipment, he and his group can get started right away.

The chapter goes into some detail about the level of secrecy and security that surrounds the work done at Los Alamos. First of all, the researchers are asked not to travel to Albuquerque directly from Princeton, for fear too many people from one small train station traveling to New Mexico might arouse suspicion (Feynman, however, travels directly to Albuquerque, because he assumes that if nobody goes to Albuquerque, they will appear to be avoiding it—and therefore the railroad company determines that all of the cargo from Princeton to be delivered there must be his.

Also, the letters he sends and receives are censored. Many times his unconventional mail raises eyebrows with the censors. His father and wife routinely send him letters in secret codes (Feynman likes to try and crack the codes). The censors do not like any mail coming in that they cannot read, and insist that if mail was going to come for him in secret codes, that they be given a key so they can crack the code.

The secrecy issue becomes more of an inconvenience when Feynman is sent to other sites (where they are processing the uranium, for example, for work on the bomb at Los Alamos). Most of the people at these other sites have no idea they are working on the atomic bomb (they are not privy to this information). This lack of information on the part of the providers creates many project inefficiencies and at times some very dangerous situations.

Back in New Mexico, Feynman is leading a group of young scientific minds through a series of calculations using an early computer. The people in Feynman's group have no idea what they are doing (since they are not privy to classified information) and are merely going through the motions (and so their productivity is very poor). After Feynman is granted permission to explain to them what the Manhattan Project is (and what their role in it is) they work much more efficiently.

Arlene, Feynman's wife, grows sicker and sicker in her Albuquerque hospital. Feynman becomes aware he may be called in, in case of an emergency, and arranges a car that he can leave in at a moment's notice. When he finally receives the call, he does leave immediately, but his journey is lengthened by three flat tires. This is a serious setback, since tires are rationed and hard to come by during the war, but he finally makes it to Albuquerque, merely hours before his wife's death. Feynman returns to work afterward, clearly wanting to lose himself in his job and think as little as possible about his loss.

During the time he spends working on the Manhattan Project, Feynman is starstruck by the caliber of distinguished scientists that he gets to work with, such as Oppenheimer, Fermi, and most notably, Niels Bohr. Bohr in particular enjoys speaking with Feynman, since Feynman is the only scientist at Los Alamos not too intimidated by his godlike status in the field of Physics to argue with him in matters of science.

The bomb is finally complete, and those who have been working on it celebrate the culmination of their efforts. Bob Wilson, Feynman's colleague from Princeton who convinced him to join the Manhattan project, is visibly distressed however. Bob Wilson is beginning to understand the level of human suffering that will come from the thing they have created, and he is overtaken with guilt and fear.

After working on the bomb and learning of the extent of the destruction done to Hiroshima and Nagasaki, Feynman becomes somewhat despondent and fatalistic. He watches people building new things and feels that what they are doing is utterly useless and pointless. As he writes the book, some four decades after the end of the war, he sounds much more hopeful.

Part 3: Safecracker Meets Safecracker

Part 3: Safecracker Meets Safecracker Summary and Analysis

In this chapter, Feynman discusses his fascination with locks and safes, and the ways he learns to crack different locks and safes.

He also talks about the locks and safes there were at Los Alamos (the ones that held the secrets of the atomic bomb). Generally speaking, the safes containing this material, which is (understandably) considered top secret, are startlingly easy to crack. When Feynman and his colleagues first arrive at Los Alamos, the construction of the facility is not even complete yet, and there is almost no security at all for the "top secret" information. Even later, when the information is stored in safes and locked file cabinets, the locks are generally cheap, and it is easy for Feynman to determine what the combination is.

Later, some information is stored in better constructed safes and locked boxes. However, Feynman is amazed by how easy it is to figure out the combinations to these. Many of the locks have the same combinations that they came out of the factory with (nobody ever bothered to change them). There are other safes that can be easily figured out if you know something about the person (such as the person's birthdate, marriage anniversary, fondness for pi, etc.) He also discovers that very often a secretary will write the combination down in a convenient place so she can remember it (he discovers it is relatively easy to find where the secretary writes things down).

During his time at Los Alamos (when he is exploring the world of cracking safes—along with helping to develop the atomic bomb), Feynman meets a professional safecracker. He learns the safecracker is using many of the same techniques he is (he assumed the safecracker knew special techniques for cutting open safes, and other things Feynman did not know). He learns the professional safecracker, much like himself, gives himself credibility by keeping an air of mystery surrounding what he does.

Part 3: Uncle Sam Doesn't Need You!

Part 3: Uncle Sam Doesn't Need You! Summary and Analysis

During the war, Feynman is deferred from the draft because he is working on the atomic bomb, but now the war is over, and the army desperately needs occupation forces in Germany, Feynman is required to report to the draft board for a physical.

At the draft center, Feynman has his vision, blood, and other physical attributes tested before finally moving to the psychatric booth. Feynman clearly has no respect for psychiatry as a profession, and is therefore rude and condescending throughout the interview.

The psychiatrist asks him questions such as "Do you think people talk about you?" and Feynman gives truthful answers such as "Yes, sometimes I do. I went to see my mother the other day and she said 'My friends and I were just talking to me.'"

During this time the interviewer writes down quite a bit in his notebook and takes no notice of any of his explanations for his answers. He is referred to a second, more distinguished looking, psychiatrist who asks him the same questions and behaves in more or less the exact same manner.

He later receives a "deficient" psychiatric score and is rejected for military service. He reads his psychiatric statement, and it is full of simple statements such as "believes people are talking about him". He finds this very amusing. He tells friends and family about it and they usually find it very amusing as well.

Part 4: The Dignified Professor

Part 4: The Dignified Professor Summary and Analysis

After Feynman finishes his work in Lost Alamos, he takes a professorship at Cornell, that he gains through his association with Hans Bethe in the Manhattan project. In his new life as a professor, he self-consciously wants to present himself as a "distinguished gentleman."

When he arrives in Ithaca he decides to take a taxi instead of walking or taking the bus, because he feels it makes him appear more distinguished. He asks to be taken to a hotel, but soon learns there are no vacant rooms in town, and he is forced to spend his first night as a "distinguished professor" at Cornell on a couch in one of the campus lobbies.

During this time Feynman attempts to begin dating for the first time since the death of his wife but soon realizes women are generally unimpressed when he tells them that he is a Physics professor. He decides to be as vague as possible about his role at the University, and this only leads to further complications.

The rest of this chapter deals with Feynman's experience adjusting to life at Cornell. He receives many offers from other places, and is intimidated by the sheer number of choices he has. He also fears he may not be able to live up to the expectations his employers at Cornell have of him.

Part 4: Any Questions?

Part 4: Any Questions? Summary and Analysis

During his time at Cornell, Feynman is asked to give lectures every week in Buffalo. He therefore is required to travel there every weekend, for which he is compensated thirty-five dollars a week (on top of his regular pay and travel expenses). Since he is less than enthusiastic about making the trip to Buffalo every week, he decides he is going to make a point of spending this extra money to entertain himself on these trips.

He decides he wants to visit a "trendy" bar, so he asks his cab driver for a recommendation. The cab driver takes him to a place called the Alibi Club. While at the Alibi Club, Feynman tries to appear "tough", always orders a "black and white" with water on the side, and basically does everything he thinks he needs to do to look cool in the bar. At one point his " tough guy" posturing gets him into a fist fight—the first in his life.

After he finishes teaching the course in Buffalo, Feynman ceases to visit the Alibi Club. Ten years later, he returns and finds it a very different place—much more run-down and "shadier" than it had been before.

Part 4: I Want My Dollar!

Part 4: I Want My Dollar! Summary and Analysis

Dr. Feynman recounts an incident in which he patents several uses for nuclear energy. While he is working in Los Alamos, an officer from the patent office tells him they want to hear every idea he has for an application of nuclear energy.

Off the top of his head, Feynman rattles off things like, "Nuclear powered airplane, nuclear power rocket, etc." From this interview, Feynman gets his name put on three patents. He has to sign a form saying he has sold his ideas to the United States Government for one dollar. When Feynman asks about this dollar, he is told there is no actual dollar (the paper only says he is selling them for a dollar as a formality). Feynman insists on getting his dollar, however, and the patent officer pays him a dollar out of his own pocket to appease tnem. Feynman uses the dollar to buy baked goods for his coworkers, who in turn insist upon receiving dollars of their own (they all signed similar forms). The officer cannot afford to pay everybody and is forced to seek government funding.

Years later, Feynman is contacted by a company that plans to produce nuclear powered airplanes. They want Feynman to direct the project, in spite of his lack of engineering experience, because his name happens to be on the patent for nuclear powered airplanes.

Part 4: You Just Ask Them?

Part 4: You Just Ask Them? Summary and Analysis

This chapter discusses Feynman's return to the dating scene after the death of his wife. He gains a reputation as a "big spender" at a nightclub in New Mexico when he inadvertently buys a woman an expensive bottle of champagne. After this incident, he finds he routinely finds women solicit drinks from him but he never "gets anywhere" afterward. He befriends a woman named Gloria and her husband (who is the Master of Ceremonies at the nightclub). Gloria and her husband explain to Feynman that he will fare better if he asks a woman outright if she intends to sleep with him before he buys her a drink. Although skeptical, Feynman tries this strategy and finds it surprisingly effective. However, after using this strategy a couple of times, Feynman abandons it, because it is not what he is used to. He finds it very interesting, however, that the world works very differently than how he was taught.

Part 4: Lucky Numbers

Part 4: Lucky Numbers Summary and Analysis

Feynman develops a knack for using logic to solve arithmetic problems in his head, a skill he largely credits to the influence of Hans Bethe, a scientist he works with at Los Alamos.

In Brazil, he encounters a Japanese man in a restaurant who prides himself on his ability to make calculations with an abacus very quickly. Feynman greatly distresses the man when he is able to outperform him without even using an abacus—he does all of the math in his head. He tries to explain the logic tricks he uses to the Japanese man with the abacus but is unsuccessful. The man has a very limited concept of the math involved, and is merely highly skilled at operating the abacus.

Part 4: O Americano, Outra Vez

Part 4: O Americano, Outra Vez Summary and Analysis

In this chapter, Feynman discusses his experiences in Brazil. He visits Brazil as a lecturer on multiple occasions, including once for a period of almost a year. During his time in Brazil, he enjoys exploring a new culture. He takes great pains to learn the language, and although he is often dismissive of the progress he makes, he evidently learns to speak Portuguese reasonably well. Not only is he able to function within the Portuguese-speaking society, he gives his physics lectures in Portuguese as well (so his Brazilian students can focus on the concepts of the lesson, and not worry about translating the information from English).

Feynman learns to play a Brazilian percussion instrument, called the frigideira, and performs with a samba during the Rio carnival. He is obviously new to the frigideira, and Samba music in particular, but practices it religiously and finally gets so good at playing it that the director points him out as an example for the other frigideira players to imitate.

He enjoys his time in Brazil (so much that he makes several extended trips), but is dismayed by the state of physics education he finds there. He finds that, while Brazilian students begin to study Physics at a lower age than American students, and exert more effort in their studies, much less is being achieved there. He blames these poor results on the way science is being taught there. He feels the students are merely taught to memorize terms, and have not had the underlying concepts explained to them sufficiently. He concedes Brazilian science education has not failed completely, citing several students and fellow students who have sufficiently learned physics, in spite of the deficiencies he perceives in the Brazilian teaching methods. He later learns that each of these people he cites as an exception of the rule, is either self-taught or learned abroad, and is therefore not entirely a product of the Brazilian education system.

Part 4: Man of a Thousand Toungues

Part 4: Man of a Thousand Toungues Summary and Analysis

This very short chapter (less than a page long) recounts one humorous anecdote. Since Feynman now speaks Portuguese and is feeling multilingual, a colleague of his has a Mrs. Smith (who is Caucasian but speaks Chinese) greet him in Chinese. When she does, he responds in "fake Chinese" (similar to the "fake Italian" discussed in Part 1). The woman is flustered because she believes Feynman is speaking to her in Cantonese, but she speaks only Mandarin.

Part 4: Certainly, Mr. Big

Part 4: Certainly, Mr. Big Summary and Analysis

This chapter discusses many of Feynman's experiences in Las Vegas, where he frequently ends up for weeks at a time, when being distracted from coast-to-coast road trips. He enjoys Las Vegas since, as he does not gamble, he is able to enjoy the meals, lodging and entertainment the casinos offer at very low prices.

He meets a man who claims to be able to make a comfortable living as a gambler. The gambler offers to share his "gambling secrets" with Feynman. It soon becomes clear Feynman is being scammed. Although Feynman does not fall for the man's machinations, he is fascinated by the way he operates.

However, later he meets a man who does earn his living as a professional gambler, a somewhat famous gambler called Nick the Greek. Feynman wonders how NIck the Greek is able to profit at gambling, when the casino stacks the odds against him. NIck the Greek lets him know he does not make a living betting against the Casino, but rather against the superstitious beliefs of other gamblers.

Feynman befriends many of the Las Vegas showgirls. At first he sees them all in terms of a stereotype, but later learns more about them and their stories, and discovers he finds many of them to be interesting people.

One of his showgirl friends introduces him to a rich Texas high-roller who tries to impress him with his wealth. Feynman remains unimpressed, however.

The rich Texas oilman introduces him to a group of Los Angeles prostitutes who, much to Feynman's surprise, are familiar with his work and that of his colleagues. They are the only people he meets in Las Vegas who are familiar with CalTech physicists.

He meets a woman who claims to be married to a very famous man in town. He later learns this story is almost completely fabricated—this woman had only a casual fling with the famous man. However, much like this woman, Feynman discovers he also likes to pretend to be associated with this man (here referred to only as "John Big") and entertains himself by following "John Big" around and pretending to be his assistant.

"Mr. Big" introduces him to a woman lawyer. They hit it off pretty well, and go dancing. Later, he hurts himself, and she takes him home where he immediately falls asleep (due to sleep deprivation). The next morning he wakes up in her bed, discovers she is gone, and tries to figure out who she is, or what her name is. He is unsuccessful in this endeavor and never sees this woman again.

Part 4: An Offer You Must Refuse

Part 4: An Offer You Must Refuse Summary and Analysis

Both CalTech and Cornell want to keep Professor Feynman on staff, so they get into a sort of "bidding war" over him, each trying to "one-up" the other, in terms of pay, benefits, and working conditions. Feynman keeps drifting back and forth between the two indecisively.

He decides he prefers working at Caltech (since everyone there is working in the sciences and because it is in a major city). He finally decides he will permanently stay at Caltech, no matter what kind of offer he receives elsewhere—he commits to a life as a CalTech professor.

Later, the University of Chicago attempts to recruit him, but Feynman refuses to hear their offer, since he has decided to remain at CalTech. He later learns Chicago wants to offer him a salary several times that which he is paid at Caltech, but he remains firm in his decision.

Part 5: Would you solve the Dirac Equation?

Part 5: Would you solve the Dirac Equation? Summary and Analysis

Feynman travels to Japan to participate in a Physics conference. The Japanese are recovering from the war and wish to reignite the academic study of Physics within their culture. Feynman studies Japanese in anticipation of his trip. He later learns he is the only American attending the conference who has done so (all were advised to).

While in Japan, Feynman goes out of his way to learn what he can about Japanese culture. He refuses to stay in western style hotels, and insists on being moved to a Japanese-style hotel. He enjoys his immersion in Japanese culture—sleeping on the floor, eating with chopsticks, speaking Japanese, for example.

An incident involving a chambermaid accidentally walking in on a man changing clothes (she excuses herself without embarrassment) convinces Feynman and his colleague that Japanese culture is far more civilized than their own.

At the Japanese Hotel, Feynman commits the Japanese faux pas of walking into the bathroom before he has been informed his bath is ready. The man he walks in on is, coincidentally, the Nobel prize winning physicist, Yukawa, with whom Feynman is acquainted. Yukawa is reasonably understanding and explains Feynman's error to him.

Feynman enjoys Japan so much, he decides to return and give lectures at a later time.

Feynman tries fanatically to learn the Japanese language, but finds speaking the language requires almost an insider's knowledge of the culture. He becomes frustrated by this and gives up his study of Japanese.

Part 5: The Seven Percent Solution

Part 5: The Seven Percent Solution Summary and Analysis

This chapter discusses Feynman's experiences at a time he is working on beta decay theory. At this point in his life, he feels somewhat behind the world's greatest experts in this particular field, and is somewhat self-conscious about this.

There is, at the time, a conundrum in particle decay theory. The qualities of certain subatomic particles cannot be explained with the current theory. It is later discovered things taken for granted (accepted as fact) in fact had not been sufficiently proven in the past, and turn out to be false.

From this experience, Feynman learns not to put to much trust in the general scientific consensus, and to check all the facts for himself, without accepting the "experts'" opinions.

This chapter is one of the few places where "Surely You're Joking, Mr. Feynman" discusses physics in a highly technical fashion. However, the author's primary purpose in writing this chapter is not to explain particle physics, but rather to demonstrate the importance of not blindly accepting information based on the fact it is the opinion of those believed to have expertise.

Part 5: Thirteen Times

Part 5: Thirteen Times Summary and Analysis

Feynman agrees to lecture at the local city college, under the condition he will not have to sign his name more than thirteen times (including the signature on his paycheck) in order to do this—he abhors paperwork.

In the end he ends up having to sign twelve forms, and then teaches the course. After he has completed the course, he is told there is one more paper he must sign in order to receive his paycheck. He refuses to sign, since the check itself would be the thirteenth signature. The college insists they are unable to pay him unless he signs this form. Feynman is so stubborn on this point, however, that he is willing to give up his pay in order to avoid writing a fourteenth signature.

This causes confusion and anguish in the college's accounting department. They have already accounted for the funds to be paid to Feynman, and services have already been rendered. They do not know how to handle the records in this particular situation, in which he refuses to claim his money (nor do they know what to do with the extra funds). In the end, they send him his check anyway—even though he never signed the form.

Part 5: Sounds Greek to Me

Part 5: Sounds Greek to Me Summary and Analysis

Feynman arrives in North Carolina, where he plans to attend a conference at the University. However, he plans to arrive at the conference a day later than the other participants. He gets a taxi at the airport and the driver asks him if he is going to the University of North Carolina at Chapel Hill, or the State University of North Carolina at Raleigh. Feynman realizes he has no idea.

Feynman points out that a large number of people must have arrived at the airport the previous day for the conference. He explained that these people would have been "science nerd" types who would have been speaking to each other in vocabulary unfamiliar to most people. The cab driver knows what he is talking about immediately. He asks another taxi driver to take him to Chapel Hill, where Feynman successfully finds the conference.

Part 5: But is it Art?

Part 5: But is it Art? Summary and Analysis

Feynman befriends an artist named Jiyrayr Zorthian, and they like to argue about whether science or art is the superior calling. It occurs to Feynman that their arguments will go nowhere, as long as he knows nothing about art and Zorthian knows nothing about science. Zorthian agrees to teach Feynman how to draw. In return, Feynman will teach Zorthian about physics. Zorthian's physics lessons do not amount to much, but Feynman puts a lot of time into his art, and soon begins to show significant progress. He goes on to take correspondence courses as well as classes at the Pasadena Art Museum. He is impressed with the instruction he receives.

Feynman continues to advance in his study of art, and finds he most enjoys drawing nudes. He admits this may have as much or more to do with his interest in looking at naked women than it does with some sort of artistic statement.

Around this time, Feynman becomes a regular at a Pasadena topless bar (he admits to frequenting the establishment five or six times a week). Although he sometimes draws the dancers during his visits, he does not pretend to be there merely for artistic reasons. He ends up actively defending the topless bar when it is taken to court by community members who want to shut the place down (Feynman receives some unwanted media attention over this).

As a result of his social connection with the owner of this strip club, Feynman is commissioned to do a drawing for a local brothel.

Feynman develops his artistic skill to the point where he is able to show his work in semi-professional exhibitions (under the assumed name "Ofey") and sells a few pieces (very few). He is thrilled to have this level of exposure to the art world, which is distinctly different from his life in the sciences.

Part 5: Is Electricity Fire?

Part 5: Is Electricity Fire? Summary and Analysis

Feynman attends a conference on "the ethics of inequality". Before the conference he receives a recommended reading list—which consists of a list of "classics" and other such books he has not read. He begins to feel inadequate, uncultured, and unqualified to participate in this conference.

When he arrives at the conference he finds the people there use very elevated language to say things that are inherently simple and obvious. His intimidation vanishes when he recognizes the pretension. He is later amused when the stenotypist assumes he is not a professor since he, unlike the other professors, uses accessible language the stenotypist is able to understand.

In another incident, Feynman attends a lecture given by a man who advocates that Americans should, as a group, part with much of their wealth and share it with those in poorer nations in the interest of preventing war. The man is such a talented speaker that Feynman is initially drawn in to his argument. It is not until he is able to get away from this charismatic character for a while that he realizes that although the speaker has good intentions, his proposal is deeply flawed. He blames the fault in the man's logic on his lack of sufficient scientific training to understand the technological reasons behind the inequality of nations.

A group of rabbinical students consult Feynman on scientific matters. Feynman agrees to help them, because he is interested in learning about the Talmud from them and because he is excited they, as future rabbis, feel the need to enhance their scientific understanding of the world. He is disappointed when he discovers they are not interested in science at all, but only in resolving issues in a centuries-old document and finding ways to make it mesh with modern society.

Although Feynman is frustrated by the inability of these rabbinical students to push tradition aside and approach science with an open mind, he (along with the rabbinical students) acknowledges Jews are overrepresented in the sciences. He seems to believe this is because Jewish teachings are friendly to scientific rationalism and carry a great respect for learning.

Part 5: Judging Books by Their Covers

Part 5: Judging Books by Their Covers Summary and Analysis

Feynman finds himself invited to Washington to attend conferences discussing weapons, public policy, and other issues he he feels unqualified to discuss. However, it may be because he feels some guilt and irresponsibility about turning down so many of these offers, that he agrees to serve on a math textbook approval committee.

The job of the committee he serves on will decide which textbooks will be used in California public schools. No textbook can be used in a classroom until it is approved by this committee. Feynman receives the books to be reviewed by the committee. He finds an overwhelming number of books (three hundred pounds of books and seventeen feet of bookshelf space) but commits himself to reading all of them (he later discovers many of the other committee members do not make the effort to read all of the books). He is dismayed to find that, despite the enormous number of books to choose from, they are all universally terrible—littered with inaccuracies, ambiguity, and other information that, while not incorrect, has no practical value in the real world (such as word problems that ask a student to add the temperatures of three random stars in the sky together).

Even after he and the other committee members have made their list of recommended materials, they are undermined by budgetary and political interests. Feynman is also disturbed by the way in which many of the book publishers try to get their books approved by providing gifts and favors to the committee members (or by "explaining" their books to committee members who have not bothered to read the books themselves). Feynman is later on a committee to approve science textbooks, and is met with similar situation, and resigns from textbook reviewing.

Part 5: Alfred Nobel's Other Mistake

Part 5: Alfred Nobel's Other Mistake Summary and Analysis

This chapter discusses Feynman's ambivalence about winning the Nobel Prize in Physics—the media attention, fame and social formalities of the experience are stressful to him.

Feynman is also nervous about being presented to the King of Sweden, and about interactions with royalty in general, since he finds the prescribed social rituals involved in such occasions confusing (he relates one very awkward encounter with a Danish princess). All in all, he seems to have fond memories of Sweden, however.

After winning the Nobel Prize, Feynman discovers people with no interest or background in physics arrive at his lectures because of his celebrity status—therefore making him feel pressured to give less technical talks than he otherwise would. He gets around this by giving his lectures dull sounding titles and scheduling them under a false name, so only students genuinely interested in the physics will attend.

Feynman seems to find fame generally inconvenient (and at times even detrimental to his career aspirations). That said, it is something he appears to have a sense of humor about.

Part 5: Bringing Culture to the Physicists

Part 5: Bringing Culture to the Physicists Summary and Analysis

Feynman learns about Mayan mathematics while on his honeymoon with his second wife. The only reason he makes any effort to learn this is because he is bored (his wife is there to study Mexican art—a subject in which he has little interest.) Feynman discovers many unexpected things about Mayan math—like how the Mayans determined the period of Venus with suprising accuracy.

Despite his self-professed contempt for academic study in the "cultural" areas, Feynman is asked to give a lecture on Mayan math at UCLA to bring culture to the physicists there.

Part 5: Found Out in Paris

Part 5: Found Out in Paris Summary and Analysis

This chapter discusses Feynman's drumming hobby. Feynman seems to have first become interested in drumming while in New Mexico (he finds some abandoned drums at the facility—which used to be a school). His habit of wandering off into the woods and playing the drums by himself causes him to be mistaken for a Native American performing a tribal ritual.

Feynman tries to give up drumming when he moves to Ithaca, but later takes it up again. He takes lessons from a Nigerian man named Ukonu. In California, he begins to drum with Ralph Leighton (the co-author of this book). Later, at CalTech, he drums for a production of Guys and Dolls. This production puts him in contact with a choreographer, who wishes to produce a ballet in which the only music is percussion (namely the percussion of Feynman and Leighton). The two drummers hesitantly agree to participate, and record the soundtrack for the ballet. The choreographer takes the ballet to several competitions and it fares pretty well.

The choreographer finally enters her ballet in a competition in Paris and ultimately ends up losing to a Latvian group. She later finds out she lost because the drumming she used as her soundtrack was amateurish. Feynman, who felt somewhat self-conscious about not being a professional musician, jokes that these cultured Parisians were able to see through his ruse.

Here again, the self-reported "one-sided" scientist achieves success in yet another artistic medium.

Part 5: Altered States

Part 5: Altered States Summary and Analysis

Feynman meets Dr. John Lilly and his wife who introduce him to the sense deprivation tank. In a sense deprivation tank, a person experiences complete darkness and silence. They are also floating in liquids kept at body temperature, so they do not feel anything either. In the sense deprivation tank, it is easy to enter a trancelike state and have hallucinations.

On one of his visits to the sense deprivation tank, he meets an Indian man named Baba Ram Das, who helps him have an "out of body" experience in the chamber.

With practice, Feynman gets better and better at having hallucinations within the chamber. He enjoys analyzing the process in which this happens, much as he enjoyed analyzing the way in which he fell asleep for his research project at MIT (as chronicled in the "Always Trying to Escape" chapter).

Part 5: Cargo Cult Science

Part 5: Cargo Cult Science Summary and Analysis

The book ends with a CalTech commencement address Feynman delivered in 1974. Feynman laments that, with a large numbers of the general populace giving credence to ESP, astrology, and other supernatural phenomena, the world may be just as rational and unscientific as it was in the middle ages.

He warns these new CalTech graduates that they are going to have to confront these obstacles in their careers as scientists. He also warns them that "pseudoscience" can slip into other, less obvious places, unnoticed, and uses pop psychology on pedagogy and parenting techniques as examples. He compares these misleading belief systems to the "cargo cults" of the south pacific. These tribal people witnessed planes landing, filled with supplies. Wanting a plane full of food, clothing and weapons to land for them, they built runways, headphones, and bamboo "antennae" and then waited for the planes to come. Of course they never did. It made no difference how much they improved their runway and assorted gear.

Feynman advises the new students to avoid the trappings of the cargo cult by considering all possible explanations for their data until it is proved false, and always keeping an open mind to possibilities very different to what you originally theorize.

He discusses the work of a scientist named Millikan and the work he did to measure the charge on an electron. Millikan's findings were almost accurate—but were slightly off due to the faulty value he had for the viscosity of air. Subsequent studies, which revealed the charge of an electron to be higher than the number Millikan came up with, were doctored to be more in line with Millikan's findings—because Millikan's number was assumed to be accurate. Therefore, it was a long time before the actual charge of an electron could be established. Feynman discusses similar phenomena in "The 7 percent solution".

Feynman uses several other examples to warn student to test all possible explanations for phenomena, to examine all data empirically without personal bias, and to extend the same courtesy, and humility when discussing your research with laypeople as you do toward fellow scientists.

Characters

Dr. Richard P. Feynman

"Surely, You're Joking Mr. Feynman" is a somewhat unconnected series of anecdotes as told by Dr. Richard Feynman. All of the anecdotes relate to Dr. Feynman's life, and he is the only thing the stories within the narrative have in common. Therefore, there are no other major characters in the book—particularly since Dr. Feynman is somewhat introverted (or at least wrapped up in his ideas—he does appear to make friends easily), and more interested in concepts and general social phenomena than in talking about his relationships with other people. Although he meets many people throughout his life whom he finds interesting, none of these people rise to become significant or developed characters in this autobiographical narrative. Very few of them receive more than one mention.

Dr. Feynman's character is revealed throughout the course of the book. It can be argued that the "purpose" of the book is to demonstrate this man's personality. From his childhood, Feynman shows himself to be extremely inquisitive, intelligent, and mischievous. We see a child with an uncanny ability to fix radios, who uses this ability largely to play jokes on his family and friends: he frightens his parents by rigging his room with a radio "burglar alarm", pretends to have eerie prescience when he is able to pick up radio stations from a city that broadcasts an hour earlier —therefore he knows what happens in his favorite programs an hour before his friends—and transmits radio programs of his own in order to entertain his sister. We see a young Feynman who is constantly trying to "reinvent the wheel". He is always trying to develop a new method for doing everything, from cutting green beans to bussing tables. From an very early age, Feynman is a character who takes genuine enjoyment in learning new puzzles, inventing new ways of doing things, and figuring out puzzles.

On several occasions, Feynman refers to himself as a one-sided individual, with few interests outside of science. However, he presents the reader with much evidence to the contrary. Even during his undergraduate years at MIT, when he avoids coursework outside of the sciences, he seems to regard the social skills he learned from his Fraternity brothers as an important element of his education. At Princeton, Feynman is one of the only graduate students who take coursework outside of their primary field of study (in his case, he studies biology). As Feynman matures, he becomes even more multi-faceted. He learns to speak foreign languages, play musical instruments, and even gains some recognition as an artist. He seems to feel that the lessons he has learned in this wide variety of activities make him a better physicist.

Feynman is not entirely humble—he is acutely aware of his superior intelligence, and not afraid to admit it. Particularly in his stories of his younger days, he constantly plays practical jokes at the expense of people he feels are less intelligent than he is. However, he takes his role as an educator very seriously, and seems to believe there are many

highly intelligent people in the world, who are capable of achieving what he has, given an inquisitive nature and the right education.

At the book's close, Feynman is a highly distinguished scientist, with a Nobel prize and a highly eclectic collection of personal and professional experiences.

Ralph Leighton

Although "Surely You're Joking, Mr. Feynman" is clearly a first person account from Dr. Feynman's point of view, Ralph Leighton is credited as co-author. The book could be seen as a series of incidents in Feynman's life as related to (and probably edited and arranged by, to some extent) Ralph Leighton.

Ralph Leighton appears as a character only once, in the chapter entitled "Found Out in Paris". We learn that Mr. Leighton is a drummer, and that this is how the two meet. The chapter tells us the two of them collaborate on several drumming projects. Although Mr. Leighton is a friend Dr. Feynman meets through one of his non-scientific endeavors, the fact he has collaborated in the writing of such a multi-faceted book suggests that he, like Feynman, may have a very wide range of interests.

Albert Einstein

Feynman interacts with Einstein, probably the most famous scientist of the twentieth century, during his time at Princeton. As a student, Feynman is giving his first scientific talk, and is intimidated when he learns the legendary Dr. Einstein will be among the extremely famous scientists in attendance at the presentation. However, the Einstein presented here appears very supportive of the young beginning scientist, and very humble.

Jiyrayr Zorthian

Artist who teaches Feynman how to draw. Feynman attempts to teach Zorthian about physics, but this does not work out as well. Zorthian is among the few people Feynman personally selects to attend the reception thrown in honor of his Nobel prize.

Hans Bethe

Manhattan Project scientist. After the war, Bethe gets Feynman a job at Cornell. Feynman accepts the position, largely because of his regard for Dr. Bethe.

Bob Wilson

Scientist from Princeton who recruits Feynman to join the Manhattan project. When the project is complete, Wilson is the first to acknowledge the terrible implications of what they have done.

Mel and Lucille Feynman

Feynman's parents, who appear to have encouraged his curious nature from a very early age. Feynman appears to credit his parents with much of his success later in life. The fact that both of the Feynman children grow up to become distinguished physicists indicates they were reared in an environment favorable to developing scientific reasoning skills.

Arlene Feynman

Feynman's first wife, who dies of tuberculosis during his time at Los Alamos.

Nick the Greek

Famous professional gambler whom Feynman meets in Las Vegas. Nick the Greek tells Feynman he is able to win by playing against other people's superstitious beliefs.

Oppenheimer

Director of the Manhattan Project

Gell-man

Physicist who works with Feynman at CalTech. A group of prostitutes in Las Vegas take notice of him as the "youngest and handsomest" scientist at CalTech. He later shows himself to be multi-faceted when he gives a lecture on linguistics.

Joan Feynman

Feynman's younger sister. We first meet her as a child celebrating her second or third birthday, and later we see her as a girl scout. Joan grows up to a distinguished physicist, much like her brother.

John Wheeler

Feynman's academic adviser at Princeton.

Mary Lou Feynman

Feynman's second wife. The book tells us little about her, other than the fact she likes Mexican art, and that she and her husband argue excessively. The marriage does not last long.

Gweneth Feynman

Feynman's third wife. The book tells us less about her (she is his wife at the time he authors this book) than it does about her two predecessors. Feynman has two children with Gweneth. She seems to have a sense of humor about her husband frequenting topless bars.

Mr. and Mrs. John Lilly

Researchers on sense deprivation. They introduce Feynman to the sense deprivation tank.

Niels Bohr

Even among the elite selection of distinguished scientists who work at Los Alamos, Niels Bohr is a god-like figure. Bohr likes speaking to Feynman, who is at the time young and unknown, because he is the only scientist at Los Alamos who is not too intimidated by Bohr's fame to argue with him.

Objects/Places

Far Rockawayappears in non-fiction

A neighborhood in Queens, New York, where Feynman is born and raised.

The Massachusetts Institute of Technology (MIT)appears in non-fiction

Prominent school of science and engineering where Dr. Feynman earns his undergraduate degree.

Princeton Universityappears in non-fiction

Feynman earns his Ph.D. at this Ivy league institution.

The Manhattan Projectappears in non-fiction

The name given to the mission to develop the first nuclear weapons during World War II.

Los Alamos, New Mexicoappears in non-fiction

Site of the Manhattan Project's weapons research and design laboratory.

Cornell Universityappears in non-fiction

Ivy League university in Ithaca, New York. Feynman works there briefly, as a professor, before finally settling at CalTech.

The California Institute of Technology (CalTech)appears in non-fiction

Famed university and research center where Dr. Feynman spends the bulk of his career as a professor.

Albuquerqueappears in non-fiction

Largest city in New Mexico, approximately 100 miles from Los Alamos. During his time with the Manhattan Project, Feynman visits his wife, ill in an Albuquerque hospital, whenever he can.

Brazilappears in non-fiction

Feynman travels to Brazil, on multiple occasions, to lecture on physics.

Japanappears in non-fiction

Feynman travels to Japan to attend a conference and is thoroughly impressed with Japanese culture.

Swedenappears in non-fiction

Feynman visits Sweden to accept his Nobel prize.

Las Vegas, Nevadaappears in non-fiction

Feynman frequently stops in Las Vegas for long periods of time during road trips.

Themes

The Nature of Genius

Perhaps the most significant purpose of "Surely Your Joking, Mr. Feynman" is to take the reader into the mind of the great physicist, in order to discover, more or less, how it works. While most biographies of highly accomplished people read like three hundred page resumes—focusing on why the person is famous and his or her major accomplishments, this narrative only brushes over these issues. It never even tells us specifically what his Nobel prize is for.

What we end up with is a series of anecdotes that clue us in to the goings on in the mind of a great genius. We learn what he is thinking as he watches gamblers in a casino, or watches ants on his window sill, or travels to a foreign culture. Through incident after incident, we learn how his unceasing thirst for knowledge and "out of the box" thinking are ever-present—even when he is doing something as simple (and seemingly unrelated to his primary field) as listening to music, opening a lock, or picking up a woman in a bar.

Although Feynman demonstrates what is, in many ways, a wide range of academic interests, he seems to care little about social protocol, and other similar issues that occupy the minds of most people. This may work to his advantage, since it allows Feynman to focus on learning within his areas of interest.

The Nature of Science

In his book, Dr. Feynman helps bring the reader a deeper understanding of science and how science works. He spends little time explaining the technicalities of the physics he works with, however. Readers wishing to develop an in-depth understanding of his physics will need to read one of his other books.

What Feynman does offer in this autobiographical narrative is an explanation of the scientific process—how scientific reason and methodology works, and the mental processes of a good scientist (and of a not-so-good scientist).

The scientific method seems to come effortlessly to Feynman. Even as a child, he seems to practice it by instinct. He is apparently born to analyze the natural world acutely and objectively, make quantitative assessments, and experiment with various possibilities, as he learns about the ins and outs of radio systems and tries to perfect the art of string bean cutting. He often appears frustrated by, and even bewildered by, people who either cannot or will not utilize scientific reasoning (and even go so far as to discourage others from doing so). To Feynman, scientific reason is as simple as opening your eyes, observing what you see, and using your common sense to come to conclusions.

However, even Feynman falls victim to faulty scientific method and reasoning from time to time, and he relates several instances when he is forced to learn a valuable lesson in what makes good science. He learns that his method naturally becomes sloppy when he moves outside of his primary field (in his case, from physics into biology). When working outside his field of primary interest, Feynman finds he does not take his work seriously, and can even go as far as to inadvertently sabotage another's work with his careless procedure.

Also, in the chapter entitled "The 7 percent solution" Feynman discovers the importance of not taking the opinions of established experts for granted, and from then on questions everything until it has been proven beyond a shadow of a doubt. In his closing word, Feynman warns the next generation of scientists not to rule out any possibilities that have not been sufficiently disproved.

Education

Unlike many (probably most) Nobel-winning research professors, Feynman takes his role as a teacher very seriously. At times it appears to be the aspect of his job that he finds most rewarding, and he states outright that he would never accept a position that did not require him to work with students. He appears to be equally concerned with the way in which teaching students helps him to sharpen his own skills as he is in his own potential service to the students in their careers (and in his quest to contribute to the scientific contributions of generations coming after him).

He has deeply held opinions about the way science and math should be taught. In "A Map of the Cat" Feynman is astounded to learn that all of the graduate students in the biology department had been required to memorize the feline anatomy. He thought this to be an incredible waste of time—to memorize something that can be looked up in a reference book within minutes if it is needed. Later, he is dismayed to learn physics students in Brazil are taught in a similar manner, emphasizing rote memorization over practical applications.

Later, in California, Feynman serves on a review board for school math and science textbooks. He is appalled by the poor quality of the materials, which are ambiguous and even incorrect in places. However, his largest complaint is that the textbooks fail to relate math and science to real world problems.

Style

Perspective

"Surely You're Joking, Mr. Feynman!" is a book with almost no plot, in which the forty chapters are each almost entirely self-contained. The only thing that is one hundred percent consistent throughout the book is its point of view—it is told in first person. The voice the reader hears is that of a single, actual person, relating his life experiences and observations. However, the book credits other contributing authors (most notably Ralph Leighton). Therefore, although the ideas, and experiences (as well as most of the words) are almost certainly Feynman's, the process of taking his words and ideas, organizing them into a coherent (if unconventional) whole, and producing them in the form of a book, was undoubtedly the fruit of several people's labors.

However many contributors may be working on this narrative, the primary purpose is to present Feynman's point of view. The book is not even about Feynman's views on anything in particular, but rather anything and everything through the eyes of Dr. Feynman.

Since Feynman is somewhat of an introverted character and, although personable, generally much more interested in ideas than in other people, the views of others rarely sneak into his narrative, except as a foil to the arguments the protagonist makes.

On occasion, Feynman relates an experience he did not personally witness, as it is related to him by an acquaintance (such as his father's encounter with the carnival mindreader). However, these instances are very rare. Nearly all of the anecdotes in this book involve Feynman relating his own personal experiences.

Tone

"Surely You're Joking, Mr. Feynman!" is extremely informal, even conversational, in tone. Most of it sounds like the words of a man telling us stories over a beer (indeed, it is very likely that large portions of this narrative actually did begin their life as the words of a man telling his friend stories over a beer).

Feynman nearly always speaks in language that is familiar and accessible. He rarely uses technical jargon, or even words that are not part of the average American adult's spoken vocabulary, and when he does, he usually gives a very simple, straightforward explanation to the word.

Throughout most of the book, Feynman remains funny, upbeat, and lighthearted—never taking himself too seriously, even when he is trying to make a point about the value of genuine curiosity, or how he feels science should be taught. Most of the incidents recorded in his book involve Dr. Feynman playing a practical joke, or setting out on an

adventure, or having something strange and bizarre happen to him. Even when there is a moral to the story, it is rarely a particularly serious story.

The only glaring exceptions to this rule are found in the book's longest chapter "Los Alamos from Below" where Feynman deals with topics such as the death of his first wife from tuberculosis, and the ramifications of the development of the atomic bomb,

Structure

"Surely You're Joking, Mr. Feynman!" is organized into forty short chapters, which are grouped into 5 "parts" roughly corresponding with the major phases of Dr. Feynman's life:

Part 1: From Far Rockaway to MIT (About his childhood and undergraduate years)

Part 2: The Princeton Years (Events during Mr.Feynman's post-graduate education)

Part 3: Feynman, the Bomb, and the Military

Part 4: From Cornell to CalTech, with a Touch of Brazil

Part 5: The World of One Physicist

Although the book consists of a series of anecdotes, rather than a traditional autobiography, they are arranged in roughly chronological order, and follow the famed physicist through his life.

However, these five sections are very loosely enforced, and he often strays away from this model. For example, although the chapter, "A Map of the Cat" gives a general overview of his many experiences with biology, and is located in the part covering "The Princeton Years," the events within it are scattered throughout his life (most of the chapter takes place during his later life—that of parts 4 and 5).

Before the first chapter, Mr. Feynman presents us with his "Vitals" (a very short summary of his life). "Vitals" reads like a short entry in an Encyclopedia, giving the date and place of his birth, family information, degrees held, career milestones, marriages and children, for example.

Quotes

"People often think I'm a faker, but I'm usually honest, in a certain way—in such a way that often nobody believes me!" p. 41.

"So I found hypnosis to be a very interesting experience. All the time your saying to yourself, 'I could do that, but I won't'—which is just another way of saying that you can't," p. 68.

"So I got a great reputation for doing integrals, only because my box of tools was different from everybody else's, and they had tried all their tools before giving the problem to me," p. 87.

"When a person has been negative to you, and then you do something like that, they're usually a hundred percent the other way, kind of to compensate," p. 20.

"I learned there that innovation is a very difficult thing in the real world," p. 29.

"That's the trouble with not being in your own field: You don't take it seriously," p. 75.

"I've very often made mistakes in my physics by thinking the theory isn't as good as it really is, thinking that there are lots of complications that are going to spoil it—an attitude that anything can happen, in spite of what you're pretty sure should happen," p. 83.

"It's a terrible thing we made," p. 136.

"But it was interesting to now that things worked much differently from how I was brought up," p. 191.

"I would never accept any position in which somebody has invented a happy situation for me in which I don't have to teach. Never," p. 166.

"I decided he wasn't an amateur photographer after all; he was just rich guy who had bought himself some cameras," p. 227.

"You see, what happened to me—what happened to the rest of us— is we started for a good reason, then you're working very hard to accomplish something, and it's a pleasure, it's excitement. And you stop thinking, you know; you just stop," p. 136.

"May I also give you one last bit of advice: Never say you'll give a talk unless you know clearly what you're gonna talk about, and more or less what you're gonna say!" p. 346.

Topics for Discussion

Discuss "curiosity." Dr. Feynman suggests much of his success stems from his curiosity rather than from inherent talent or knowledge. How does the way in which Feynman sees the world and his thirst to "figure things out" contribute to his accomplishments?

What does Feynman's narrative tell you about the way science is conducted and the way in which scientific discoveries happen?

How do the experiences of Feynman's youth contribute to his adult success?

Feynman talks a lot about secrecy surrounding the Manhattan project. He seems to think the extremely secretive environment caused the workers to be less efficient (since many people had little idea of what they were working on) and in some cases, people's lives were put in danger by their lack of information. Do you think this level of secrecy was necessary in this particular situation, or would the project have been better served if those working on it were better informed?

What are Dr. Feynman's views on education? How does he feel about his role as an educator? How does he feel physics should be taught? How does he feel about the state of science education in America? In Brazil?

On several occasions, Feynman describes himself as "one-sided." During his undergraduate years at MIT he complains about having to take courses outside of the natural sciences. Later, he chooses to leave Cornell for CalTech, largely because Caltech is a science institution, untainted by departments (such as the humanities) in which Feynman claims to have no interest. However, Feynman appears to have many interests outside of the sciences. He learns foreign languages, seems generally fascinated by foreign customs, and learns to draw and play musical instruments. Is this inconsistent with his claims that he is a one-sided person only interested in science?

What are Dr. Feynman's views on fame?